

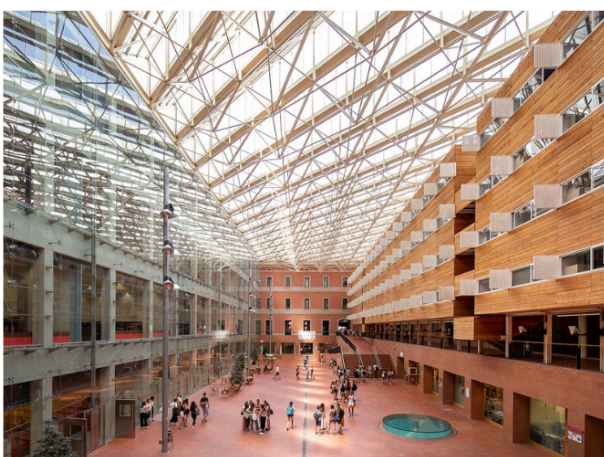
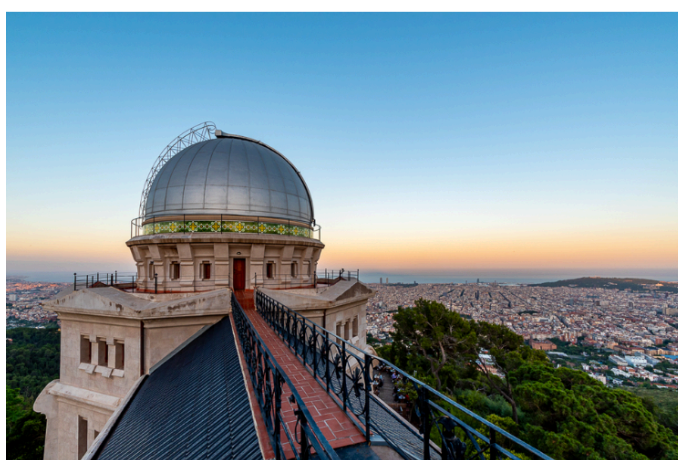


**11th Conference of the
European Society for the
History of Science**
Science, Technology, Humanity,
and the Earth

**4-7
September
2024**

ESHS BARCELONA 2024

Book of Abstracts



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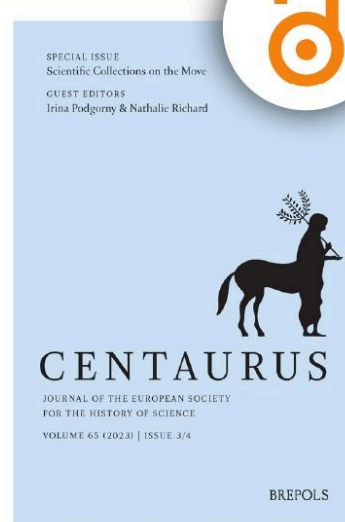
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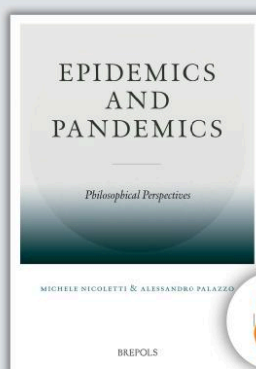
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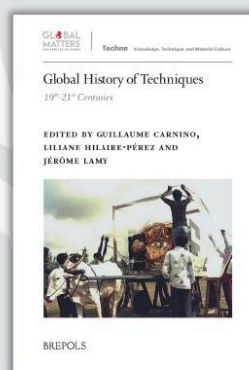
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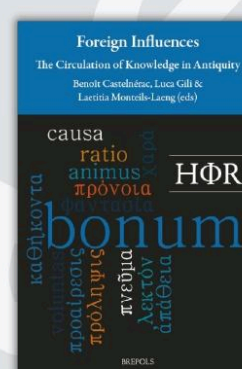
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304 p., 2024
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Abstracts and Summaries

Wednesday 4th

11:00 - 12:00

Early Career Scholars Network Meeting

Room: 40.063

Chairs: José Caetano and Sofiya Kamalova

The ESHS Early Career Network (ECN) is hosting a special event for early-career researchers in the history of science. This event aims to provide insights on research planning, scholarships, and funding opportunities, alongside networking opportunities.

The event will begin with opening remarks by Sofiya Kamalova and José Caetano from ECN-ESHS, followed by a panel discussion with experts Charlotte Abney-Salomon (Science History Institute), Eleonora Andriani (French National Centre for Scientific Research), and Sofia Varino (University of Potsdam). The panel will share their experiences and strategies for securing funding and planning research projects.

After the panel, there will be a networking session to foster connections and potential collaborations among attendees and information on future ECN initiatives.

12:00 - 13:00

Brunch sponsored by the History of Science Institute

room: 30.S Sala d'Exposicions

14:00 - 14:30**Welcome and Introduction to the ESHS Barcelona 2024 Conference**

Room: 30.S Auditori Ciutadella

Chair: Daniele Cozzoli UPF & Oliver Hochadel, CSIC/Institució Milà i Fontanals

Welcome by:

Prof. Marta Jorba Deputy Director of the UPF Department of Humanities

Prof. Cristina Pujades, Vice-rector for Research of the UPF

Àngel Messeguer i Peypoch, General Secretary of the IEC, Institut d'Estudis Catalans.

Prof. Annette Mülberger, University of Groningen, co-chair of the ESHS Barcelona 2024 Steering Committee

Prof. Dana Jalobeanu, University of Bucharest, President of the ESHS

14:30 - 17:00**Plenary Lectures****Early career lecture 1**

Room: 30.S Auditori Ciutadella

Chair: Simon Schaffer, Cambridge University

“Material cultures and indigenous knowledges in colonial networks”

Jenny Bulstrode, University College London

Abstract: Watches were among the most complex material artefacts in the 18th Century world, and 18th Century watchmaking centres are celebrated as centres of precision engineering skill and innovation in industrial engineering. This presentation is concerned not with the recognised centres of Britain, Holland and Switzerland, but with the networks of Black watchmakers in the 18th Century Caribbean, and their innovative skill in precision engineering. To engage with these Black watchmakers on their own terms, the presentation brings together oral histories and material culture with archives, newspapers, and published works. By

focusing on the practices and priorities of these precision engineers, the significance and reach of their work begins to be uncovered. Among other things, documentary evidence in the trial transcript of an 18th Century Old Bailey record has the potential to turn popular understanding of the British industrial revolution on its head. The aim of this presentation is that by the end you will see how little that outdated narrative matters, because the purposes of the Black precision engineers of the 18th Century Caribbean mean so much more.

Early career lecture 2

Room: 30.S Auditori Ciutadella

Chair: Elena Canadelli, University of Padua

“European museums and human remains. Towards an ethical scientific display”

Beatrice Falcucci, Pompeu Fabra University, Barcelona

Abstract: Tens of thousands of human remains, ranging from bones to mummies, and from fragments of hair to bodily organs, are part of today's museums and scientific collections worldwide. While some of these remains are openly exhibited, often without critical examination, others are relegated to storage facilities, used for research purposes that probe the intricacies of civilization development, human migration patterns, disease dissemination, and nutritional studies. This repository of human remnants extends beyond the purview of museums, encompassing university collections, research institutions, as well as municipal and governmental entities. Historically rooted in the positivist ethos and the physical anthropology of the Nineteenth century, skulls and bones were consigned to an ambiguous category, and were classified as halfway between “human subjects” and “material objects”. In recent years, there has been a notable surge in the significance of the topic of human remains within academic discourse, especially those obtained through colonial practices or in contexts marked by historical injustices. These remains are under intense scrutiny, often sparking demands regarding their display and, in certain instances, calls for restitution. In light of these developments, the nexus between ethics, law, and science assumes great importance in the ongoing discourse surrounding human remains. Therefore, my intervention seeks to evaluate how relevant these debates are for historians of science, and to consider whether it's

possible to display human remains ethically, taking into account the different interests and demands of those involved.

Early career lecture 3

Room:30.S Auditori Ciutadella

Chair: Gemma Cirac, Institut d'Història de la Ciència, Universitat Autònoma de Barcelona

“Shared (battle)grounds: War and ecocide at the crossroads of History of Science and Environmental History”

Santiago Gorostiza, Universitat Autònoma de Barcelona/Institut d'Història de la Ciència

Abstract: Following the Russian invasion of Ukraine, the environmental impact of warfare has made front-page news. From the bombardments around Zaporizhzhia nuclear plant to the floods following the destruction of Nova Kakhovka dam, the impact of military operations on the environment has been increasingly under scrutiny. Discussions about “ecocide”, a term first proposed in 1970 by Yale biology Professor Arthur Galston to refer to the mass damage and destruction of ecosystems in Vietnam, are back in the spotlight. From the role of experts in assessing the long-term toxicity of warfare to the mobilisation of scientists against war, both the origins and current discussions around ecocide feature plenty of relevant topics for the historians of science. Meanwhile, since the turn of the 21 st century the study of war and the environment has become a burgeoning subfield of environmental history scholarship. Edmund Russell’s *War and Nature* (2001) inspired a stream of environmental history articles, monographs and edited collections exploring the direct and indirect impact of military operations in the environment, as well as its legacies. By reviewing research on the environmental consequences of war from both environmental history and history of science perspectives, this lecture will argue that the emerging discussions about ecocide constitute an opportunity for the cross-fertilization and collaboration between these fields.

17:30 - 19:00

Sessions

1 Ancient Science

Room: 40.113.

Chair: Dario Tessicini, University of Genoa

A State Employing Astrological Information in Governance: The Assyrians

- Aydanur Kocabiçak, Samsun University

Abstract: The Assyrian Empire, which was the most powerful state of its time, believed that it did not derive its power solely from its military, but also thought it could be possible by interpreting celestial signs and terrestrial omens to foresee the future. It is understood from state archives, letters, and omen reports that the Assyrians observed and interpreted astronomical and terrestrial events. The king had his own scribes, whom he trained for this purpose. Outside the royal palace of Nineveh, a network of state-wide observation stations was established, responsible for sending reports from Arbela, Kalhu (Nimrud), and Kalizu to the capital. In cases where adverse weather conditions prevented the observation of a celestial sign in Nineveh, the probability was quite high that another team stationed elsewhere could observe important phenomena, as the weather conditions were more favorable. This way, the king could ensure that no significant omen was overlooked.

Dealing with natural disasters in ancient Greece. Science and technology at the selfless service of humanity

- Soultana Vasileiadou and Ioannis Kakogiannos, University of West Attica

Abstract: Natural disasters have marked the entire trajectory of human presence, compelling societies to co-create innovative solutions in response to these challenges. The impact of such events transcends mere economic and societal aspects, prompting collaborative efforts to mitigate their effects. Throughout history, communities residing in regions prone to natural calamities, such as the Balkan Peninsula, have engaged in co-creative processes to develop adaptive strategies.

The ancient inhabitants of the Balkans, despite facing recurrent earthquakes, droughts, floods, and wildfires, chose to remain in the region due to its fertile lands, advantageous for agriculture, fishing activities, and strategic positioning for commerce. This steadfastness reflects a collective decision-making process rooted in the acknowledgment of both risks and opportunities.

Observing the Earth and nature, Greek scholars advanced sciences such as mathematics, astronomy, and physics. This collaborative pursuit of knowledge enabled them to develop engineering solutions aimed at alleviating the complexities arising from environmental hazards. Archimedes and Ctesibius, renowned for their scientific prowess and engineering ingenuity, stand as symbols of collaborative innovation.

Inventions, such as the Archimedean screw and Ctesibius's force pump, were products of co-creation, integrating scientific principles with community needs. These tools, with their intricate engineering construction and multifunctional capabilities, were instrumental in coping with natural disasters and enhancing the quality of life for ancient communities. Their development and refinement over time signify an ongoing process of co-creation, where knowledge exchange and collective problem-solving drive progress.

In this study, we seek to delve into the necessity of co-creating tools, their purposes, varied applications, and the enduring impact they have had on the advancement of engineering and societal resilience over the centuries. By understanding the collaborative nature of innovation in addressing natural disasters, we can glean insights that resonate with contemporary challenges and inform future co-creative endeavors.

The Evolution of the Usage of Three Kinds of Days in the Indian Calendar and Their Dissemination in China

- Shuhao Li, University of Science and Technology of China (USTC)

Abstract: The traditions of time measurement are different in China and India. In the Indian traditional calendar system, there are three kinds of days: the solar day, the civil day, and the lunar day(tithi), which are the result of dividing the solar month, civil month, and synodic month into 30 parts, showing a rigorous quantitative relationship. The astronomical meanings of these three types of days are specific, and they were applied to the arrangement of intercalary months during the Vedic period. However, after being influenced by Greek astronomy, the concept of the solar day in the calendar system was gradually weakened, and the use of the concept of tithi and the related concept of the "omitted days" became more apparent, which was reflected in the literature such as Romakasiddhānta and Khaṇḍakhāḍyaka.

The contents of these concepts were initially introduced into China through Buddhism. During the development of the Chinese calendar, some of these concepts were absorbed and integrated into the calendar system, and preserved in the form of the calculation methods for the concepts of "Mori"(Mo days, 沒日) and "Mieri"(Mie days, 滅日). The dissemination and formation process of the concept of "Mieri" was not an overnight achievement, but was continuously adjusted and improved by Yixing in the Tang Dynasty. After mathematical deconstruction, the concept of "Mieri" can be connected with the concepts of "tithi" and "omitted days" in India. By studying the concepts of these three kinds of days and the history of intercalary month calculation, it is helpful for us to understand the different traditions and mutual connections between China and India in time arrangement.

2 Climate sciences framing climate change debates (1/2)

Room: 40.002.

Organiser and Chair: Carolina Granado, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

Addressing the global challenge of climate change encompasses a nexus of scientific, societal, and political dimensions. This double session seeks to delve into the multifaceted impact of diverse scientific disciplines on our comprehension, discourse, and response to this pressing issue. The first session traces a chronological trajectory, spotlighting the public dimension of climate change. Through diverse case studies, we aim to dissect how climate sciences' presentation, discussion, and legitimization in the public sphere framed public perceptions. This session further delves into how the scientific community navigates dissent, controversies, questions of authority, and power dynamics.

Fôret's study scrutinizes paradigm shifts within climate change sciences and their communication within the scientific community. Additionally, it explores how disciplinary tensions may fuel debates surrounding climate change. Naylor and Shaw's research dissects, following the case of climate change populariser Humb Lamb and his correspondence with editors during the 1970s, the crucial role of editorial staff in shaping early climate change narratives. Zariko's investigation embarks on an exploration of climate change denial discourses and shows that they often revolve around questions of temporality. He traces a link between conflicting

temporalities and epistemologies, and climate change political inaction. Finally, Saltelli's inquiry centers on the interplay of science, politics, and the media in contemporary societies. Specifically, it focuses on the influence of mathematical modeling on the post-truth debate.

Together, these studies adopt a historical lens to unravel the intricate interplay between different climate sciences, public understanding, scientific discourse, and the societal mechanisms that shape our responses to the complex challenge of climate change.

'If you could say a little about the implications in as dramatic terms as possible so much the better': Journal Editors and 1970s Climate Narratives

- Robert Naylor and Eleanor Shaw, Manchester's Centre for the History of Science, Technology and Medicine

Abstract: The role of editorial staff in shaping early climate change narratives has been underexplored and deserves more attention. During the 1970s, the epistemological underpinnings of the production of knowledge on climate change were contested between scientists who favoured computer-based atmospheric simulations and those who were more interested in investigating the long-term history of climatic changes. Although the former group later became predominant in the Intergovernmental Panel on Climate Change during the 1980s, the latter had a sizable influence over climate discourse during the 1970s. Of these, one of the key popularizers of climate discourse during the 1970s was the British climatologist Hubert Lamb (1913–1997). The correspondence between Lamb and journal editors who gatekept and curated different audiences helped craft resonant messages about climate change and its potential effects, and we explore Lamb's interactions with editors of *Nature*, *UNESCO Courier*, *The Ecologist* and *Development Forum* in the period 1973–74. Through understanding how climate change discussion was influenced by editors, we gain an insight into how such narratives had to be adjusted to fit into pre-existing discourses before their importance was more widely established, and how these adjustments helped shape conceptualisations of climate as a global, human-caused phenomenon and a source of universal threat.

The resilience turn in the Mediterranean

- José Carlos Cañizares Gaztelu, University of Seville

Abstract: This presentation explores the emergence of resilience approaches in the Mediterranean Sea, the impact these approaches had in regional environmental sciences and policies since the 1990s, and the significance these developments have for the currently understudied relations between regional and global histories of the Earth and Environmental Sciences. A powerful critical narrative has emerged recently in relation to climatology and other Earth and environmental sciences. In an influential paper Hulme (2011) criticized the “globalizing instincts” of climatologists, the place-insensitive character of climate assessments, and their technocratic leanings. There and elsewhere, the scheme of science-policy relations followed by the IPCC is similarly cast as technocratic and ineffective. Similar criticisms have emerged in relation to the Earth System Sciences (Lovbrand et al. 2015) or to specific tools coming from those sciences, such as planetary boundaries or Anthropocene (Lam & Rousselot 2024). These critics share an aspiration to geographically differentiated knowledge and a better integration between natural and social sciences, especially in informing management and policy. They also rely, more or less explicitly, in a Foucauldian perspective (i.e. governmentality) whereby certain problems identified in relation to global governance are tied to specific epistemes, or ways of knowing and producing knowledge. As I will show, scientific and management efforts in the Mediterranean Sea in the last 70 years or so offers material for engaging critically with these discourses. I proceed thus. I begin by describing a perspective that dominated among scientists and policy-makers until the 1990s: namely, that the Mediterranean was essentially stable and manageable. The next two sections outline how this perspective changed in the 1990s, leading to shifts in conservation efforts in the 2000s. Next, after reviewing recent developments in relation to the climate crisis, I use the insights gained in the Mediterranean to engage in open discussion with the critical narratives discussed above.

Antagonizing the Anthropocene: Climate Science and the competing epistemologies of the American Right

- Iason Zarikos, National and Kapodistrian University of Athens

Abstract: It is common knowledge that the American Right has been the most vociferous host of climate denialism. Nevertheless, historians need to disentangle their gaze from the rejection of climate science alone. This is not only because denialism is in retreat, but also because the American Right's stand against coordinated climate action was always multifaceted and thus not dependent exclusively on the rejection of anthropogenic climate change itself. The neoliberal argument was structured around a set of temporalities contesting not climate science per se but the social relevance of the deadlines suggested by natural scientists and the IPCC. In defense of their call for "policy nihilism" a plethora of statistics and theories such as the Environmental Kuznets Curve, the temporalities of growth and the climate economics of the Nobelist William Nordhaus, while also invoking the failure of previous "Green" predictions like Paul Ehrlich's population concerns and the Limits to Growth's resource depletion warnings. These theories pointed to an altogether different future from the one projected by climate scientists: a future where societies can easily adapt to the climatic destabilization due to their increased wealth and technological advancement. This paper argues that the intellectual trajectory of neoliberal temporalities must ultimately be traced back to the 1970's and the long legacy of the Limits Debate and will demonstrate it by examining the publications of National Review and Reason, arguably the most important reviews of the American Right, along with material from the Economist and other sources.

3 Cross-cultural Circulations of Shipboard Medicine and Experimental Knowledge in the Early Modern Transpacific World

Room: 40.105.

Organiser: Wim de Winter, KU Leuven

Chair: Mariana Estela Sánchez Daza, KU Leuven

During the early modern period, European voyages to the Americas, Asia, and to the archipelagos of the Philippines and the Mariana islands posed new challenges for health and shipboard nutrition during navigation. To address these challenges, sailors and maritime agents looked for solutions in developing sciences as well as in

their surrounding environments. With an experimental mindset, they sought for cures in an often understudied world, either by experimentally approaching the natural environment, through interactions with island cultures, or by known technologies. The resulting body of knowledge often consisted of surprising and unforeseen finds driven by the relentless search for provisions or medical cures in the Transpacific oceanic environment. Using sources other than printed scholarly works, such as lists of items taken on board ships, mission reports, or shipboard correspondence, each panel participant opens up a broader perspective on the dissemination of knowledge. Within this history of constantly developing experimental knowledge, the panel specifically looks into the medicinal history of Transpacific interactions. It highlights the efforts pursued by the Spanish King to provide medicines in the Philippines, which were transported by the Manila galleon route and whose success depended on New Spain's authorities. It shows how late 18th-century sailors and shipboard surgeons held great attention for 'native' endemic herbal medicine in China, the Philippines, Peru and Mexico, as they shipped seeds and samples across the Pacific. They discussed these in shipboard letters in a lively discourse contributing to the development of a maritime ethnobotanical science for practical use in the maritime environment, along with developing technologies such as distillation and the production of new medicinal remedies. Addressing elements sheds light on the history of medicine in marginal or still often overlooked places for knowledge building such as ships, but also on navigational practices and techniques in the Spanish colonial context.

The Transpacific Circulation of Native Asian Botanicals and Medicinals in 18th-century Spanish Shipboard Letters: a case of Experimental Ethnobotany

- Wim de Winter, KU Leuven

Abstract: The recent discovery of shipboard documents captured from Spanish ships taken by British privateers yields the considerable correspondence of the 1779 ship *La Perla*, making its way from Lima to Cadíz. This correspondence contains the letters and belongings of ship's doctor Pedro de Vicuña y Oranegui, revealing new insights in ship surgeons' interactions with Asian herbal remedies. Comparative research with similar correspondence, such as that of the 1742 Manila galleon'

Covadonga', shows that such remedies were both transported and discussed across the seas, as both samples and letters were sent to relatives and pharmacists from China and the Philippines to Mexico, Peru, and Europe. The written discussions allow us to learn about the remedies' practical applications. To their writers, Asian herbal medicine and procedures were used as experimental yet effective remedies to ailments in circumstances when the limits of then-known Western medicine failed them. Missionaries and sailors both acknowledged that Asian medicine operated by "very different principles than those of Europe", yet they were not averse to trying them when needed. The letters also show how that this transpacific engagement with forms of 'native' herbal medicine was bi-directional: native Mexican or Peruvian medicine was exported to the Philippines while Asian medicine was exported to the Americas and Europe as remedies for gastric illnesses, fever, genital conditions, or fertility issues. All were discussed in a private discourse within shipboard letters revealing unseen transmission histories, which also leads us to reflect on the transmission and survival of ethnobotanical remedies today.

Circulation of naturalist knowledge in the early modern Hispanic territories in the Pacific Ocean

- Mariana Estela Sánchez Daza, KU Leuven

Abstract: Natural History is a discipline that became autonomous from Natural Philosophy during the 16th century. Natural History developed its own methods of working and collecting information and specimens, as well as a community of scholars able to share knowledge and evaluate each other's work. In the Hispanic territories on the American continent, naturalists' work was essential not only for exploring the new lands but also for the colonial enterprise. This was also the case for the Pacific Archipelagoes. The Philippines and the Mariana Islands were relatively isolated from other natural environments, yet after the arrival of the Hispanic conquerors and missionaries they entered in a system of exchanges of medicinal substances and of food, drinks and techniques of their production. In this presentation I will present some products and technologies that travelled from New Spain to Philippines and Marianas in the Manila Galleon, in order to sustain the travelers during the crossing of the Pacific and also to nourish the missionaries, soldiers and the inhabitants of colonial territories. The paper will have a particular

focus on distillation technics for the production of medical remedies, alcohol and fresh water.

Manila's Medicine Monopoly Contract. Medicinal Provision and circulation of Medicines in the Philippines

- Juan Carlos González Balderas, KU Leuven

Abstract: This paper studies the medicine monopoly contract in Manila, established in 1717. By analysing its new medicinal arrangement, the present research sheds light on the knowledge exchange and the political, economic, and social spread of medicine and medicinal plants in early modern history. Broadly speaking, this medical agreement signified a new stage in the delivery of remedies in the Philippines, reshaping a longstanding deal and confirming a development of a medicinal experimentation stage in these islands by early eighteenth century.

4 Displaying Science and Envisioning Futures in Political Turmoil, 1973-1991 (1/2)

Room: 40.004.

Organiser and chair: Jaume Valentines and Ned Sommerville, Universitat Autònoma, Institut d'Història de la Ciència.

Making politics and displaying science go hand in hand. Facing politics and contesting displays of science come together as well. This session will focus on spaces, objects and narratives of science and technology that have been displayed in times of political turmoil, social change and revolutionary dreams. How could a diorama of the nuclear icebreaker 'Lenin', a family car in an advertisement or the notion of 'working-class heritage' shape political arenas? Which artifacts were kept frozen in museum rooms and which ones were hidden away in dark warehouses? Which readings of old exhibitions produced new ideas about nation, citizenship and democracy? How did they clash with grassroots proposals on display?

This panel aims to problematize these questions. It will pay particular attention to the period from the 1973 oil crisis to the fall of the USSR, a period which witnessed multiple scenarios of social unrest and political struggles across Europe. The fall of the dictatorship in Portugal, class struggles in Spain, the rise of communism in Italy, its decline in Bulgaria, ethnic disputes in Kazakhstan, feminist movements in

Germany, among others, opened the door to subvert sociotechnical imaginaries at local, national and transnational scales: in these contexts, exhibitions of science became cultural battlegrounds in the struggle for the future. This panel will discuss some of these exhibitionary battlegrounds in which demands for political transition were intertwined with transitions in other domains (energy, epistemic, environmental...). These cases will highlight top-down representations and hegemonic discourses (or those that would become hegemonic) as well as social responses to them, bottom-up displays and non-elite managed heritage.

Making “Scientific Culture”: The Exhibition Catalonia, the Factory of Spain (1985) as a Civic Laborator

- Jaume Sastre, Universitat Autònoma, Institut d’Història de la Ciència

In May 1985, the exhibition “Catalonia, the Factory of Spain” was inaugurated in the old central municipal market in Barcelona (El Born). Curated by the economic historians Jordi Nadal and Jordi Maluquer de Motes, and organized by the City Council, it was one of the first big-scale exhibitions that would characterize the cultural policies in Barcelona around the 1992 Olympic Games, as well as a key moment in the construction of “industrial heritage” in Catalonia. Drawing from Tony Bennett’s analysis of the situated and material practices of the making culture, this paper analyzes the exhibition Catalonia, the Factory of Spain as a “civic laboratory” in which a specific constellation of objects, discourses and spaces aimed at producing both epistemological and political effects, thus becoming a tool for governance in the period of consolidation of the institutions of the new parliamentary monarchy after the end of the military dictatorship.

Story-Things, Cultural Politics, and the Museum that Never Was: The Case of the Vapor Vell de Sants (1975-1998)

- Ned Sommerville, Universitat Autònoma, Institut d’Història de la Ciència

Abstract: Did the transition to democracy in Spain open the door to the democratic management of heritage? In this presentation, the concept of heritage as a ‘story-thing’ is developed and used as a framework for reconstructing a history of the industrial heritage movement in Catalonia. Following the case of the Vapor Vell of Sants, one of Catalonia’s oldest steam-powered factories, we trace its transformation

into a monument to the industrial neighborhood of Sants (part 1), into industrial heritage (part 2), and into a symbol of the Catalan labor movement (part 3), paying special attention to the stories, things, and constituencies involved. Finally, we consider the reasons why a proposal to turn the factory into a ‘museum of the town of Sants and of the Catalan working class’ never came to be and draw conclusions regarding the cultural politics of the transition to democracy.

5 Doing science in hybrid places: scientific infrastructures in extreme environments, 1930s-1980s

Room: 40.006.

Organisers: Katja Doose, University of Freiburg; Dania Achermann, University of St. Gallen; Peder Roberts, University of Stavanger

Chair: Vladimir Jankovic, University of Manchester, Centre for the History of Science, Technology and Medicine

This panel traces the ways scientific infrastructures in extreme environments have shaped our understandings of the Earth, with a particular focus on the Arctic and the Pamir. As we study the historical developments of these infrastructures, ranging from research stations to transport networks, as well as the lives of the people running them, we aim to illuminate the vital role they have played in advancing or hindering scientific knowledge production on these regions and their landscapes. The establishment of research stations and the intricate web of transport networks in these extreme environments are not mere logistical necessities; they are integral components of scientific exploration that influence the very nature of research conducted in these regions. They shaped the scope of research and influenced the methodologies employed. The lives of the scientists dedicated to maintaining and operating these infrastructures are equally crucial, as they navigate the challenges of isolation, harsh climates, and the unique demands of sustaining a scientific presence in remote locales. Studying science infrastructures in these extreme environments enables us to better understand the various impacts on field sciences, as these infrastructures are not only built into the environment but serve as a field themselves. The panel will explore how these infrastructures act as living laboratories, providing unique opportunities and challenges for scientific inquiry.

From monitoring climate change to studying biodiversity, these infrastructures have become integral to unraveling the ecological systems of the Arctic and the Pamir.

Gorbunov Meteorological Station: Science and Colonization in the Pamir, 1932-1958

- Katja Doose, University of Freiburg

Abstract: This conference paper analyses the diverse roles of the Gorbunov Meteorological Station on Glacier Fedchenko in Tajikistan, constructed in 1932 within the framework of the Second Polar Year. The station's establishment served dual purposes: to enhance climate and meteorological data collection in the arid region, crucial for understanding run-off dynamics essential for Central Asian agriculture, particularly cotton production. Simultaneously, the construction of the station formed part of a broader Soviet effort to assert ownership over one of the world's largest glaciers and the region - also called the Third Pole, in general, showcasing technological prowess and achieving another superlative by erecting the highest high-altitude meteorological station globally. The paper investigates the interplay between official Soviet narratives promoting territorial claims and the experiences of scientists engaged in building the station, overwintering in it while enduring extreme conditions for scientific exploration. It explores how the station functioned as both a scientific hub and a symbol of Soviet achievements in glaciation research and high-altitude meteorology. By analysing the intersection of colonizing narratives and scientific endeavours, the study unveils the tensions, connections, and divergences between official agendas and the lived experiences of those involved. Through an analysis of archival materials, scientific reports, and personal accounts, this paper contributes to a nuanced understanding of the Gorbunov Station as a site where scientific exploration of the Earth and geopolitical ambitions converged. Finally, the Station serves as a microcosm, offering a lens through which to examine broader shifts in scientific methodologies and technological advancements during the mid-20th century.

The delicate art of matching infrastructure to research in Cold War US Arctic oceanography

- Peder Roberts, University of Stavanger

Abstract: This paper examines the role of infrastructure in shaping and constraining scientific research, focusing on the US Office of Naval Research (ONR) and Arctic oceanography in the 1950s and 1960s. The ONR's support of the Arctic Research Laboratory (ARL) at Point Barrow, Alaska, aimed to attract researchers studying diverse topics, from aircraft capabilities on sea ice to regional animal and plant distributions. Additionally, the ONR established research stations on floating ice islands, proving valuable to oceanographers exploring the deep Arctic basin and aligning with naval interests in potential conflict theaters. However, the existence of ARL and ice islands directed funding primarily to projects feasible within these infrastructures, especially those on politically significant ice islands conducting classified submarine-related research. This privileging of projects on ice islands over those requiring terrestrial facilities raised concerns about the infrastructure's influence on scientific priorities. As insufficient interest emerged among Arctic oceanographers for ice island projects, questions arose about infrastructure-driven research priorities superseding scientists' pursuit of meaningful and diverse inquiries. The paper concludes with reflections on the concept of inertia, highlighting its relevance in analyzing cases like this. The inertia of both research programs and infrastructure posed challenges when aligning with military priorities shifted or when the obtainable environmental knowledge from ice islands changed with their location shifts. Understanding the intricate relationship between infrastructure and scientific agendas is crucial for navigating potential conflicts between research goals and the imperatives of the infrastructure itself.

From field to lab to lab in the field: On the role of infrastructure in the interdisciplinaryisation process of 20-century earth sciences

- Dania Achermann, University of St. Gallen

Abstract: During the 20th century, and especially after WWII, the study of the natural environment underwent fundamental changes, not only in size and scope, but also in regards to infrastructure and form of cooperation. In the interwar period, “laboratories in the field” as a new concept challenged traditional dichotomies between lab and field research. In the post-war period, military and economic interests, amongst others, let funding flow and facilities grow in even the most extreme environments. At the same time, the study of the earth became more and

more interdisciplinary, accompanied by the emerging idea of the earth as an interconnected entity. What was the role of infrastructure in this process of “interdisciplinarisation” of the earth sciences? In my presentation I will analyse this question drawing on the case of glaciology and climate science. Studying university and field infrastructure and technology in Europe and the Arctic, I aim to understand how it influenced not only interdisciplinary cooperation but also research questions and practice beyond disciplinary boundaries.

6 Knowledge and Technique in the French and Spanish gas industry until the Great War (ca. 1850-1918): study of technical journals

Room: 40.008.

Organiser: Francesc X. Barca Salom Universidad Polit cnica de Catalunya & Antonio J. Pinto Tortosa, University of Malaga

Chair: Antonio J. Pinto Tortosa, University of Malaga

Gas production for industrial purposes originated in Great Britain in 1792, thanks to the initiative of William Murdoch. Its first uses were linked to lighting, private and public. In 1799, Philippe Lebon followed his example in France; Albrecht Winzer, who changed his name for Frederick Winsor, led the qualitative and quantitative transformation of the sector in British territories: first, he built bigger factories to reach the broader public; second, in 1812 he founded the Gas Light and Coke Co., first European gas company to carry out supply at national level. From Great Britain, gas spread to France; thence, it reached central, western, and Latin Europe.

The 1850s marked a turning point in the history of European gas industry: gas lighting had become a common feature of most relevant cities. Engineers, inventors, and entrepreneurs started to think of ways to improve the service, looking for alternative ways to produce that energy source. In the 1870s, the improvement in living condition of urban masses made it possible for the slow consolidation of consumer society, fully developed at the turn of the 20th century. Moreover, the rise of electricity threatened the gas market. Therefore, technical societies and technical press developed, in order to share knowledge, and to protect the interest of “the gas people”.

In this session, we present three works. Firstly, Francesc X. Barca Salom studies the attempts to produce gas from water by mid-19th century. Secondly, Mercedes

Fernández-Paradas, José J. Luque, and Antonio J. Pinto describe the role of the gas technical press since the end of the 19th century until the Great War, focusing on the French *Journal des usines à gaz*. To conclude, José J. Luque and Antonio J. Pinto study the role of the technical journals in the gas sector during the conflict (1914-1918).

Gas water, between its role as an alternative and disappointment: the debate in specialised journals

- Francesc X. Barca Salom Universidad Politècnica de Catalunya

Abstract: By mid-19th century, gas lighting had reached a good level of implementation in some European countries. In France, lighting based on coal distillation had been implemented in many towns, defeating other alternatives, such as wood, gas, or resin gas. However, some drawbacks remained in the gas production process that led inventors to make advances in obtaining hydrogen gas from water. The procedure was not unknown, but it had not undergone the laboratory phase, yet. Transition to the industrial phase occurred in the 1850s, thanks to the work of French inventors, who later applied hydrogen gas from water in some factories in that country. In this paper, I study the advances and resistances to the development of water gas in France during those years. In addition, we delve into the repercussions that these new techniques had in Spain, either in industrial uses, or in others.

European specialized gas journals: *Journal des usines à gaz* (1877-1918)

- Mercedes Fernández-Paradas, José J. Luque-García, Antonio J. Pinto Tortosa
University of Malaga

Abstract: In 1877, the founders and members of the *Société Technique de l'industrie du gaz* (1874), first technical society linked to the European gas industry, created the *Journal des usines à gaz* in Paris. The context was relevant, as the last quarter of the 19th century saw the birth of consumer society in most western countries: salaries increased; social groups that had until then struggled to survive could now buy some goods and commodities linked to a better living standard; and companies adapted to new circumstances, generating scale economies, and diversifying their production, in

order to reach a broader public. Technical societies like the Société reflected the new industrial spirit, conditioned by the need to share knowledge within a peculiar industrial sector, and to protect the interest of its people. In this sense, the role of the technical press in general, and to gas technical press in particular, was essential: it was the tool to communicate the development and achievements of this industrial sector. In the case of the Journal des usines à gaz, they created the Société du Journal des usines à gaz to manage it. In this presentation, we study the name, career, and social background of the managers of the Société Technique, the Journal des usines à gaz, and the Société du Journal, who were often the same people, until the end of the First World War. Thus, we will define the socioeconomic profile of French gas industry.

Ink and trench: the technical gas press during the First World War

- José J. Luque-García & Antonio J. Pinto Tortosa, University of Malaga

Abstract: The gas industry was one of the economic sectors in which the First World War had a dramatic impact. Three were the main causes: business disorganisation, due to the mobilization of workers to the front; damage caused to production infrastructures; and the difficulties that coal supply, essential in gas production, found, put this energetic sector in serious trouble. Since mid-19th century, gas journals acted as tools for the communication and defence of gas interests. The turbulent events that started in the summer of 1914 were not ignored by these publications, which in fact became involved in the conflict. Thus, gas journals are both an indispensable source in the study of the gas industry during the Great War, and an important object of study in their own right. Here we will analyse the role of gas journals in France, the United Kingdom and the United States, in the context of the war, as a means of scientific, technical and business communication, as well as a way of defending the interests of the sector.

7 Landscapes and Bodies: Ecological Practices, Imagination, and Knowledge

Room: 40.010.

Organiser: Tina Asmussen, Ruhr University, Bochum & Pietro D. Omodeo, Ca' Foscari University of Venice

Chair: Monica Azzolini, University of Bologna

Diverse cultures across time have engaged with landscapes and bodies, often looking at landscapes as bodies. Contemporary ecological debates call for novel reflections on the entanglement between humans and the material and cultural spaces they inhabit and transform. In this session, we address historical cases of environmental interactions, mediated by representation as well as economic, ecological and technological practices – e.g., ideas of natural elements as organic entities, of human bodies as cosmological bodies, waterscapes engineering as analogous to medical treatment, resources extraction as a metabolic process, etc.

In the context of the early modern history of science and medicine, the exploration of landscape-body relationships has predominantly centered on micro-macrocosm relations. However, this perspective has often neglected the complex stratigraphy of interconnected layers between the human body and the cosmos, in particular the environmental component, which was key for the comprehension of human agency. These and other historical cases help us reassess the history of human interactions with landscapes as an inner relation instead of mere manipulation of a passive nature.

This session contributes to ongoing geo-anthropological and Anthropocene debates by drawing on the history of science in order to challenge dematerialized conceptions of human environmental action. It delves into the intricate interdependencies that extend beyond paradigms of human isolationism (the insulation of action from its settings). Focusing on case studies from early modern mining, water management, and fishing in Europe, to 20th geological practices, our exploration aims to redefine the relationship between body and landscape. Rather than viewing landscapes as passive entities, we propose to examine them as dynamic and variably constituted 'processes', necessitating a comprehensive consideration of the interdependencies of landscapes and bodies together.

Resource Landscapes in Cosmic Ecologies: Resource Extraction and Astrological Calendars in Early Modern Germany

- Tina Asmussen, Ruhr University, Bochum

Abstract: Resource Landscapes in Cosmic Ecologies: Resource Extraction and Astrological Calendars in Early Modern Germany This paper examines the profound

landscape transformations caused by resource extraction in German mining regions since the sixteenth century through the prism of printed astrological pamphlets. Mining calendars and other astrological ephemera contained general information about specific calendric dates, religious holidays as well as moon phases, eclipses, weather forecasts or the apt time for bloodletting, sowing and planting. Further they inform about the composition of the mining administration and market dates. Some of these prints, especially the *practica* or *prognostica* contain detailed information about the right time to extract specific metals or about health risks such as toxic vapors. The interrelationships between astrological constellations, landscapes and human bodies shed light on the chains of dependence and reciprocities within human-environment relations. In this paper I will examine the complex entanglements between practices of resource extraction, bodies and environments. Whereas former studies on natural resources concentrated on the aspect of appropriating mineral resources, I will emphasize the practices of apprehension that refers to human capacities to perceive and make sense of minerals and metals including their effects on health and the environment. This also includes the spiritual, emotional and moral connotations associated with these materials.

Riverine and Lagoonal Bodies in Early Modern Venice: Ecological Practices, Imagination, and Hydrology

- Pietro D. Omodeo, Ca' Foscari University of Venice

Abstract: Riverine and Lagoonal Bodies in Early Modern Venice: Ecological Practices, Imagination, and Hydrology Early-modern projects of river reengineering, land reclamation and irrigation deeply transformed the Venetian landscapes, its lagoon and the costal lines. Political authorities embraced these initiatives and realized them with the support of their expert practitioners (engineers, water experts, mathematicians), in a phase of transition for Venice from a fundamentally maritime and mercantile Mediterranean republic to one that was more deeply rooted in its mainland territories and agricultural interests. A process of co-creation of the natural-cultural waterscapes, which is still inscribed in the territory, took place through a complex interplay of ecological practices, mediated by forms of imagination, scientific abstractions and technology. In this communication, I explore images of the waterscapes (lagoon and river bodies) that emerged from water uses

(e.g., fishing, traveling, energy production for proto-industrial practices, fields irrigation...) and from technological and scientific practices (including surveying, mapping, measuring in disciplinary areas such as hydrology, ichthyology, mechanics, and cosmology). I here focus on vitalistic conceptions about the interconnectedness of water bodies, humankind, and the cosmos, as these were widespread among different social groups ranging from practitioners, officers, learned people, and the popular classes. I mainly base my presentation of the ecological culture of hydrology in early modern Venice on archival documents relative to water management (*Savi alle acque*). They comprise technical reports and drawings, scientific advices, and interviews with labouring people (such as fishermen and paysans).

Transforming the Dinarides: Habsburg “Cultivation” Projects, (Inter)nationalism, and the Emergence of Karst Research, 1860–1890

- Johannes Mattes, University of Oslo

Abstract: Transforming the Dinarides: Habsburg “Cultivation” Projects, (Inter)nationalism, and the Emergence of Karst Research, 1860–1890 This paper examines large-scale afforestation and cultivation projects undertaken at the end of the nineteenth century in partnership between the Habsburg imperial administration, scientific institutions, and forestry authorities in the Dinaric Karst, a barren rocky landscape stretching along the Adriatic coast from Slovenia to the Ionian Islands. It offers novel insights into the interplay of geoscientific research, power-political and “civilizational” claims on the Balkans, and the introduction and internationalization of the term “karst”, originally the name of a limestone plateau east of Trieste, as a universal model for comparing phenomena in soluble rocks. These reforestation projects were preceded by early ecological studies on vegetation, climate, and hydrology by the naturalist and ministry official Joseph Lorenz von Liburnau (1825-1911), who described the Dinaric Karst as an environment threatened by (historical) overexploitation and water scarcity. Behind the resulting cross-regional efforts to transform entire karst landscapes from their “neglected state” to a “more humane” one were not only economic considerations, but also stereotypical images of the Balkans as the “European Orient”, embodying Habsburg policymakers’ idea of the Monarchy as a “cultural state” and its civilizing mission towards the “East”. My paper argues for a critical reassessment of this nexus of

bodies and landscape in the Dinaric Karst and the emergence of karst knowledge, paying more attention to geopolitics and public engagement in research.

8 Making “the Present” Present: Managing Time in Modern Earth Sciences

Room: 40.012.

Organiser and Chair: Lachlan Summers, Max Planck Institute for the History of Science

To study the Earth is often understood as being synonymous with studying time. For James Hutton, who developed the concept that would later become known as deep time, “the mind seemed to grow giddy by looking so far back into the abyss” of earthly history. For the scientists that followed, time has been a subject of inquiry, a method, and a variable, taking different shapes according to unique scientific contexts, practices, and conceptual apparatuses. Time has, to put it crudely, been a problem for Earth scientists. Using case studies from the history of geology, seismology, and geophysics, we explore how epistemic time work integrated different timescales, reformulated the historicity of the present, and transformed the time of the present from a variable to be managed to a tool to be used. Observing meetings, laboratories, and field registries, and examining the diplomacy, experimentation, and daily practice that take place there, this panel explores the emergence of epistemic frameworks—namely, synchronization, extrapolation, and abstraction—that rendered time smooth, consistent, and unproblematic. These practices, epistemics, and technologies permitted time to be imagined as a force domesticated, as somehow at once beyond humans and completely manageable by them. By foregrounding the practical timework involved in sustaining the present as a stable temporal category, this panel illustrates the contingency of contemporary presentism and points toward how we might imagine a giddier present.

It’s Always Now in the International Geophysical Year: The Scientific Production of the Planetary Synchronicity During the Cold War

- Gloria Maritza Gómez Revuelta, El Colegio de México/Universidad de Guadalajara

Abstract: In the early years of the Cold War, sixty-seven countries joined in a global effort to study thirteen Earth and space sciences during the International Geophysical Year (IGY, 1957-1958). Driven by the tensions of a geopolitically-fractured world, the IGY sparked a new type of expertise: scientists as diplomats, whose efforts were driven both by the promise of cutting-edge scientific knowledge and the hope for conciliatory international relations. For a year and a half, national teams of scientists and technicians undertook worldwide observations of the Earth, its interactions with the Sun, and its surrounding interplanetary space. These practices took place according to IGY-specific temporal intervals—Regular World Days, World Meteorological Intervals, and Special World Intervals—operating under the assumption that inferences about planetary processes required the production of simultaneity. Via coordination, comparison, and synthesis, scientists could understand discrete geophysical events around the world as unified, and the globe as singular. By examining programs, instruction manuals, and report sheets, this paper suggests that the IGY’s emphasis upon simultaneity reframed “the planetary” from a spatial question to a temporal one.

Deep Time Labscapes: Natural Analogue Studies and the International Atomic Energy Agency, 1950-1990

- Leander Diener, Max Planck Institute for the History of Science

Abstract: This paper examines the experimentalization of geological time at the International Atomic Energy Agency (IAEA) in Vienna. Starting in the 1950s, the IAEA tried to solve the major problem of nuclear power: radioactive waste. Long-term storage of radioactive waste soon became an issue for two reasons. Firstly, new regulations in the 1970s required the waste situation to be clarified before new nuclear power plant licenses were awarded. Secondly, scientists and politicians reconsidered and regulated the handling of waste (e.g. Basel Convention). As radioactive waste involves geological time periods, scientists tried to predict future processes providing a "reliable extrapolation of experimental data with short time periods" to meet political and industrial regulations. So-called “natural analogue studies” offered an "opportunity [...] to examine processes occurring over geological timescales, hence allowing more confident extrapolation of short timescales

experimental data" (NAGRA report, 1984). Examining the historical epistemology of natural analogue studies reveals how scientific experiments in nuclear deep time science combined laboratory and field studies as sociotechnical hybrids transgressing the lab-field border (Robert Kohler) in order to extrapolate the experimental present beyond the temporal limitations of scientific and political work. Deep time labscales therefore proffered the idea of a manageable future and backed presentist ideologies of the twenty-first century.

Keeping Time With the Earth in 20th Century Mexico

- Lachlan Summers, Max Planck Institute for the History of Science

Abstract: Where most stories about the emergence of the international order of Greenwich Mean Time emphasize capital, in nineteenth-century Mexico, the nation's business owners feared that entering global time would increase the US' power over Mexican markets. Scientists, however, particularly seismologists, required a universal standard of time in order to triangulate the tremors of their territory with those around the world. At the turn of the 20th Century, Mexican seismologists were as involved in international efforts to institutionalise a universalised abstract time—such as the Greenwich Meridian Conference of 1884—as they were in the documentation and measurement of earthquakes. In these meetings, seismologists positioned Mexico within international time, then in their practical work, they brought this abstract time to Mexican territory. Mexico's participation in universal time arose, at least to some extent, from these efforts to keep time with the Earth. This required specific technologies like the telegraph—for calling the capital from distant registries to obtain the nation's time—but also seismographs that would maintain a 24-hour day that was not subject to "local time drift." By examining the practices and technologies Mexican seismologists used to ensure the accuracy of the time against which they plotted earthly movements, this paper illustrates how everyday scientific work turned universal time into a tool for domesticating the deep time of the Earth.

9 Opportunities and Challenges: Questions on the Application of Digital Humanities in the History of Science (1/2)

Room: 40.063

Organiser and Chair: Rana Brentjes, Max Planck Institute for the History of Science & Jade Norindr, Observatoire de Paris-PSL

Chair: Rana Brentjes, Max Planck Institute for the History of Science

The two proposed symposia bring together actors collaborating in digital humanities projects within the context of the history of science with the aim of improving the collective awareness of essential aspects of current research practices.

Symposium 1 - This symposium will introduce three digital humanities projects in the history of science from the perspective of different kinds of actors, including digital engineers, historians, archivists, or curators, and with different research agendas. It focuses on conceptual and technical problems with the aim of discussing different types of skills and contributions brought to such projects by these actors.

The three proposed talks will present experiences in DH projects in the history of science in Russia, China, and France. Thematically they address, first issues arising from three DH projects in the history of science in Russia, second a network analysis project from China focusing on multilingual contexts, and third, the needed technical tool for AI computer vision algorithms developed currently in France.

Through these three talks, this symposium intends to reflect on the opportunities and limitations of digital humanities applied to the history of science, to share best practices, and identify common challenges and structural issues that need to be collectively tackled on a larger scale and with shared strategies.

Words and Objects: History of Science in Terms and Images

- Kira I. Kovalenko & Valeria B. Kolosova, Russian Academy of Sciences and European University at St. Petersburg

Abstract: In the presentation, an overview of contemporary Russian digital humanities projects, connected with the history of science, will be given. Three online projects will be described in more details: 1. State Catalogue of the Museum Fund of Russia (<https://goskatalog.ru/portal/>) is an online catalogue aimed to describe all museum objects in Russia. It was created by the Ministry of Culture of the Russian Federation. Now the database includes 41,587,872 images of museum objects provided by 3,555 museums. The users may find a lot of materials about history of science. 2. PhytoLex (<https://phytolex.eusp.org>) is a database containing information about plants and their uses from the 11th up to the 18th cc. It includes data about

historical and modern plant names and plant part names (in Russian and Latin), types of use, ethnical and social identity of the actors, places of growth or trade, scanned copies of the 18th c. herbarium species. Now it has 41,3222 records. 3. Bibliolex (<https://bibliolex.iling.spb.ru>) is a linguistic database describing the history of Russian words and phrases (5,429 units). At the moment, history of terms used in mathematics, physics, chemistry, geography, geology, astronomy, zoology, medicine, botany, and computer science is available. All three projects can be quite useful for science historians. At the same time, they are very different at their size, number of participants and type of funding. That results in advantages and disadvantages these and similar projects usually have.

The Many Names of Creatures: A Network Analysis of the Vocabulary for Animals, Plants and Minerals in Glossaries and Dictionaries across Medieval Eurasia

- Che Jiang, Department of the History of Science, Tsinghua University

Abstract: The flourishing of bilingual or multilingual glossaries and dictionaries is a significant cultural phenomenon in Medieval Eurasia. These highly dynamic texts act as important vehicles for transmitting knowledge across geographical, cultural, and epistemic boundaries. In these sources, the names of many animals, plants and minerals were recorded for purposes of translation or instruction. A network analysis of these names will map the structure of the flows of natural knowledge across different written cultures in Medieval Eurasia. In this picture, many categories of various folk taxonomies are explicitly presented and integrated through the practice of multilingualism; moreover, the discontinuity in the transmission of knowledge about natural objects is recognizable. I also intend to argue that the role of several bridge languages in the spectrum of pre-modern natural histories needs to be re-estimated. This work-in-progress captures the absence of a common solution to encoding and displaying the characters of medieval languages of Central Eurasia, which could be analogized to the MUI project for European digital medievalists. For digital humanities scholars attempting to work within the historiographical framework of the “Global Middle Ages,” a multilingualist infrastructure in digital humanities is both a challenge and a possible goal for future collaborative work.

Building a computer vision pipeline for historical sources: the EIDA project and the automation of astral diagram edition

- Jade Norindr, Observatoire de Paris

Abstract: By creating digital humanities tools for researchers in history of science, the EIDA project – started in February 2023 – incorporates artificial intelligence into the study and analysis of a corpus of manuscripts of Ptolemaic tradition and early prints of mathematical astronomy. With the help of computer vision algorithms to accelerate specific steps (such as visual elements extraction, clustering, and vectorization) of the processing of the sources, EIDA opens new perspectives for the study of astral diagrams. The information system created for the project, based on a data model enabling the detailed description of the sources, will provide a diversity of tools dedicated to the exploration, analysis, and edition of diagrams in historical sources. This presentation synthesizes how computer vision algorithms can be integrated to the work of historians and automate multiple steps of the processing of their source material, and how digital tools can be built in collaboration with researchers to both support their work and lay the groundwork for a public platform featuring reusable resources.

10 Science and Democratisation Processes in Europe (1/3): Science, Freedom and Democracy

Room: 40.101

Organiser: Doubravka Olšáková & Jan Surman, Czech Academy of Sciences

Chair: Alexei Lochmatov, University of Erfurt

Our panel focuses on an under-researched topic: the relationship between science and democracy. Current literature on the relationship between science and democracy tends to focus on tensions between science and democracy, neglecting both historical experience and epistemological issues. Our aim is to historicize this relationship and to examine the role of science (including access to data, tools, technologies, etc.) in the democratization of society. The panel will focus on Cold War science and the role of different expert cultures before and after perestroika. We are

particularly interested in analysing the role of science and scientific communities or individual experts in democratisation processes in East Central Europe. In the context of current discussions on the decolonisation of the history of science, we would like to pay special attention to the role of science in the dissolution of the Soviet empire and, in particular, the Soviet Union.

Imagining Freedom of Science Before and After the World War II

- Jan Surman, Czech Academy of Sciences

Abstract: Shortly after the conclusion of the World War II, Polish representative of the Lwów–Warsaw school of logic, philosopher Kazimierz Ajdukiewicz, published a short essay “On freedom of science” (1946). Its extended version from 1957, published after the end of Stalinism 1953 and Polish October of 1956, became not only famous in state socialism, but was revived (republished and frequently discussed) during the heyday of conservative reaction in Poland in 2020. In my talk I will situate Ajdukiewicz’s idea on freedom of - and for - science within discussions of the Central European interwar period and situate them within historical discussion about the relation between science and various ideas of freedom of the first half of the 20th century. As I argue, his writing merges the very formal “a-political” idea of science and its freedom from analytic philosophy, reacting at the same time to political tensions he experienced in post-1945 Poland. I will inquire into how much WWII impacted Ajdukiewicz’s, but also few of his other contemporaries, conceptualisations of scientific freedoms. In the last part of my talk I will discuss how his thought was instrumentalised in the most recent history, to defend a particular vision of scientific autonomy.

Scientists, Activism and Democracy in Eastern Europe before 1989

- Doubravka Olšáková, Institute of Contemporary History, Academy of Sciences of the Czech Republic

Abstract: The aim of this paper is to analyze the relationship between science and democracy in Eastern Europe before 1989. Many of the scientists who collaborated with dissenting voices before 1989 were in fact operating in a kind of grey zone, since their social engagement could be seen neither as sympathizing with dissent and political opposition as such, nor as sympathizing with the ruling communist power.

To what extent can this situation be interpreted as an activist stance on the part of scientists who, by gaining access to certain sensitive facts and managing information, managed to gain insight into social processes that remained hidden from society - and often from its leaders (Alain Touraine)? This paper will attempt to reflect briefly on the relationship between science and democracy in totalitarian societies, not only from an upside-down perspective as the role of experts and expert cultures, but also from a bottom-up perspective as the birth of activism in pre-1989 societies, drawing on other works as well (Sheila Jasanoff).

Science And Democratisation Processes In East Central Europe: CERN and East-European Countries

- Luca T. Forgiarini, Utrecht University

Abstract: The European Organisation for Nuclear Research (also known as CERN) was established in 1954 with the aim to help rebuild European science in the field of nuclear science. Owing to the geopolitical context of the Cold War, CERN's membership was, with the exception of Yugoslavia's membership until 1962, exclusively Western European. Starting in the late 1950s, however, CERN began to establish ties with countries such as Poland, Hungary, and Czechoslovakia. After the dissolution of the Soviet Union, these three countries were very quick to join CERN, doing so in 1991 and 1992, respectively. This speedy integration process into an intergovernmental European organisation strongly suggests that participation in CERN was not only considered for its scientific benefits but also constituted a political asset in the democratisation processes that followed the end of the communist regimes. In my contribution, I aim to provide a CERN-internal perspective on the relationships of CERN with Poland, Hungary, and Czechoslovakia. Starting from their first contacts in the 1950s, I will retrace the origins and development of these cooperations as they happened against the changing political climate of the Cold War years, and investigate how they facilitated the speedy acceptance of these countries into CERN in the early 1990s.

Plenary Session

19:00 - 19:30

Room: 40 S Pati Roger de Lluria

Catalan Society for the History of Science and Technology presentation “Sabers en Acció”

The Catalan Society of History of Science and Technology (Societat Catalana d'Història de la Ciència i de la Tècnica-SCHCT) co-organizes this Conference. SCHCT, a filial society of Institut d'Estudis Catalans (IEC), was founded in 1991. In this plenary session, the blog *Saber(s) en acció*, promoted by the SCHCT, and the journal *Actes d'Història de la Ciència*, the official organ of the SCHCT, will be presented.

Saber(s) en acció/Knowledge(s) in Action is a blog designed to provide short and up-to-date introductions to key topics in the history of science, technology, and medicine (HSTM). It is a practical resource for teaching and learning, supporting both coursework and independent study. The blog is extensively used in universities for educational purposes, helping graduate and postgraduate students to grasp fundamental concepts in HSTM. It is also intended for academic historians seeking concise reviews on topics outside their specialization. The aim is to serve as a bridge between academic research, teaching, and current public debates in topics related to HSTM. As a collaborative project in digital humanities, more than 60 scholars have written short entries (1500 words, 5 images, large bibliography) in this blog. Articles are translated and provided in three languages: Spanish, Catalan, and English. The blog is accessible at <https://sabersenaccio.iec.cat/en/>

Actes d'Història de la Ciència i de la Tècnica is the international journal of the SCHCT. The journal is devoted to the history of science, medicine and technology. Its periodicity is one volume per year. It publishes articles, research notes and reviews. The first volume appeared in 2008

(<https://revistes.iec.cat/index.php/AHCT/index>).

Welcome Reception

19:30 - 21:00

Room: 40 S Pati Roger de Lluria

Thursday 5th

09:30 - 10:30

Plenary Lecture

Presidential lecture

Room: auditorium Ciutadella

Chair: Dana Jalobeanu

“Mind the Gap! Global Inequality and the History of Science”

-Simone Turchetti, University of Manchester

11:00 - 13:00

Sessions

1 Astronomy and Cosmology in Iberia (1550-1650) (1/2)

Room: 40.006

Organisers: Miguel Á. Granada, University of Barcelona; José Chabás, Pompeu Fabra University, Barcelona

Chair: Miguel Á. Granada, Universidad de Barcelona

The pandemic prevented from commemorating the centenary of the birth of Jerónimo Muñoz (ca. 1520-1591), surely the most important Spanish astronomer of the 16th century. The celebration of the 11th ESHS Conference in Barcelona in September 2024 may be an excellent occasion to address the state and development of astronomy and cosmology in the Iberian Peninsula (Spain and Portugal) between 1550 and 1650, a subject that has not received by scholars all the attention it deserves, both because much of the production has remained in manuscript and also because it is largely written in the vernacular (Castilian and Portuguese).

Between Heaven and Earth: Epicurean Cosmology in Pliny, according to the Commentary of Pliny's Natural History (book II)

- Karine Durin, University of Nantes

Abstract: The aim of this paper is to consider the Commentary on the second book of Pliny's Natural History, written in Latin by Jerónimo Muñoz (1568), which has been neglected by connoisseurs of the work of the Valencian astronomer. This singular text remains isolated in studies of Muñoz's contribution to the history of science in the early modern period. This paper reflects on the influence of Pliny's Natural History (book II) in Muñoz's philosophical ideas about cosmology. Written in Latin to reach a scholarly audience beyond Spain, Muñoz's Commentary is representative of the reception of Pliny's work in Western Europe, specially the second book of his Natural History, frequently marked by the dual influence of Erasmian and Protestant thought. However, far from being a philological project, the aim of this *lectio pliniana* was mainly doctrinal. Muñoz's conception of cosmology was affirmed by his reflection on a natural philosophy based on a Epicurean reading of Pliny. His scientific approach reconsidered controversial aspects of Epicurean incredulity. Muñoz's text is quite unique in addressing directly a rare question in the reception of Epicureanism: the existence of a Epicurean cosmology and Epicurean physics. The radical positions asserted in this commentary nonetheless make it an original example of the reception of atomism in Renaissance cosmology. Understanding Muñoz's intellectual career is essential to determine the origins of his reading of Pliny, and to understand the intellectual implications of his text. Was it the result of a prolonged interest in Pliny since his studies at Louvain with Gemma Frisius, surrounded by Spanish physicians and natural philosophers who were reluctant to accept doctrinal Aristotelianism? How much of the influence of the Judeo-Conversionist scientific milieu that he frequented in Ancona, around Amato Lusitano, is present in his critical cosmology? The originality of this text lies consequently in an attempt to reintegrate the principles of atomism into a physical conception of the universe.

Copernicus among astronomers and literati in seventeenth-century Portugal

- Luís Miguel Carolino, Lisbon University Institute: ISCTE-IUL

Abstract: Copernicus was a matter of great dispute among Catholics. As his revolutionary idea that the Earth moves around the sun contradicted the Bible and

was accordingly reproved by the religious authorities, scholars active in Catholic countries became particularly anxious about how to deal with the Copernican ideas. Portugal was no exception. Philosophers, astronomers, and literati discussed Copernicus's astronomical ideas within the borders of Catholic orthodoxy. If the philosophers who taught at the universities tended to be more assertive in their refusal of the Copernican ideas, the astronomers at the Jesuit College of Saint Antão displayed a more nuanced approach to them. They highlighted the mathematical advantages of the Copernican system while disputing its physical plausibility. Nevertheless, scholars who gathered at the literary academies by the mid seventeenth century went further by claiming that the Copernican system was plausible, not only from the mathematical but also from the physical points of view. Only religious constraints prevented them from considering that it was a real representation of the universe. This paper discusses the reception of Copernicus's ideas in Portugal. It argues that the institutional context in which the debate took place played a crucial role in this process.

A lasting legacy. The disciples of Jerónimo Muñoz and the teaching of astrology in the seventeenth century

- Tayra Lanuza-Navarro, Pompeu Fabra University

Abstract: While being a professor, at the University of Valencia in the 1560s and 70s, the astronomer Jerónimo Muñoz prepared a commentary on Alcabitius' work for teaching, and according to his own words, a commentary on Ptolemy's *Tetrabiblos*. After learning from him, several of his disciples became professors and taught astrology at the universities of Valencia, Alcalá de Henares, Seville, and Salamanca. This paper will focus on the astrological contents of the lectures and publications of Muñoz's disciples, discussing Gabriel Serrano, Diego Pérez de Mesa, Antonio Juan Ripollés, Antonio Núñez de Zamora, and others, in order to explore their common elements, and reflect on Muñoz's teaching of astrology, and his lasting legacy also in this less explored aspect of his influence.

2 Climate sciences framing climate change debates (2/2)

Room: 40.002

Organiser and Chair: Carolina Granado, Institut d'Història de la Ciència, Universitat Autònoma de Barcelona

Chair: Floris Winckel, Rachel Carson Center, LMU

Setting the Political Agenda on Climate Change: Advocate Scientists at the Villach and Bellagio meetings, 1987

- Carolina Granado, Institut d'Història de la Ciència, Universitat Autònoma de Barcelona

Abstract: This paper explores the role played by advocate scientists in bringing the climate change issue to the international arena in the late 1980s. Following the momentum generated by the 1985 Villach conference, which urged the collaboration between scientists and policymakers to explore solutions, a group of international scientists, led by ecologist Gordon Goodman and operating under the newly formed Advisory Group of Greenhouse Gases, devised a plan that culminated in the establishment of the United Nations Framework Convention on Climate Change, in 1992. This presentation analyses in detail two key events held in the fall of 1987: the Villach and Bellagio meetings. The former assessed existing knowledge on regional climate change impacts, while the latter deliberated on immediate policy actions and necessary institutional frameworks for their execution. Both events engaged participants in one of the first explicit international policy debates on the issue. Furthermore, I examine the impact and influence of these events, particularly in shaping discussions at the Toronto conference, in 1988, where serious cutting emissions targets were proposed. Lastly, the paper discusses the intricate relationships between this group of advocate scientists, their endeavors, and the creation of the Intergovernmental Panel on Climate Change, in 1988. By investigating the strategies employed by scientists and experts to communicate climate science and engage the political debate, my research aims to stimulate discussions on the epistemological and political role of assessments in framing climate change debates, policy, and public perception.

Latinoamerica in the IPCC: Science and Politics of Climate Change

- Cecilia Ibarra, Universidad de Chile

Abstract: “Only 28 countries responded to the call for the meeting in Geneva in November 1988...” recalled Bert Bolin (2007:49) when he describes the formation of the Intergovernmental Panel for Climate Change (IPCC). Since its creation in 1988, the IPCC has established itself as an official body in the elaboration of climate change knowledge assessment reports that are made available to the Convention of the Parties. Among the first countries to form the IPCC were Brazil and Mexico, since then the participation of Latin American countries has been growing. This presentation explores the participation of Latin America in the history of the IPCC. The first part of this work replies to descriptive questions about the countries from Latin America that joined the IPCC, the profiles of country delegates and scientists involved, considering the number of scientists, scientific disciplines and gender. It also looks at the roles assumed by representatives and the scientific participation in the assessments. From the initial description follows an exploration of the relationship between science and climate policy, in particular the relationships between Latin American participants - scientists and government representatives -, alliances and disagreements, and their roles in relation to the other countries in the IPCC.

Climate models and political objectives underestimate climate risk

- Marc Delepouve, Conservatoire national des arts et métiers

Abstract: Two targets for reducing carbon dioxide emissions, 45% by 2030 compared to 2010 and carbon neutrality by 2050, are a reference for policies at international level, with the aim of not exceeding a rise of 1.5°C by 2100. In 2021, Glasgow Pact concluded COP26 and explicitly incorporates this reference. These two targets are a political translation of scenarios from the IPCC Report on 1.5°C of global warming (2018). However, these scenarios are based on climate models that do not take into account phenomena that could amplify global warming. These include polar glaciers melting, seabed hydrates melting and marine life disruption. Each of these phenomena could emit massive quantities of methane and carbon dioxide into the atmosphere, and thus become the cause of accelerated global warming, which in turn would stimulate these phenomena and increase greenhouse gases (GHG) emissions,

leading to further acceleration of warming. During the 21st century, these phenomena, combined with other phenomena not taken into account by the scenarios, present the risk of triggering a runaway climate. The upheaval of marine life is particularly enlightening. Marine life plays a major role in the greenhouse gases concentration. The oceans are being affected by global warming and a range of other anthropogenic disturbances. These are creating an unprecedented environment for marine life, which is entering an unknown zone. Its evolution until the end of the 21st century is largely unpredictable, with the risk of a significant surplus of GHG in the atmosphere.

3 Cultures of Accuracy in Early Modern Mathematics: Precision, Approximation and Correctness

Room: 40.008

Organisers: Thomas Morel, Bergische Universität Wuppertal; Dalia Deias, ESHS, Centre Alexandre Koyré, Paris

Chair: Colette Le Lay, Centre François Viète

While modern mathematics devotes a great deal of attention to proofs and abstract formalization, early modern mathematical practitioners often rather aimed at obtaining precise, correct or useful outcomes. The aim of this symposium is to reflect on the development of various cultures of accuracy during the 17th century. Mathematical accuracy encompasses conceptions that are broader than simple degrees of precision: according to the context, it can mean that results have been obtained using a socially validated method, or that observations have been properly described, or that they are easily reproducible. This can for instance be seen in astronomical measures: what makes a measure acceptable or state a too large uncertainty? Italian astronomers strove for the *esattezza* in their observations and instruments (including using buildings as instruments). Architects possessed an approximate, yet precise know-how to perform their practical activities, reproducing the appearance of precise geometrical shapes, both in treatises and in real-life city squares, decorations, building structures. German surveyors and accountants, on the other hand, respected codified procedures meant to ensure both the correctness and the fairness (*Gerechtigkeit*) of their computations. French instrument makers,

painters and print-makers also struggled with competing, sometimes fiercely contested conceptions of visual accuracy as they tried to understand and usefully apply the rules of perspective.

Cultures of accuracy allow us to go beyond simple dichotomies of true/false, proven/refuted, and thus to better understand what early modern mathematics consisted of by considering the common knowledge, the contemporary procedures and the rules in which they developed. In this symposium, we welcome case studies aiming at comparing the various meanings of accuracy, their dynamics, and what made mathematical methods, instruments or procedures valid in the early modern period, looking for similarities and differences across various contexts and disciplines.

Cultures of Accuracy among Mathematical Practitioners in the Holy Roman Empire

- Thomas Morel, Bergische Universität Wuppertal

Abstract: Since the pioneering works of Eva Taylor and Edgar Zilsel, the role and work of mathematical practitioners has attracted a lot of attention from historians of science. Recent works have analyzed the concrete uses of mathematics, focusing on the diffusion and publicity of mathematical methods and its influence on society at large. In this talk, I would like to argue that a meaningful “culture of accuracy” developed in the early modern Holy Roman Empire. Numerous professionals dealt with measurements, from wine gauging to map-making, and from subterranean geometry to accounting. The new numerals and commercial developments gradually made arithmetic and geometry much more pervasive, but the efficient uses still had to be explained and justified to the “common man” (gemeiner Mann). Studying textbooks, archive material and general cultural elements, it can be argued that the “mathematization of nature” was a phenomenon that largely went beyond the rise of the new sciences. Protestantism, with its critique of presumptuousness (Vermessenheit) and its focus on fairness (Gerechtigkeit) lent a great importance to measurements, while secular authorities issued countless regulations. Using Witold Kula’s analytical framework, the role of measurement and its cultural significance will be analyzed in detail with case studies on Rechenmeister (reckoning masters)

and surveyors. I hope to show how the newly gained prestige and centrality of mathematics was based both on its objective efficiency and on a subjective social construction.

Between the project drawing and the construction yard: chasing the interchange of elliptical and oval curves in European architectural texts (16th-19th centuries)

- Paola Magrone, Roma Tre University

Abstract: From the flourishing of book production on practical arithmetic and geometry, in the period of the diffusion of the press, emerges the non-elite mathematics of the "mathematical practitioners", as well as the autonomous scope of "professional mathematics". A realm of non-scholarly mathematics, approximate knowledge, but (precise) enough to lead the processes of practical activities, as construction in architecture, for example. I will trace through several European treatises of architecture and descriptive geometry, dating from the XVIth to XIXth centuries, the reasons why two curves, the ellipse and the oval, are so often used interchangeably. The first book of Sebastiano Serlio's (1475-1554) treatise on architecture – marking the transition from mainly oral Medieval mason knowledge to the culture of architect-engineers – contains a detailed analysis of ovals as mixed lines. In subsequent architectural treatises, P. Cataneo (16th century), J.B. Rondelet (1743-1829), G.A. Breymann (1807-1859) the terms "ellipse" and "oval" are found, in those parts devoted to perspective, as an ellipse is needed to draw a circle in perspective. Since those are curves with very different mathematical properties, one may wonder whether the authors did not deem it necessary to distinguish them, or they were unaware of the difference. Moreover, as typical of field of practical knowledge, artefacts, objects, architectures will be considered (for those curves, squares such as San Pietro in Rome) in combination with written sources, considering the implicit mathematical and geometric knowledge they contain and can unveil, regarding the understanding of precision between the design drawing and the construction yard.

The Problem of Binocular Vision and The Limits of Mathematical Modelling in Late Seventeenth-century France

- Antoine Gallay, University of Geneva

Abstract: Before Charles Wheatstone's first experimental demonstration of binocular stereoscopy in the 1830s, the functioning of binocular vision was a mystery. During several centuries following the reception and reformulation of Ibn-Al-Haytham's optics in the West, the question had remained unproblematic and little considered. However, in the late seventeenth century, Sébastien Le Clerc's geometrical demonstration of what we now call retinal disparity fueled new debates. Le Clerc was a printmaker and a professor of geometry in the French royal academy of painting and sculpture, and his demonstration was initially a response to painters' discussions about the way perspective rules should be strictly applied. To support his own argument on the question, Le Clerc had to demonstrate that the images received by each eye were fundamentally different one from the other, hence that they could not merge. It led him to affirm that natural vision was always monocular. While this affirmation was supported by an effective geometrical demonstration, it was also incompatible with everyday experience, so that most of Le Clerc's contemporaries disagreed with his view and attempted to reaffirm that vision was genuinely binocular. In this talk, I will reconstitute the impact of Le Clerc's demonstration and show to what extent it might have led scholars to question the way mathematical modelling could accurately describe physical phenomena. I will then further interrogate the connection between raising awareness toward the limits of mathematical modelling and the way mathematical accuracy could be conceived.

Astronomical Observations and the idea of "Esattezza" in the 17th century

- Dalia Deias, ESHS, Centre Alexandre Koyré, Paris

Abstract: At the beginning of the 18th century, letters circulating between France and Italy discussed different and multiple ideas of what a place to make celestial observations should look like, and which rules to follow to observe the sky. Which schedule to make astronomical observations? How to make collective observations more systematic? Which techniques were needed for such observations? How should an edifice built for such activities be organized? How to distinguish a reliable measurement from a more uncertain one? What *expertise* (and which astronomers) should decide about all these things?

In this paper, I will sketch some elements of an important culture of precision of this period, one established in connection with the complex subject of the astronomical observatory. Borrowing the vocabulary used by the astronomers of the Observatoire royal in Paris and the Instituto delle scienze in Bologna at the beginning of the eighteenth century, and mobilizing some major works on the observatory (Picolet, 2000, Aubin, 2015, Nasim, 2016) and its deep link with societies (Lamy, 2007, Aubin, 2010, Kwan, 2010, Schaffer, 1988, 2014), I will focus on the specific culture of *esattezza*.

The physical structures in which one used to observe could itself participate in the observations, functioning as a large instrument and thus contributing to the reduction of errors in measurements.

The quest for *esattezza* combined celestial observations, management of observational errors and measurement errors, instruments, architecture, as well as the organization of buildings dedicated to these activities.

A Technician's Mathematics: The Case of Jost Bürgi

- Damian Moosbrugger, ETH Zürich

Abstract: Early modern Europe saw the emergence of a figure I refer to as the technician-mathematician. By this term, I wish to denote people that were involved in mathematical pursuits while at the same time being engaged in technical practices. In my research I focus on the mathematical works of the German-speaking part of this tradition, which has – probably thanks to the earlier invention of the printing press – left a considerable amount of source material in the form of books on mathematics written in the vernacular. An almost paradigmatic member of this community was the Swiss clock- and instrument-maker Jost Bürgi (1552-1632). Technical practitioners like Bürgi gained practical knowledge through the experience of constructing artifacts, interacting with tools, and performing measurements and calculations. Based on the conception of mathematics as contingent human practice, I argue that the adaptation of their technical experience to mathematical tasks can be expected to have significantly shaped the discourse of mathematics among technician-mathematicians, resulting in the emergence of a specific mathematical and computational culture out of technological craftwork. While this is the main

hypothesis of my ongoing research that is still in its first stages, I already managed to identify several interrelations between mathematics and technology for the case of Bürgi. More specifically, it can be shown that there are a number of original instances in his mathematical works – concerned with trigonometry, especially sine computation, algebra and a logarithmic tool – that express a resemblance to the technical apparatus he engaged with. These thus potentially shaped his mathematics.

4 Soviet Climate Science and its Legacy

Room: 40.010.

Organiser: Jon Oldfield, University of Birmingham

Chair & Commentator: Katja Doose, University of Fribourg

Anthropogenic climate change is arguably the most significant threat confronting humankind in the 21st century. Russia has played an influential role in terms of both overall contributions to global greenhouse gas emissions and the shaping of the international response and associated mitigation activities. Efforts to understand Russia's role in these areas have attracted sustained analysis in the English-language literature during the course of the last twenty years. More recent work has reflected on the potential impact of climate change on Russia's economy and broader society, building on Russia's own domestic assessment in this regard. Cumulatively, this literature has underlined Russia's hesitant and increasingly marginalised position with respect to the international climate change agenda, a situation that has been intensified by recent geopolitical events associated with Russia's invasion of Ukraine. At the same time, the overwhelming focus on Russia's reluctant engagement with the politics of climate change and weak implementation of mitigating strategies has deflected attention away from the country's long association with the underlying science of anthropogenic climate change, which can be traced back to the mid-Soviet period. This lacuna is significant not only in view of the important contribution made by Soviet and Russian scientists to international understanding and associated debate in this area post-1945, but also because this intellectual legacy remains an integral part of contemporary Russian scientific debate. More broadly, a focus on Soviet scientific activity in this area offers a fresh perspective on the early international debates concerning climate change and the character of East-West

scientific interaction during the Cold War period, with climate science representing one of the most effective areas of collaboration.

This symposium brings together the findings of a major research project funded by the UK's Arts and Humanities Research Council (2017-2022) titled 'Soviet climate science and its intellectual legacies' (AH/P004431/1).

Soviet climate science: managing and theorising climate change

- Nina Kruglikova, University of Manchester

Abstract: This paper argues that Soviet science was at the forefront of activity in the area of climate science and advanced a sophisticated agenda to gain deeper insight into the processes shaping weather and climate from the local through to global levels. The paper provides an assessment of the character of scientific debate concerning climate change within Soviet science post-1945. Two broad positions were advanced with respect to the role of humankind in climate change. The first coalesced around M.I. Budyko and colleagues at the Main Geophysical Observatory in Leningrad and was characterised by firm support for human-led climate change at the global level. The second position placed greater emphasis on natural factors underpinning significant climate shifts, and this approach was particularly evident in establishments such as the Arctic and Antarctic Research Institute, although it found support within other areas of the scientific community. Furthermore, there was extensive debate concerning the physical mechanisms behind the marked changes in global climate and particular attention was paid to the pivotal role of the Arctic region, in addition to a plethora of core climatic processes. These activities were carried out within disciplinary areas (e.g. oceanography, geophysics, geography, mathematics), specialist multidisciplinary centres as well as interdisciplinary areas of research exploring, for example, the physics of the atmosphere-ocean coupling.

Budyko, Hecht and the Past Futures of Climate Scenarios

- Vladimir Jankovic, University of Manchester

Abstract: In this presentation I explore a year-long, privately funded, online conference between the Soviet and American climatologists, (Greenhouse Glasnost, 1988-1989) focusing on the differences of opinion on the issue of scientific method used in developing climate change scenarios. The presentation gives a brief account

of the conference activities with the aim to add a new dimension to the history of bilateral cooperation between US and USSR, highlighting the role of netizen diplomacy in addressing an emerging security concern during the late Cold War. I also wish to look into the role of alternative cultures animating the spirit of the project that mobilized a heterodox community of scientists, astronauts, educators and cultural entrepreneurs interested in blending the spiritual and the scientific to better serve the need for climate action. But as the tele-conference evolved, differences of opinion on the relative merit of numerical modeling versus paleoclimatic reconstructions sparked confrontations between lead actors that called for concessions and compromises. To highlight how these adjustment shaped the bilateral agreement on geopolitical futures in a warming climate, I especially focus on disagreements between the Soviet climatologist Michail Budyko and EPA's Alan Hecht as well as the mediating role in these proceedings of NCAR's President Walter Orr Roberts.

Soviet climate science and its intellectual legacies

- Jon Oldfield, University of Birmingham

Abstract: This paper examines the legacies of Soviet climate science post-1991 and the extent to which they continued to shape both domestic and international debate. The influence of Russian science declined with respect to key bodies such as the IPCC following the dramatic socio-economic shifts of the 1990s, although the debates animating Soviet science continued during the decade and remained part of the wider discussion. There was a generally negative political position adopted with respect to the efforts of the international community to address global climate change and most notably in the case of the Kyoto Protocol. This negativity was nurtured by a combination of factors including a growing disillusionment with the international scientific process, a sense that the Kyoto Protocol was at best limited in its potential to address climate change to any significant extent, and the socio-economic uncertainties of the period. In spite of the political headwinds and strong climate scepticism within sections of society, the Federal Service for Hydrometeorology and Environmental Monitoring (Rosgidromet) advanced a clear agenda concerning anthropogenic climate change and the range of likely consequences for the country culminating in a detailed report in 2008.

5 Describing reality through mathematical models (1/3)

Room: 40.012

Organiser: Eleonora Sammarchi, ETH-Zürich & Riccardo Bellé, University of Rome Tor Vergata

Chair: Veronica Gavagna, University of Florence

In various ways, sciences have attempted to describe reality by building predictive models for the interpretation of natural and social phenomena. Particularly in the mathematical universe, model building throughout history has meant providing simplified images of events in the phenomenal universe, and translating them into mathematical language to make predictions consistent with experimental data. In this symposium, we aim to investigate how mathematical models were conceived in relation to various fields of knowledge such as mechanics, optics, hydraulics, biology, economy, etc. The core questions of our investigation are:

How does mathematical knowledge influence the construction of scientific models?

Does modeling (in turn) guide mathematical research? And if so, how?

By gathering together scholars whose expertise is representative of the interdisciplinarity of mathematics, we will provide a better understanding of the interrelations between mathematics and reality.

According to the time period and the field of application, the concept of “model” can be understood in different ways: as a geometric model for describing natural sciences; as a pattern for probabilistic problems; or else as standardized procedures for mercantile problems. Also, what happens when the model fails in describing reality? In our first symposium, we will discuss these issues by taking into account medieval and early modern sources. More precisely, we will focus on certain authors and traditions that conceived mathematical models in relation to economy (and social activities more broadly), optics and statics.

Algebra as a model for describing social activities in Arabic and Latin medieval sources

- Eleonora Sammarchi, ETH-Zürich

Abstract: In medieval mathematical writings, algebraic methods become standardized procedures for solving various types of problems that are related to the social uses of mathematics. Salary problems, problems on mercantile transactions, inheritance problems, problems related to land surveying, etc., are among the types of problems that scholars aim now to solve through an equation. The different “dressing” of the statement of the problem has primarily a pedagogical function: it provides students with various examples of the utility of algebra, and allow them to practice in this new “art”. In my paper, I focus on some Arabic and Latin sources dealing with the translation of concrete problems into algebraic ones. I present the methods and tools scholars applied in order to solve the problem, and show how these methods become standard algebraic procedures. I conclude by discussing how algebra is a representative case study of the interplay between medieval mathematics and social activities across the Mediterranean Sea.

Optics and Euclidean theory of proportion in the works of Francesco Maurolico

- Riccardo Bellé, University of Rome Tor Vergata

Abstract: Maurolico addressed various problems related to optics in his writings. For example, photometry and pinhole image are treated in *Photismi de lumine et umbra* (1521), refraction and rainbow in *Diaphana* (first composed in 1523 and heavily revised in 1554-5). In particular, I focus on the mathematical model that Maurolico proposed for refraction. His theory is built on assumptions that allowed him to apply Euclidean theory of proportion to this optical phenomenon. But every attempt to elaborate a geometric model of the physical properties of bodies has its flaws and is not completely satisfactory. In the case of refraction, Maurolico chose to build his geometrical model using the angles formed by the light rays and the perpendicular to the surface between the two media, but other choices were possible. The choice of the magnitudes to “geometrize” is thus essential and is part of the model itself.

Fortunes and misfortunes of geometrization: examples from the history of optics and statics

-Dominique Raynaud, Université Grenoble Alpes

Abstract: Canguilhem (1977: 14) made the distinction between “science of the past” and “past of science”, in order to exclude from the history of science the judgment of past theories through present-day knowledge. The view that science progresses on the basis of the successes of mathematization is dependent on such a retrospective view, and relies on drastic selection. From antiquity to the 17th century, mathematization primarily involved reducing phenomena to geometry, this is why I will focus on two geometrical sciences: optics and statics. Geometrical optics developed on the principle of rectilinear ray propagation. Discoveries in the 17th century, such as diffraction (Grimaldi 1665) and refraction in inhomogeneous media (Hooke 1665), gradually revealed the limits of geometry. Here, the failure of geometrization stemmed from a simplifying assumption. In the field of statics, builders have long used Derand-Blondel’ geometric method to determine the thickness of a vault’s jambs. Subsequent work by La Hire (1692) and Bélidor (1729) showed that this rule was wrong, as the thickness of jambs is not a geometrical problem. Here, the failure of geometrization resulted from not taking into account the materiality of the building. My paper will attempt to understand the reasons why the geometrization of the reality has failed. These reasons can be both objective (the failure is due to the structure of the world) and subjective (the failure is due to the misapplication of geometric methods).

6 Displaying Science and Envisioning Futures in Political Turmoil, 1973-1991 (2/2)

Room: 40.004

Organiser: Jaume Valentines and Ned Sommerville, Universitat Autònoma de Barcelona, Institut d’Història de la Ciència

Chair: Ned Sommerville, Universitat Autònoma de Barcelona, Institut d’Història de la Ciència

Making politics and displaying science go hand in hand. Facing politics and contesting displays of science come together as well. This session will focus on spaces, objects and narratives of science and technology that have been displayed in times of political turmoil, social change and revolutionary dreams. How could a diorama of the nuclear icebreaker ‘Lenin’, a family car in an advertisement or the

notion of ‘working-class heritage’ shape political arenas? Which artifacts were kept frozen in museum rooms and which ones were hidden away in dark warehouses? Which readings of old exhibitions produced new ideas about nation, citizenship and democracy? How did they clash with grassroots proposals on display?

This panel aims to problematize these questions. It will pay particular attention to the period from the 1973 oil crisis to the fall of the USSR, a period which witnessed multiple scenarios of social unrest and political struggles across Europe. The fall of the dictatorship in Portugal, class struggles in Spain, the rise of communism in Italy, its decline in Bulgaria, ethnic disputes in Kazakhstan, feminist movements in Germany, among others, opened the door to subvert sociotechnical imaginaries at local, national and transnational scales: in these contexts, exhibitions of science became cultural battlegrounds in the struggle for the future. This panel will discuss some of these exhibitionary battlegrounds in which demands for political transition were intertwined with transitions in other domains (energy, epistemic, environmental...). These cases will highlight top-down representations and hegemonic discourses (or those that would become hegemonic) as well as social responses to them, bottom-up displays and non-elite managed heritage.

Displaying automobility futures in the 1970s revolutionary period in Portugal

- M. Luísa Sousa, CIUHCT, Universidade Nova de Lisboa

Abstract: During the revolutionary period of 1974-76, there was a vigorous debate in Portugal about the role of the car and other modes of mobility in the desired new society. The debate was intensified by the preceding first international oil crisis. Strong ideological rhetoric was used either to defend the potentially liberating role of the automobile or to condemn its “bourgeois” underpinnings. This debate influenced social movements, policies, perceptions and views of social actors, thus contributing to market distortions, the short-lived disappearance of luxury and sports cars, and the creation of new models considered to be adapted to the “real” needs of the Portuguese. Other modes of mobility were also part of this debate, namely public transport and what are now called “active” modes (cycling, walking), which were often presented in opposition to private automobility in terms of environmental, safety and traffic concerns. This paper analyses the presentation of these mobility

futures during the period of political turmoil in Portugal in the 1970s, through advertising in the public sphere (newspapers, magazines, television, films) and in public space (e.g. posters on urban streets). The analysis of the public space will focus on the Portuguese capital, Lisbon, which had the highest motorisation rate in the country, through the results of the research project “Hi-BicLab - History Lab for Sustainable Urban Mobilities: Lisbon's cycling policies”.

'US Power? USSR Power? Nuclear Power? No, thanks': Soviet nuclear exhibitions and grassroots sun-powered displays in Portugal after the Carnation Revolution, 1974-1978

Jaume Valentines, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

Abstract: Historians of science have devoted much effort to studying ‘made-in-US’ exhibitions that travelled around the world as part of the co-production of the “American hegemony” during the Cold War. Less attention has been paid to other kinds of exhibitions facing this hegemony. On the one hand, I refer to Soviet exhibitions in the geopolitical space of NATO. On the other hand, to community-based exhibitions in the sociopolitical space of the street. In this paper, I propose to (virtually) enter into the exhibits of this kind that landed in Portugal after the Carnation Revolution in 1974. In this context, a long-awaited nuclear project by the Portuguese dictatorship seemed to be closer than ever: the construction of the first Portuguese nuclear power plant in the village of Ferrel. In a context marked by a political turmoil, a severe economic crisis and the rise of Communist forces, foreign ministries of Portugal and the USSR agreed to launch a program of economic and scientific cooperation, in which nuclear energy would be central. One of the first decisions was to organize an exhibition in Lisbon on the “Soviet peaceful atom”. When the exhibition was inaugurated in March 1978, the newly-born anti-nuclear movement painted “Ferrel will succeed” in the walls of the exhibition and make fun of the “proletarian atom” in their magazines. Meanwhile, an exhibition organized by ecologist groups travelled across Portugal with the aim to present their dreamscapes crowded with sustainable energies.

A Destroyed Exhibition and the Multiple Meanings of Nuclear Fission

- Donatella Germanese, Max Planck Institute for the History of Science

Abstract: For the 50th anniversary of the discovery of nuclear fission in December 1938, historian of science Jost Lemmerich organised and curated an exhibition in Berlin with the support of key scientific institutions. Scientists, museum scholars, historians of science, archivists and artists were involved in the project. However, the exhibition hit the headlines when radical antinuclear activists vandalised it just before the opening on the afternoon of December 2nd, 1988. The impact of the discovery of nuclear fission on military and political developments – from the atomic bomb to nuclear power – and thereby on the Earth system through atomic fallout, is at the centre of numerous historical and scientific investigations. With this case study I ask how displaying the history of nuclear physics is transformed into a political issue at local level when radical positions clash with the consensus on the role of science in society. Using extensive archive material and interviews I first outline the scientific, artistic, and educational motivation for organising the Berlin exhibition; in a second step I address the practical aspects of the groundwork, and finally describe the assault and public reactions concluding with some general reflections.

Future Energy Expo-2017 and atomic dreams in Kazakhstan: From the arms race to energy transition

- Saulesh Yessenova, University of Calgary

Abstract: Cold War has produced a radioactive environment at a global scale. My research is about how governments and citizens have come to understand this contaminated environment and the importance of using hegemonic concerns, such as those with climate change and energy transition, as opportunities to negotiate their place within it. I examine the renewal of the atomic industry in Kazakhstan against the legacy of the arms race. During the Cold War, Kazakhstan hosted a nuclear weapons test site that was shut down under the pressure of the anti-nuclear movement in the late 1980s. Upon independence, Kazakhstan gave up nuclear weapons it inherited from the USSR; but the country remained ‘nuclear.’ In this paper, I examine how the material dimensions of the arms race continue to shape political visions, possibilities, and relations by focusing on the Expo held in Astana, the capital of Kazakhstan, in 2017. Dedicated to Future Energy, this EXPO showcased

technological advances enabling energy transition towards a sustainable future. As the host of this international mega event, Kazakhstan exhibited the country's devotion to nuclear technologies. I analyze Kazakhstan's display of its atomic dreams against the earlier expositions of nuclear history as unfolded in Soviet Kazakhstan to argue about the bizarre co-existence of conflicting narratives, including commemorative practices of suffering caused by the nuclear technology and strong anti-nuclear sentiments across the country.

7 From controlled nuclear fusion to fusion energy: Scientific technological, political and environmental histories (1/3)

Room: 40.154

Organiser: Roberto Lalli, Polytechnic University, Turin

Chair: Roberto Lalli, Polytechnic University, Turin

There is increased interest in fusion energy as a viable future clean energy technology. Since it became a central focus of international cooperation in the 1958 Conference of Peaceful Uses of Atomic Energy, fusion energy has been researched and developed because of the associated environmental, political, and economic gains. Moreover, fusion energy research has been described as a major science diplomacy exercise with the neologism of “fusion science diplomacy” as well as a key area of experimentation in the process of European integration since the late 1950s. On the other hand, in different periods research on fusion energy has raised controversies in scientific and political circles as a technology that has not fulfilled the expectations and whose development requires large amounts of public investments. These debates indicate that the development of fusion energy research has been shaped by complex interconnections of factors including techno-scientific advances, different national political agendas and environmental issues.

The symposium provides a venue to analyze and discuss the multiple historical patterns related to research on fusion energy and related debates that regard various domains, from scientific cooperation to political imperatives, from technological choices to environmental issues. The symposium is organized in three sessions. The first session presents general mappings and socio-epistemological analyses of international cooperation schemes in fusion energy research. The second session

addresses the science diplomacy dimension of fusion research for international institutions and nations as well as the relations between technological decision-making and political agendas in chosen case studies. The third session concludes the symposium by focusing on environmental implications and non-scientific actors that played a crucial role in the process of fusion research. A discussant will comment on the entire symposium at the end of session III. The Symposium is sponsored by the Italian Society for the History of Physics and Astronomy (SISFA).

Fusing Europe from EURATOM to ITER: A network analysis of European techno-scientific cooperation in nuclear fusion research

- Roberto Lalli, Polytechnic University, Turin

Abstract: Scholars and policymakers consider techno-scientific cooperation as central in the process of European integration. However, few historical cases have explored this role in detail. In particular, the role of cooperation on fusion energy research remains largely unexplored, apart some preliminary studies suggesting that it had played a major role in some key moments of European integration. In the context of the project FusEurope: European cooperation in nuclear fusion research: from history to future policy design—which aims at addressing this shortcoming from an interdisciplinary perspective—the talk discusses the change over time of technoscientific cooperation in nuclear fusion research in Europe against the background of global developments by applying concepts and tools of network analysis. In different European countries, scientific research that would flow into nuclear fusion research was initiated under various circumstances depending on the political conditions of the immediate post-World War II period. Different research streams research, often related to domains apparently unconnected to nuclear matters—notably, on astrophysical plasma—provided both expertise and knowledge essential to produce advances in fusion research. Using information available in reports, published literature, and archival materials the talk will produce a temporal social network analysis of techno-scientific cooperation on topics related to fusion research, identifying particularly central scientists, subcommunities and topics. By understanding the relations between persons and knowledge across national borders

we aim to clarify in what specific ways fusion research became progressively international in the European context.

Shedding light on a rising star: A survey on the history of nuclear fusion research in Europe

- Adele La Rana, University of Macerata

Abstract: The hopes that fusion energy research might be a solution for the sustainable production of energy are based on two main features of nuclear fusion energy. First, nuclear fusion is considered ‘cleaner’ because its radioactive wastes have much shorter time-life compared to fission wastes. Second, the efficiency is supposed to be remarkably larger than that of nuclear fission reactors. While in some circles nuclear fusion research is enthusiastically embraced, the techno-scientific choices made as the basis of very expensive projects have been controversial. This is especially true for international projects in Europe, as techno-scientific negotiations were intimately connected with political agendas of national governments. The present contribution will present a general survey of the main phases of the European thermonuclear fusion program, starting from the early work of the group de liaison lead by Donato Palumbo up to the establishment of the International Thermonuclear Experimental Reactor (ITER) in 2007. Spanning over five decades since the late 1950s, the survey will identify the different stages of the development of fusion research in Europe through its main scientific targets, its technological hurdles and the possible solutions, analyzed in the international scientific context of plasma physics investigations. This historical-scientific review will trace a framework for a future more detailed analysis on how scientific requirements interfaced political constraints, and what were the outcomes in terms of techno-scientific decisions and solutions.

The potential of a social-epistemological account of the fusion energy research in Europe

- Luca Guzzardi, University of Milan

Abstract: Nuclear fusion research in Europe was envisaged, since its very beginnings in the 1950s, as a highly cooperative endeavor involving many countries with possibly diverging political interests and objectives. This paper intends to

explore the possible structure and the potential of a social-epistemological account of the European cooperation effort for nuclear fusion research that culminated in the project ITER (International Thermonuclear Experimental Reactor). First, I will argue that, in order to produce an image of the teamwork in a research project of this type, it is crucial to characterize three key factors: a) the epistemic goals of the actors involved in a given research project; b) how those actors negotiate and re-define their epistemic goals in light of their interests as research progresses; c) how epistemic constraints help shape the social structure of a given research project, setting limits on the actors' interests. Second, I will emphasize that the identification of the relevant actors may profit of a preliminary network analysis on the one hand and a historical analysis of the main phases in the European fusion program. Finally, I will advance the idea that the resulting social-epistemological portrait of nuclear fusion research in Europe may also be used to sketch a "counterfactual map" offering insights into unaccomplished goals and unrealized benefits, indirectly outlining conditions for achieving these goals.

The Road to ITER: A historical database for identifying key political actors in European fusion research

- Giorgio Matteoli, Polytechnic University of Turin

Abstract: The multibillion-dollar International Thermonuclear Experimental Reactor (ITER) project is being described as the ultimate frontier to invest into in order to solve the world's energetic and environmental crises. The member parties that run it include governments that represent more than half the population of the world, making ITER one of the most expensive and extensive efforts at international scientific collaboration ever undertaken. International cooperation had been a characteristic of the fusion programs since the mid-1950s, after the declassification of fusion research conducted during World War II and the partial repurposing of nuclear strategies for peaceful uses. In order to organize these cooperation strategies, a great number of both national and international agencies and institutions were founded, often under the guidance and supervision of the government officials sitting in the IAEA's International Fusion Research Council. But when the idea of joining forces to actually construct what would become the ITER reactor was finally proposed in 1988, all the members internally reorganized their expectations and

goals in order to gain the highest ground on a political level. As the final designated site of construction for the ITER reactor testifies, the EU acquired a central diplomatic role in the advancement of the project. In this talk, I present a historical database of scientists and policymakers and their relations through joint participation to main international commissions and projects, which is used to build networks of political decision-making that brought EU's political agenda to adjust unto this role.

8 Science, Art and Communication

Room: 40.047A

Chair: Ilaria Ampollini, Università degli Studi di Milano

Sperm Whales, Wax Sculptures, and Historical Analysis: The Role of Fat Chemistry in Authenticating Artworks in early 20th-century Germany

- Josephine Musil-Gutsch, Ludwig Maximilian University (LMU)

Abstract: In 1909, Friedrich Rathgen, chief chemist of the Berlin Museum, faced a challenging task: dating a newly acquired wax bust and ideally confirming its origin as a Renaissance artwork attributed to Leonardo da Vinci. To authenticate the bust, the chemical composition of its wax components had to be determined, forming historical arguments by correlating the material components with their historical usage.

However, the chemical analysis of wax presented significant challenges, especially in the early 20th century when the field of fat chemistry sought to standardize and refine its measuring techniques. Additionally, the chemical analysis of art objects called for the use of microchemical methods due to the need to minimize damage.

Applying and refining analytical chemical methods within art history intrigued leading fat chemists. They collaborated with Rathgen, teaching him their methods and tailoring them to art history's needs. Debates ensued in the pages of the *Chemiker Zeitung*, discussing accurate measuring techniques and the complexities of isolating chemical substances from a historical wax bust. Historians of chemistry were consulted to shed light on the historical use of spermaceti, a wax-like substance derived from sperm whales.

This case illustrates the relationship between art history and chemistry in the analysis of material objects. It shows how chemists adapted their methods to address the challenges of analyzing art works and how historical and chemical hypotheses intertwined to form art historical arguments. Moreover, it highlights the reciprocal benefits derived from chemistry's engagement in art history, thereby advancing methods in both disciplines.

Tracing the origins of fat chemistry within the broader context of chemistry and contextualizing the museum's chemical laboratory within art history, this study acknowledges the larger context encompassing both natural sciences and humanities. Lastly, this study serves an instructive example of the transfer of practical knowledge between sciences and humanities around 1900.

Camera, Tachistoscope, and the Unconscious: Toward a New Science of Art

- Sofia Michel, University of Göttingen, Germany

Abstract: Although art theory is not considered a part of the human sciences nowadays, this was not the case 100 years ago. This presentation addresses the issue of the “new science of art” that arose in Europe in the early 20th century. Its goal, following the path outlined by Theodor Fechner in the 1870s, was to combine the life sciences with art theory in order to make the latter more objective by analyzing the creative process and the perception of art based on experimental evidence. This focus raises several questions: How did theoretical discourses, methods and equipment migrate from one discipline to another? What was meant by “objectivity” and “science”?

To answer these questions, I turn to the striking example of the State Academy of Artistic Sciences in Moscow (GAKhN, 1921-1930). It was an experimental research institution where scholars from various scientific fields collaborated on joint projects to establish the foundations for a “new science of art”. By discussing specific projects of the Department of Physics and Psychology, which united psychologists and art historians, I suggest that the perception of art as a new research object did not significantly affect the methods and vocabulary of psychologists. There were, however, some exceptions: Pavel Kapterev attempted to apply hypnosis, which had previously been an object of research itself, to the study of creativity. At the same

time, art historians Alexei Sidorov and Anatoly Bakushinsky applied principles from psychological research to their studies. I argue that it was exactly the qualities that characterized scientificity for them: the use of measuring apparatuses and cameras, the standardization and seriality of experiments, and the pursuit of consistency in the language of description and notation. The research practices of the GAKhN thus serve as an important prologue to the global trend toward interdisciplinarity.

Forgotten half of humanity: the overlooked role of women in shaping Western science communication

- Isabel Richards, The Australian National University, Canberra

Abstract: The origins of Western science communication can be traced back to the beginnings of science popularization in the 18th and 19th centuries. However, up until now, there has been a lack of attention to the work of women during this period and their important contributions to science communication. Research and teachings on the history of science communication remains disproportionately focused on men, when women played an equally critical role in shaping the field. This proposed paper aims to explore the contributions of women to early Western science communication. The 2024 ESHS conference invites “the community of European historians of science to look at the object of their historical research with a view to the great challenges that humanity has been facing both nowadays and throughout its history.” Gender inequality is one such challenge and, as made clear above, a challenge that science communication and theories of its history also faces. The thus far ‘invisible’ work of women in science communication should be made visible to paint a more accurate, inclusive, and holistic picture of the field. This paper will examine the historical works of Priscilla Wakefield, Jane Marcet, and Mary Somerville as case studies to highlight the overlooked stories of women in early science communication and what we can learn from them. This will include, in particular, investigating their role in educating children, sparking dialogues, and hosting dinner parties and other social events to facilitate ‘informal communication’ about science.

9 How Computing Influenced our Understanding of the World: Scientific Communities as Communities of Computing (1/3)

Room: 40.109.

Organisers: Helena Durnová, MU Brno, Czechia; Ulf Hashagen and Rudolf Seising, Deutsches Museum and LMU Munich, Germany

Chair: Rudolf Seising, Deutsches Museum

The practice of scientific research changed significantly with the arrival of the computer. Our historical understanding is influenced by two contradictory observations. On the one hand many academics follow the general belief of the public and of the political leaders, that Moore's law has a significant role in determining the place of technology in society and is not only a determinant of our society but also of our current research practice in the natural and social sciences and in the humanities. On the other hand, historians of computing advocated against technological determinism and made the argument that the computer is a "protean machine" (Michael S. Mahoney). In their understanding, studying scientific communities as communities of computing is just as relevant as the overwhelming technological determinism.

In our symposium we would like to explore these historical phenomena by analysing, among others, the interactions between the personnel of the computing centers, programmers and scientists, new computer-based scientific methods such as scientific simulations and artificial intelligence, and the emergence of new disciplines and sub-disciplines (such as computational linguistics or cognitive science).

This symposium is sponsored by the Interdivisional Commission on History and Philosophy of Computing (HaPoC hapoc.org).

Scientific Communities as Communities of Computing? Some Problems in History of Science and Computing

- Ulf Hashagen, Deutsches Museum, Munich (Germany)

Abstract: The history of science and the history of computing have long had one thing in common: they ignored the other field of research. In the history of science, this built on a long tradition of ignoring the role of technology in scientific thought and practice. In computer history, on the other hand, the main focus was on the professionalization and creation of computer science as a discipline and not on the many applications of computers in traditional scientific disciplines. Both sides largely ignored the fact that the computer was a new type of instrument that had been

created and was constantly being reinvented in the scientific communities. In the second half of the 20th century, the computer first penetrated scientific practice in the natural and engineering sciences and then also in other scientific fields such as economics and social sciences to such an extent that it has become virtually indispensable as an instrument for scientific practice. The lecture will give an introduction to the topic of symposium on the basis of a dozen problem areas and will attempt to develop important problems and questions for future research in this field.

Communities of Programming (Programming languages and the emergence of different communities of computing)

- Amelie Mittlmeier, Ludwig-Maximilian-Universität, Munich, Germany

Abstract: The first so-called high-level programming languages emerged at the end of the 1950s. They differed from the previously developed automatic coding systems not only in terms of their complexity and their wider range of applications. Different communities of computing emerged, each grouped around a specific programming language. These were, for example, those users who applied the programming language FORTRAN, which had been developed for computers from the manufacturer IBM and who institutionalized themselves in "user groups" such as SHARE. Another example is the ALGOL programming language developed in 1958, whose users were sometimes referred to as "algotists". The communities that formed around various programming languages were by no means clearly defined groups. Nevertheless, they differed from each other in several aspects - and they developed a very different understanding of what computers were all about, where the machines could and should be used and whether what they were doing was a science, a craft or even an artistic activity. The lecture will shed light on the role of the new concept of programming languages in the emergence of these different communities and show how the different understandings of these groups shaped further technological developments in this area. The dynamics that characterized the cooperation and opposition of the different communities will be examined. Finally, the question of what influence this dynamic had on the development of an independent scientific discipline - computer science - will be discussed.

‘Those interested should be informed’: computing for science in Brno in the 1960s

- Helena Durnová, Masaryk University, Brno, Czechia

Abstract: The arrival of the computer in the early postwar years inspired the use of the technology in various disciplines of science. In the university environment, mathematicians (even though as users, they had been preceded by engineers and physicists themselves) took over the initiative of spreading the word of the new tool and making it useful for sciences across their wide range. At Brno university, computing became institutionalised in 1964 with the founding of the department of mathematical machines within the department for numerical mathematics. Using computers for the purposes of mathematics and taking care of the computer itself (including its maintenance) was one thing, finding relevant uses of the computer in other scientific disciplines another. The team around the emerging computing centre was eager to show other scientists how to use the new wonder machine, as expressed in their shared opinion that “those interested should be informed”. Among those groups, linguists had a special place, with the view of machine translation. Co-operation between mathematicians and linguists in Brno started with teaching relevant mathematics to linguists (provided by mathematicians) and grew into the establishment of the local branch of computational linguistics. Combining published and archival sources, I will show how the co-operation between mathematicians working with mathematical machines and researchers in the humanities played out in Brno.

Technological Determinism and the Eye of the Painter: Building an Automatic Cartography System to Overcome ASCII Maps’ Drawbacks (France, 1962-1980)

- Edgar Lejeune, Centre Alexandre Koyré, CNRS, Paris

Abstract: In the late 1950s, cartographers started to use mainframe computers to improve map production. Yet, that ambition was constrained by technological limitations, e.g. the cost of computing services, the lack of dedicated software technologies, or the poor quality of display devices (printers, cathode-ray tube monitors, plotters). In 1963, the first edition of the American Standard Code for Information Interchange (ASCII) opened up new possibilities for cartographers by

providing 95 alphanumeric printable characters to play with. However, ASCII maps were still considered crude by specialists. One of them, the French cartographer Jacques Bertin (1918-2010), claimed that these visualizations did not allow "the eye to distinguish between different and similar areas at the scale of the whole map". In order to overcome that situation, he and his team at the EPHE in Paris developed, in collaboration with IBM: 1) an original system for printing maps automatically, the IBM 870; and 2) a dedicated technique for representing visual information, the "points Bertin". This talk will aim at showing that Bertin's dismissal of ASCII maps did lead to the invention of an alternative method for automatic cartography, combining hardware and theoretical innovations. In doing so, I will argue that technological determinism should always be discussed in light of actors' activities and how they shaped their working tools.

10 Imperial Science and Global History

Room: 40.113.

Chair: Kamlesh Mohan, Panjab University

The Lop Nor 'Problem': Imperial Science and Debates over Climatic Stability and Change on the Silk Roads

- Lachlan Fleetwood, Ludwig Maximilian University (LMU)

Abstract: In the late nineteenth century, questions about a large lake Central Asia coalesced into a vexing 'problem' in imperial geography. That this lake – Lop Nor – had once existed was indicated by information in Chinese chronicles and the writings of Ptolemy. However, identifying the lake proved challenging, not least because it did not always appear to have been found in the same place. Often discussed with romantic epithets like 'mysterious' and 'wandering,' Lop Nor became an important site for imperial and scientific speculations about environmental stability and change. This paper considers investigations by Russian, British, Swedish and American geographers and scientists into the hydrography of Lop Nor. I also consider the key roles of Loplyk brokers such as Ördek, who located the ancient city of Loulan that had once graced the shores of the lake and been abandoned in the face of changing habitability, and Tokhta Akhun, who was a key source of intergenerational knowledge about environmental change over time. In turn, this

paper examines the way Lop Nor was investigated alongside the formation imperial imaginaries of the ‘Silk Roads,’ as well as incorporated by geographers like Peter Kropotkin and Ellsworth Huntington into theories of desiccation and climate change within recent human history. More widely, considering debates over Lop Nor allows for an examination of the role of geographical ‘problems’ in the history of imperial climate sciences and evolving environmentally determinist categorisations of extra-European landscapes.

(Dis)locating Commodity Chains: Medicinal Plants from the Extractive Peripheries of the West to the Factories of the German Empire (1884-1945)

- Matti Leprêtre, EHESS-Ecole des hautes études en sciences sociales

Abstract: After centuries of globalization, relocalizing strategic industries has become crucial for actors across various political orientations, driven by challenges like climate change, the COVID-19 pandemic, and the rise of China. This movement has historical precedents. From the 1880s onwards, the commodity chains of medicinal plants, vital to the nascent pharmaceutical industry, sparked inter-imperial rivalry between the German empire and the English, Dutch, Russian, and Austro-Hungarian empires, which dominated global production. After WWI, drug shortages caused by disrupted international trade prompted each empire to attempt relocalizing production within its metropolitan territory.

Drawing on archives from the pharmaceutical industry, scientific institutions, learned societies, and trade statistics, this paper delves into the historical cycle of delocalization and relocalization. Focusing on the German case within an inter-imperial context, it employs the concept of “workscape” to examine the relationship between environmental transformations and the efforts of invisible actors in the cultivation and collection of plants.

The study spans from the wives and children of German peasants to semi-nomadic communities in the Kirghiz steppes, highlighting the diverse contributors to medicinal plant production beyond male physicians. It argues that the decline in the use of medicinal plants resulted not from “scientific innovation” but from significant transformations of workspaces in both the West and its extractive peripheries.

Consideration is given to factors leading to delocalization, including changes in agricultural techniques, land privatization, the shift from agricultural to industrial societies, and the revolution of transportation. The analysis also addresses the obstacles to relocalization. Since profitability depended on cheap labor, the paper examines how, in Germany, the “revival of phytotherapy” was facilitated by the forced labor of women, children, and prisoners in concentration camps during WWII. Historical pictures and GIS maps are utilized to alternate between micro-level details and macro-level overviews.

Connecting Through Technology: Building a Colonial Analogy Between Birds' Nests and Human Dwellings

- Matthew Holmes, University of Stavanger

Abstract: In an 1867 essay titled ‘The Philosophy of Birds' Nests’, British naturalist Alfred Russel Wallace drew an analogy between the nests of birds and human dwellings. Both birds and people, he argued, drew on the materials around them to build their homes and learnt how to improve these structures by experience and imitation. Scholars have documented numerous cases in which non-human animals have become part of human technological systems. Less work, however, has been done on animal technology and how structures like birds' nests were understood. This paper argues that birds' nests and their study (the science of caliology) were an important – if short-lived – part of human-animal relations in the nineteenth and early twentieth centuries. Drawing upon ornithological archives, books, and periodicals, this paper explores how and why the comparison between birds' nests and human dwellings was made. Wallace and his supporters recognised that nests were not static constructs and were often integrated into human dwellings and infrastructure. This flexibility suggested that birds possessed reason and did not operate on instinct alone. However, the attempt to construct a comparative psychology based on the technological sophistication of homes led to the replication of the colonial era divide between ‘savage’ and ‘civilised’ peoples. Drawing closer to animals meant rehashing racial stereotypes.

Dependency theory and global histories of science: a critical reappraisal

- Maurizio Esposito, University of Lisbon

Abstract: The political economist Ingrid Kvangraven has recently argued that the Dependency theory is more relevant than ever (2023). Kvangraven's diagnosis is far from being isolated. Not only has Dependency Theory been used to understand global economic and political history, but it has lately been employed to analyze the structural inequalities affecting northern and southern countries in the European Union (Schoening, 2018). A growing number of heterodox economists think that Dependency Theory has never been seriously refuted and continues to be largely valid and insightful (Katz, 2019).

In this talk, I aim to foster reflection on whether and how the latest versions of dependency theory can enrich our ways of understanding and writing global histories of science. Once we assume that there has been (and there is) a connection between the economic and technoscientific development of nations, dependency theory might become immediately relevant for local and global historiographies of science. I will first introduce and summarize the most recent models put forward by heterodox economists (in particular, Kvangraven and Katz). Then, I compare those models with narratives provided by recent historiographies of global science (in particular, Raj 2007 and Poskett 2022) and highlight their alleged contradictions and continuities.

I argue that if those new versions of dependency theory are accepted, we should update many recent historical overviews that have dismissed the center/periphery axis in favor of narratives that prioritize circulation and appropriation of knowledge. I suggest that there is no need to refuse the new versions of Dependency Theory or reject the contemporary historiography of global science. There are ways to integrate both in a more sophisticated synthesis, emphasizing structural epistemic inequalities – portrayed through the scheme of centers, peripheries, and semi-peripheries - and knowledge's global circulation.

11 Ontologies, transits, displacements in 20th Century Sciences and Technologies (1/2)

Room: 40.152.

Organiser: Ana Romero de Pablos, Instituto de Filosofía, CSIC, Spain

Chair: María J. Santesmases, Instituto de Filosofía, CSIC, Spain

Displacements and knowledges and practice-in-changing evokes circulation. The analysis of ontological configurations of technoscientific objects—by clarifying the relational dynamics and ontoepistemic environments within which they develop—has helped us to better understand the material stress, cultural impact, and political regimes, both imposing and imposed by emergent objects. It also helps to explain the tenacious stability of many of these objects as they circulate.

We are interested in exploring the many ways in which transits and displacements are leading both to possibilities of co-construction, cohabitation, de-escalation, re-signification or, on the contrary, to irreversible degradation.

We call for contributions that explore transits between epistemologies, movements of knowledge between technologies, that consider collectives and collaboration as agents. We suggest that transits are produced and themselves produce overlappings. These overlappings are conceptualized as hybrid knowledge, hybrid ontologies and epistemologies as inhabitants of a world – a planet, a society, a collective- whose dynamics we proposed to explore in this symposium.

Reframing Disease Identities in Late Modern Medicine

- Lara Keuck, Bielefeld University, Germany

Abstract: Disease identities are being reframed in late modern medicine. Regarding often-contested disease entities such as endometriosis and Chronic Fatigue Syndrome, it has been argued that a diagnostic process represents not only a way to identify a pathology, but that the respective diagnostic label can also become a framework for patients to reframe their identity and understand their lives in medical terms. Identity has here a twofold meaning: it relates, first, to a patient's personal identity as being tied up with a disease. This includes performative acts of appropriation, for instance, when patients label themselves as 'endometriosis warrior'. Second, disease identities are formed by the medical identification and validation of a patient's complaints and their assignment to a category. Drawing on interdisciplinary discussions on the history of identity, validation and classification, I trace these two meanings of identity and their interrelations, in particular regarding diagnostic kinds at the border of health and disease, focusing on people with possible

early signs of a degenerative disease. In the borderlands of being considered neither healthy nor ill, a diagnosis is not necessarily the entry point to therapy, but often the holy grail of an odyssey. The borderlands were introduced in the 1980s as an analytical category to think from the marginal—but in late modern medicine, cases that are unsettled, not-yet-fully-diagnosed, seem to be moving into the center of medicine. My contribution explores this movement and the associated reframing of disease identities in light of the symposium’s focus on socioepistemic transits and ontoepistemic interrelations.

Global and regional scales

- Soraya de Chadarevian, University of California, Los Angeles

Abstract: At the height of the nuclear fallout crisis in the late 1950s, the Greater St. Louis Citizen’s Committee on Nuclear Information launched the baby tooth survey, aimed at establishing the amount of radioactive strontium already accumulated in young children’s teeth as an effect of above-ground atomic testing. The project, repeated in other cities, occupies a central place in atomic histories and is sometimes credited of having helped convince President Kennedy to sign the partial atmospheric test ban treaty of 1963. In this paper I will place the project into a longer history of women activism, civic engagement, and the fight for healthy food and environment in the St Louis region reaching back to the 1880s that responded to the global crisis in the 1950s.

Transparent Glass and Crystal, Enduring

- Miguel Ángel Rego Robles, Universidad Europea / Escuela Universitaria de Artes TAI

Abstract: In Book XXXVI of his Natural History, Pliny the Elder recounted the coincidental appearance of “transparent streams of an unknown liquid” (Elder, 2020: LXV. XXVI. [2]), as nitrate of potassium traders used this material as a support for cooking pots on the shores of Phoenicia. The transition between the properties of transparency and opacity in glass and crystal has been a constant in their industrial applications—from French embossing in the mid-19th century, emphasizing translucency, to the durability of holograms affixed to Iron-Doped Lithium Niobate crystal ($\text{LiNbO}_3\text{:Fe}$), developed by Eva Mónica de Miguel (de Miguel Sanz, 2000),

emphasizing transparency. Precisely, in the early 21st century, the transparency of glass became a possibility for long-term digital data storage. However, magnetic recording hard drives and USB memories prevailed in the market, despite offering lower durability in information degradation and higher energy consumption. Currently, quartz glass disks with 5D technology have taken center stage and could become the storage medium of the future, at a time when environmental respect, fear of digital information disappearance, and excessive consumption dominate several current social issues.

12 Opportunities and Challenges: Questions on the Application of Digital Humanities in the History of Science (2/2)

Room: 40.063.

Organisers: Rana Brentjes, Max Planck Institute for the History of Science; Jade Norindr, Observatoire de Paris-PSL

Chair: Jade Norindr, Observatoire de Paris-PSL

In all fields of the humanities and beyond, the era of the lonely researcher is now being superseded by an era of collaborative work. Collaboration, however, creates new social conditions and hence problems. For example, not all contributions in this collaboration are valued equally, depending on the type of intended product and its publication platform. Among the new social difficulties for historical research emerging from this changed framework, and the ensuing activities, are questions about who is an author, which rights each member of the group has, and which contributions need to be acknowledged in which type of publication (a book, an article, a database, a website, etc.).

This session will explore a set of questions resulting from this new form of collaborative work in the field of history of science. It aims to reflect on the issue of what is particular in this cooperation and their conditions within the history of science. It will focus on questions of precariousness and contested modes of recognition in collaborative projects. Continuing the discussion from the first session, where we began looking at questions of authorship and labor recognition associated with the data entry process, we now explore these issues further while considering

data usage and valorization within a context of open access. Subsequently, issues of durability and sustainability of digital resources and projects will also be addressed.

Questioning the participatory dimension of the link between libraries and museums collections thanks to a Citizen science project

- Rossella Baldi & Lukas Heinzmann, Université de Neuchâtel and Universität Bern

Abstract: The research project *Bibliothèques et musées en Suisse 18e-19e siècle* (Université de Neuchâtel) is dedicated to exploring the forgotten link between library and museum collections in Switzerland. With the exception of a few studies, objects have tended to be excluded from the general history of libraries, which has privileged to focus on the history of education, reading practices, architecture and institutions. The project and the hallerNet platform (<http://www.hallernet.org>) — which specializes in digital editions exploring knowledge and scientific networks for the period 1700-1850 — have therefore been working together since 2022 to produce digital data that will allow the study of natural history cabinets in 18th-century Swiss private and public collections. This collaboration includes a Citizen science project. A dozen of senior citizens have transcribed sources extracted from the registers of the Neuchâtel authorities and the minutes of the city's cultural institutions, i.e. its library and its natural history cabinet whose objects were instrumental in the creation of the city's museums network. The edition material will soon be edited on hallerNet with a particular attention to prosopographic data, in order to shed light on the cultural politics of a city between the French Revolution and 1848. Our paper will address the challenges of this collaborative editing, and its social, technical and historical dimensions. By highlighting the participatory dimension of research, Citizen Science allows to better understand a historical phenomenon such as the emergence of museums, whose participatory dimension was a key factor in their success.

Cooperation and its contradictions in DH projects in HoS

- Rana Brentjes, Max Planck Institute for the History of Science

Abstract: DH projects in history of science have been applauded by various producers and audiences as essential to the future of history of science. Critical voices warn that the desired outcomes of such projects are often in conflict with needed investment. This applies in particular to the labour needed to set them up before any

meaningful result can be achieved. Funding opportunities are insufficient in many European countries for financing both labour and infrastructure. As a result, private companies have been created to fill the gaps. Regulation within public academic institutions as well as these new private companies concerning rights of participants, products, and sources are insufficient. Social actors, like trade unions, or academic associations are often not involved in these processes. Precariousness, lack of recognition, and inequality are major effects of this development. This applies in particular to questions of labour recognition and authorship as a substantial theme of collaboration in DH projects within HoS. Specific aspects of this general theme concern data usage and valorization within a context of open access as well as the durability and sustainability of digital resources and projects. Durability and sustainability are not merely technical, although this is an important point, but a social issue of high relevance to the career development of the younger members of the project. In my talk I will present examples addressing funding, regulations and rights in different countries within Europe and outside of it.

13 Science and Democratisation Processes in Europe: Forecasting Democracy and Sovereignty (2/3)

Room: 40.101.

Organiser: Doubravka Olšáková & Jan Surman, Czech Academy of Sciences

Chair: Doubravka Olšáková, Czech Academy of Sciences

A ‘Democratic’ Intelligence And An ‘Intelligent’ Democracy: Making ‘Scientific’ Virtues Political In Central And Eastern Europe, 1870s – 1920s

- Alexej Lochmatow, University of Erfurt

Abstract: ‘I call the thinking style of the natural sciences a democratic one, because it is based on organisation and constant putting under control (Unterkontrolle stehen), denies the privilege of the divine origin and strives to be accessible and useful. However, the experience teaches [us] that each democracy has its small lies; one wants to have an impressive and majestic government, not just a useful and intelligent one.’ With these words, the microbiologist Ludwik Fleck advocated an ‘intelligent’ form of democratic ruling and, at the same time, indicated

the internal contradictions of this claim. Since the late 19th century, the discourse of intelligence started to gain an increasing popularity in both the scientific and public discourses. This tendency was closely related to the ideological distinction of 'natural sciences' based on the epistemic virtues of objectivity, usefulness, and verifiability that were supposed to turn to political virtues. This paper will examine the role of the discourse of intelligence in the debates on the role of 'scientific' virtues in 'doing' democracy. After reviewing the historical developments of Polish and German discourses on intelligence in the 19th and early 20th centuries, the author intends to focus on the debates about the 'nature' of democracy that took place in the formative years of the Weimar Republic and the Republic of Poland. Based on these sources, the paper will demonstrate how 'democratic' praxeology of the natural sciences was supposed to be applied in political practice.

Studies between Enemy Surveillance and Science Diplomacy: an Episode from Eastern and Western Germany, 1970s–1990s

- Friedrich Cain, University of Vienna

Abstract: From the 1970s to the early 1990s, several institutions served as hubs for science diplomacy between Eastern and Western countries. Next to the prominent example of the IIASA in Laxenburg/Vienna, a much smaller hub existed at the Institute for Society and Science (Inst. f. Gesellschaft und Wissenschaft, IGW) in Bavarian Erlangen since 1963. While the IGW was originally installed to monitor science policies in the GDR, over time the institute established close contacts with science studies colleagues from Socialist countries, especially at the Academy Institute for Theory, History and Organisation of Science (Inst. f. Theorie, Geschichte und Organisation der Wissenschaft, ITW) in East Berlin. Between 1972 and 1991, annual joint research workshops were organized. During the 1980s, an Office for Intergovernmental Relations (Büro für zwischenstaatliche Beziehungen) was established at the IGW to coordinate scientific-technical projects between the two German states. The paper analyses the annual workshops, during which sociologists, historians and philosophers of science from Western and Eastern Germany met to discuss scientific practice and its organization within specific political contexts, until both the IGW and the ITW were disbanded in 1991/1992 during the unification of Germany. The history of the research workshops documents three interrelated

developments in both political backgrounds: a) a turn from cybernetic approaches to empirical qualitative and quantitative research in science organization and creativity, b) the multi layered negotiations between Marxist and Non-Marxist science studies, and finally c) the agonal relations between opposing political epistemologies (ideological research context, funding schemes etc.) during transformation times.

Forecasting Democracy

- Luboš Studený, Czech Academy of Sciences

Abstract: The Velvet revolution in 1989 marks the beginning of return to a democratic form of government in Czechoslovakia. One of the institutions which remained connected to this development in the collective memory until now is the Forecasting Institute of the Czechoslovak Academy of Sciences. This institute was part of the reform effort in the 1980s which was mainly aimed at the reform of the economy. Nevertheless, considerations about the state of politics and democracy are present not only in main results of the institute. Founded originally in 1984, its stance toward the desired political system and critique toward the current state of politics and democracy was also changing until it was dissolved in 1993, stressing different problems which the state and society were facing. Employees of the Forecasting Institute became also leading figures of the post-1989 development. Their rise to power is a showcase for an opportunity which was used by different experts to move from only devising reform plans to enacting them. In my contribution, I will focus on these two threads. First, I will analyse the discourse on democracy in the works of the Forecasting Institute how it developed during its existence. Second, I will tackle the role of the experts in the post-1989 process, especially how they used the opportunity to gain high-level governmental posts, what allowed it and how did they present themselves to successfully enter such positions.

Thursday 5th 13:00 - 14:00 Lunch

Room: 40.002.

Women and Gender in Science

Room: 40.004.

Stand - Early Career

Thursday 5th 14:00 - 16:00 sessions

1 Astronomy and Cosmology in Iberia (1550-1650) (2/2)

Room: 40.006.

Organiser: Miguel Á. Granada, Universidad de Barcelona & José Chabás, Pompeu Fabra University, Barcelona

Chair: Miguel Á. Granada Universidad de Barcelona

The pandemic prevented from commemorating the centenary of the birth of Jerónimo Muñoz (ca. 1520-1591), surely the most important Spanish astronomer of the 16th century. The celebration of the 11th ESHS Conference in Barcelona in September 2024 may be an excellent occasion to address the state and development of astronomy and cosmology in the Iberian Peninsula (Spain and Portugal) between 1550 and 1650, a subject that has not received by scholars all the attention it deserves, both because much of the production has remained in manuscript and also because it is largely written in the vernacular (Castilian and Portuguese).

The Translation into Castilian of Ptolemy's Almagest by Juan Bautista Vélez

- José Chabás, Universitat Pompeu Fabra. Presented *in memoriam* by Miguel Ángel Granada.

Abstract: Ptolemy's Almagest was the most influential work on mathematical astronomy from the second to the sixteenth century. Originally written in Greek, it was translated several times to other languages, first probably to Syriac, several times into Arabic in the ninth century, then into Latin in the twelfth century, and into Hebrew in the thirteenth century. In more recent times, a few translations into modern languages were produced, in French, German, and English. No translation into Castilian was known. Yet there is one made in Madrid in the early seventeenth century by the scholar Juan Bautista Vélez. It is extant in a manuscript at the Real Biblioteca del Monasterio de El Escorial. This paper focuses on the translation of Books V and VI of the Almagest, concerning syzygies and eclipses, and on the many

commentaries made by Vélez to its contents and, more generally, to astronomy as it was practiced at the time. It turns out that Vélez was a thorough translator, a well-informed scholar, and a skilled mathematician, with a deep understanding of a most difficult book, Ptolemy's *Almagest*.

The Construcción Matemática of Juan Bautista Vélez and its Transcendence in the History of Astronomy in Spain

- Félix Gómez Crespo, independent researcher

Abstract: Under the reference number K-I-11, in the library of the Royal Monastery of El Escorial, there is a large manuscript volume whose existence was first reported by José Antonio Sánchez Pérez in his book *Las matemáticas en la Biblioteca del Escorial* (1929). When we consulted the manuscript in 1991, we discovered that it was an extensively glossed translation of the first six books of Ptolemy's *Almagest*, the first translation into a vernacular language. We also were able to conclude that the translation of the remaining seven books had been completed and was ready for publication. However, this second volume has not been located to date. The work was done by Juan Bautista Vélez, an almost unknown author who belonged to the intellectual circle of the Court and surely worked for years in the library of the Monastery. We do know that the bulk of the writing was done between 1630 and 1631. The most important in this manuscript lies in its very extensive glosses, typical of a modern scientist, which represent a document of considerable originality and interest. They review a great number of notions of earlier astronomy, still in force at the time when the Commentaries were written, but also the fundamental conceptions of Tycho Brahe, Copernicus or Kepler and a great number of scientists who prepared and developed the revolution of the sixteenth century. The Spanish translator's extensive erudition of the Spanish translator is evident from the fact that he cites two hundred authors, ancient and contemporary, including Holwarda, Boulliau and Kepler himself, in what is the first citation in Spain of these names. In addition, Vélez's *Comentarios* provide a comprehensive exegetical discourse on the heliocentric concepts that preoccupied scientists at that time.

Celestial Knowledge in Transit: Diagrams of (the End of) the World in Iberian-American Repertorios de los tiempos

- Sergio Orozco-Echeverri, Instituto de Filosofía, Universidad de Antioquía

Abstract: The *repertorios de los tiempos*, a genre of early modern Iberian-American almanacs, produced cosmographical knowledge across the Atlantic. In contrast with other works of royal cosmographers and major pilots (Chaves, Zamorano), repertorios extensively circulated celestial knowledge that served practical purposes such as the construction of calendars, prognostications for agriculture, and medical prognosis. These practical aspects were founded upon Renaissance cosmography, astronomical chronology, and Catholic eschatology. These foundations involved diagrams representing the order of the cosmos and the motion of planets. During the evolution of repertorios, particularly in the Americas, the diagrams came to visualise the historical transformation of the cosmos. In so doing, repertorios displayed how the world and its inhabitants—encompassing the ‘New World’—shall form a unity under Christianity and the Spanish Monarchy, leading to the second coming of Jesus. This paper analyses the evolution and argumentative functions of illustrative and mathematical diagrams representing the world and its end in repertorios.

Round table with the chair and all the speakers in the two sessions or panels.

Roundtable with the chair and all the speakers in the two sessions or panels, discussing the issues on astronomy and cosmology in Portugal and Spain (with inclusion of the overseas territories) in the period between 1550 and 1650, and the question of new editions of the relevant sources.

2 Creating the useful animal. Acclimatisation in the Spanish-speaking world and beyond (1/2)

Room: 40.002.

Organiser: Oliver Hochadel, Institució Milà i Fontanals, CSIC, Barcelona

Chair: Miquel Carandell, Institut d’Història de la Ciència, Universitat Autònoma de Barcelona.

Acclimatisation is a fuzzy term. It is hard to pin down because it refers to diverse theories and practices dealing with “exotic” animals in the nineteenth and twentieth centuries. It refers to attempts to introduce non-human animals into another climatic

zone through selective breeding and “experiments”, mostly from the South to the North. The final objective is to derive economic benefit from the acclimatised creatures. Commercially viable products might be feathers, pelts, meat, eggs, or the introduction of new draught or transport animals.

Most of the historiography so far has focused on France and Great Britain (including their colonies). Yet acclimatisation was a transnational movement with animals, theories and “best practices” circulating among institutions and other actors all over the globe. This session would like to shift the attention to acclimatisation initiatives on the Iberian Peninsula and Latin America. As regards the concrete spaces for the acclimatisation projects it will focus primarily on zoological gardens but will also include private estates, international fairs and other venues. The session will address the following questions: Did the acclimatisation projects in Spanish-speaking areas differ in interesting ways (theories, practices, actors ...) from other, better-studied contexts? How were they connected with other acclimatisation efforts, particularly across the Atlantic? How far were these initiatives shaped by larger debates on human-animal relationships, race, class conflict and human migration? The eight papers will span the period from the mid-eighteenth to the mid-twentieth centuries. The thematic diversity of these papers (in terms of chronology and specific institutional and historical context) will allow for a mapping of the spectrum of acclimatisation efforts. The commentary will discuss the “fluidity” of the term acclimatisation and how it might be useful as a conceptual tool to talk about animals and the environment.

Sheep Mercantilism: Genetical Capital as a National Resource in Eighteenth-Century Europe

- Jens Amborg, Uppsala University

Abstract: This paper examines French efforts to emulate Spanish wool production by acclimatizing foreign sheep in the eighteenth century. In the period, wool textile manufacturing constituted the largest industry in most European countries. Sheep breeds and their ‘genetic capital’ were seen as national resources which countries like Spain and Britain protected by prohibiting all exportation of live sheep. The French, on the contrary, strived to improve their sheep stock, which they perceived to be hopelessly degenerated, by importations. Their efforts were intensified in the wake of

the Seven Years' War (1756-1763) as state officials collaborated with the naturalist Daubenton to import Spanish sheep through commerce, diplomacy and smuggling. Following speculations about the potential African or Asian origins of the Spanish breeds, the French furthermore tried to bypass their European rivals by getting animals directly from these initial sources. The paper thus explores acclimatization as a transnational project at the intersection of natural science and mercantilist imperial politics.

At the limits of biology: Acclimatization and Hybridization in the zoological collections of Madrid in the nineteenth century

-Nuria Benítez Prián, Universidad Complutense de Madrid

Abstract: In mid-19th century Europe, enthusiasm for acclimatising new exotic species from the colonies involved naturalists, breeders, veterinarians and governments through acclimatisation societies such as the Société d'Acclimatation de France. In Spain, Mariano de la Paz Graells established an acclimatisation zoo in the Botanical Garden in 1859. Yet already well before that, the monarchy conducted acclimatisation experiments on its collections of exotic animals in La Real Casa de Fieras and the Royal Sites. This presentation deals with the experiments carried out, the agents involved, the criteria followed, the failures and the achievements obtained. Veterinarians, zoologists and agricultural experts followed these developments with interest. The zootechnical experiments were aimed at improving certain domestic breeds by hybridisation, but no exotic species were acclimatised to the productive levels of domestic breeds. The scarcity of zootechnical endeavours in Spain has been lamented in comparison with colonial powers such as France or England. However, the documentation found provides evidence of important efforts from the end of the 18th century onwards by Spanish sovereigns in this line of thought. This finding motivates us to continue researching in archives for a deeper understanding of this part of our history.

Glamorous feathers for the metropolis. Promises and realities in the acclimatisation of the ostrich (1854-1914)

- Laura Valls, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

In 1867 two stuffed ostriches were exhibited in the Algerian section during the **Abstract:** In 1867 two stuffed ostriches were exhibited in the Algerian section at the Parisian International exhibition. They made visible the first experimental essays for acclimatising the African bird in Algeria and the French ambitions on the colony by means of animal production. The specimens were a young ostrich from the Jardin d'acclimatation d'Alger, provided by its director M. Hardy and an adult ostrich that belonged to M. Chagot, the owner of a Feathers house in Paris. Both were members of the Société zoologique d'acclimatation created in 1854. Chagot promoted an award to stimulate the acclimatisation of ostriches; and in 1857 Hardy accomplished the first breeding in captivity of the ostrich and, two years later, a second generation. These were promising steps for the French to lead the global trade in ostrich feathers. However, the pursuit revealed far more difficult, since during the following fifty years France failed to truly establish a centre of production in Algeria. By contrast, the acclimatisation in Cape Town proved successful since 1863 and the British colony was able to dominate the feather market until the advent of the First World War. In Spain, in 1859 Graells achieved the breeding of a couple of ostriches. But it is not clear that a scientific program for the acclimatisation of ostriches was really envisaged. Why did the acclimatisation of the ostrich succeed in one case and failed in another? The Algerian case shows that it was not strictly a matter of knowledge. This communication will explore some reasons at stake.

3 Data, satellites and environmental knowledge (1/2)

Room: 40.004.

Organiser and Chair: Gemma Cirac-Claveras, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

Scientific, economic and political knowledge about the environment relies enormously on satellite data about the oceans, the atmosphere, the land surfaces and the ice. These data are collected, processed, shared and maintained through a knowledge infrastructure that turns measurements made in the orbits into environmental information ready-to-be-used by various social groups. Satellite data are thus relevant research objects, inherently social and technical artefacts, whose

building and maintenance must be historically contextualized. This symposium presents empirical cases that examine the complex array of individual actors, institutions and forms of organization that intervene in the development, maintenance, dissemination and use of satellite data, the sociotechnical arrangements from which they emerge, and the power relations, values, routines and norms that go with them. Some of the topics that will be explored are:

- Sociotechnical infrastructures (e.g. who produces and who accesses satellite data, how and under what conditions; what models of data sharing have been developed; what activities are carried out to promote satellite data, at what scale (international, regional, national));
- Governance (e.g. how access, ownership and credit are negotiated; how archiving, curating, accumulating, quality control, long-term sustainability are materialized; through which kind of materialities data governance and environmental governance are imbricated);
- Power (e.g. which power dynamics the production, circulation and usage of data entail, reproduce and produce; how data act as relevant diplomatic assets in negotiating scientific, technological, and political agendas; how satellite data can be articulated with resistances to environmental governance, data governance and satellite technology itself, what kind of economic frictions are involved);
- Knowledge and epistemologies (e.g. how data is arranged in maps, images, measurements, and graphs, and what messages do they convey; what aspects remain unseen; how do these messages reach diverse audiences, and how does a particular dataset gain economic, scientific, aesthetic or ethical value).

The making of the Sea Surface Temperature: the Earth Resource Satellite and its payload Along Track Scanning Radiometer as scientific objects

- Hèctor Isern, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

Abstract: Earth observation satellite data are complex scientific objects. As such, they embody tangibility questions and specific practices, both entangled in global data infrastructures which co-construct our climate knowledge. Due to its required nuancing, this paper focuses on a specific data, the Sea Surface Temperature (SST) collected with the Along Track Scanning Radiometer (ATSR) instrument as payload of the ERS-1.

The European Space Agency (ESA) started designing the ERS-1 at the beginning of 80s, with EARTHNET as its central ground element. At the same time, the ATSR was being developed mainly by the British Rutherford Appleton Lab (RAL) under the leadership of the climate scientist John Houghton. Both processes took place with new concerns about the importance of higher resolution satellite data, due to the new approach on small-scale processes demanded by the increasing climate change challenge. What kind of data negotiations involved SST? What role played the ATSR promoters as a fostering agent of the small-scale approach regarding SST? Who lead the negotiations between RAL and ESA and what political concerns were at stake? This paper aims to delve into historical data questions to understand how the technological change co-constructed our climate knowledge.

Representing the Landsat Image Mosaic of Antarctica as an aesthetic and scientific object

- Amelia Urry, University of Cambridge

Abstract: How has ice historically been seen from space? The first Landsat satellite was launched in 1972 with a goal of imaging "earth resources", but ice and snow were slippery targets for Landsat's sensors as compared to the mineral deposits, crops, and urban landscapes that the satellite's operators were more interested in. Thus composing a Landsat mosaic of Antarctica took 30 years—and a shift in science paradigms—to achieve, long after composite imagery of the other continental landmasses had been achieved. The eventual result was the Landsat Mosaic of Antarctica or LIMA, and its construction required a rethinking of how satellite imagery should represent ground truth, and how its many pieces could be related in order to represent the surface of the earth as a seamless whole. This paper will examine the decisions and actors by which representation of Antarctica by Landsat was eventually achieved. By looking at satellite vision through an icy lens, I will suggest some approaches to more general questions about the changing nature of satellite data. Ultimately, LIMA was a compromise between scientific and aesthetic goals, reflecting the status of satellite imagery as a form mediating between scientific data and public imagery.

Crafting the European Climate Narrative Using Satellite Data

- Grigoris Panoutsopoulos, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

Abstract: In the 1980s and 1990s, discourses about climate began to play increasingly significant roles within the realms of science, policymaking, and global diplomacy. This presentation will aim to investigate how the European climate narrative was molded by satellite data production, circulation, and utilization, with a particular focus on two of Europe's most prominent meteorological initiatives, the EUMETSAT (European Organisation for the Exploitation of Meteorological Satellites) and the ECMWF (European Centre for Medium-Range Weather Forecasts). Examining these two organizations in tandem raises several compelling questions: What disparities existed in terms of their instruments, expertise, practices, methods, strategies, and rhetoric? To what extent did they manage to find common ground, and what power dynamics came into play during this interaction? Additionally, how did their scientific and technological agendas align with the broader political landscape? From this perspective, notions such as climate, satellite data and international affairs can be approached not as isolated and static concepts, but more as a nexus, where the emphasis is given on their co-production and multifaceted relations.

The ESRO Origin Story of European Environmental Data, 1967-1975

- David Skogerboe, Utrecht University

Abstract: This paper aims to understand the origins of Europe's robust environmental satellite data infrastructure. The European Space Research Organization (ESRO) was formed in 1964 with a strictly scientific agenda. This agenda was soon challenged, as Member States argued for Europe to develop a sovereign capability in 'application satellites' (communications, navigation, meteorology, and remote-sensing). I will analyse ESRO's slow and complex transition from a scientific to an applications focused organization, focusing on meteorology and remotesensing programmes. It was not until ESRO and ELDO merged to form ESA in 1975 that tangible results were achieved, specifically: Earth observation data network Earthnet (1976), meteorological satellite METEOSAT-1 (1977), and remote-sensing satellite ERS-1 (1991). This paper will argue that deliberations within ESRO between 1967-1975 codified the research agenda that later produced the

European environmental satellite data infrastructure. This process of agenda setting offers a view into how a European context became embedded into its data.

4 Describing reality through mathematical models (2/3)

Room: 40.012.

Organiser: Eleonora Sammarchi, ETH-Zürich & Riccardo Bellé, University of Rome Tor Vergata

Chair: Riccardo Bellé, University of Rome

In various ways, sciences have attempted to describe reality by building predictive models for the interpretation of natural and social phenomena. Particularly in the mathematical universe, model building throughout history has meant providing simplified images of events in the phenomenal universe, and translating them into mathematical language to make predictions consistent with experimental data. In this symposium, we aim to investigate how mathematical models were conceived in relation to various fields of knowledge such as mechanics, optics, hydraulics, biology, economy, etc. The core questions of our investigation are:

How does mathematical knowledge influence the construction of scientific models? Does modelling (in turn) guide mathematical research? And if so, how? By gathering together scholars whose expertise is representative of the interdisciplinarity of mathematics, we will provide a better understanding of the interrelations between mathematics and reality.

In our second symposium, we will discuss the aforementioned questions by looking at certain attempts of mathematization of reality of the modern period. We will focus on models of phenomena both outside and inside mathematics. Mathematical models are also understood here as engineering projects, in which one identifies the essential features that guarantee the efficiency of the object to be built. Finally, we will examine the case of mathematical modelling as an activity in relation to research practice within the field of biology.

Governing the waters: the activity of Teodoro Bonati as mathematician and experimenter in Ferrara

- Maria Giulia Lugaresi, Università degli Studi di Ferrara

Abstract: Teodoro Bonati (1720-1820), mathematician and hydrostatic scholar in Ferrara, was one of the most important experimenters and researchers in the field of both theoretical and practical hydraulics in Italy, as of the second half of the 18th century. In his double role of consultant for problems related to the waters and professor of hydrostatics at the University of Ferrara, Bonati realized many experiences on the waters, with which he tried to practically test the mathematical theories. Bonati searched, even with the use of empirical rules, the solution of problems related to the motion of waters. He paid specific attention to the construction of models and devices that were suitable for the measurement of the speed of waters, like the so called “asta ritrometrica”, i.e. a rod for measuring flow. In his works Bonati presented the experiences he made using different kinds of vessels and considering different kinds of openings and fluids. A large part of Bonati’s scientific production remained unpublished and it is still preserved in Ferrara. Starting from a recognition of Bonati’s published and unpublished works about the science of waters, I will focus my attention on the description of the hydraulic devices that he designed and used as hydraulic consultant.

The role of models in the early development of non-Euclidean geometries

- Alberto Cogliati, Università di Pisa (Italy)

Abstract: Geometrical conceptions experienced a radical change in the course of the 19th century that concerned both the role of principles and the nature of geometrical objects: axioms ceased to be regarded as necessary propositions that are endowed with a truth content while elementary notions such as that of point or straight line gradually became capable of assuming different meanings and interpretations. An early manifestation of this new tendency was the introduction by Bolyai and Lobačevskij of hyperbolic models of Euclidean geometry in order to deduce formulas of hyperbolic trigonometry. Only at a later stage, Euclidean models were exploited, among others, by Riemann, Beltrami and Klein, in order to investigate non-Euclidean geometries and their extensions and also to provide support to their legitimacy. My talk aims at offering a general historical account of the notion of geometrical model and its use in the early period following the discovery of non-Euclidean geometries. Here are some questions that I intend to address: how the possibility of employing different models to interpret a given axiomatic system came

about? Were Euclidean models actually regarded as a tool to prove coherence of non-Euclidean geometries? How did this radical transformation of geometrical conceptions affect the way of regarding geometry as a model of physical space?

Rashevsky's early development of mathematical biology: the significance of mathematical "paper and pencil" models

- Tinne Hoff Kjeldsen, University of Copenhagen

Abstract: The Ukrainian physicist, Nicolas Rashevsky, was one of the pioneers in the emergence of mathematical biology in the twentieth century. In the talk, we will discuss Rashevsky's early work on modelling cell division along with some of his philosophical ideas with a focus on his motivation, perception of and goals for mathematical modelling as a research practice in biology. We analyze his modelling activity and discuss why his ideas clashed with the biologists' views. We also touch upon his attempts to create and establish a research field and an education in mathematical biology.

5 From controlled nuclear fusion to fusion energy: Scientific technological, political and environmental histories (2/3)

Room: 40.154.

Organiser: Roberto Lalli, Polytechnic University, Turin

Chair: Barbara Hof, University of Lausanne

There is increased interest in fusion energy as a viable future clean energy technology. Since it became a central focus of international cooperation in the 1958 Conference of Peaceful Uses of Atomic Energy, fusion energy has been researched and developed because of the associated environmental, political, and economic gains. Moreover, fusion energy research has been described as a major science diplomacy exercise with the neologism of "fusion science diplomacy" as well as a key area of experimentation in the process of European integration since the late 1950s. On the other hand, in different periods research on fusion energy has raised controversies in scientific and political circles as a technology that has not fulfilled the expectations and whose development requires large amounts of public investments. These debates indicate that the development of fusion energy research

has been shaped by complex interconnections of factors including techno-scientific advances, different national political agendas and environmental issues.

The symposium provides a venue to analyze and discuss the multiple historical patterns related to research on fusion energy and related debates that regard various domains, from scientific cooperation to political imperatives, from technological choices to environmental issues. The symposium is organized in three sessions. The first session presents general mappings and socio-epistemological analyses of international cooperation schemes in fusion energy research. The second session addresses the science diplomacy dimension of fusion research for international institutions and nations as well as the relations between technological decision-making and political agendas in chosen case studies. The third session concludes the symposium by focusing on environmental implications and non-scientific actors that played a crucial role in the process of fusion research. A discussant will comment on the entire symposium at the end of session III. The Symposium is sponsored by the Italian Society for the History of Physics and Astronomy (SISFA).

A tale of two systems: Contributions to laser fusion research in the two Germanies 1972-1991

- Johannes-Geert Hagmann, Deutsches Museum

Abstract: With the invention of the laser in 1960, a small number of research groups around the globe explored the lasers' potential to achieve inertial confinement fusion (ICF) as an alternative concept to the control of plasmas through magnetic fields. Owing to the connection to defense related research and thermonuclear weapons, many aspects initially remained classified in countries including the United States and the United Kingdom. From 1972 on, progress reports and the US declassification of some elements of ICF research sparked increased enthusiasm and research activity on both sides of the Iron curtain. In this contribution, we contrast the political and scientific motivations for driving laser fusion research in both the Federal Republic of Germany (FRG) and the German Democratic Republic (GDR), from the time of the Montréal Quantum Electronics Conference in 1972 up to reunification and the dissolution of GDR research institutes. For West Germany, we retrace that this research at times also included tensions regarding classification and proliferation

with Allied partners. In addition, we argue that despite very scientific and economic different boundary conditions as well as its development toward big science eventually driving this research to conclusion, research teams in the two Germanies were able to deliver original scientific contributions on an international level.

The Next European Torus NET as the ancestor of ITER As a nuclear engineer I worked from 1973 to 2016 in the area of fission and fusion safety

- Werner Gulden, Stuttgart University

Abstract: In the years 1986 to 1988, when the ITER terms of reference and the ITER concept were negotiated, the international tokamak reactor INTOR which had been developed since 1978 in close cooperation by Russian, European, Japanese and American scientists was well advanced. The INTOR documentations would have been available as a starting point for ITER, but they were hardly taken into account, because the ITER partner organisations brought in their own ideas on their domestic “Next Step” Tokamak devices: NET (EU), TIBER (USA), OTR (UdSSR) and FER (Japan). Whereas NET and FER were quite similar, the Russian device OTR could not be accepted because it was a fission-fusion hybrid. TIBER was at its beginning, because the American strategy concentrated on an ignition machine and not yet on a Next Step device. To reach consensus took a long time, because each partner tried to adjust ITER to their own domestic fusion strategy. In this process INTOR did not play any role because it was of limited political interest. The NET (Next European Torus) device forming part of the EURATOM fusion programme strategy, was ready to be used as ITER starting point. Its design had started in 1984, and a detailed Conceptual Design Report was available in 1988. It will be shown that the ITER concept of 1988 resulting from the negotiations was very close to the already existing conceptual NET design. Emphasis will be put on safety and environmental aspects.

A Very Long Way to New Energy (1987-2035?): The ITER Project from Cold War...to a New World Order?

- Stefano Salvia, University of Pisa

Abstract: Although a lot of information and official documents can be found on the International Thermonuclear Experimental Reactor (ITER) located in Southern

France, on its complicated history dating back from the 1980s, its present state of advancement, and even its "scheduledly open" future for the peaceful and sustainable use of atomic energy, a comprehensive socio-historical-epistemological account of the whole Project is still needed from a global perspective on cooperative/competitive networks of techno-scientific diplomacy/rivalry, following almost four decades in which the world has dramatically changed: from Cold-War confrontation to the illusion of an "American Century", from late-1990s expectations on the European Union to its current crisis, from the rise of China as new superpower to the most recent international tensions due to war in Ukraine and Palestine. Aim of my contribution is to outline such a long-term research programme on ITER as a whole, paradigmatic case study for science and technology diplomacy in the domains of civil nuclear physics, which would also benefit from the instruments and methods of Historical Network Analysis and would be carried on at the Polytechnic University of Turin, in cooperation with: the research network "FusEUrope - European cooperation in nuclear fusion research: from history to future policy design"; the EU Science Diplomacy Alliance; the ERC funded project "NEWORLData - Negotiating World Research Data: A science diplomacy study"; the working groups "ModelSEN - Socio-epistemic networks: Modelling Historical Knowledge Processes" and "Networks, Network Science, and Knowledge Graphs", within the VII Research Theme "Digital and Computational History of Science" at the MPIWG Berlin (Department I).

6 Healthcare, diagnosis and socio-political decisions

Room: 40.008.

Chair: Jon Arrizabalaga, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC), Barcelona

Responding to the challenge of humanization in Healthcare: Let's be healthcare professionals from day one

- Rafaela Domínguez Vilaplana, Complutense University of Madrid

Abstract: This communication aims to address one of the current challenges within the global healthcare. Through an historical and reflective view of the past, we intend new health professionals to get tools, values and skills, to face one of the most

important future challenges, such as the relationship with patients or in other words, the humanization of Healthcare. Society is moving towards the primacy of data (Big data) and artificial intelligence (AI). However, it is still necessary to focus professional vision on the human being, so as to avoid the dehumanization of patients. This is especially important in Health and Healthcare. The accumulation of numbers and data cannot distance the health professional from focusing on the patient and his human dimension, considering him as a person and not as a set of aggregated data. Currently, Health Sciences students are in contact with a huge amount of new technologies (AI, robotics, etc.), turning tools into the end and not the means. Our work as teachers of “History of Pharmacy, Pharmaceutical Legislation and Deontology” and “Healthcare Profession” within the degree in Pharmacy, is to try our students to understand that their ultimate goal is the patient health and quality of life. Other aspects are secondary tools, overall if their objective is not clear from their first day. So we put them in contact with potential patients, to make the students aware of their status as future healthcare professionals with the corresponding legal and/or ethical and deontological responsibilities that will be constantly present in their professional life.

Tell Tale Toes: Neurology, Surrealism, and Knowledge of the Body

- Jasmina Karabeg

Abstract: Cutaneous plantar reflex, or Babinski sign, a diagnostic method widely used in modern neurology, was presented at the 1896 meeting of the Société de Biologie, firmly directing French psychiatry toward neurology. Babinski’s diagnostic method aims to identify patients with lesions of the pyramidal tract. His diagnostic method was used in medico-legal evaluations of work and war injuries, with the absence of Babinski sign taken as suspect, and an indication of malingering. Hence, flexing or extending toes was understood as a reliable indicator not only of the nature of the injury but also of the patient’s overall medico-legal status. Toes tell the truth. Bataille’s text “The Big Toe,” accompanied by Boiffard’s photographs, was published in Documents in 1929. Like Babinski before him, Bataille also finds a hidden testimony in the toes, disclosing the essential baseness of the species. Bataille unmask humanity’s penchant for méconnaissance that invariably seeks to represent only those aspects of itself that are desirable and noble. Seemingly unique and

infinitely remote from the protocols of medical diagnostics, adjudication of insurance, and protection of national interests, the text still exudes epistemological confidence comparable to Babinski's. Both Babinski and Bataille pair their statements with visual evidence; however, the photographs work in distinct ways. By stressing the continuity of the body and claiming the objectivity of diagnostic procedure, the image in Babinski and Froment's neurological textbook evades the problem of extrapolating partial evidence to the entirety of the patient's medical, social, and legal existence. However, Boiffard's photographs highlight problems concealed by the self-effacing work of medical photography. Boiffard's images cast a shadow of doubt, hiding his subjects and inserting a gap between a general claim and the knowledge of each individual body, showing the limits of Babinski and Bataille's epistemological confidence.

The challenges of research on rare diseases in Spain during the late-Francoism and the transition to democracy: the case of lysosomal storage diseases

- Raúl Velasco Morgado, University of Salamanca

Abstract: Owing to a confluence of factors, among which stand out the molecularization of medicine and the empowerment of patients, during the second half of the 20th century the group of "rare diseases" was constructed as a new nosological category. Defined primarily by their low incidence rates, this categorization holds significant historiographical value, facilitating the aggregation of disparate conditions sharing common challenges, including diagnostic and therapeutic complexities, reliance on advanced technologies, and their association with pediatric patients and disability issues. However, the origin of the term—at least of the new socio-economic concept sealed with the US Orphan Drug Act in the 1980s—was directly related to research and the private resources dedicated to it by the pharmaceutical industry. Nevertheless, what hurdles did non-industry-affiliated research encounter in investigating these diseases?, and to what extent did governments allocate resources to such endeavors? This paper tries to address these inquiries, employing lysosomal storage diseases as a case study, focusing specifically on Spain during late-Francoism and the Democratic transition (1960s-1980s). As primary sources, we will use the historical archive of the Juan March Foundation—a

philanthropic organization that financed the most important projects— and an interview with Teresa Pàmpols Ros (b. 1942), a pioneer in research on this group of low-prevalence diseases. We will present some conclusions that demonstrate: (1) a key role of philanthropic investment, (2) the existence of practices aimed at reversing the "brain drain" to import knowledge with such a high degree of ultra-specialization, and (3) the challenges encountered in conducting research on prenatal diagnostics prior to the legalization of abortion in Spain under certain circumstances.

7 How Computing Influenced our Understanding of the World: Scientific Communities as Communities of Computing (2/3)

Room: 40.109.

Chair: Ulf Hashagen, Deutsches Museum and LMU Munich, Germany

Organisers: Helena Durnová, MU Brno, Czechia; Ulf Hashagen and Rudolf Seising, Deutsches Museum and LMU Munich, Germany

The practice of scientific research changed significantly with the arrival of the computer. Our historical understanding is influenced by two contradictory observations. On the one hand many academics follow the general belief of the public and of the political leaders, that Moore's law has a significant role in determining the place of technology in society and is not only a determinant of our society but also of our current research practice in the natural and social sciences and in the humanities. On the other hand, historians of computing advocated against technological determinism and made the argument that the computer is a "protean machine" (Michael S. Mahoney). In their understanding, studying scientific communities as communities of computing is just as relevant as the overwhelming technological determinism. In our symposium we would like to explore these historical phenomena by analysing, among others, the interactions between the personnel of the computing centers, programmers and scientists, new computer-based scientific methods such as scientific simulations and artificial intelligence, and the emergence of new disciplines and sub-disciplines (such as computational linguistics or cognitive science).

This symposium is sponsored by the Interdivisional Commission on History and Philosophy of Computing (HaPoC hapoc.org).

Automatic Proof -- an early AI application in the Federal Republic of Germany

- Rudolf Seising, Deutsches Museum, Munich, Germany

Abstract: At the "10th Karlsruhe Learning Conference" in 1963, the young mathematician and computer centre employee Gerd Veenker from Tübingen gave a presentation on "A decision procedure for the propositional calculus and its realisation in an automatic calculator" before submitting his diploma thesis. The corresponding article in the same year was probably the first scientific publication on "Automatic (theorem) proving" to appear in the Federal Republic of Germany. Four years later, Veenker published his dissertation on "Proof methods for the predicate calculus". In the USA, the programmes "Logic Theorist" and "General Problem Solver" were the first steps into a field of research that is now called "Artificial Intelligence". These first theorem provers were written in the 1950s for the large von Neumann computers in the USA, and two research directions developed. One seeks proofs with the help of the computer by imitating the proof of a human (and therefore not purely logical) mathematician, the other does not allow any deviation from deductive-logical reasoning. The first involves the "simulation of mental processes when solving problems", which is why the Chinese-American logician and philosopher Hao Wang called it "psychocentric", while the other - called "logocentric" by the German physicist and linguist Helmut Schnelle - is based on the "simulation of mental processes when solving problems". The investigation of both paths led Veenker to the thesis that the mathematical search for proofs would only lead to success in direct co-operation between mathematician and computer.

A new Science? – Computational Linguistics and Artificial Intelligence Research in the Face of Big Data

- Amira Moeding, University of Cambridge

Abstract: How computer systems could and should be used to model human intelligence and processes of understanding was (and is) a highly contested question. However, a question that has been at the core of artificial intelligence (ai) research, parts of neuroscience and other fields. The introduction of computers and especially large data models in computational linguistics (CL) have fundamentally changed the

field of CL and how computers are perceived and used to model language from the mid-1980s onwards. Computational linguists have noted that using statistical models and computer systems, mainly as data-processing machines, led to ‘...a new relationship between science and engineering in speech recognition, computational linguistics and artificial intelligence more generally.’ The use of computers fundamentally changed modelling practices but also how core concepts within CL and ai research were understood. The presentation shows how new statistical methods explicitly developed for computational evaluation and parameter generation changed the idea of understanding in CL from the 1970s to the mid-1990s. The presentation recovers, first, how the new modelling practices were developed and engages the institutional and epistemological context of these developments. Second, I show how the computer was re-conceptualised foremost as a data processing machine to allow for the development of new statistical methods. Third, I engage how these developments led to the implementation of new testing practices for models promoting quantifiable standards under the common task framework. These new testing practices changed, I argue, what was seen as scientific practices and progress in CL.

‘Chasing the secret of cognition’: Cognitive Science in the Federal Republic of Germany

- Helen Piel, Deutsches Museum, Munich, Germany

Abstract: How does (human) cognition work? How do we solve problems, how do we learn, how do we perceive the world? Traditionally, these and similar questions have been addressed primarily by psychologists and philosophers. Yet since the rise of computer technology in the mid-twentieth century, a new group of researchers has emerged: cognitive scientists. In cognitive science, several disciplines with an interest in cognition combine their concepts and methods. Computer science, artificial intelligence in particular, and cognitive psychology are two of these. Cognitive scientists understand cognition as a process of information processing and for them, the computer has become both a conceptual source and a major tool. One of cognitive science’s central methods is therefore the modelling of cognition with computer programs (cognitive modelling). In the Federal Republic of Germany, cognitive science emerged in the 1980s. Starting in 1985, the German Research Foundation

funded these beginnings with the Priority Programme “Knowledge Psychology” (Schwerpunktprogramm “Wissenspsychologie”). These programmes are designed to support emerging, interdisciplinary research by funding individual projects from across institutions and regions within a larger thematic framework. The Priority Programme “Knowledge Psychology” was the first to do so for cognitive science. This presentation will place it into the longer timeline of how cognitive science developed in the FRG and discuss how it relates to computers and AI research.

8 Illustrating the Anthropocene with Toxic Histories

Sponsored by the GVRTE/2023/4593462 project

Room: 40.047A.

Organiser: Sofiya Kamalova, Institute López Piñero, University Valencia

Chair: Max Bautista Perpinyà, Université catholique de Louvain

In fostering interdisciplinary collaboration, our initiative seeks to deepen our understanding of the intricate relationship between toxic histories and the Anthropocene. Participants contribute to this intellectual exploration by employing innovative methodologies following the theoretical frameworks that explore the sociomaterial dimension of chemicals and toxicology. The goal is to develop a comprehensive narrative of the historical and contemporary dimensions of toxic legacies, shedding light on the complex web connecting human actions, toxic materials, and the ongoing transformation of our planet.

Histories of toxic materials emerge as pivotal narratives in the broader interpretation of the Anthropocene, providing profound insights into the lasting imprints of human activities on Earth. Ranging from industrial pollutants to chemical waste, these histories not only document environmental degradation but also unveil intricate socio-political narratives. Participants delve into different historical dimensions of toxic materials, from the architecture of ignorance and DDT to the complexity of particle toxicology. From the study of deindustrialization to the ethical dimensions of glyphosate. Drawing inspiration from the works of Emmanuel Henry, José Ramón Bertomeu Sánchez, Scott Frickel, Max Liboiron, and Soraya Boudia, we explore diverse perspectives, examining how chemicals shape and contribute to the Anthropocene in various spaces related to the chemical industry. These histories

serve as vital threads in the tapestry of the Anthropocene, offering insights into the enduring imprints of human activities on the planet. Inspired by recent studies, scholars explore concepts such as residues, slow violence, environmental justice, and agnotology as frameworks for understanding the socio-material properties of chemicals and their world-making powers. This panel session encourages a holistic examination of chemicals, considering their singular and ubiquitous presence as well as their regulated yet unruly characteristics. Through this collective endeavor, we aim to unravel the multifaceted dimensions of toxic histories and their implications for our planet's ongoing transformation.

Unraveling the Legacy of DDT in Spain: A Comprehensive Analysis of Production, Utilization, and Societal Implications

- Silvia Pérez-Criado, Institute López Piñero, University Valencia

Abstract: The research is centered on conducting a comprehensive analysis of the production and utilization of DDT in Spain, delving into its presence and consequences on both environmental and human health levels. Set against the backdrop of the establishment of the pesticide chemical industry in Spain during the autarkic policies of the Francoist era, the primary objective of the investigation is to scrutinize how the pervasive promotion of pesticide usage, endorsed by the State and the chemical industry, notably DDT, has contributed to the enduring toxic legacy faced today. This study aims to augment the understanding of toxic narratives and their intricate relationship with the Anthropocene. Not only is the history of DDT in Spain sought to be chronicled by this research, but it also aspires to contribute to comprehending the socio-material complexities inherent in these products. Additionally, the aim is to elucidate the short- and long-term implications arising from the regulatory processes of toxic substances, which are interwoven with deliberate practices of instilling doubt. This is compounded by the inherent "architectures of ignorance" characterizing regulatory systems. By examining DDT in the Spanish context, anticipation exists regarding the provision of a valuable perspective on the interaction between human and non-human actors.

The ripple effect of particulate matter: air pollution and field transformations of particle toxicology

- Candida Sánchez Burmester, Maastricht University

Abstract: More than 99% percent of the world's population breathes air that exceeds the limits of air quality guidelines by the WHO. One key research field that has been investigating the effects of air pollution is particle toxicology. This field has undergone several changes over the last five decades, one of the most prominent ones is the shift toward nanotoxicology. In this paper I focus on the field transformations of particle toxicology since 1970, and link some of the field's continuous concerns to contemporary discussions on the Earth's climate. My analysis is based on conference proceedings and reports, scientific articles, governmental reports, and annual reports of toxicology societies. Particle toxicologists have continuously investigated how the size, surface and structure of particulate matter impacts human and non-human animals and the environment. I argue that contemporary discussions on climate change might present new challenges and opportunities for particle toxicologists. Their findings can lead to regulations to reduce air pollution, however, these regulations have an impact on the climate, as certain types of particulate matter (e.g., sulfates) have a cooling effect on the climate by reflecting sunlight back to space. Reducing particulate matter can therefore amplify the warming effect of greenhouse gases. Thus, it might be beneficial if particle toxicologists and climate scientists collaborate in order to understand the far-reaching consequences of particulate matter on animals, the environment and the climate. Past insights from particle toxicology on the size, surface, and structure of particulate matter can be crucial in these interdisciplinary collaborations.

Glyphosate in the future of chemical sciences

- José A. Chamizo, FQ-IIF, UNAM (México)

Abstract: In its different commercial presentations, glyphosate is the most used herbicide on the entire planet. Developed by the North American company Monsanto in the 1970s, it is currently a Bayer AG product after this German company bought Monsanto in 2018, creating the largest agrochemical company in the world. A few years before this incorporation took place, demonstrations were held in hundreds of cities against the use of glyphosate, once its widespread use was, and still is, subject of various scientific, economic and political controversies. In this paper, two of the four scenarios proposed in the document Future of the Chemical Sciences by the

Royal Society of Chemistry (2016) will be faced. These scenarios are: "chemistry saves the world", the chemical sciences have the potential to solve many of the world's greatest challenges; and "free market chemistry", if austerity measures continue in the world's biggest economies, public funding for research could be withdrawn entirely. The ethical positions, corresponding to each of these scenarios focus on the work of chemical communities as Schummer and Borensen recently indicated (2021), are "responsibility", related to Precautionary Principle, Green Chemistry, Codes of professional conduct, and "freedom" considering different positions about freedom and trust, particularly in economy, politics and technology.

9 Knowledge Production, Circulation, and Adaptation as Sites for the Construction of National Identity in the PRC

Room: 40.047C.

Organiser: John Krige, Georgia Institute of Technology, Atlanta

Chair: Karine Chemla, SPHERE (CNRS & Université Paris Cité)

These papers bring together scholars at different stages of their careers with an interest in space history, history of medicine and history of mathematics who describe the way in which various actors in the People's Republic of China (PRC, China) constructed and affirmed a national identity for a revolutionary regime facing a hostile world order. Barrett and Krige contrast the humiliation imposed on Chinese space scientists on being excluded from the IGY and the confident affirmation, forty years later of their 'self-sufficient' construction of a powerful satellite launcher. Chen contrasts the Primary Health Care programmes in China with those in India and Tanzania to highlight the specificity of the Chinese 'model' of socialist medicine over those pursued in other developing countries. Bonvoisin makes a fine-grained analysis of the travel of U.S. military research in mathematics from the United States to the Soviet Union, through the work of Tsien Hsue-shen, a Chinese engineer deported from the United States to the People's Republic of China during the Red Scare. After his arrival in China, Tsien was a driving force in the development of the Chinese missile and rocket technology discussed by Krige in his paper. Together the papers attest to the diversity of scientific activity in the PRC during the first decades of its

existence and to the confident achievement of a major scientific and technological project by the end of the millennium.

Socialism and local roots of primary healthcare

- Lu Chen, Wellcome Centre for Cultures and Environments of Health, University of Exeter

Abstract: This presentation examines the dynamic relationship between socialist ideologies and the development of Primary Health Care (PHC) in China, India, and Tanzania. PHC is a fundamental approach to healthcare that focuses on providing accessible, comprehensive, and community-based care. The initiation of the modern concept of PHC is often attributed to the Alma-Ata Declaration, a landmark event in the history of public health. However, the origins of PHC often originated in community health practices in settings that were short of medical resources and personnel and is often associated with the socialist leftist movement in the developing world. This paper examines how socialism, with its diverse interpretations and applications, has shaped and influenced the establishment of early PHC practices at the community level within local contexts in China, India, and Tanzania. By examining case studies from various regions, the research sheds light on the intricate interplay between socialist principles and the specific cultural, social, and political environments in which PHC initiatives take root in Asia and Africa. It challenges a previous historical analysis of global health that assesses the roles played by the global South through a foreign gaze that assumes US- and Western Europe-centric superiority. The development of PHC practices in diverse cultural and political landscapes underscores the adaptability of healthcare systems to local demands, transcending external constraints. The cases presented here assert that scientific progress is a response to societal demand, and ideas like PHC evolve irrespective of political and diplomatic impediments.

Flows Interrupted and Diverted: Geopolitics and Science in the 1957-58 International Geophysical Year's 'Western Pacific Region'

- Gordon Barrett, Centre for the History of Science, Technology and Medicine, University of Manchester Knowledge

Abstract: The Republic of China's eleventh-hour entry into the 1957-58 International Geophysical Year programme and the exit of the People's Republic of China shortly thereafter ensured that the IGY's 'Western Pacific Region' clearly demonstrated the extent to which this ostensibly 'non-political' global scientific undertaking had geopolitical dimensions. For all the rhetoric and framing of the IGY by those involved as a project something apart from or above politics, historians have long established the extent to which both domestic and international politics alike were thoroughly imbedded in the IGY. Moreover, in that scholarship, the RoC's joining in mid-1957 and PRC's abandonment of its planned programme for participation have been afforded particular prominence as a classic case that illustrated the centrality of politics in the IGY programme. Reconsidering this episode and its after-effects from multiple vantage points, this paper focuses on the implications and impacts of the RoC-PRC rivalry playing out in the context of the IGY. It considers the ways that the multiple actors involved created not just new channels and opportunities for cross-border knowledge flows, but also created new barriers in the process. It will demonstrate that this was far from as straightforward a scenario as has been typically portrayed, especially in being one that set in motion longer- term processes over subsequent decades. These played out for both PRC and RoC science in different ways and on several levels, from the individual, including fostering of relations with Canadian geophysicist J. Tuzo Wilson, to the institutional, as in relation to the development of the World Data Center system. Common to these cases, though, was an interaction between nationalist and internationalist impulses alongside the geopolitical imperatives pursued by not just politicians and foreign policymakers, but scientists as well.

From New Jersey to California to Moscow: how a Chinese-born engineer brought U.S. military research to the Soviet Union

- Clément Bonvoisin, SPHERE Laboratory (UMR 7219), Université Paris Cité

Abstract: This presentation will discuss how Soviet scientists managed to appropriate and build on restricted research carried out in the United States during the McCarthy era. More precisely, I will focus on Engineering Cybernetics, the book published in 1954 by Tsien Hsue-shen (1911–2009), a Chinese-born engineer then living in California. Back then, Tsien was on the verge of deportation to China, under

house arrest and constant surveillance from the FBI, due to suspicions over his loyalty towards the United States after the Chinese Communist Party came to power. He had lost the security clearance that had been granted to him during World War II, despite his status as a foreigner. His scientific activities were then restricted to his teaching duties at the California Institute of Technology, and to theoretical research. In particular, he could not take part in the military developments in his field at that time, on ballistic missiles and fighter airplanes. Despite this constraining situation, Tsien built parts of his monograph on the Navy- sponsored work carried out in New Jersey by American mathematician Donald Bushaw (1926–2012). The military context of Bushaw's work shaped the circulation of his research: it was edited as a technical report in 1953, with a restricted distribution list and a diffusion limited to U.S. citizens. However, through Tsien's book, Soviet scientists at the Academy of Sciences of the USSR managed to appropriate Bushaw's findings. This situation raises questions I wish to address from the standpoint of circulations of knowledge, at national and transnational scales. How, and to what extent, did Tsien have access to Bushaw's technical report? How did he adapt its content to fit his priorities? How did his book allow Soviet mathematicians to get acquainted with Bushaw's result? And how did Tsien's adaptation of Bushaw's findings shape the way Soviet mathematicians received, and subsequently built on the results?

U.S. – PRC disputes in the 1990s over the transfer of tacit knowledge and knowhow across the civil military interface

- John Krige, Georgia Institute of Technology, Atlanta

Abstract: In the late 1990s two U.S. satellite manufacturer were accused by the Department of Justice of sharing sensitive knowledge and know-how with their Chinese colleagues in the PRC's space program, to the detriment of U.S. national security. The corporations denied the charge, the Department of Justice upheld it, and both firms were fined heavily. How did the U.S. government decide that intangible knowledge and know-how that would enhance the performance of China's Long March launcher had been passed from American to Chinese engineers, when both denied that they had learnt anything from the other, and when each already had years of experience in putting satellites into space? This paper describes these debates that prefigured the even more widespread attempts to regulate the

circulation of tacit knowledge between the US and China that are operating today, leading to escalating tensions between Washington and Beijing.

10 Ontologies, transits, displacements in 20th Century Sciences and Technologies (2/2)

Room: 40.152.

Organiser: Ana Romero de Pablos, Instituto de Filosofía, CSIC, Spain

Chair: María J. Santesmases, Instituto de Filosofía, CSIC, Spain

Displacements and knowledges and practice-in-changing evokes circulation. The analysis of ontological configurations of technoscientific objects—by clarifying the relational dynamics and ontoepistemic environments within which they develop—has helped us to better understand the material stress, cultural impact, and political regimes, both imposing and imposed by emergent objects. It also helps to explain the tenacious stability of many of these objects as they circulate. We are interested in exploring the many ways in which transits and displacements are leading both to possibilities of co-construction, cohabitation, de-escalation, re-signification or, on the contrary, to irreversible degradation. We call for contributions that explore transits between epistemologies, movements of knowledge between technologies, that consider collectives and collaboration as agents. We suggest that transits are produced and themselves produce overlappings. These overlappings are conceptualized as hybrid knowledge, hybrid ontologies and epistemologies as inhabitants of a world – a planet, a society, a collective- whose dynamics we proposed to explore in this symposium.

From green to gene: the technological frontier of nitrogen fixation and genetic sequencing in 1980s Mexico

- Marco Ornelas-Cruces, National Autonomous University of Mexico (UNAM); Erica Torrens, National Autonomous University of Mexico (UNAM); Erica Torrens, National Autonomous University of Mexico

Abstract: At the beginning of the new millennium, in 2001, a work began on what at the time appeared to be a titanic task that could take months or even years. The project to sequence the genome of *Rhizobium etli*, a nitrogen-fixing bacterium that

lives in symbiosis with the bean plant, was the first of its kind in Mexico and the results were published five years later. Today, almost any sequence can be obtained in a matter of hours or days. Just three years after the end of the Human Genome Project, Mexico had the complete sequence of *R. etli*. This was possible thanks to the development of national research centres that have been part of the professionalisation of molecular biology and genetic engineering techniques since the 1970s. The aim of this paper is to examine, from a transnational history of science approach, the process of knowledge circulation and the construction of socio-technical networks in the production of biotechnological knowledge in Mexico. Specifically, advances in sequencing and genetic engineering since the 1980s. This paper will show how, in the last years of the Cold War, scientific macro-projects, characterised by large international (and local) collaborations, proliferated around the world initiating a race to sequence biological entities and to commercialise the results of a research programme that began with a focus on macromolecules and proliferated in the post-war period: molecular biology.

Genetic databanks as tools for family reunion: investigating opaque adoptions in Spain between the military dictatorship and the early days of democracy (1940s-1990s)

- Miguel García-Sancho, University of Edinburgh

Abstract: The spread of genetic testing and databasing techniques in forensics has provided victims of opaque adoptions with renewed hopes of finding their relatives. Opaque adoptions – understood as not fully consented and/or transparently registered adoption processes – are a global phenomenon with varied incarnations across the world. In Spain, they are deeply associated with repression of incarcerated women following the rise to power of General Francisco Franco in 1939. As Franco's dictatorial regime unfolded, this form of adoption became less of a state policy and more of a decentralised practice at mother homes and maternity wards that sought to victimise single or vulnerable women and hand their babies to families deemed better aligned to the strict Catholic precepts of the time. The cases reported by victims spread until the beginning of the 1990s, more than a decade after the start of a democratic regime. Yet to date, cases after Francoism have not been proven at courts of justice.

Since the 2010s, following the first Spanish laws seeking historical reparation and preservation of memory, genetic databanks have been established to assist victims. My presentation will explore the communities that converge around this type of data repository, and the combination of genetic information with other forensic or documentary evidence derived from the historical study of the networks that sustained the opaque adoptions. The movement of the genetic databank out of the scientific laboratory disrupts ongoing processes, and forces scientists and other stakeholders to negotiate relationships and standards of practice.

Immunoprecipitation tests: exploring the role of emotions, gender, and circulation in their stabilization as technologies for influenza virus identification in Spain (1970-1980).

- Marta Velasco-Martín, Universidad Castilla La Mancha

Abstract: Understanding how and when epidemics appear and how they expand was always of interest of biomedical researchers, microbiologists, and virologists in their struggle to find measures to control and, even, eradicate them. As historians has demonstrated through decades, the connections between infective diseases, climate, microorganisms, and their displacements and transits were also key as well as the circulation of practical and theoretical knowledge and that of the material culture related to them. The careful study of these factors suggests the participation of collectives, international research communities, and collaboration as agents, but also hierarchies of power mediated by political, cultural, and social factors such as gender and emotions. By analysing the process of influenza understanding in the 1970s Spain and the transits and movements of technoscientific objects developed to control the disease, like the immunoprecipitation tests used by the virologist Pilar Pérez Breña, this paper has a double objective. On the one hand, it aims to contribute to study the role of the agents mentioned before, especially gender and emotions, and, on the other hand, to explore the stability of knowledge and scientific instruments. Research on other technoscientific objects like the glass jars containing flies, key to *Drosophila* genetics discipline, suggests that scientific instruments related to virus could be gendered objects with a hybrid nature –material, epistemic, sensorial, and emotional– and, thus, with a stability which is only apparent.

11 Pandemics and environmental control

Room: 40.063.

Chair: Peder Roberts, University of Stavanger

The quest for alternatives to pesticides: integrated control in the WHO, 1960 - 2000

- Timothy Sim, University of Cambridge

The historiography of vector control in the WHO has been dominated by the rise of the pesticide DDT and the resulting Global Malaria Eradication campaign (1955 – 1969). Despite some initial success in controlling malaria by controlling *Anopheles* mosquitoes, insecticide and drug resistance, inadequate funding, and organizational difficulties ultimately led the WHO to abandon the campaign. Historians have noted that in the wake of the campaign's failure, the WHO's goal for vector control shifted from eradication to control. However, few have interrogated what exactly this control entailed. This paper provides one answer by tracing the history of “integrated control” in the WHO from 1960 – 2000. Proponents of integrated control argued that insect vector control could only be sustained if pesticides were integrated with other methods such as biological control, community participation, and environmental modification. First advocated in the 1950s by entomologists in North America, but increasingly inspired by developments in non-Western spaces like China and Cuba, integrated control gradually rose to prominence in the WHO. In the 1960s, when concerns about insecticide resistance and environmental pollution were high, integrated control prompted the WHO to fund preliminary investigations into “alternative”, non-chemical forms of insect control. In the 1970s and 1980s, the rise of primary health care renewed interest in integrated control. Primary health care's critique of top-down, overspecialized healthcare chimed with integrated control's emphasis on community involvement and ecologically appropriate methods. Optimism ran so high that some envisioned that insecticides would be made obsolete by non-chemical methods. By the 1990s, however, the radicalness of the approach became diluted, and the centrality of insecticides was re-established. By tracing the trajectory of integrated control, my paper connects important topics in the historiography of the WHO with continuing struggles to “roll back” malaria and other vector-borne diseases.

Zoonotic Pathogenesis: Biomedical and Environmental Genealogies of Disease Transmission

- Sofia Varino, University of Potsdam, Germany

Abstract: From the early days of the Covid-19 pandemic, theories about the nonhuman origin of the virus and cross-species disease transmission brought to the fore concerns about rapid species extinction, deforestation and habitat loss. In this paper, I seek to address these concerns by examining them historically using a transdisciplinary methodology that challenges strict disciplinary divisions. Moving beyond the clinical implications of the Covid-19 pandemic, I examine its networked circuitry linking biomedical and environmental genealogies of disease transmission with a focus on zoonosis. In a special issue of *Environmental Humanities* dedicated to “Multispecies Studies,” the guest editors observed that “Life cannot arise and be sustained in isolation. But relationships also have histories. Beyond a static ecological exchange, like the energy circuits mapped by early ecologists, organisms are situated within deep, entangled histories” (Dooren, Kiksey, Münster, 2016: 2). It is these deep, entangled environmental histories that I mobilize to engage with zoonotic pathogenic mechanisms in a way that is attuned to interspecies relations across epistemologies, politics, and ethics.

My paper is situated at the intersection of history of science and medicine, medical and environmental humanities, and science and technology studies, with a methodological framework that is historically informed by the transdisciplinary ecologies of Rachel Carson, Félix Guattari, James Lovelock, Arne Naess, and more recently Donna Haraway, taking from the latter a desire to “stay with the trouble” (2016) by finding creative ways to collectively build a possible, if uncertain future. Tracing genealogies of the Covid-19 pandemic where the clinical and the ecological have converged, my paper thus considers how such genealogies demand the decentering of a normative “human” species position while proposing a foundational interspecies reorientation that centers non/human life forms and life worlds.

Visual Thinking in Times of Crisis: Scientific Representations on Climate Change and Global Pandemics

- Silke Körber, Institute Vienna Circle, University of Vienna

Abstract: Climate impact research and research on pandemics are areas in which experts from different fields collaborate so that internal communication according to values and rules of scientific practice play a significant role. At the same time, in both fields, communication with the general public is a key element, as with decision-makers and those in positions of power within society. Scientific representations and corresponding epistemic techniques enable us to draw conclusions or function as part of arguments. They are meant to help us describe and conceptualize the world and cope with a complex and “messy” reality. The question of how this can be done without simplifying and distorting information was already addressed by the philosopher and member of the Vienna Circle Otto Neurath. Together with the British philosopher L. Susan Stebbing, he was concerned with the promotion of “scientific humanism” through “clear thinking” and the use of verbal and visual symbols. In this sense, a successful transfer of scientific knowledge was associated with a representation that was not only suitable for a specific purpose, but also had to be conceptually transparent and intersubjectively comprehensible. Furthermore, external factors such as accessibility, choice of medium and material aspects played a role. Both saw the dissemination of the latest scientific knowledge as a way to further the cognitive and emotional development of human beings as social entities, using formalised procedures and standards for the implementation of information. However, the demands on science, scientific experts and their role and responsibilities in society have changed. This is particularly important as the credibility of experts and actors in the public discourse is called into question or general trust in the epistemic environment decreases. By comparing historical and current examples, similarities and differences are to be identified that constitute the process of connecting, analyzing and understanding scientific representations.

12 Physical sciences and their status in the 20th century

Room: 40.113.

Chair: Simone Turchetti, University of Manchester

Steve Weinberg’s early concept of effective theory

- Sebastien Rivat, Munich Center for Mathematical Philosophy, LMU

Abstract: The concept of effective theory in physics is often either too loosely characterized (e.g., “approximate theory”) or too closely tied to a particular theoretical context (e.g., “cut-off Lagrangian QFT”). My goal in this talk is to show that the history of effective theories brings crucial conceptual insights. I will focus on Steven Weinberg’s early concept of effective theory in the 1960s and clarify it by retracing the steps that led him to his first version of an effective theory. Weinberg had been concerned with finding systematic principles to unify particle phenomena under some putatively fundamental model since the mid-1950s. In 1966-1967, and in a rather surprising twist, he came to follow a similar strategy to rederive the results of current algebra with a new kind of non-fundamental “effective” model. Despite the lack of a reliable and systematic power-counting scheme, I will argue that Weinberg’s mature concept of effective theory as a covariant field-theoretic expansion in some scale is already pretty much in place at this stage. In particular, I will show that the constitutive feature of an effective theory for Weinberg is already to embody a set of symmetry principles in the most systematic manner. I will briefly explain how this feature relates to what is sometimes referred to as “Gell-Mann totalitarian principle” and conclude by briefly comparing Weinberg’s early concept of effective theory with Ken Wilson’s.

Indistinguishable elements in the origins of quantum statistics

- Enric Pérez, Universitat de Barcelona

Abstract: The origins of quantum statistics have been studied with varying degrees of thoroughness. On the one hand, Bose-Einstein statistics has long received the attention of historians of physics. Both the background in Planck’s and Einstein’s contributions, Bose’s seminal paper, and Einstein’s sequel have been widely discussed and analyzed. In contrast, the origins of the other quantum statistics, the Fermi-Dirac one, appears much less treated in the literature. In our paper we explain the results of our inquiries in this direction, focusing on the papers by Fermi, Heisenberg and Dirac. We compare the birth of this statistics with that of bosons and discuss to what extent it was a consequence of the latter. We analyze the first discussions about which of the two statistics was the right one to consider for one particle, after Dirac established the clear distinction between the two treatments from a quantum mechanical perspective. Finally, we argue that this historical episode

is a very good example of looking closely at the birth of a concept (“indistinguishable particle”) which was not fully operative in the foundational papers in which it began to take shape.

Emergence in Physics: Navigating the Intersections between Science, Society, and Technology

- Núria Muñoz Garganté, Max Planck Institute for the History of Science, Berlin

Abstract: This talk explores the construction of “emergence” in physics—the idea that novel properties arise in complex systems which are unpredictable from their basic components. Drawing from the works of condensed matter physicist Philip Anderson, notably his seminal paper “More Is Different” (1972), I trace the evolution of emergence as a philosophical principle in physics. I argue that it was shaped not only by scientific concepts like symmetry breaking and phase transitions, but also by the efforts of solid state physicists to rebrand their field to “condensed matter physics” in the 1970s. Anderson’s definition of condensed matter physics as “the search for emergent properties” reflects this dual process of conceptual and disciplinary transformation and illuminates the reciprocal relationship between scientific discourse and professional identity formation. This narrative unfolds against the backdrop of shifting societal expectations of science and technology, marked by a growing scepticism toward the reductionist aims of particle physics and the decline of mega-science projects like the Superconducting Super Collider. Its cancellation in 1993 represented a tangible proof that the public’s expectation of science no longer resided in a unified, universal scientific world picture, which propelled the popularization of emergence as a new public image for physics. Moreover, my research underscores the technoscientific implications of emergence during the second half of the 20th century. It highlights how societal and political apprehensions about Big Science influenced Anderson’s advocacy for smaller-scale scientific experiments as alternative pathways for basic research, using emergence to argue that fundamental knowledge can be found at every scale. This analysis reveals the intricate interplay between scientific concepts, professional identities, and societal dynamics in shaping knowledge production. By examining emergence through multiple lenses—scientific, technological disciplinary, and societal—this

research contributes to our understanding of how knowledge is co-constructed within and beyond the confines of academia.

13 Science and Democratisation Processes in Europe: Science, Perestroika, Feminism and Workers (3/3)

Room: 40.101.

Organiser: Doubravka Olšáková & Jan Surman, Czech Academy of Sciences

Chair: Jan Surman, Czech Academy of Sciences

Our panel focuses on an under-researched topic: the relationship between science and democracy. Current literature on the relationship between science and democracy tends to focus on tensions between science and democracy, neglecting both historical experience and epistemological issues. Our aim is to historicize this relationship and to examine the role of science (including access to data, tools, technologies, etc.) in the democratization of society. The panel will focus on Cold War science and the role of different expert cultures before and after perestroika. We are particularly interested in analysing the role of science and scientific communities or individual experts in democratisation processes in East Central Europe. In the context of current discussions on the decolonisation of the history of science, we would like to pay special attention to the role of science in the dissolution of the Soviet empire and, in particular, the Soviet Union.

Socialist Reproductive Medicine? Abortion Reform And The Provision Of Abortion Services In Spain (1970s-1990s)

- Agata Ignaciuk, University of Granada

Abstract: In 1985 the Spanish parliament, configured by the socialist majority, partially decriminalized abortion. The early implementation of legal abortion in Spain was however very limited due to the widespread resistance of physicians employed in public healthcare. In November 1986, the Partido Socialista Obrero Español's government decreed that private clinics could obtain authorization for providing first-trimester abortions, thereby liberalizing as well as privatizing the abortion marketplace. My paper explores professional and activist trajectories of gynecologists providing abortion services in mid-1980s Spain. Using oral history

interviews, the press and biographic accounts, I examine the significance of abortion providers' socialist and feminist militancies, the meanings they attached to public and private healthcare, and their broader understanding of the emergent concept of reproductive rights in Spain.

(Non) Mea Culpa? – Late 1980s' International Attempt At The Resolution Of The Conflict Around The Political Abuse Of Psychiatry In the USSR

- Anastassiya Schacht, University of Vienna

Abstract: Over the course of the 1960s-1980s, Soviet psychiatry became internationally challenged on its established practice to falsely diagnose, confine, and forcibly treat political dissidents, opposing the Communist regime. It took a generational change at the highest level of Soviet politics and the landslide impact of the Perestroika reforms in the second half of the 1980s to recommence the expert dialogue on the issue of deeply engrained malpractices in psychiatry of the authoritarian regime. In this talk I follow this rather unique state-led attempt at halting the political abuse of psychiatry from the previous political era, at reconfiguration and re-integration of the compromised and isolated expert community back into the international domain. Based on these observations, I analyse why the Soviet Perestroika, though offering a chance of a new start for psychiatric experts, failed to provide a lasting impact upon the ways how science and state coordinate in late and post-Communist contexts. With the malpractices creeping back into the realities of several post-Soviet states ever since the late 1990s and skyrocketing in late-Putinist Russia, my talk discusses how international expert organisations can, in future, better respond to severe rule-breaking from their peers in authoritarian regimes, but also create scenarios for sustainable change when the re-integration of such peers becomes unavoidable.

Working-Class Professional And Science Education Within The Hungarian Workers' Movement

- Sára Bagdi, Eötvös Loránd University - Kassák Museum

Abstract: This talk looks at the Hungarian workers' movement's attempts to democratize science education, using the scientific carrier of János Dancza as an example to discuss the role of the interwar workers' education in the production of

the local intellectual elites of the post-war Hungary. In doing so, I also discuss how the informal knowledge production within the workers' movement provided the members with either upward mobility or at least prevented them from social backsliding despite the lack of meaningful institutional background. Dancza, despite lacking a secondary school degree, became the director of the Baradla Cave Centre in 1949. During the years of the inter-war Great Depression, he was one of those unemployed workers who worked at the archeological excavation sites in the Bukk region, where he did not only learn the practical management of an excavation but actively participated in the scientific interpretation of the found Neanderthal remains, and he used the platform of the Social Democratic Party (MSZDP) to legitimize his achievements in front of the broader public. Professional scientists rarely formed strong alliances with MSZDP. Nevertheless, the party offered regular lectures and education programmes for its members, where, among many other subjects, they were taught anti-clerical sciences like Darwinism. These seminars and the workers' associations' annual exhibitions did contribute to both the self-improvement and the social establishment of Dancza and some other non-academic professionals, and in the post-war regime, this semi-formalized status also provided them with the opportunity to acquire official positions but often just loosely connected to their specific expertise.

14 Science communication / Science popularization (1/2)

Room: 40.010

Chair: Jaume Sastre-Juan, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

Immersed in science. Magnified representations and the circulation of scientific knowledge (1750-1900)

- Ilaria Ampollini, Università degli Studi di Milano

Abstract: This proposal explores the relationship between immersivity and the dissemination of scientific knowledge outside of scholarly circuits (popularisation, education, forms of entertainment). Although several scholars have addressed optical devices such as solar microscopes, stereoscopes or panoramas and the ways in which they were used to project 'scientific' content, no study has yet systematically and

exhaustively examined the extent to which they contributed to the dissemination of science. Nor is there any historical reconstruction that attempts to see them from the perspective of the history of science education and popularisation. What I am trying to do is to write such a history, based on a large corpus of primary sources, covering a period from 1750 to about 1900. Such time span goes from a paper theatre (or *vue à perspective*) displaying the Lisbon earthquake, published in 1756 by Englebrecht, and the Cosmorama, that was built in Paris for the World Expo in 1900. Among the questions that underlie my research, two are particularly relevant. First, what can the relationship between immersivity and the circulation of scientific knowledge tell us about the modalities of investigation, analysis and representation developed over time by men and women of science? Second, how did immersive modalities relate to other modalities (and models) of representation, such as miniaturisation, manipulation or 'immersivity'?

Educate, Entertain, Popularize. The Popularization of Science in the Italian Protestant Press for Children between XIX and XX Centuries

- Carlo Bovolo, University of Turin

Abstract: The paper intends to analyze the popularization of science in the periodicals for children published and promoted by the Italian Protestant movements and churches, from the second half of the Nineteenth century to the early Twentieth century. In Nineteenth century Italy, protestants were a minorance, composed maily by Waldesians ,Methodists, and Baptists. However, after their civil and social emancipation first in the Kingdom of Sardinia in 1848, then throughout the newly unified Italy from 1861, Italian protestants aspired to a moral, religious and cultural renewal of the Country, in parallel with the political and liberal renewal of the Risorgimento. So, despite their minority, they entered Italian religious, social, political and cultural life, founding schools (Sunday schools) and periodicals, many of which were dedicated to children and young people. Protestant children press was significant in shaping a Italian protestant identities and in religious but also cultural education. In this context, the popularization of science gained significant space and was a central tool for both educational, and religious and moral purposes. Thus, articles on natural sciences (especially zoology and botany), chemistry, medicine, agronomy, physics and technology, but also reports of explorations and proposals for

small scientific experiments, were published in various children's newspapers, often accompanied by illustrations. Given the centrality of science and also of its popularization in the press between the Nineteenth and Twentieth centuries, Protestant magazines for children tried to propose an evangelical alternative to both the secular and Catholic press: thus science played a fundamental role in the education of Italian protestant youth. The paper aims to describe the themes, methods, times, influences, and uses of this "popular science".

Citizen Vs Professional Science: The Great Tide Experiment's Case

- Tatiana Sokolova, Russian Society for the History and Philosophy of Science

Abstract: The talk is devoted to the analysis of the phenomenon of citizen science and its role in the professionalization of scientific knowledge's progress on the example of one case - the Great Tide Experiment of 1835. In the history of science, the XIXth century appears as a century of scientific progress, embodied in the industrialization and professionalization of scientific knowledge, new discoveries and inventions. The number of scientific disciplines is increasing, new technologies are actively developing, the symbiosis of science and technology brings economic benefits and radically changes the entire structure of society. At the same time, it was during this period that, against the background of scientific professionalization, the phenomenon of citizen science emerged – the participation of non-professionals in scientific research. The case study of the Great tide experiment shows that explaining the phenomenon of citizen science solely by economic factors is incomplete. The organization of scientific research within the framework of citizen science repeats the internal conflicts of scientific institutions associated with the hierarchical division of disciplines. In addition, citizen science perpetuates the privileged status of professional scientists over volunteers, just as in the past, representatives of the «pure» sciences had a higher status than scientists conducting empirical research.

15 VERITRACE, or, how to find 'traces de la vérité' in a sea of ancient wisdom

Room: 40.144.

Organiser and Chair: Cornelis J. Schilt, Vrije Universiteit Brussel

This panel centres around the ERC StG project ‘Traces de la Verité: The Reappropriation of Ancient Wisdom in Early Modern Natural Philosophy’, aka VERITRACE (see also <http://veritrace.eu>). VERITRACE addresses the influence of ancient wisdom writings on the development of early modern natural philosophy. During the Renaissance, works such as the Chaldean Oracles, the Sibylline Oracles, the Corpus Hermeticum and the Orphic Hymns were rediscovered and reappropriated into a *prisca sapientia*, a perennial tradition that considered these writings to contain truths about God, mankind, and the cosmos. Nicolaus Copernicus, Johannes Kepler, Francis Bacon, Pierre Gassendi, Isaac Newton, and Gottfried Wilhelm Leibniz, foundational for the development of modern science, all ascribed to this tradition, and with them many others; yet so far, no comprehensive account exist of exactly what they took from these ancient wisdom writings and how the idea of a perennial truth influenced their knowledge-making.

VERITRACE deploys bespoke techniques for distant reading on a corpus of several hundred thousand early modern printed works, tracing how the most prominent ancient wisdom writings returned in the natural philosophical discourse, what exactly natural philosophers took from these writings, and how these writings functioned in the economy of early modern science. Moreover, it traces the debate surrounding these ancient wisdom texts and the supposed truths contained therein throughout early modern Europe, differentiating between the various sentiments with which these texts were perceived, read, and discussed. As such, VERITRACE fills in a major lacuna in our understanding of the emergence and development of early modern science, while making use of state-of-the-art digital techniques adapted for an early modern environment. The four papers included in this panel each highlight typical aspects of the main project and its offshoots: from its uses of new technologies to trace the influence of ancient texts, and the challenges this brings.

New Tech in Old Wineskins: NLP, APIs, and the Search for ancient wisdom

- Jeffrey C. Wolf, Vrije Universiteit Brussel

Abstract: In this paper, I discuss how the VERITRACE team at Vrije Universiteit Brussel are using the latest technologies to explore early modern editions of ancient texts. First, I provide a general introduction to the project, with an outline, in

non-technical language, of the various project components, and how we hope to accomplish our goals. I emphasise how our digital tools are in the service of broader, intellectual aims that have wide-ranging implications for the history of science. Second, I describe the current stage of the project, as well as some of the challenges we have faced. In a visual way, I present some of our preliminary results. For instance, I describe how we have tapped into our three primary data sources and used them to construct a powerful tool to search through hundreds of thousands of digital texts published throughout the early modern period. I then show an initial analysis of our close reading corpus – a collection of ancient wisdom writings that includes the various editions (80+ works in total) of the Corpus Hermeticum (including the Asclepius), the Chaldean Oracles, the Sibylline Oracles, and the Orphic Hymns. And I provide an example of the smaller case studies we are doing, e.g. an intertextual comparison of the Corpus Hermeticum with the works of Copernicus. Finally, I conclude with thoughts on next steps – what we hope to accomplish in 2025 – including some of the big challenges that remain.

Scientific progress or Edenic restoration? The utopian vision of Francis Bacon's New Atlantis

- Nicolò Cantoni, Vrije Universiteit Brussel

Abstract: This paper focuses on the relationship between utopian thought, millenarianism, and the so-called *prisca sapientia* at the dawn of the modern age. The *prisca sapientia* tradition became a phenomenon in the Renaissance and refers to pagan writings of supposed remote antiquity in which fundamental truths about man, nature, and God were allegedly revealed. Intriguingly, despite their pagan origins, these texts were considered to all intents and purposes compatible with Christian testimonies and were thus incorporated into the dominant culture. Moreover, they encapsulate teachings that for us today belong to distinct domains, and with their own prerogatives and methodologies, but back then were interconnected in their approaches to knowledge. The belief in an ancient wisdom tradition also conveyed an alternative conception of history, in which the ancients were regarded as custodians of a superior knowledge and modern man had to return to the wisdom of a primordial, edenic age in order to progress in the knowledge of the world. As a case study, I will highlight some aspects of the utopian novel *New Atlantis*

(1626) by the philosopher and statesman Francis Bacon (1561-1626). Generally regarded as one of the founding fathers of the modern scientific method, Bacon was also a man deeply motivated by his Anglican religious faith and an adherent of the *prisca sapientia* tradition. This work therefore invites us to reflect on the multifaceted relationships between science, philosophy and religion, as well as the seemingly contradictory themes of progress and restoration that are so central to Bacon's thought.

Tracing Stoic Influences on Early Modern Natural Philosophy: A Computational Analysis

- Demetrios Paraschos, Vrije Universiteit Brussel

Abstract: Within the broader context of VERITRACE, this paper encapsulates a segment of a PhD project exploring the transmission of Stoic concepts to early modern natural philosophy via ancient wisdom texts. Although we know the early modern period witnessed a renewed interest in Stoicism, very little research has been done to trace this renewal, and how it influenced early modern knowledge-making. My project tries to remedy this by constructing a comprehensive Stoic dictionary, based on the vocabulary found in the many editions of Stoic texts published throughout the early modern period, such as those of Seneca and Tacitus, and the writings of Stoic advocates such as Justus Lipsius. This will be done through computational analysis utilising Python, notably integrating the Classical Languages Toolkit (CLTK). The aim is to create our own toolkit, capable of analysing Latin texts and providing statistical insights into vocabulary usage, as well as enabling comparisons between texts and text collections, so that we can more accurately identify the influence of stoicism on early modern natural philosophy. In addition to a detailed overview of the construction of the Stoic dictionary, I show some examples of how the dictionary is used to identify the influence of stoicism on natural philosophy in the early modern period.

Named Entity Recognition for Ancient Wisdom Texts

-Eszter Kovács, Vrije Universiteit Brussel

Abstract: The goal of this paper is to examine the use of Named Entity Recognition (NER) for studying the influence of ancient wisdom texts in early modern natural

philosophy. A named entity is a real-world object, such as a person, location, organization, product, etc., that can be denoted with a proper name. It can be abstract, such as ‘ancient wisdom’, or have a (perceived) physical existence, such as Hermes Trismegistus. NER then seeks to locate and classify named entities mentioned in structured or unstructured texts into pre-defined categories, such as person names, organizations, locations, and so on. My primary research question is to critically evaluate whether and how an automatically or semi-automatically composed ancient wisdom vocabulary can help distant reading queries while searching for influence (such as literal and non-literal borrowings, paraphrases, thematic similarities, debates on ancient wisdom, etc.). I will focus on limits and pitfalls, data preparation and cleaning, and the use of different languages, including Latin, English and French. Can it reveal difficulties or inconsistencies in the translation of ancient wisdom texts into the vernacular? As a case study, I will focus on the semantic field related to the notion of fire and light because these notions, while clearly being concepts in ancient wisdom texts, are more abstract than person names. Tools or NER methods tested are wikifier (making an automatic alignment to Wikipedia entries) and the Python library spaCy, adapted to our research.

Thursday 5th 16:00 - 16:30 coffee break

Thursday 5th 16:30 - 18:30 Sessions

1 Between innovation and control

Room: 40.152.

Chair: Jenny Bulstrode, University College London

Surveys and property: the Franciscan cadaster and the abolition of serfdom in the Habsburg Empire

- Svit Komel, University of Ljubljana

Abstract: The paper analyzes the survey as a particular form of governmental and scientific practice, which developed in the eighteenth and nineteenth centuries. Examples of surveys include campaigns for the unification of weights and measures, cadastral surveys, compilations of customary law, inquiries on prices and trade, geological and meteorological surveys, etc. The common object of these surveys was

to produce systematic accounts of local phenomena, practices and practical knowledge, like proprietary boundaries and customary rights, qualities of animals and lands, regional measurement units. They were ordinarily directed by the state and employed a mixture of experts, civil servants, military personnel, as well as local informants who provided on-the-ground intelligence. The paper demonstrates how such surveys could be used by the state as an effective technique for reforming local social relations, habits and daily life by considering the influence of the Franciscan cadastral survey on the 'land relief' (1848-1853) – the reform which abolished serfdom in the Habsburg Empire and introduced a unitary and exclusive notion of property. Examining the work of cadastral surveyors, I illustrate how they prepared the ground for the later reform of land property relations by mapping peasants' knowledge of local land features, proprietary and municipal boundaries, agricultural routines and staple products. In particular, I will focus on how cadastral surveyors divided and compartmentalized the landscape into parcels – geometrically demarcated and cartographically represented pieces of land surface. The parcel soon became the only form in which land could figure as an object of property rights, which facilitated the enactment of a unitary and exclusive notion of property. The case contributes to recent debates on the logistical power of the state, showing how the Habsburg Empire mobilized contemporary science to materially transform both the environment and the social relations in which people reproduced their life.

Freight of earth: vampire agriculture and chemical histories of famine

- Simon Schaffer, University of Cambridge

Abstract: In Paris in June 1864 the Imperial Agricultural Society debated which was worse, vampirism or robbery. The prompt for this remarkable argument was the appearance of a French translation of a then recent treatise on agriculture, chemistry and soil by the pre-eminent chemist Justus von Liebig. The treatise contained a widely-reported denunciation of profligate British exploitative fertiliser application, a vampire sucking on Europe's throat. This startling attack, which included a ferocious denunciation of the character of British science, has now drawn study from eco-socialist writers on the relations between this mid-nineteenth century soil chemistry and Karl Marx's exactly contemporary analysis of disruptions of material exchanges of fertility and their economic and political meanings. There has also been

intense attention to systematic field trials on soil, fertility and infection in the epoch of Liebig and Pasteur – exemplary cases for current sociologies of scientific experiment and political leverage. At that time, in Second Empire France, these polemics fed accounts of what was labelled vampire agriculture among socialist and reformist practitioners backing field trials and climatic regulation. They described what they called chemical statics linking human societies and the soil. Across Europe, these chemical histories mattered to political economy. After the catastrophic Irish Famine, where Liebig's policies had been at stake, fatal issues of earth chemistry and state planning were urgent. Marx reckoned England had effectively exported Irish soil while banning replacement of its exhausted constituents. Dublin newspapers, including that which employed the writer and administrator Abraham Stoker, reported French science journalists' denunciation of British colonial agronomy as not only empirical but actually vampirical. Historic relations between scientific experience and extinction were worked out through models of climate, fertility circulation and health. Like Dracula's luggage, these nineteenth-century scientific projects carried their freight of earth.

2 Creating the useful animal. Acclimatisation in the Spanish-speaking world and beyond (2/2)

Room: 40.002.

Organiser: Oliver Hochadel, Institució Milà i Fontanals, CSIC, Barcelona

Chair: Miquel Carandell, Institut d'Història de la Ciència, Universitat Autònoma de Barcelona

Acclimatisation is a fuzzy term. It is hard to pin down because it refers to diverse theories and practices dealing with “exotic” animals in the nineteenth and twentieth centuries. It refers to attempts to introduce non-human animals into another climatic zone through selective breeding and “experiments”, mostly from the South to the North. The final objective is to derive economic benefit from the acclimatised creatures. Commercially viable products might be feathers, pelts, meat, eggs, or the introduction of new draught or transport animals. Most of the historiography so far has focused on France and Great Britain (including their colonies). Yet

acclimatisation was a transnational movement with animals, theories and “best practices” circulating among institutions and other actors all over the globe. This session would like to shift the attention to acclimatisation initiatives on the Iberian Peninsula and Latin America. As regards the concrete spaces for the acclimatisation projects it will focus primarily on zoological gardens but will also include private estates, international fairs and other venues.

The session will address the following questions: Did the acclimatisation projects in Spanish-speaking areas differ in interesting ways (theories, practices, actors ...) from other, better-studied contexts? How were they connected with other acclimatisation efforts, particularly across the Atlantic? How far were these initiatives shaped by larger debates on human-animal relationships, race, class conflict and human migration? The eight papers will span the period from the mid-eighteenth to the mid-twentieth centuries. The thematic diversity of these papers (in terms of chronology and specific institutional and historical context) will allow for a mapping of the spectrum of acclimatisation efforts. The commentary will discuss the “fluidity” of the term acclimatisation and how it might be useful as a conceptual tool to talk about animals and the environment.

Applied Natural History on Display. Barcelona’s Museo Zootécnico around 1900

- Oliver Hochadel, Institució Milà i Fontanals, CSIC, Barcelona

Abstract: The Museo Zootécnico was inaugurated in Barcelona in 1899. Its mission was to instruct the general public how to exploit animals and their products. The mastermind behind the museum was the naturalist Francesc Darder (1851-1918), director of the nearby zoo. The sections were named Hipocultura, Bovicultura, Ovicultura and so on, detailing how horses, cows, sheep, goats, pigs, dogs, rabbits, birds, fish, silkworms and bees may yield the greatest possible economic benefit. Catalan businesses exhibited their animal-based products: brushes, buttons, parasols, fancy feathers and all kinds of food. Visitors were addressed in double sense: as potential customers of the wares, but also as future entrepreneurs, inspired by the exhibits to come up with new profitable ways to extract monetary value from animals. The Museo Zootécnico only existed for about two decades. Yet this paper argues that this museum is an instructive example of applied natural history so

typical for the period around 1900. It was an attempt to systematically commodify animals (both wild and domestic), their bodies and products from fur to feathers to eggs, using specific technologies (e.g., breeding devices) as well as new insights from natural history. This paper will describe the particularities of the Museo Zootécnico, specifically the role of the Barcelona Zoo as an umbrella institution for Darder's program of applied natural history. And it will ask where the objects of the exhibition (and the knowledge associated with them) came from, thus placing the Museo Zootécnico in an international context.

Spanish horses for the improvement of the Portuguese breed: the work of the Sociedade Hípica Portuguesa (1911-1974)

- Ignacio García Pereda, University of Lisbon

Abstract: Horses have not received the attention they deserve in studies of Portuguese breeding. This paper is concerned with the science and economics of Spanish horses in Portugal, how numerous they were and how much they cost to buy. The Portuguese Equestrian Society (Sociedade Hípica Portuguesa, SHP) is today one of the strongest proponents of horse riding, and one of the oldest associations of the country. In 1911, a group of “cavalheiros”, closely related to the aristocracy, founded the SHP, some months after the end of the monarchy. From the first moment, the importation of Spanish Horses, or Pura Raza Española (PRE) was an important way for the “improvement” of the Portuguese animals. From 1926, in a period of strong nationalism, the crosses with purebred Andalusians were viewed favourably by Portuguese breeders, members of SHP, a point that allows for interesting research questions. Portuguese breeders consciously adapted the body of the horse to perform specific tasks, looking for forms more predictable, more consistent. The body of the horse and international fashions shaped each other in important ways. We shall examine how leading members of the SHP, such as Rui de Andrade, used and thought about breeding technology. The history of these travelling Spanish horses reveals surprising continuities between what is known today as “modern agriculture” and former forms of rural production.

Acclimatization of elephants in Chilean zoos. Writing an animal history (XIX-XX centuries)

- Carolina Valenzuela Matus, Universidad Autónoma de Chile

Abstract: The proposal seeks to reflect on the acclimatization of elephants in Chilean zoos during the XIX and XX centuries. Elephants were seen as “exotic” animals with the potential to attract visitors (increasing ticket sales in zoos) and also attract considerable press attention. Elephants in Chile also produced scientific curiosity among scholars and when they died, they were subjected to autopsy and their remains were transferred to natural history museums. The study of elephants from a historical perspective demonstrates that it is possible to explore the micro-history of animals as individuals. This kind of study starts from the perspective of historical animals, invites us to ask unconventional questions about the interspecific past in non-anthropocentric ways and also helps us to examine how humans and animals shared cultures and how we might approximate them (Nance, 2015). This interdisciplinary perspective can contribute to a larger view of the history of acclimatization of exotic animals in Chile.

Preparing exotic animals for the Barcelona Zoo. Ikunde, “el Centro de Aclimatación y Experimentación Animal” in the Spanish colony of Guinea

- Josep Reyné Vergeli, Institut d’Història de la Ciència, Universitat Autònoma de Barcelona

Abstract: During Franco's regime, the Barcelona Zoo was reformed, its facilities were enlarged, the animal collection was expanded and the number of visitors increased considerably. The Zoo was transformed in harmony with the institutions of the Franco regime, following and promoting its purposes, discourses and narratives, and became a public showcase and a symbol of the regime's legitimacy, both locally and nationally. One of the overlapping interests between the Zoo and the Franco regime was the promotion of the colonial exploitation of Spanish Guinea, as the African territories in the Gulf of Guinea that were once a Spanish colony were known. Between 1958 and 1969 the Barcelona Zoo received thousands of animals from Ikunde, the Centro de Aclimatación y Experimentación Animal, including the famous albino gorilla Snowflake. Ikunde was a research station owned by Barcelona City Council, run from the Barcelona Zoo and located on the mainland of Spanish Guinea. This context of colonial domination allowed the establishment of the centre and

allowed it to exploit with impunity the fauna of the colony with the permissiveness of its rulers and the collaboration of the business network that facilitated its transport to Barcelona and its distribution to zoos all over the world.

3 Data, satellites and environmental knowledge (2/2)

Room: 40.004.

Organiser and Chair: Gemma Cirac-Claveras, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

Scientific, economic and political knowledge about the environment relies enormously on satellite data about the oceans, the atmosphere, the land surfaces and the ice. These data are collected, processed, shared and maintained through a knowledge infrastructure that turns measurements made in the orbits into environmental information ready-to-be-used by various social groups. Satellite data are thus relevant research objects, inherently social and technical artefacts, whose building and maintenance must be historically contextualized. This symposium presents empirical cases that examine the complex array of individual actors, institutions and forms of organization that intervene in the development, maintenance, dissemination and use of satellite data, the sociotechnical arrangements from which they emerge, and the power relations, values, routines and norms that go with them. Some of the topics that will be explored are:

- Sociotechnical infrastructures (e.g. who produces and who accesses satellite data, how and under what conditions; what models of data sharing have been developed; what activities are carried out to promote satellite data, at what scale (international, regional, national));
- Governance (e.g. how access, ownership and credit are negotiated; how archiving, curating, accumulating, quality control, long-term sustainability are materialized; through which kind of materialities data governance and environmental governance are imbricated);
- Power (e.g. which power dynamics the production, circulation and usage of data entail, reproduce and produce; how data act as relevant diplomatic assets in negotiating scientific, technological, and political agendas; how satellite data can be

articulated with resistances to environmental governance, data governance and satellite technology itself, what kind of economic frictions are involved);

- Knowledge and epistemologies (e.g. how data is arranged in maps, images, measurements, and graphs, and what messages do they convey; what aspects remain unseen; how do these messages reach diverse audiences, and how does a particular dataset gain economic, scientific, aesthetic or ethical value).

Mapping others' green: the Cartographic Institute of Catalonia, SPOT, and the territories of Latin America

- Andrea Álvarez, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

Abstract: A knowledge infrastructure is required to produce, use, circulate, and archive satellite data from the Earth. Infrastructure that hasn't been –and still isn't– symmetrical concerning data access, governance, and distribution. I present a case study specially crossed by these asymmetries: a monitoring project led by the Catalan Cartographic Institute (Spain) that used SPOT data to map regions in Latin America during the 1980s and 1990s. Employing extensive archival and oral records, I aim to examine how the different epistemic, political, material, scientific, and social actors' conditions can inform who, how, and for what got engaged with satellite technology to produce data, representations, knowledges, and actions on the environment. With this, I contribute to understanding the construction of the great challenge the environment is today by examining satellite data of the Earth as constructs with capacity to reflect and reshape the global power dynamics in which they are embedded.

From the satellite to people's homes: The origins of satellite data in TV weather forecasting maps

- Anna Drou, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

Abstract: The research presented aims to study how the use of satellite data became mainstream in daily TV weather reports throughout the 1980s. Taking as a case study the catalan public television channel TV3 in the moment it started using data from the weather satellite Meteosat (operated by the European Organisation for the Exploitation of Meteorological Satellites), I will explore how the use of satellite data

affected the way information about the weather was produced, displayed and mass-consumed. Some of the questions that will be examined are: Through which infrastructures weather data circulated from the satellite in orbit to people's TVs? What data exactly, and how did it change during this circulation? Who were the actors involved, and which were their roles, practises, expertises, objectives, expectations and collaborations? How did the use of satellite data transform previous techniques, and messages, of TV weather reporting?

Critical epistemologies of remote sensing

- Lilian Kroth, University of Freiburg

Abstract: Epistemologies and knowledges of remote sensing technologies have over the last decades been prolifically discussed by different strands of feminist critiques, with strikingly shifting territories of criticism. Commencing with ecofeminist critiques from the 1990s that scrutinize the masculinist foundations of RS-technologies and holistic Earth depictions (Garb 1990; Roberts and Schein 1995; Litfin 1997), this exploration delves into a discourse from the late 1990s and early 2000s, which grapples with the question of how feminists can, and should, engage with discourses on remote sensing and GIS without outright dismissal (Schuurman and Pratt 2002; Openshaw 1997; Kwan 2002). Subsequently, a noticeable shift has materialized, prompting a reevaluation of the objectivity of satellite images and a potentially affirmative role of distance (Bennett et al. 2022; Engelmann et al. 2022; Grevsmühl 2017). The tracing and unfolding of these alterations in feminist critiques has the potential to shine a broader light on conceptual coordinates of critiques of remote sensing as well as the debate around accurate engagement and intervention of criticism.

Monitoring the Mediterranean Sea: observing through simulations, modeling through satellites

- Pablo Lima, Universidad de Sevilla

Abstract: As many scholars in history and philosophy of science and technology claim, deployment of worldwide infrastructure for Earth observation was a critical step forward in the development of Earth System sciences. Thus, focusing on the specificities of computer simulations as a kind of scientific instrument, namely a

technical artifact, that processes the data produced by these observations and serves as a means of assessing the validity of these data, becomes a meaningful epistemological endeavour. For this reason, I will look into exemplary practices of measurement and modelisation of marine ecosystems in the Mediterranean Sea, like MedArgo and POSEIDON, to explore how the rich interactions between computer simulated data and data obtained from in-situ and satellite measurements produce joint representations of climate and ocean forcings that shape biogeochemical cycles. Following recent contributions on the epistemology of data, my claim is that the progressive steps in the chain of data production and traveling are neither unidirectional nor hierarchical, but that simulated and experimental data can rather satisfy complementary and interchangeable epistemic goals.

4 Decolonizing the past

Room: 40.101

Chair: Danuta Ciesielska, Institute for the History of Science, Polish Academy of Sciences, Warsaw

Decolonization within the American colonial framework: The pensionado scientists and Filipino science in early 20th century Philippines

- Francisco Jayme Paolo Guiang, Department of History, University of the Philippines, Department of History, The Chinese University of Hong Kong (online)

Abstract: The implementation of “Filipinization” policy under Governor General Francis Burton Harrison, who served from 1913 to 1921 during the American colonial period (1899–1946) in the Philippines, facilitated a drastic shift in colonial state-building. This policy allowed the employment of more Filipino civil servants in the colonial bureaucracy, thereby passing the reins of governance to the colonized elites. Of particular interest here were American-educated Filipino bureaucrats called the pensionados. The pensionados were recipients of the Pensionado Act of 1903—a scholarship program for qualified Filipino students who were sent to the United States to study in colleges and universities. After their scholarship, they were required to go back to the Philippines and serve in the colonial government. The pensionados became an essential part of colonial state-building at a time when the

colonizer-colonized dynamic changed and the capacity Filipino civil servants were questioned by several American colonizers who did not agree with Harrison's Filipinization policy.

I intend to examine how the pensionados employed in the colonial bureaucracy's Bureau of Science and Bureau of Health became agents of decolonization by developing a Filipino science, despite several American colonizers who expressed distrust in their capacity for scientific work. This study's investigation will probe into the contestations and negotiations between a colonial state that was ambivalent towards Filipinization and the pensionados (particularly the Filipino scientists, doctors, and public health practitioners) who were catapulted into positions of power within the colonial bureaucracy. This study foregrounds the work of pensionado scientists who, in the context of pro-independence nationalism in 1920s and 1930s, wanted to assert autonomy in scientific work in order to disprove the U.S. imperialist philosophy that an indefinite period of American tutelage was still essential to lead Filipinos towards the "correct" path of self-government.

Decolonising the Rural Thai Mind: Ghosts, Spirits, the Buddha, and Transcultural Psychiatry During the Cold War

- Krittapak Ngamvaseenont, University of Manchester

Abstract: This paper explores the interaction between Thai psychiatry and rural Thai culture during the Cold War. It focuses on how Thai psychiatrists attempted to decolonise the discourse of mental health in Thailand by incorporating rural concepts of the mind. At the outset of the Cold War, American versions of social psychiatry, mental hygiene, and psychoanalysis began to dominate Thai psychiatry, replacing old colonial psychiatric practices in Thai asylums. The dominance of American psychiatry created tension between Western concepts and Thai values in the field of mental health. Subsequently, the rise of transcultural psychiatry as a new global project, supported by the WHO and WFMH, provided an opportunity for Thai psychiatrists to establish their own identity. An essential aspect of this identity construction lay in traditional and rural Thai culture, with one of the main sites of this project being Northeast Thailand, the poorest region of the country with the highest rates of communist insurgency incidence in Thailand. Drawing upon unexplored Thai medical journals, this paper examines how Thai psychiatrists

ventured into rural Northeast Thailand in the 1970s. An influential psychiatrist during this period was Sangun Suwanlert, who hailed from the Northeast himself. Suwanlert and his team conducted research on rural ghosts, spirits, and culture-bound syndromes, seeking to incorporate rural ideas of madness and its rituals into the field of Thai psychiatry. Thus, this paper argues that the effort to integrate rural and spiritual understandings of the mind provided a pathway to decolonise the rural Thai mind. Despite these efforts, Thai psychiatry abandoned rural and spiritual concepts of the mind and turned to Theravada Buddhism in the 1980s. The rise of Theravada Buddhism, an integral part of the Thai state, marked the end of the decolonising project and the beginning of a new internal colonial project concerning the rural Thai mind.

“The patriarch of the Judeo-Italian intellectuals longing for the embrace with Uncle Sam”: Oswald Veblen and the Italian Refugees

- Erika Luciano, University of Torino, Italy

Abstract: The so-called Measures for the defense of the race (5 September-17 November 1938) in Italy led to mass migrations, not only of scholars and intellectuals, but of some 6,000 individuals of Jewish descent from all walks of life who found themselves forced to leave because of the impossibility of providing for one's self and family and of tolerating the loss of civil and political rights. In particular, this exodus involved members of the academy, which in 1938 counted almost 200 university professors and lecturers of Jewish origin out of a total of 1250. The loss of this human capital in some sectors slowed down, and even halted, Italy's cultural, technological, and economic progress, with serious short- and long-term implications. The choice between leaving or staying, and the success or failure of the migration project, were conditioned by many factors: individual financial possibilities, age of the potential exile, gender, and the breadth and effectiveness of the social and relational capital which he or she could raise. In particular, those who had scant or distant connections with the English-speaking intellectual world, saw their opportunities reduced to a minimum. Based on new archival materials, this paper presents an overview of the Italian mathematical emigration, with an emphasis

on those mathematicians who had a connection with the American mathematician Oswald Veblen and could rely on his assistance formally or informally.

5 Describing reality through mathematical models (3/3)

Room: 40.012.

Organiser: Eleonora Sammarchi, ETH-Zürich & Riccardo Bellé, University of Rome Tor Vergata

Chair: Eleonora Sammarchi, ETH-Zürich

In various ways, sciences have attempted to describe reality by building predictive models for the interpretation of natural and social phenomena. Particularly in the mathematical universe, model building throughout history has meant providing simplified images of events in the phenomenal universe, and translating them into mathematical language to make predictions consistent with experimental data. In this symposium, we aim to investigate how mathematical models were conceived in relation to various fields of knowledge such as mechanics, optics, hydraulics, biology, economy, etc. The core questions of our investigation are: How does mathematical knowledge influence the construction of scientific models? Does modeling (in turn) guide mathematical research? And if so, how? By gathering together scholars whose expertise is representative of the interdisciplinarity of mathematics, we will provide a better understanding of the interrelations between mathematics and reality.

In our third symposium, we take a specific case study into account, namely the theory of ratios and proportions. For a long time, this theory played the role of the language used in order to describe reality. It was applied to various fields, including astronomy, mechanics, geometrical optics and music. However, since it presupposed to work with homogeneous quantities, it was in certain cases inadequate to represent reality. During the Renaissance and the 17th century, scholars progressively replaced it by other theories which fitted better with the paradigm changes of early modern science. We will analyze this shift by considering questions such as: where and how does the theory of proportions represent a tool for describing reality? Why did this theory go into crisis? And by which other theories was it replaced?

When the proportional model does not work: the problem of points in the Early Renaissance

- Veronica Gavagna, Università degli Studi di Firenze

Abstract: One of the earliest and most important problems attesting the development of a mathematical theory of probability in the Latin West is the so-called "problem of points" or "problem of division of the stakes". The problem concerns a game with two or more players who have equal chances of winning each round: the winner is the one who reaches the predetermined score and receives the prize money, to which each player contributed equally. If the game is interrupted for any reason and no player has yet won, the problem to be solved is how to divide the stakes equally. Giving meaning to the phrase "dividing the stakes equally" and creating a mathematical model based on that meaning is the crux of the problem. A number of authors, most notably Luca Pacioli in his *Summa de arithmetica, geometria, proportioni et proportionalita* (1494), tried to mathematize the problem by adopting the model of proportional distribution of gains according to paid-up capital, taken from economics (the model of the *compagnia* or *societas*). In my talk, I will illustrate the proportional models proposed by Pacioli and the abachist Filippo Calandri, as well as the criticisms made by authors such as Girolamo Cardano and Niccolò Tartaglia, which gave rise to a lively debate on the mathematical tools needed to properly model a random situation.

Two different mathematics? Ratio and proportion in the Renaissance debate on mechanica

- Elio Nenci, Università degli Studi di Milano

Abstract: The 16th century was a period of fundamental importance for the recovery and assimilation of Greek mathematics and the so-called 'disciplines subordinated to mathematics'. Among the latter, *mechanica* was studied and discussed continuously and from different points of view and often in controversy with the medieval tradition of *Scientia de Ponderibus*. The main ancient sources studied and discussed by Renaissance scholars were: the Pseudo-Aristotelian Mechanical Problems, Archimedes' *On the Equilibrium of Planes*, and the eighth book of Pappus's *Mathematical Collections*. The mathematics present in the first of these works is 'substantially different' from that present in the other two, and consequently the use

of the concepts of ratio and proportion also changes in them. In the talk, an attempt will be made to analyze the different ways chosen by the authors who dealt with this discipline to resolve the previously noted diversity.

From “relation” to “function”: changing notions of ratio and proportionality c. 1700

- Antoni Malet, Universitat Autònoma de Barcelona

Abstract: The early modern debate on the Euclidean concepts of ratio and proportionality included many substantial voices, from Galileo to Giovanni Alfonso Borelli (1608-1679), Antoine Arnauld (1612-1694), and mathematicians of the Roman Catholic educational orders, Jesuits and Oratorians prominently. The historiography has enmeshed the debate on ratios and proportionality in a grand narrative according to which 17th-century mathematics was torn up in two camps. On the one hand, the “analysts” — followers of Viète and Descartes and partisans of the algebraization of mathematics. On the other, the traditionalists, who ignored or downplayed the novel algebraical approach to geometry. In this narrative, as in any historical narrative opposing “tradition” to “progress” and “modernity”, the winner is known before the game is played. The historiography represents the debate as a confrontation of those who “promoted a new algebraic definition of proportion ... [and thereby] Proportion and its management ... were absorbed into algebra,” against those that criticized the mathematical inconsistencies in the new algebraic definitions of ratio. Since the “numerical theory of proportion”, which asserts the priority of arithmetic over geometry, was “more modern” than the Euclidean, relational one, the soundness of the numerical conception of ratios is taken for granted, without actually probing into its mathematical consistency. This paper will revisit the debate from this perspective in the writings of Wallis, the Oratorians Prestet and Reyneau, and Leibniz.

6 From controlled nuclear fusion to fusion energy: Scientific technological, political and environmental histories (3/3)

Room: 40.154.

Organiser: Roberto Lalli, Polytechnic University, Turin

Chair: Roberto Lalli, Polytechnic University, Turin

Commentator: Barbara Curli, University of Turin

There is increased interest in fusion energy as a viable future clean energy technology. Since it became a central focus of international cooperation in the 1958 Conference of Peaceful Uses of Atomic Energy, fusion energy has been researched and developed because of the associated environmental, political, and economic gains. Moreover, fusion energy research has been described as a major science diplomacy exercise with the neologism of “fusion science diplomacy” as well as a key area of experimentation in the process of European integration since the late 1950s. On the other hand, in different periods research on fusion energy has raised controversies in scientific and political circles as a technology that has not fulfilled the expectations and whose development requires large amounts of public investments. These debates indicate that the development of fusion energy research has been shaped by complex interconnections of factors including techno-scientific advances, different national political agendas and environmental issues.

The symposium provides a venue to analyze and discuss the multiple historical patterns related to research on fusion energy and related debates that regard various domains, from scientific cooperation to political imperatives, from technological choices to environmental issues. The symposium is organized in three sessions. The first session presents general mappings and socio-epistemological analyses of international cooperation schemes in fusion energy research. The second session addresses the science diplomacy dimension of fusion research for international institutions and nations as well as the relations between technological decision-making and political agendas in chosen case studies. The third session concludes the symposium by focusing on environmental implications and non-scientific actors that played a crucial role in the process of fusion research. A discussant will comment on the entire symposium at the end of session III. The Symposium is sponsored by the Italian Society for the History of Physics and Astronomy (SISFA).

A bridge to a fusion future: major oil companies and their investments in long-term nuclear fusion projects, 1968-1986

- Michiel Bron, Maastricht University

Abstract: The introduction of the Soviet Tokamak fusion reactor design not only re-established major state funding for fundamental nuclear fusion research in the Soviet Union, United States and Europe during the 1970s, but also sparked the interest of major oil companies. Following increasing difficulties with getting access to cheap oil concessions in the Global South, various big international oil businesses turned to nuclear energy as a way to diversify their business portfolios and become an “energy company”. This paper argues that investing in nuclear fusion became an instrumental part of these diversification strategies by offering a potential solution to some of the problems facing the rapidly growing nuclear energy sector, like nuclear waste disposal and projected uranium resource scarcity. Oil companies promoted their nuclear fission investments as establishing a bridge between the experienced increase in oil prices and the future introduction of nuclear fusion. By focussing on the cases of Exxon Nuclear’s investments in laser fusion research and Shell and Gulf Oil’s joint venture in nuclear fusion, this paper examines how oil companies publicly and politically presented their long-term investments in still very experimental and fundamental research projects in nuclear fusion during the 1970s and early 1980s.

Fusion valley: The International Thermonuclear Experimental Reactor (ITER) and the territories (2006- 2012)

- Gabriella Rago, University of Turin

Abstract: This paper addresses the territorial impact of the International Thermonuclear Experimental Reactor, the largest international techno-scientific collaboration project that has ever existed in the nuclear field, which is currently being built in the forest of Cadarache (France). Through this case study, it asks: how do the territories of nuclear experiments change from a socio-environmental point of view? Do they themselves become experiments? I will focus on the local governance of ITER, closely intertwined at the national and global level; the sociotechnical imaginaries conveyed by the green atom; and the strategies for building the social acceptability of high-tech projects, from the integration of public opinion into decision-making processes through the practice of public debates, to the ecological compensation. The interdisciplinary approach is particularly effective in weaving the complex links between the global history of nuclear energy and its territorial ramifications: from Science and Technology Studies, to address the technopolitical

use of some technology projects to implement policy objectives; to Nuclear Geography, to show the elements of acceptance or bottom-up push that make them locally integrable and that in turn integrate territories into the global techno-scientific system, by tracking fuels and technologies across multiple spatial and political scales: global, transnational, imperial, post-colonial, national, regional and local. Through the sources from the French departmental, regional and Commissions Locale d'Information archives, it is thus possible to see how energy transition on a local scale translates into a real territorial transition, that is a transition of the relations between population and territory and of the territory itself. Indeed, even before the experimentation began within the walls of the ITER, it extended into the entire surrounding area, making it in turn a social, environmental political, economic and cultural experiment.

7 Knowledge and control

Room: 40.006.

Chair: Sofia Varino, University of Potsdam

Epidemics and poverty: a relationship of interinfluence. The Oporto case (19th century)

- Tânia Ferreira, Universidade do Minho - Lab2PT (Braga, Portugal)

Abstract: "In general, all the people who have been attacked belong to the less affluent classes of society: they have been poorly dressed, poorly fed and not very well off in life". Words published in a newspaper's "O Comércio do Porto" article in 1855, about the main victims of a cholera epidemic ravaging Portugal at the time. This observation exemplifies the relationship of interinfluence that we see in any health crisis: diseases and epidemics emerge and/or spread more quickly when they encounter populations affected by poverty. The city of Porto, hit by several epidemics throughout the 19th century, will be the study subject chosen to problematize this issue. We will see that, despite the territory's vulnerability as a harbor city, with multiple land and sea communication routes that would be the entry to distant diseases, the city still had serious problems in terms of hygiene, sanitary and household. All these factors furthermore increased the risk of contamination and the spread of disease, which resulted in high mortality rates, especially among children.

Using various documentary sources, namely articles from the periodical press, medical reports and records, and documentation from political and administrative authorities, this paper's main goal is to study the factors that explained the Oporto's vulnerability to epidemic diseases, through a portrait of the population's sanitary and social conditions, as well as to problematize the interinfluential relation between poverty and disease which, even though evident to doctors and journalists at the time, would persist into the following century.

The night sky and street lighting: A history of nature in the city at the interface of history of science and technology & computer science (Paris, late 18th – 19th c.)

- Benjamin Bothereau, Centre Alexandre Koyré

Abstract: Streetlighting is a controversial public policy today with conflicting uses of the night opposing security issues to environmental issues. A blind spot remains around the very definition of 'light pollution', as there is still a cruel lack of interdisciplinary approach to the Night-Lights-Society problem.

This communication will present a research project that aims to overcome this methodological and epistemological challenge, investigating the making of the pact between night, lights and society at the interface of social sciences and humanities and computer science. What information can historians draw from lighting digital simulations that other methods do not supply?

I will draw on my actual postdoc (FabLight project), which is an ongoing interdisciplinary collective project (art history, history of science and technology, digital sciences) that studies lighting in workshops, schools, and art academies, as well as its representations in the visual arts during the Enlightenment. Developing with computer scientists a new methodology for the empirical study of the divergences between narratives, imaginaries, perceptions and the physical realities of urban lights in the 18th and 19th centuries, will contribute to a better understanding of the contradictory conceptions of the night on the part of the police, astronomers and the general public. How did the night-lights-society problem and its vocabulary emerge? What images and imaginaries did they produce? How did the framing of the problem hierarchize, canonize, or erase different types of knowledge, together with

their actors? How did they finally define (un)legitimate, (un)necessary uses of the night?

Considering calendar reform in the 1930's in Portugal

- Vitor Hugo da Rosa Bonifácio, Departamento de Física, Universidade de Aveiro

Abstract: The incommensurability between the lengths of the day, lunar month and year have, throughout history, created problems for drawing up the calendars that both regulate human life and are synchronised with the seasons. Today, the most commonly used calendar is the Gregorian calendar, which dates back to the 16th century. In the 19th and early 20th centuries economic, philosophical and mathematical considerations have justified a panoply of proposals to replace it. For example, in the 1920s, several US companies were already using an alternative 13-month calendar. In the 1920's, the newly created League of Nations set up a committee to analyse the issue. When queried about the matter, several countries set up local advisory commissions. In this communication, we discuss the Portuguese government response, taking into account both local initiatives and the international context. The Portuguese commission included, among others, the university professor and astronomer Francisco Miranda da Costa Lobo (1864-1945) and the Navy officer Abel Fontoura da Costa (1869-1940). The commission started a nation wide consultation to commercial, industrial, agricultural, financial, scientific, educational, social organisations as well as to official public services. Approximately 22% of those queried replied. This small number of responses reveals that a possible calendar reform failed to galvanize civil society. The commission final report favoured a thirteen-month solution but in the end tradition, possible difficulties in combining civil and religious calendars and indifference meant that this League of Nations initiative was in fact forgotten after the 1930's.

Designing Systems for People: The Development of Human-Computer Interaction in Britain

- Elisabetta Mori

This paper reconstructs the early developments of the discipline of Human-Computer Interaction (HCI) in Britain, intertwining the research developments in the field with the governmental and industrial policies in the UK. This recollection spans from from

Brian Shackel's work for EMI and his 1959 *Ergonomics for a Computer*, often considered one of the first articles in the history of HCI, until the 1980s, when Human-Computer Interaction was established as a discipline. In the 1970s several British centres in the UK began to focus on HCI research and development: such as the Man-Machine Interaction Group at the National Physical Laboratory, directed by Christopher Evans; the Human Sciences and Advanced Technology Research Group (HUSAT) at Loughborough University, among others. In the beginning of the 1980s, the Alvey Programme gave a major input to the development of HCI in the UK. Driven by industrial priorities, the Alvey Programme was a government sponsored research programme in information technology, that ran from 1984 to 1990. In parallel, the British Computer Society Specialist Group on Human-Computer Interaction was established in 1984 to promote the study and practice of HCI in the UK at a time when the field of HCI was still in its early stages, and the development of interactive systems was becoming increasingly important in many areas of industry and academia. The group played a key role in advancing the study of HCI in the UK and in connecting with the international community throughout the 1980s and 1990s, while the British HCI conference was one of the main early conferences that shaped the discipline. This paper takes into account original archival materials, cross referencing them with recently recorded oral histories with practitioners and academics in the field.

8 How can the History of Natural History Collections help us understand biodiversity?

Room: 40.008.

Organiser: Luca Tonetti, University of Padua

Chair: Elena Canadelli, University of Padua

Commentator: Nuala P. Caomhanach, New York University

The relationship between natural history collections and biodiversity, and its impact on related disciplines such as ecology, is becoming increasingly important to the international community and policymakers. However, as a result of developments in biodiversity research and advances in technology, the objectives, access and organisation of collections are also being reconsidered. In light of these changes,

Johnson et al. (2023) propose the creation of a global museum network to connect existing collections and guide decisions on biodiversity, sustainability and climate change. In the context of this debate, this panel aims to draw attention to the role of the history of natural history collections in our understanding of biodiversity and our relationship with the environment. We will examine the approaches and methods used (and their progression) in constructing such collections. We will consider how local practices and knowledge have contributed to these processes. Papers will focus on the following topics: 1) the relationship (from naturalistic voyages to colonial missions) between specimens and collecting environments; 2) the evolution of collection techniques; 3) the changes in conservation methods; 4) the processes of naming and classifying specimens, from objects “in nature” to scientific objects. In order for the history of collections to enable us to talk about past and present biodiversity, an integrated approach between physical collections and archival sources is needed. It is important to make the scientific community, which is currently engaged in massive digitisation projects, aware of the need to take all these historical aspects into account. Through this approach, natural history collections can take on new significance for our understanding of our relationship with the environment.

Paul Hermann’s Annotated Herbaria: Ethnobotany, Philology, and Botanical Text-Making (c.1675-1750)

- Bettina Dietz, Forschungszentrum Gotha, Universität Erfurt

Abstract: Some early modern herbaria contain more than dried plants. Botanists annotated them with descriptions, references to botanical literature and information on how plants were named and used by people in their regions of origin. In the 1670s, the German botanist Paul Hermann (1646–95) spent several years in Ceylon (today Sri Lanka) as a medical officer in the service of the Dutch East India Company. During his stay he put together four herbaria, two of which contain a wealth of handwritten notes by himself and several later owners. Botanical observations on plants and their habitat were inextricably intertwined with linguistic observations on Sinhala (the language that is spoken by the largest ethnic group on the island) and its script. On the one hand, this talk will focus on Hermann’s field notes to show that his botanical practice demanded and, at the same time, generated knowledge of Sinhala,

which he learned and mastered to a certain degree in order to collect what we now call ethnobotanical information. On the other hand, Hermann's herbaria will be linked to the scribal practices and publication strategies of eighteenth-century botany. Along with field notes, letters, manuscripts, illustrations, and printed books, herbaria were knots in the textual–visual mesh of early modern botany.

Plant Hunting in the Library: Conservation between Neglect and Care

- Anna Svensson, Department of History of Science and Ideas, Uppsala University

Abstract: This paper explores the relationship between conservation and collections through paying close attention to the conservation of a particular kind of object: printed books in which pressed plants have been pressed and left for later generations to discard, marvel at, or study. Librarians, archivists, antiquarian book dealers and researchers alike often come across plant or other biological material (or their traces) in books dating at least as far back as the sixteenth century. However, they are rarely visible in the metadata or scholarly publications due largely to the lack of stable classification and terminology. Who put them there, when, and why? When plants have been removed, was this by the person who pressed them, or a later intervention to 'clean' the volume? Ultimately, these questions reflect whether the plants should be considered an integral part of the object the book has become, or a foreign body that potentially poses a threat to the integrity or value of the volume. The example of pressed plants in early printed books, and changing attitudes towards them, raises broader questions about the relationship between conservation and taxonomy. Paradoxically, their continued preservation in a volume can be the result of both neglect and careful conservation, although the latter tends to privilege certain ways of seeing, knowing or being. Equally, their uncertain epistemological status is productive as a resource for exploring the pre-Linnaean circulation of specimens, and the power of pressed plants to express time and place in entangled multispecies relationships.

Achille Forti's *Algarium*: A History of Travel, Biodiversity and Scientific Objects

- Claudia Addabbo, Botanical Garden, University of Padua,

Abstract: In the international debate about the relationship between natural history collections and biodiversity, the history of collections plays a crucial role in understanding the connection between specimens and their environment, as well as the changes that have occurred over time. It also sheds light on the methods used for collecting, storing, and classifying samples. The Italian botanist Achille Forti (1878-1937) created several botanical collections during his life and scientific work. Among these was a large herbf macroalgae, which he donated to the Botanical Institute (now Botanical Museum) of Padua in 1937 with his bequest. It is a collection of about 10,000 algae specimens, representing 1,000 genera, arranged in over 100 folders. The specimens provide information about places, dates, and collectors, revealing the high level of stratification of the collection. Some samples were collected directly by Forti, while others by his friends and colleagues. Numerous specimens originated from scientific expeditions, such as those led by Vettor Pisani or the cutter Corsaro, during the second half of the Nineteenth Century. This paper focuses on the five folders of Forti's *algarium* dedicated to the genus Sargassum. This analysis serves as a case study to detect how the history of collection provides valuable information on plant species and their (past and present) relationship with the environment. It also examines the conservation practices in relation to the context in which the samples were taken. Finally, it explores Forti's scientific network through the annotations in the herbarium and the study of archival sources.

Classifying the Interspecies Relationship: Gallicolous Fungi from the Trotter's Gall Collection at the Botanical Museum of Padua

- Tiziana Beltrame & Luca Tonetti, Department of Historical and Geographic Sciences and the Ancient World (DiSSGeA), University of Padua

Abstract: Generations of naturalists and amateurs alike have been fascinated by galls—abnormal plant growths caused by fungi, bacteria, insects or mites. The Botanical Museum of Padua holds an important collection of galls collected by Alessandro Trotter (1874-1967) over a period of about 50 years, from 1890 to 1940. A student of the Italian mycologist Pier Andrea Saccardo, Trotter contributed decisively to the study of galls as a discipline between botany and entomology. This multidisciplinary approach is reflected in his collection, in which botanists and entomologists from all over the world have taken part. After graduating (in 1899) and

working as Saccardo's assistant (1900-1902), Trotter collected a special gall herbarium, focusing on a specific aspect of the gall phenomenon: the ecological relationships between the host plant, the galls and the 'gallicolous' fungi, those particular micromycetes that form a coenosis with the galls, i.e. an association of different species that have no direct relationship with the formation of the galls, but whose life is conditioned by the galls themselves. This interest in the ecological relationships manifested by the gall was part of a theoretical framework in which the pathological perspective dominated the study of plants. This paper discusses the possibility of interpreting this herbarium from a different point of view, an ecological one that sees gall formation not as a pathological condition but as an interspecies relationship, drawing on new implications for the contemporary debate on biodiversity.

9 How Computing Influenced our Understanding of the World: Scientific Communities as Communities of Computing (3/3)

Room: 40.109.

Organisers: Helena Durnova, MU Brno, Czechia, Ulf Hashagen, Deutsches Museum - LMU, Munich and Germany and Rudolf Seising, Deutsches Museum - LMU, Munich, Germany

Chair: Helena Durnova, MU Brno, Czechia

The practice of scientific research changed significantly with the arrival of the computer. Our historical understanding is influenced by two contradictory observations. On the one hand many academics follow the general belief of the public and of the political leaders, that Moore's law has a significant role in determining the place of technology in society and is not only a determinant of our society but also of our current research practice in the natural and social sciences and in the humanities. On the other hand, historians of computing advocated against technological determinism and made the argument that the computer is a "protean machine" (Michael S. Mahoney). In their understanding, studying scientific communities as communities of computing is just as relevant as the overwhelming technological determinism. In our symposium we would like to explore these historical phenomena by analysing, among others, the interactions between the

personnel of the computing centers, programmers and scientists, new computer-based scientific methods such as scientific simulations and artificial intelligence, and the emergence of new disciplines and sub-disciplines (such as computational linguistics or cognitive science).

This symposium is sponsored by the Interdivisional Commission on History and Philosophy of Computing (HaPoC hapoc.org).

The APE project: The emergence of massive parallel computer from theoretical physics research

- Arianna Borrelli, TU Berlin and Bielefeld University

Abstract: Claims of a "computer revolution" in the natural sciences often imply that the availability and use of computers gave rise to new ways of conceptualizing natural phenomena. In contrast to this (much criticized) technological-deterministic view, I will present a case study in which the path of innovation ran in the opposite direction: new ways of understanding micro-physical phenomena led theoretical physicists to design and build architecturally innovative computers, namely massive parallel machines. This happened in the early 1980s at the same time in different parts of the world -USA, Japan, Europe- in context of a singular combination of scientific research developments in theory and experiment, innovations in electronics technologies and markets and decisions in science policy and funding. It was only later on that commercial manufacturers took up and promoted this innovation. Focus of my presentation will be the APE (Array Processor Experiment) computer developed from 1984 onward at Rome University after the initiative of established theorists collaborating with a group of younger researchers and physics students.

The electric analog computing roots of biophysics

- Gabriele Gramelsberger, RWTH Aachen

Abstract: In 1951, Britton Chance and colleagues from the University of Pennsylvania constructed a computer to steer and record data from rapid flow experiments in molecular biology. This computer was an electric analog computer "especially designed to display a maximum amount of information" which enabled

Chance et al. to conduct quantitative experiments for studying the intermediates of enzymatic reactions. This very early computer-based experimental environment in science became the centerpiece of physiological investigations in biology and can probably be regarded as the first computer-aided simulation in molecular biology. What's more, Chance's research marked the beginning of biophysics. He was able to develop such a computer because during wartime he worked at the MIT Radiation Lab together with J. Presper Eckert who was involved in the development of ENIAC. Thus, Chance was one of the first researchers to be knowledgeable in the design and use of electric computers. The paper presents this crucial step in building the community of computing in biophysics.

The Computation and the Communities of the Lennard-Jonesium

- Johannes Lenhard, RPTU Kaiserslautern-Landau

Abstract: The Lennard-Jones (LJ) fluid, named after mathematician-physicist-chemist Sir John Lennard-Jones (1894-1954), occupies a special place among fluids. It is an ideal entity, defined as the fluid whose particles interact according to the Lennard-Jones potential. This paper expounds the history of the LJ fluid to throw light on the changing relationships between theory, computational practice, and communities of computation. The paper argues for the following claims. Firstly, the computational approach—even prior to the computer—pragmatically aims at prediction, not truth. Secondly, from the late 1960s onwards, computer simulation methods, especially “molecular dynamics” (MD), triggered a change in epistemology and social organization. Then, simulated model fluids became targets of investigation in their own right. The urge for prediction turned the LJ fluid into the most investigated fluid in engineering thermodynamics. Thirdly, MD took a huge upswing in the 1990s, due to exploratory options in simulation that made software attractive for a broad community of users.

Computational chemistry and tensions around software in computational science

- Alexandre Hocquet, Université de Lorraine, Nancy - Archives Henri Poincaré & RWTH, and Frédéric Wieber, Université de Lorraine, Nancy - Archives Henri Poincaré & RWTH

Abstract: Because of its advent in times of entrepreneurship science incentives, because of its proximity to the pharmaceutical industry, computational chemistry has always been dealing with academic norms as well as business norms. The community of computational chemists emerged in times of a plural hardware ecosystem. They blossomed in between two epochs. They were no longer in the age of supercomputers, when they were remote and dependent on the attribution of calculation time provided by computing centers. They were not yet in the age of ubiquitous desktop computing. In this specific computing context, the circulation of software has proved pivotal for practitioners. Software packages are first of all devised to provide knowledge on the structure and properties of molecules, of course. But it is also epistemically important to describe how they were and are distributed, maintained and licensed under sometimes conflicting academic and business norms. Computational chemistry is thus a field with peculiarities regarding software which highlight computing dimensions that have been understudied until now. In media such as newsletters, mailing lists or journals' op-eds, computational chemists passionately debate about issues of transparency, openness, dissemination... in short software issues, and the tensions they entail. For example, some scientists advocate for open-source software as a necessary condition for sound science, others defend proprietary packages as a warrant for reliable scientific software as a scientific tool. A lot lie in between, trying to reconcile academic norms and a sustainable business model. These heated debates help unveiling tensions about software in science that are otherwise invisibilized.

10 Indescribability and the Creation of Atmospheric Knowledge

Room: 40.113.

Organiser: Fiona Amery, University of Cambridge

Chair: Carolina Granado, Institut d'Història de la Ciència, Universitat Autònoma de Barcelona

In constructing knowledge of the atmosphere, researchers and naturalists were confronted with problems of vertical inaccessibility, periods of phenomenological absence and taxonomic difficulties associated with categorising their objects of study. Analysing the ways in which ephemeral objects were studied provides a particularly rich foundation for understanding the techniques scientists and naturalists used to deal with, or in fact leverage, incommunicability and ineffability. Phenomena such as the aurora borealis, snowflakes, clouds and fair-weather electrification pressed on the limits of description and defied neat linguistic, visual and disciplinary categorisation. How could singular observations be communicated to broader audiences without a standardised nomenclature or conventions for depiction? And how was authority moulded in cases where common classifications were non-existent or only just emerging?

In other words, how did a lack of information about an atmospheric object pattern ways of discussing and understanding it? We want to understand how trends in appearances of fleeting atmospheric phenomena were established over the long durée when descriptions and means of identification varied considerably. Furthermore, we wish to understand how phenomena which could only be detected with instrumental devices come to be known as fully fleshed out, visual and material objects. Just as historical climatologists look to proxies to reconstruct past climates and we, as historians, find palpable omissions in our archival material, so too did eighteenth and nineteenth century researchers employ strategies to navigate gaps or discrepancies in atmospheric records. We invite scholars working on the issues of inaccessibility and indescribability in the atmospheric and climate sciences to take part in our discussions at an ESHS symposium in September 2024.

‘No pencil can draw it, no colours can paint it and no words can describe it’: The Aurora at the Limit of Communicable Experience, c.1880

- Fiona Amery, University of Cambridge

Abstract: This paper explores the aurora as it was conceived of as an ineffable phenomenon in the literature of the First International Polar Year of 1882-3. The phenomenon’s apparent indescribability caused inherent problems for an international programme dependent on written communication and the ‘virtual witnessing’ of an object situated out of reach in the atmosphere and in an inaccessible

area of the globe. The aurora could not be extracted or reproduced and therefore knowledge of the phenomenon seemed destined to remain incomplete. Because it could not be captured through language or imagery in a way that was perceived as faithful, emphasis was placed on first-hand embodied observation. I survey the techniques employed in the late nineteenth century to make the aurora 'knowable' at the disciplinary boundary between the physical sciences, where the laboratory was the exemplary site, and the emergent field of geophysics. Despite the common adage that 'not words can describe it', language was deployed purposefully by the researchers of the IPY to navigate the relationship between the aurora's power as a potent imaginative resource and a topic of scientific scrutiny. At the limits of common registration techniques, the language of obscurity and occlusion became part of the aurora's visuality. Indeed, it emerged as a way of expressing the sublime nature of the phenomenon and underlining the need for first-hand witnessing in making sense of it.

The Disappearance of Dragons and Dancing Goats in Times of Solar Minima

- Jinu Choi, Princeton University

Abstract: This paper traces the disappearance and resurgence of written accounts concerning nocturnal illuminations during the Spörer (ca.1460-1550) and Maunder (ca.1645-1715) solar minima in early modern Europe. A wide range of sources from chronicles, almanacs and sermons to diaries and scientific observations abound with references to a menagerie of fantastic apparitions—dragons, dancing goats, blazing columns and battling armies—that occasionally brightened the night sky. Some scholars in this period sought to demystify these phantasms by drawing on the categories and explanations provided in Aristotle's *Meteorologia* and other classical works of natural philosophy, which they read through centuries of commentary and alteration. Others resisted the naturalisation of these phenomena, preferring instead to harness their awe-inspiring potential to the promotion of piety as well as doctrinal polemic in times of religious schism. Whatever the learned had intended, those they deemed 'the vulgar' had vernacular interpretations of their own, which this paper will examine alongside the Latinate discourse surrounding the phenomena. By the eighteenth century, I show, the cycles of retreat and return in testimonies of these

lights over centuries attracted the attention of observers keen to better understand the newly coined class of ‘meteors’ they now called the aurora borealis. The inheritance of these Enlightenment debates ultimately came to inform theories of solar activity that produced hypothesised periodisations such as the Spörer and Maunder minima. This paper thus treats the themes of absence and appearance and their invention in early modern science through the lens of dragons and dancing goats.

Sensing and Making Sense of Snowflakes Before Photography

- Floris Winckel, Rachel Carson Center for Environment and Society

Abstract: During the seventeenth century, the snowflake became an object of interest to a variety of prominent European naturalists, philosophers, and microscopists. At the time, it was a liminal object, familiar to many but fleeting and difficult to observe, rendering it an enticing object of microscopic inquiry. Over the course of the eighteenth and into the nineteenth century, the number of recorded snowflake observations and images proliferated, in large part due to a widespread and growing interest in meteorological knowledge and collecting natural specimens, amongst both expert and non-expert publics. Authors speculated about the means by which these beautiful and complex forms grew, accompanying their explanations with anywhere from a handful to almost a hundred drawings. But doing so was by no means straightforward. Many observations relied on a high degree of serendipity (being in the right place, at the right time, with the right tools and with sufficient patience), and very few were based on more than a couple days of snowfall. An already patchy record of snowflake observations was further complicated by disparate conventions of describing and organising these forms, both textually and visually. In this paper I analyse the various efforts to find order in snowflakes during this period, both in word and in image. In the absence of consistent records and common conventions, we see how observers employed different textual and visual strategies to make sense of these liminal objects.

11 Non-human animals and medicine

Room: 40.047A.

Chair: Claire Crignon, Université de Lorraine

Animals in turn of the century medicine

- Jonathan Simon, Université de Lorraine

Abstract: In 1895, serotherapy was widely introduced as a treatment for diphtheria in France, with the Pasteur Institute as the principal manufacturer and supplier of this innovative medicine. The Institute's serum was taken from a sizeable number of immunized horses that were kept on a large estate in Garches outside Paris. What relationship between human and animal does this imply? In the context of the modernization of a city like Paris, this redeployment of horses presaged a new norm. On the one hand we can argue that it is an extension of the industrial use of animals, an important element of the industrial revolution, while on the other it represents a relatively new function for horses in the context of scientific biomedicine. All this at a time when animal strength was starting to be replaced in the cities by fossil fuels and electricity. Furthermore, behind the horses producing the serum for serotherapy were thousands of guinea pigs that died testing each batch, the largely forgotten victims of this process for the production and control of this novel medicine. Thus, in the context of the fight against a lethal childhood disease, at least two species were placed under the yoke of industrial medical production.

The story of serotherapy for diphtheria is a story of how animals were subjected to a routine of hygiene, discipline and death dictated by the need to produce a medical drug considered safe and effective in the treatment of a highly dangerous human disease. This case seems particularly interesting at a time where we as a society need to decide whether other animals only interest us for what they can provide to humans or whether we need to reassess our relationship to them.

Relevance and presence of non-human agents in rabies control in the 19th century - a case study from the Iberian Peninsula

- Monique Palma, CIUHCT NOVA

Abstract: The contribution of non-human animals to the development of human society is a subject that still deserves a lot of study. In History of Science, Technology and Medicine we have references such as the publication "Animals and the shaping of Modern Medicine - One Health and its histories" (Woods, A, et al., 2018), which suggest that the history of medicine could be rewritten with the addition of the

history of non-human animal medicine. This work is part of that methodological framework. This paper will look at the disease of rabies in the 19th century. The aim is to present data from an investigation that will be carried out in the archives of the Institut d'Història de la Medicina i de la Ciència López Piñero with the following objectives: a) to point out the presence and b) the relevance of non-human agents in the development of human medicine to combat rabies in the sources that will be identified and c) and the context of the application of vaccines to control the threat of rabies. In this case study we intend to verify the convergences or divergences of the measures that have been adopted in Valencia, Spain and in Portugal, in Porto. Portuguese archives will also be consulted, such as the Porto Municipal Public Library. By analyzing all the participants, direct or indirect, in the process of disease management, as in the case of rabies, we will use history to construct narratives that may help in the implementation of health control policies in the present time by highlighting containment data used in the past to combat diseases that still threaten human societies currently.

Understanding the Non-human Animal in the Age of the Anthropocene: A Case Study of Modern Broilers in China Since the 1980s

- Yixuan Li, Centre for the History of Science, Technology and Medicine, University of Manchester

Abstract: Based on genetic change and intensive farming practices, the chicken on our tables today is significantly different from a century ago. Broilers, also known as commercial meat-type white-feathered chicken, have dominated the chicken meat market all over the world. The industrialisation of poultry production, driven by scientific and technological advancements, has transformed animals into a hybrid of nonhuman bodies and human intentions, turning them from pure animals into techno-scientific artefacts. This paper argues that broilers that are produced in the laboratory and on modern farms have lost their original connection to nature and undergo a process of socialisation within human society through the modern meat production chain. While Western animal breeders commenced the commercial breeding business in the mid-20th century, modern breeding work on meat-type chickens started in the 1980s in China, when the productive lines and farming practices were imported from Western countries. This paper provides a retrospective

overview of the development of China's modern broiler industry since the Reform and Opening up in the 1980s, looking at some key facts such as the evolution of breeding and farming practices, feed efficiency, and disease management. This paper probes how chickens leverage their non-human nature to interact with and influence agricultural practices, industry infrastructures, and policy formulation. It also examines the potential agency among chickens within these modern agro-industrial complexes, and how they would interact with the local environment, including their contributions to climate change, loss of biodiversity, antibiotic resistance, and animal welfare concerns. This case study aims to provide a historical framework to better understand the entangled relationship between humans and non-human animals in the Anthropocene, shedding light on broader issues of sustainability, coexistence, and our responsibilities towards the more-than-human world.

Towards a humanities-grounded Planetary health

- Núria Pujol Furelos, University of Groningen

Abstract: This theoretical interdisciplinary paper is at the intersection between Environmental Humanities and Critical Epidemiology. Critical epidemiology advocates for a definition of sustainable health based on the pillars of social justice and planetary health. Sustainable health advocates for decolonizing narratives to unveil the unfair and unequal distribution of resources between the Global North and the Global South. One of the pillars of sustainable health is planetary health, defined by the Planetary Health Alliance as "a solutions-oriented, transdisciplinary field and social movement focused on analyzing and addressing the impacts of human disruptions to Earth's natural systems on human health and all life on Earth". Most of the authors of planetary health have a background in natural sciences including medicine, public health, and environmental sciences. However, a humanities approach to planetary health is missing. While the community of planetary health scholars is knowledgeable about animal health, environmental sciences, and human health, in this paper I argue that the long tradition of division between humans and non-humans needs to be healed from a humanities perspective. To achieve this objective, it needs a Latourian approach. Bruno Latour has been working on the idea of relationality almost since the beginning of his career. His work *Facing Gaia* introduces the idea of the "earthbound": "Whereas Humans are defined as those who

take the Earth, the Earthbound are taken by it”.[1] The Latourian approach helps us to bring the idea of planetary health to a meta-level, in which both human and non-human actors play at the same hierarchical level, which is very much needed to achieve social justice and can also be extrapolated to other problems related to climate justice in the Anthropocene.

[1] Bruno Latour, *Facing Gaia: Eight Lectures on the New Climatic Regime*, trans. Catherine Porter (Cambridge, UK ; Medford, MA: Polity, 2017), p.251.

12 Regulating Life with the Seasons: Seasonal Knowledge and Practices in Islamic Societies

Room: 40.047C.

Organiser: Razieh S. Mousavi, Ca' Foscari University of Venice & MPIWG

Chair: Theresa Jäckh, University of Tübingen

The objective of this panel is to analyse the substantial impact of seasonal fluctuations on the lives of people in pre-modern Islamic societies and landscapes, particularly through the lens of intellectual history. The transition from one season to another has played a pivotal role in shaping various aspects of society, including food availability, economic regulations, travel, clothing, and military strategies. Moreover, it has influenced the timing of cultural events like religious gatherings and rituals. This panel seeks to highlight the importance of combining history of science with social, cultural, and environmental studies to gain a comprehensive understanding of the patterns for seasonal activities, such as agricultural tasks, regulation of healthy food and drinks, and planning land and sea voyages. It also acknowledges the crucial role of seasonality in organisation of labour, economic policies, and dietary habits in agrarian societies within various regions. This acknowledgement contributes to clarifying the connection between these aspects and the professional efforts for creating and standardising calendars, challenging the prevailing idea of the separation between scientific and commonplace approaches to the natural world. Recent research has unveiled changes in how people responded to seasonal variations over time, despite relatively stable environmental conditions. Our interdisciplinary approach is eager to emphasise the need for a holistic approach that combines textual and material archaeology with ethnographic analysis to better

comprehend the seasonal habits of people in the surveyed regions. It aims to provide a deeper knowledge of how seasonality is perceived and represented, moving beyond the observable changes in astronomical and weather conditions to delve into cultural perspectives.

Seasonal Changes and Water Management: Tracing Concerns on Water Resources in the Islamic Almanacs (8th–10th c.)

- Razieh S. Mousavi, Ca' Foscari University of Venice & MPIWG

Abstract: Seasonal Changes and Water Management: Tracing Concerns on Water Resources in the Islamic Almanacs (8th–10th c.) Recent explorations into pre-Islamic Arabia, facilitated by archaeological findings, stone inscriptions, and insights from anthropological observations of contemporary tribal life, reveal a lack of awareness regarding the concept of four seasons and geometric divisions related to equinoctial and solstitial points on the ecliptic. Instead, the perception of seasons relied on familiar climatic patterns, rain and pastoral periods, and various weather phenomena associated with the dawn rising and setting of specific stars. Following the extensive translations of astronomical works in the 8th and 9th centuries, scholars in the Islamic societies integrated Arab star lore with the Indian lunar zodiac, although Greek tradition strongly influenced their seasonal knowledge. This paper argues that a strong political interest in centralised water management, driven by the fear of drought in the immediate pre-Islamic era, resulted in a revolutionary change in how society interacted with water sources. Significantly, this led to a drastic transformation in the concept of seasonality, shaping a new perspective on the relationship between time, environment, and sustainability. Through an examination of almanacs (annual calendars marked by astronomical events) from the eighth to tenth centuries, this paper delves into environmental concerns related to hydraulic structures and water distribution within Islamic societies with diverse regional and societal settings. The goal is to grasp a better understanding of the role of environmental experiences in this transitional period and explore how a new comprehension of seasonal changes became integrated into the everyday practices of people in these regions.

Knowing and Working with the Seasons in a Persian Agricultural Text (c. 1311 CE)

- Riaz Howey, University of Bonn & MPIWG

Abstract: Knowing and Working with the Seasons in a Persian Agricultural Text (c. 1311 CE) While agricultural literature in Medieval texts rarely engages with topics like defining or explaining seasons, practical farming knowledge is invariably calibrated to the seasons. This paper focuses on seasons in New Persian-language texts on agriculture from Mongol Iran. The period saw movements of texts, plants, people and entire farming systems into unfamiliar lands with different climatic and seasonal coordinates. With a ruling class and government following pastoral rhythms, regulating economic life according to climate patterns was a concern cutting across social and cultural lines. Contextualised in Islamic agricultural-scientific literature and social history sources from the period, I will focus on Rashīd al-Dīn's Hamadānī's Persian-language agricultural text from c. 1311 CE (710 H). While the initial chapter, on seasons and climates, from his agricultural text is unfortunately non-extant, there is a sustained engagement with seasons throughout the work. Two themes explored are 1) time-keeping in different places using certain plants, famously melons, with reliable responses to seasons and 2) harnessing and mitigating the impacts of seasons through technological artefacts, especially in relation to water control and non-human life-cycles. Empirical examples are brought into conversation with questions around the relationship between knowledge and practitioners.

Travelling through the Seasons: Sea Voyages in the Indian Ocean prior to the 17th Century

- Inês Bénard da Costa, University of Lisbon

Abstract: Travelling through the seasons: Sea voyages in the Indian Ocean prior to the 17th century The focus of this paper is to discuss two ways in which seasonality influenced maritime culture around the Indian Ocean prior to the seventeenth century. A first part will be dedicated to navigation proper and analyse how the regular changing of the monsoons was associated with the closing and opening of sailing seasons, as well as with the best astronomical measurements to perform at that same time of the year. A second part will then enquire how such nautical

decisions impacted on the cultural life of major port cities. Harbours such as the ones in Aden, Hormuz and Malaca created important cosmopolitan centres even though they themselves faced harsh environmental conditions. Captains, merchants and navigators from all over the Indian Ocean were drawn to such places due to their strategic positions, sometimes staying up to months as they waited for the right season to return.

13 Science communication / Science popularization (2/2)

Room: 40.010.

Chair: Kristian H. Nielsen, Center for Science Studies, Aarhus University

Globalising Science and Education through the New Educational Fellowship: The Cases of Paul Neményi and Vilhelm Rasmussen

- Mavi Corell Domenech, Florida University in Valencia; Hans Henrik Hjermitsev, University College South Denmark

Abstract: The interwar period from 1918 to 1939 offered an exceptional window of opportunity for the circulation of scientific and educational knowledge across borders through conferences, visits, translations, and journals. Spearheaded by the New Educational Fellowship (NEF), established in 1921, European educationalists were eager to appropriate foreign ideas to improve their own educational systems.

The NEF promoted democracy, cooperation, critical thinking, coeducation, and personal autonomy. The teaching of science was relevant in this context because of its secular values such as solidarity, objectivity, and laicism.

However, the progressive ideas of the New School were challenged by the emergence of fascist regimes in several European countries. These regimes did not welcome democratic values and critical, scientific thinking. As an irony of faith, the persecution of Jewish and Socialist scientists in Nazi Germany meant that progressivist international networks were established in the 1930's, when the scientists migrated to other European countries.

In this paper, we will combine the global history of progressive education and the NEF with a microhistorical approach to the circulation of scientific ideas. Thus, the paper deals with the unexpected interest of the Croatian mathematician Paul Neményi (1895-1952) in the work of the Danish pedagogue Vilhelm Rasmussen

(1869-1939) which became clear in a review in the NEF journal *New Era* of Rasmussen's work *Børnepsykologi og Pædagogik* (Child Psychology) in 1939.

Neményi belonged to a group of left-wing Jewish mathematicians who, after Adolf Hitler came to power in 1933, took refuge in Copenhagen, where they remained until 1936. Rasmussen, in turn, was a socialist, Darwinist, and educationalist, who became reknown for his work *Nature Study in School* (1909), which was translated into several languages, including English in 1929 and Spanish in 1933. The microhistories of Neményi and Rasmussen thus reveals the global character of science and education in the interwar period.

NASA's Portrayal of Science, Technology, Humanity and the Earth: Space Science Education for Domestic and Foreign Audiences in the 1960s

- Christina Roberts, University of California, Santa Barbara

Abstract: In early 1961, the National Aeronautics and Space Administration (NASA) and the Franklin Institute, a Philadelphia, PA popular science museum, collaborated on a travelling science education program called the Spacemobile. Two Ford Econoline vans splashed with fancy graphics and the NASA meatball logo loaded with rockets and spacecraft models and a team of science educators each, which began five decades of NASA's domestic science education and teacher training in the U.S. The agency simultaneously developed an international operation that was overseen by NASA's Educational Programs Division, the USIA and the U.S. State Department. It visited 50 countries in Europe, Latin and Central America, Africa, the Middle East, and South Asia during the 1960s, spreading the United States' vision of humanity's changing relationship with science, technology and the earth during the space age. My paper compares the domestic and international programs using primary sources from NASA, the USIA, oral histories, and memoirs to examine the rhetorical justifications of this dual approach. I suggest that historians of science can and should investigate connections between domestic science education and international science education diplomacy to understand how shared scientific knowledge not only moves around the globe, but also translates depending on the circumstances of its dissemination and reception.

Is Formal Logic Exceptional? New Logics for New Sciences in 20th-Century Russia

- Elena Dragalina-Chernaya, National Research University Higher School of Economics, International Laboratory for Logic, Linguistics and Formal Philosophy, Moscow.

Abstract: This paper attempts to clarify the dichotomy of exceptionalism and anti-exceptionalism in the debates on formality in the 20th-century Russian logic. The purpose of the paper is twofold. Firstly, the paper addresses the puzzle of the rise of the logical pluralism in the Soviet anti-pluralistic system. Despite the emergence of some non-classical logics in pre-revolutionary Russia (e.g., Nikolai Vasiliev's non-Aristotelian "imaginary" logic inspired by Lobachevsky's non-Euclidean geometry) and the variability of the Soviet state politics in logical education (up to the introduction of logic courses into the school curriculum in 1946), the accusation of logic of being formalistic and abstract remained invariant. Paradoxically, although a pseudoscience called "dialectical logic" was officially declared a "genuine" logic of science, many non-classical (e.g., relevant, constructivist, modal) logics arise and develop in Soviet times. Secondly, the historical outcome of the debates on formality in the Russian logic of the 20th century will be examined from the perspective of the anti-exceptionalist turn in modern logic. According to current anti-exceptionalism, logic is not a "formal" exception to the dynamic of scientific inquiry. The Soviet project of "dialectical logic" rooted in the ideologized science phenomenon was full of absurdity, but it was exactly the neglect of dynamics of border-crossing and socially situated scientific inquiry in which this project saw the fragility of formal logic. While putting the focus on the dichotomy of substantial and dynamic formality, this paper draws attention to some lessons learned from the history of Soviet logic which support the "old-fashioned" idea of formality of logic. The paper will argue for compatibility of anti-exceptionalism about logic and its formality. It will be shown that distinguishing between different types and levels of formality make it possible to combine non-exceptionality and formality of logic.

14 Science Speaks! History of science communication

Room: 40.063.

Chair: Agustí Nieto-Galan

Historically, scientists have sought to communicate with people outside of science. In doing so, scientists have invited the public to weigh in on what science does and who does it. This interaction has allowed science to become, as the ESHS theme suggests, “one of the primary means by which mankind understands, represents and intervenes in the world”. Humanity has come to look to science for answers to the challenges that threaten its future in large part because of science communication. This symposium will explore the ways in which scientists (and science communicators) have sought to communicate with the public, why they have done this, and to reflect on the impact of science communication on the historical practice and profile of science.

‘Let the Public Decide’: Scientific deceptions in the Nineteenth-century United States

- Sarah Baxter, Universitat Autònoma de Barcelona, Institut d’Història de la Ciència

Abstract: The nineteenth-century United States was an era marked by a cultural tolerance for deception and trickery. Caveat emptor ('buyer beware') economics reinforced the notion of individual responsibility in discerning truth in the marketplace. This ethos permeated not only commercial transactions but also the realm of scientific knowledge, influencing how the public engaged with and interpreted scientific information. As science became increasingly commodified in the form of spectacles and public exhibitions, deception also became part of the landscape. Often billed as entertainment, deceptive practices ranged from good-natured hoaxing to outright fraud. Such cases had the power to split the public into sceptics and believers, initiate disputes among experts, and provide thrilling detective work for the masses. This paper traces how hoaxes and deception throughout the century shaped public discourse and understanding of science. Central to this study are the evolving dynamics of scientific authority and public trust. The nineteenth-century American public, when confronted with various forms of scientific deception, played a crucial role in shaping the contours of scientific reality through their active participation in truth-finding. This paper reveals how nineteenth-century deception contributed to a unique, participatory approach to

science, reflecting broader trends in societal values and attitudes towards knowledge and authority.

Cafe Scientifique at 25: History, memory, and politics in the Innovation of late twentieth century public science engagement

- Karen A. Rader, Department of History, Virginia Commonwealth University

Abstract: 2023 marked the silver anniversary of the Café Scientifique: Duncan Dallas staged the first such event at a wine bar in Leeds in May 1998 (Dallas 1999). In 2014, the year that Dallas died, science communication scholar Ann Grand remarked: “the café movement was central to Duncan’s life; at his memorial, it was mentioned by almost every speaker...,but the news made scarcely a ripple in the wider café family. And that’s just as it should be; a network that barely notices the removal of one of its founding nodes is surely the strongest and best kind of network” (Grand 2014, p. 278). This paper will survey English-language journalistic accounts and assessments of the history of science cafés that have appeared in a wide range of print media, including (but not necessarily limited to): anniversary essays, science journalism, and promotional essays, as well science communication and science education research articles. It will analyze the tensions in these accounts between individual versus institutional agency, between local versus global effects, and between history and memory – especially around the political implications of cafes relative to public understanding of science and technology social movements.

A 100 years ago at the first Bengal Baby Weeks (1924): Exhibiting 'scientific' motherhood and childcare in colonial Bengal

- Ranjana Saha, Institute of Advanced Studies, University of Turku

Abstract: ‘Scientific’ childcare advice involving regularity and precision by the clock, often promoted as mothercraft, was crucial to the early twentieth century global baby week movement. Baby weeks consisted of almost week-long child health exhibitions with a wide range of ‘scientific’ midwifery and mothercraft lectures, posters, model exhibits and slideshows, film-screenings, competitive baby shows, and sometimes even children’s fêtes. These were also a significant component of the first Bengal Baby Weeks, held across districts of Bengal, which in turn were launched as a part of the All-India Baby Week movement in 1924. By emphasising on so-called universal

western medicine as not always having been a blanket imposition upon the colonised, this research paper argues that although primarily motivated by the British Baby Weeks, the All-India Baby Week movement was a product of colonial and indigenous local collaborations which emphasised on raising public awareness about the urgent problem of high infant morbidity and mortality rates. The study aims to decolonise the colonising cult of 'scientific' motherhood and childcare by examining the cross-cultural tensions between mothercraft, colonialism, and nationalism. It highlights the significance of the baby weeks as spaces not just for colonial 'civilising missions' but also identity formation of and self-representation by the colonised. It draws on previously unexplored rare Bengal baby and health week reports (from the 1920s-1930s) to make extensive local and global connections.

15 Water and Knowledge, Heaven and Earth. Historical-epistemological from Early Modern Sources

Room: 40.144.

Organiser: Corinna Guerra, Ca' Foscari University of Venice & Alberto Bardi, Tsinghua University, Beijing

Chairs: Corinna Guerra and Alberto Bardi

Commentator: Pietro Daniel Omodeo, Ca' Foscari - University of Venice

Historical studies offer crucial guidance for present and future actions, intertwining with scientific questions on reality and urgent problems. Understanding the interplay of past, present, and future reveals our active role in shaping planetary-scale dependencies. This is especially pertinent amidst acute challenges faced by water resources, and distribution, globally and locally. Our panel delves into an historical exploration of waterscapes, spotlighting their intricate ties to scientific practices. We aim to dissect philosophical treatments on water as well as waterscape engineering, encompassing water's vital societal applications: potable water access, agriculture, healthcare, transport, energy, defence, and recreation. These applications hinge upon a synergy of ecological, social, and cosmological knowledge. Examining historical and philosophical perspectives from early modernity opens pathways to enhance contemporary discourse on water issues. Insights from this era can guide us toward

proposing informed solutions, bridging the gap between past wisdom and present predicaments.

Crane Knee and Dragon Bone: Exploring the transmission of knowledge between astronomical instruments and hydraulic machinery in ancient China

- Zheran Wang, Tsinghua University, Beijing

Abstract: Su-song's Clock-tower is a large astronomical instrument constructed in the capital of the Song Dynasty in the late 11th century. While the famous water clock has been extensively researched, there continues to be ongoing discussion among scholars regarding the meaning and structure of a particular component known as the "iron crane knee" - acted as a connection between the upper and lower balance. In fact, the "crane knee" also refers to the wooden paddle blades of the dragon-bone water lift, a traditional Chinese hydraulic mechanism used for irrigation and drainage, invented no later than the third century. The purpose of the "crane knee" is to function as a conveyor chain, continuously drawing water. It is reasonable to assume that the "iron crane knee" in the water clock had a similar structure but made of iron instead. The literati of the Song Dynasty were well-acquainted with hydraulic machinery, which allowed them to utilize this knowledge in the creation of water clocks.

Dealing with Marine Meteorology from Early Modern to Modern China: An Historical-Epistemological Examination of Dinghai Meteorological Station

- Xiao Liu, Tsinghua University, Beijing

Abstract: Throughout the development of meteorology in early modern and modern China, understanding the waterscapes so as to dealing with marine disasters is considered to be one of the key purposes. Via case studies concerning meteorological stations, this paper focuses on the early modern roots that led to the construction of Dinghai Meteorological Station. In doing so, it sheds light on the process of China's development of marine meteorological research, emphasising its transformation from early modernity to modernity, i.e. from passive development to active promotion. The establishment of Dinghai Meteorological Station reveals that marine

meteorology research was not entirely led by the government; the fishing industry played a driving role – a fact that was evident in the financing of its construction. Subsequently, the meteorological activities carried out by the Dinghai Meteorological Station, especially conducting marine meteorological observations and developing warning system to prevent natural disasters, mainly served fishery. With the completion of the Dinghai Meteorological Station, China not only studied meteorological characteristics for the surrounding areas but also established a basic network for marine meteorology in the late 1940s. This paper reveals how this phenomenon has its roots in early modernity and the local knowledge on fishery.

Working on/in Water in Early Modern Venice

- Marie Luise Leonard, Ca' Foscari University of Venice

Abstract: Venice's unusual lagoon setting has long been recognised by scholars as having a fundamental influence on the urban and social fabric of the city. Environmental challenges presented by Venice's waterscape shaped the development of state structures, and made the survival of the Republic dependent upon water based jobs; from fishermen working in the lagoon and mainland rivers, to those who dredged canals in the city to keep water moving, and from boatmen who transported people and goods around the lagoon, to sailors who manned the merchant and state ships that traversed the Adriatic and beyond. While state magistracies including the Sanità and the Magistrato alle Acque, monitored both water supply to the city and also bodies of water that could be detrimental to the health of the city's inhabitants. This paper explores how those working on or in water in the Venetian republic created and applied water-based knowledge to safely carry out jobs that were so crucial to the survival of the city. In doing so, it connects labour, health and environmental challenges in an early modern city defined, then and now, by its relationship to water.

Water and society in the Basin-Valley of Mexico. Historical alternatives

- Omar Rodríguez Camarena, Ca' Foscari University of Venice

Abstract: Mexico-Tenochtitlan City has always had a particular relationship with water, but this has changed dramatically through time. Over the centuries, diverse populations have come to the Basin of Mexico with new ideas about the local waterscape, transforming not only water management but the environment itself.

Since pre-Aztec times, artificial plots for agriculture—called chinampas— were constructed within the waters, and when Aztecs arrived they built their entire city inside the lakes. In an opposite way, Spaniards opened an outlet to the lakes' waters to try to prevent flooding, converting the closed basin into an open valley. These works continued in the 19th and 20th centuries, reducing the lakes to allow the expansion of the city, at the same time, freshwater was brought from increasingly distant places. Nowadays, a huge metropolitan area occupies the place of the ancient lakes whose environmental impact has even reached the adjacent watersheds. Recovering the diversity of historical alternative ideas, policies and practices around water can help us conceive of other ways to address the challenges facing the Valley of Mexico today in a more sustainable way.

Thursday 5th 18:45 - 19:45

Neuenschwander Prize 2024

Room: Auditorium Ciutadella

Chair: Dana Jalobeanu & Erwin Neuenschwander

-Karine Chemla, Sphere, CNRS & Université Paris Cité

Friday 6th

09:00 - 10:30 Sessions

1 Circulation of Knowledge Through Mathematical Courses (16th - 19th centuries) (1/4)

Room: 40.002.

Organiser: Mònica Blanco & M. Rosa Massa Esteve, Universitat Politècnica de Catalunya; Davide Crippa, Czech Academy of Sciences, Institute of Philosophy

Chair: Davide Crippa, Czech Academy of Sciences, Institute of Philosophy

One of the cornerstones in the history of mathematics is the process of algebraization, which involves the interaction between algebra and geometry that occurred from the 17th century to the early 18th century. The publication of *In Artem Analyticen Isagoge* (1591) by François Viète (1540-1603) marked an early milestone in this process with the development of the symbolic language and an analytic method for solving problems. Subsequently, the development of analytical geometry, boosted by the works of René Descartes (1596-1650) and Pierre de Fermat (1601-1665), as well as the development of calculus by Isaac Newton (1643-1727) and Gottfried W. Leibniz (1646-1716), allowed the mathematical community not only to address old problems, but also to tackle new ones, using these innovative analytical tools.

This newfound mathematical knowledge was disseminated through various mathematical courses that were used in diverse teaching contexts, including military academies and religious institutions, among others. The writing of these mathematical courses can be regarded as a form of communication that contributed to the shaping of “modern” mathematics. Their impact on mathematics education played a crucial role, the more so since these courses were widely circulated across different countries and institutions. Thus, exploring the readership of these courses and examining their actual uses, naturally leads to the study of local appropriation. This symposium aims to provide a cross-national comparative analysis of the circulation of mathematics through a variety of mathematical courses written during the 16th to 19th centuries.

The Tratado de Mathematicas by Juan Pérez de Moya

- Fàtima Romero Vallhonestà, Centre de Recerca per a la Història de la Tècnica, & Iolanda Guevara Casanova, Departament d'Educació Generalitat de Catalunya Departament de Didàctica de la Matemàtica i de les Ciències Experimentals (UAB)

Abstract: In this talk we will deal with some aspects of the *Tratado de Mathematicas* en que se contienen cosas de Arithmetica, Geometria, Cosmografia y Filosofia natural. Con otras varias materias necesarias a todas las artes liberales (1573) by Juan Pérez de Moya (ca. 1513 – ca. 1596). The author wants to make algebra known, not only to the public interested in the subject, but to all types of publics, as demonstrated by the dialogue that constitutes the last book of his *Arithmetica* (1562), the reading of which is in some way, a participation in the scientific production of knowledge. After summarizing the content of the *Tratado*, we will emphasize the improvements largely in the algebraic part such as the demonstration of the rules for solving equations of the second degree that were not in his previous works, and we will highlight the aspects that we consider most interesting in the parts devoted to geometry and astronomy.

Jesuit origins of comprehensive teaching of mathematics

- Ladislav Kvasz, Institute of Philosophy, Czech Academy of Sciences, Prague, Czech Republic

Abstract: Jesuit origins of comprehensive teaching of mathematics It was the Jesuits who introduced mathematics into the general secondary school curriculum in the 17th century and thus created the first general approach to teaching of mathematics. This was a significant change, as the humanists of the 16th century had a dismissive attitude towards mathematics. Some Jesuits, such as Nadal or Clavius, saw mathematics as an important subject and made its teaching part of their school curriculum. Clavius was the author of textbooks both on geometry as well as algebra that had wide circulation and influenced several mathematicians, among them for instance Descartes. Many standard conventions in mathematical notation and style of presentation have their origin in Clavius' textbooks. The thesis of the present paper is that the way of teaching mathematics that the Jesuits introduced can be described as transmissive, in the sense that the students were presented with ready-made

mathematical knowledge that they learnt by rote and then practice on artificial, standardized problems. When the Jesuit order was abolished in 1773, their organization and style of education was taken over by the state together with the approach to teaching of mathematics, which was deeply ingrained in school practice. The various school reforms that came later usually concerned content of teaching and organisation of schools, while the transmissive style of teaching remained intact and can be perhaps understood as Jesuit relic.

The influence of Viète, Fermat, and Descartes in the Supplement (1642) to Hérigone's Mathematical Course

- Antonio Mellado Romero, Departamento de Matemáticas, Universidad de Murcia;
Antonio Linero Bas, Departamento de Matemáticas, Universidad de Murcia

Abstract: The influence of Viète, Fermat, and Descartes in the Supplement (1642) to Hérigone's Mathematical Course Pierre Hérigone (1580-1643) wrote a Mathematical Course in six volumes. The first four were published in 1634, the fifth in 1637, and the sixth, a supplement, in 1642. One of the most important features of the Course is the creation of a new method of demonstration based on a syllogistic procedure that uses a completely symbolic language, through which he developed various mathematical content. This new logical-symbolic method allowed him to explain both classical and modern mathematics, pure and mixed, following a pedagogical project based on three pillars: clarity, brevity and rigor. In this way, he marked a distinctive style present throughout his work. In his Algebra (Volume II), he presented specious algebra and the analytical methods of François Viète (1540-1603), going so far as to improve upon Viète's algebraic methods. His new method, applied to algebraic procedures, transformed into a heuristic method for the discovery and derivation of new results. Thus, he saw and conveyed algebra as a tool that allowed for obtaining universal results, not limited to any genre of problem and equally useful for inventing all kinds of theorems to find solutions and proofs of problems. In this work, we will analyze the Supplement to the Course, where we find the exposition of the geometric resolution of Viète's cubic equations, the reduction of equations by René Descartes (1596-1650), and the method of maxima and minima by Pierre de Fermat (1607-1665), highlighting Hérigone's contributions.

Experimental mathematics, structural axis for Juan Caramuel's *Cursus Mathematicorum Facultatum*

- David Virgili Correas, Universitat Politècnica de Catalunya

Abstract: Experimental mathematics, structural axis for Juan Caramuel's *Cursus Mathematicorum Facultatum* Juan Caramuel y Lobkowitz (1606-1682) was a Spanish Baroque polymath, very active in the European intellectual debate of the time, who contributed prominently to the project of universal unification and systematization of all knowledge. His scientific course, collected mainly in the vast encyclopedia "Mathesis Biceps, Vetus et Nova", exposes both the knowledge of the ancients and the contributions of the moderns, not only theoretically but based on practical experiments in all fields: Astronomy, Architecture, Geodesy, Hydraulics, etc. He rejects the principle of authority and advocates for experimentation, as opposed to the Cartesian mechanistic model, and establishes Logic and Combinatorics as the methodological instruments of his scientific work. His fundamental contributions in probability theory (Kybeia) and the exposition of arithmetics with a non-decimal base, probably motivated by the contact and the willingness to spread non-European mathematical cultures, have been traditionally highlighted. The objective in this case is another one: the mathematical analysis of selected scientific experimental problems, in order to understand his new perspective, modern and reformist.

2 Engineering the rivers and the sea: interactions between hydraulics and environmental thinking in the early modern period

Room: 40.010.

Organiser: Jip van Besouw, University of Sevilla; Davide Martino, Cambridge University

Chair: Davide Martino, Cambridge University

To say that access to water is central to civilization is a truism. Beyond the direct need to bring sufficient drinking water to major cities, access to water was central for trade, warfare, farming, fishing, and many other activities on which early modern humanity depended. Artworks of the time represent canals, wetlands and seas in great detail. Controlling waters both fresh and salty, especially around cities, was a major political and economic issue. But it was also a scientific issue.

Bridging History of Science, Art History, and Environmental History, scholarship of the last decade has overcome earlier narratives which characterized hydraulics and hydromechanics as sciences devoid of practical meaning before the end of the eighteenth century. We now know that ‘experts’, often members of scientific institutions, played a significant part in developing control over waters well before that. They did so especially through innovative approaches to practical issues such as building aqueducts, dikes, ports, and canals, or developing hydraulic technologies such as reckoning and measuring, water-raising machines, desalination devices, and impermeable building materials. Just as these engineering and scientific practices innovated ways of placing, or seeing, water in the landscape, so did artists.

The grounding hypothesis of this panel is that interactions between scientific institutions and the politics of water did not only change the engineering of the water. They also changed the way waters were conceived and represented. There was a great historical awareness of managing access to waters both fresh and salty in regions such as the Netherlands, Venice, and Egypt, where local concerns constantly interacted with global ones. In these and other places, thinking about hydraulics therefore had important social, cultural, and political dimensions. This panel aims to explore interactions between thinking about, representing, and acting on water, in the early modern period, in its many facets.

Seething Waters: Environmental Affects in Seventeenth-Century Dutch Landscape Drawings

- Sarah Mallory, Morgan Library & Museum and Harvard University

Abstract: This paper will contextualize Rembrandt’s drawings of the watery Dutch landscape within the broader scientific and environmental histories of the Dutch Republic. Of particular importance is a drawing by the artist, now in the collection of the Louvre, in which Rembrandt depicts through impossibly smudgy patches of brown ink a wetland scene; on the back he wrote his recipe for ink, which calls for a variety of pigments to be added to ‘seething waters’ for half an hour. Taking this work and the idea of ‘seething waters,’ as a starting point, alongside a close study of the places in which he walked and sketched, this paper examines how the artist conceived of and managed water in his drawings. I situate my visual and material analysis of the drawing alongside the works of other artists, texts related to water

management, and techniques of Dutch paper manufacture—an important industry that grew out of acumen in groundwater management. I also consider how the mercurial wetland environment, replete with fleeting haptic qualities, such as damp air and muddy ground, impacted drawing praxis. For as these very features of the environment were themselves being newly studied and theorized, so too was Rembrandt learning about these phenomena, likely from his circle of humanist friends in Leiden and Amsterdam. I argue that Rembrandt's particular use of ink and paper is more than just an aesthetic choice: his drawings embody the process and experience of inhabiting the distinctive and ever-changing wetland environment in the Dutch Republic.

Reckoning with Sea Level Rise in Early Modern Holland

- Jip van Besouw, University of Sevilla

Abstract: Rising sea levels are at the forefront of present-day imaginations of our planetary future. The possibility of globe-spanning changes through rising sea levels first evolved in specific places and landscapes in which people imagined global causes for their local problems. In this paper, we delve into early modern debates about changes in sea level from the vantage of Holland and the Dutch Republic, focusing specifically on the work of the surveyor Nicolaas Cruquius (1678-1754) who was then the country's leading cartographer and meteorological observer. In 1731, Cruquius wrote a report to local water authorities, addressing the dangers of river silting and sea level rise. According to Cruquius, the mouth of the rivers Rhine and Meuse, crucial for trade and flood control, risked closing up. Gradual sea level rise and the long-term mis-management of rivers, he argued, had led to this situation. The report is remarkable for the way in which Cruquius tied together different temporal and spatial scales. To substantiate his advice, Cruquius drew on both hydrological knowledge about river environments and antiquarian scholarship on the history of the Dutch landscape, combining mathematical reasoning, antiquarian evidence, and an extensive historical discussion of shifts in Holland's geography. Situating Cruquius' work in a broader learned, political and environmental context, we show how the local circumstances of the Dutch Republic gave rise to a particular way of seeing and thinking about global change.

3 Looking at the words: Science and Language

Room: 40.047C.

Chair: Michiel Bron, Maastricht University

Esperanto, Science, and South Asia: Contact Zones of a Universal Language

- Bipasha Bhattacharyya, Department of History, University of Cambridge

Abstract: The international auxiliary language Esperanto has been the subject of much linguistic and sociological study. Very little attention however, has been paid to its existence as a historical phenomenon, with many uses, meanings, and actors across regions and themes. This paper aims to historically interrogate Esperanto's presence in South Asia, through the lens of its use as a language of scientific communication. Esperanto's beginnings in a Russian Empire floundering from the consequences of the Pale of Settlement, were imbued with an attempt to challenge the constraints of this empire. Its near-simultaneous migration to the British Empire in South Asia was marked by the participation of individuals working for the consolidation of Empire. My paper aims to investigate Esperanto's relevance to science through three main strands. First, it examines Esperanto's position amidst late nineteenth and early twentieth century debates on scientific standardisation as a product of earlier Enlightenment debates on philosophical languages. Secondly, it aims to create a map of Esperantists in British India and Ceylon, an eclectic group of individuals ranging from geologists in the Trigonometrical Survey of India, to gold miners in Mysore, to pioneers of the 'Spectro-Chrome', and 'color therapy', to members of the Bengal pilot service, to 'the first European to visit Trucial Oman'. Finally, it aims to situate the Esperanto scientific journal 'Internacia Science Revuo' (1904-1923) as both a forum for the dissemination of scientific knowledge, and a cover for the perpetuation of colonial anthropology and pseudo-science.

Acronyms: A Historical Perspective on a Recent Trend in Scientific Language

- Helge Kragh, University of Copenhagen

Abstract: Present research articles in all branches of science are crowded with acronyms, abbreviated technical terms such as NASA, IUPAC, laser, radar, and DNA. Indeed, since about 1970 the number of acronyms in science and technology has exploded, leading critical voices to speak of acronymia as a contagious disease. The proportion of acronyms in titles in scientific papers has increased from 0.7 per 100 words in 1950 to 2.4 per 100 words in 2019. A few acronyms, such as DDT, radar, and laser, have entered common language and are used as proper words, but most of them are known only by specialists. They are often weird and artificial, cp. names such as SQUID, GADZOOKS! and ABRACADABRA. Given the massive use of acronymic terms in modern science it is noteworthy that the word 'acronym' only appeared in print in 1943. Abbreviations of this kind were practically unknown in pre-World War II scientific literature. Based on a recent study of acronyms in the physical sciences, the address focuses on how, when and why some well-known acronyms were proposed and became generally accepted. The examples mostly refer to physics, astronomy, and astrophysics but also include cases from the biomedical sciences. Among them is the subgroup of acronyms formed by eponyms as in EPR (Einstein-Podolsky-Rosen) and JWST (James Webb Space Telescope). Apart from systematizing and problematizing different kinds of acronyms, the address considers more broadly this linguistic phenomenon in the light of general trends in science during the last seventy years.

Cross disciplinary research on names of stars and constellations - mining databases of science and humanities

- Susanne M Hoffmann, Friedrich-Schiller-Universität Jena

Abstract: Astrophysics aims to identify historical novae and supernovae because the historical data is much more accurate than age estimates in astrophysics. In the interdisciplinary research branch of "applied historical astronomy" (that emerged in the 1970s but stands in a long tradition of at least 2000 years of predecessors), historical data from chronicles and other sources is compared to data from modern space telescopes observing in any possible waveband of the electromagnetic spectrum. The problem is that chronicles and other sources are not astronomical diaries or observation reports but the information is selected and framed. For instance, if any ancient astronomer saw a "new star" emerging in the constellation of

Cetus, the ancient person would have described its position "in the belly" or "at the flank" or "between the comb and the front legs" of The Monster which gives us a more or less big area instead of the accurate position. Additionally, some people might have seen the Monster as a fish-like creature while others would have imagined with front legs. These differences in imagination of the mythological or religious figures depicted in the sky might have caused different orientation (is the halved Greek ship the front part or the rear part? is the Maiden standing or lying?) of the figure and of the frame of reference. In order to find out what a specific ancient omen means and if there is an astrophysical truth behind the appearances that are mentioned in chronicles, we need to create, manage and arrange huge data collections of history of art and science. My contribution (for Rana Brentjes's DH-session) will show some results of all the various directions of research mentioned above: the cross-disciplinary study on the constellation Cetus, the transdisciplinary research on historical novae and variable stars, and the open tasks and questions.

4 Material Practices of Chemical Analysis (1/2)

Room: 40.101.

Organiser: Armel Cornu, Uppsala Universitet, Sweden; Sarah Hijmans, Technische Universität, Berlin, Germany; Charlotte Abney Salomon, Science History Institute, Philadelphia, United States

Chair: Armel Cornu, Uppsala Universitet, Sweden

Writing the Experiment. Experimental Practice, Gender, and Materiality in the Lavoisiers' Travel and Laboratory Notebooks (1770s-1780s)

- Francesca Antonelli, Universitat de València, Spain

Abstract: As a growing historiography has shown, writing played a fundamental role in early modern experimental practices, allowing to keep track of experimental procedures, results, and various other information. Notebooks, registers, and papers of diverse kinds were crucial components of savants' and naturalists' work routines, as were instruments, specimens and raw materials. This presentation concentrates on a set of notes dealing with chemical analysis and co-written by the French chemist Antoine-Laurent Lavoisier (1743-1794) and his collaborator and wife, Marie-Anne

Paulze-Lavoisier (1758-1836), between the early 1770s and the late 1780s. Over around two decades of collaboration, the Lavoisiers worked together on an extremely rich series of experiments. But how were these experiments recorded? Does the choice of the paper support (a notebook, a diary, a loose sheet, etc.) impact the contents and the style of the notes and more broadly the way in which the experiment was represented on paper? To what extent are the social and gender identity of the note-taker intertwined with the act of writing? This presentation will propose some answers to these questions, based on a new reading of the Lavoisiers' laboratory notebooks, compiled in their laboratories in Paris between 1772 and 1788, and their travel diaries, drafted during journeys across the French provinces in 1787 and 1788.

Dextrine: from fraudulent substitute to fondant essential

- Patrick Charbonneau, Duke University, North Carolina, United States

Abstract: Throughout the 18th century, Parisian confectioners pursued innovations of all types—shape, color, perfume—to keep their wealthy customers coming back for more. The underlying art, which relies on controlling sugar crystallization (or the absence thereof), however, changed relatively little. The large-scale production of dextrine—later glucose—in France starting in the 1830s, which as an additive can modulate sucrose crystallization, should therefore have been a boon to confectionery. In fact, dextrine, by preventing sucre cristallisable from crystallizing so readily, did eventually lead to the emergence of fondant, whose sweet yet malleable nature reflects its fine crystalline makeup. Unlike in bread and beer making, however, dextrine was not initially well received in confectionery. The sweetener was instead deemed a cheap and fraudulent substitute to beet sugar and honey. Chemical analysis and legal manœuvres attempted to suppress its confectionery use for over two decades before innovations came out ahead. This paper examines the gradual shift of dextrine from analytical outcast to technically indispensable.

5 Museums and Industry: Long Histories of Collaboration: Science Museums in Transition (1/2)

Room: 40.213.

Organiser: Harry Parker, Science Museum, London

Chair: Carlos Tabernero Holgado, Universitat Autònoma de Barcelona

The display of science, technology, engineering, and medicine (STEM) in museums, science centres, and international expositions has long depended on industry: as a source of artefacts, interpretive expertise, and financial support. Despite this close and ongoing connection, the causes and consequences of industry's patronage of STEM displays have been little explored. Under what circumstances, and for what reasons, has industry become involved in exhibiting STEM? How have the interests and institutional logics of industrial patrons on the one hand, and museums and cultural heritage organisations on the other, either meshed or caused friction? What limits has the patronage relationship imposed on the public presentation of science and technology? Conversely, what new kinds of exhibitory regimes has this relationship opened up? And how has this relationship reflected, reinforced, or helped to reshape sociotechnical imaginaries more broadly?

The first of two symposia on the Museums and Industry: Long Histories of Collaboration (MaILHoC) strand, this panel will bring together scholars to explore the impact of industrial patronage on the changing roles and self-conceptions of STEM museums in the second half of the twentieth century. Each paper will study a key inflection point in the story of the institutional transformation of the twentieth-century museum, taking in, for instance, the 'educational turn' of French museums after the Second World War, and the shift towards a more managerial museum in Britain during and after the 1970s. Keeping the museum-industry relationship in focus throughout, papers will reveal the inner workings of this relationship, ask how these relationships have been viewed both by policymakers and the public at large, and consider the implications of these relationships for the making of a STEM museology. The resulting aim will be to put industrial patrons firmly back into the story of science and technology's 'co-construction' in the twentieth century.

'Science Museums, Commercial Sponsorship, and the Shifting Technologies of Governance in Later Twentieth-Century Britain'

- Scott Anthony, Science Museum

Abstract: This paper argues that the growing controversy surrounding commercial sponsorship of science museums (and the cultural sector more generally) in

late-twentieth century Britain was less reflective of a political clash than in a shift in the technologies of governance. Until the 1970s, both left and right wing parties in the UK described state spending on museums and culture as ‘government patronage’ rather than public funding. It was a formulation that expressed a shared political ambivalence about the use and potential misuses of central state power that was typical of the Cold War. But this formulation also reflected the influence of new technologies of governance, in particular the way the language of modern management had entered policy discourse. By the 1960s even a relatively radical Minister of the Arts began to formulate policy responses to the cultural sector through the language of productivity. As it became widely accepted that productivity gains in the cultural sector were impossible, a consensus emerged that a robust national culture required a mixture of government patronage, private sector funding, and philanthropic donations to survive. But by the 1970s this consensus was challenged by the rise of new leisure industries, which suggested to a younger generation of policy makers that the financial problems faced by the UK’s museums was not sectorial but rather managerial. This shift in governmental expectations of the cultural sector had the effect of both creating new cultures of management and undermining the previously shared assumption that patronage was both inevitable and ethically neutral.

Popularizing Technoscience by Display: The Palais de la Découverte and the educational turn of Postwar Science and Technology Museums (1945-1955)

- Thomas Mougey, Université Aix-Marseille

Abstract: In the immediate postwar period, the museum landscape underwent profound transformations. The newly established International Council of Museum (ICOM) and UNESCO’s Museum Division spurred international discussions on the educational role and social responsibility of postwar Science and Technology Museums (STM). Meanwhile on the exhibition floor, museum professionals experimented with new exhibitory formats and partnerships to fulfil their newly claimed responsibility to prepare the general public to the technoscientific exigencies of the postwar world. Both international ethics and on-the-ground museographic transformations played out against the backdrop of reconstruction and questions

regarding STMs' appropriate relationship to an industry to scientifically bolster. The director of the Palais de la Découverte, André Lèveillé, pioneered both fronts, fashioning his museum as the living model of a new public-centered and science-based museology. This paper proposes to dissect the making of the postwar STM by examining the entangled development of a new educational ethos and a rational museography through Lèveillé's trajectory. It will emphasize the tensions arising from these ethical and practical changes and retrace their implications: Who was the public and how did STM engage with it? What kind of technoscience was to be shown and how? How did museum engage with industry and to what end?

'The nature and art of patronage is subtle and delicate': The Sainsbury Family as patrons for Food for Thought: The Sainsbury Gallery at the Science Museum, London

- Emily Rees Koerner, Science Museum

Abstract: In the UK in the 1980s, changes to how museums were governed and funded have been posited as the reason that museums had to turn to private patronage, often in the form of corporate sponsorship. The role played by these patrons in exhibition displays was often viewed as ethically suspect, an effect that is still felt in current discourse. This paper examines a late twentieth century case study of patronage at the Science Museum, London. Already scrutinised in some depth by Sharon Macdonald (1997; 2002), this paper revisits Food for Thought: The Sainsbury Gallery (opened 1989) instead through the lens of the main patron: the Sainsbury Family Charitable Trusts. Using archive material from both the Science Museum and the Sainsbury's archive, this paper explores how the relationship between the patron and museum was brokered, the conditions imposed by both parties, and the attendant shaping of gallery content. Skewing our focus towards patrons hopes to rectify a lack of reflection on patrons as co-constructors of knowledge – for good and for bad – within the display of STEM, despite their longstanding involvement. This may be due to an effacement of their role to assuage doubts about compromised curatorial integrity in climates of unease about what patronage means for museums, but in this case study, it also speaks to broader institutional changes in the Science Museum - which were taking place across the sector - to do with professionalisation,

managerialism and increased anxiety about how knowledge is produced and displayed.

6 The activity of the Iberian mathematicians during the XXth century dictatorships in the Iberian Peninsula

Room: 40.063.

Organiser: Luis Saraiva, CIUHCT and Mathematics Dept, University of Lisbon, Portugal; Luis Español González, University of La Rioja, Logroño, Spain

Chair: Antoni Malet, Universitat Autònoma de Barcelona

The Iberian countries had both to endure long dictatorships in the XXth Century. Portugal had its Republican revolution in 1910, which abolished monarchy. But the Republic was unable to have a stable political and social situation, governments followed in a quick succession, and conditions were created for the coup of May 28, 1926, which initiated a right-wing dictatorship which would last until 1974.

Similarly, Spain has had dictatorial governments in two periods of the 20th century, 1923-1931 and 1939-1975. During the first, under the reign of Alfonso XIII, the dictator was General Primo de Rivera and in the second, without a monarchy, it was General Franco. In the intervening period, the Second Spanish Republic (1931-1939), unstable after 1934, suffered the military uprising of 1936 followed by the civil war (1936-1939), which caused its gradual disappearance while Franco's dictatorship began to take shape in the territory initially held by the rebels, ultimately securing its final victory in 1939.

Our purpose is to present some cases of the activity of the Iberian mathematicians in the context of the dictatorships in the Iberian Peninsula. A significant number of those mathematicians were against the dictatorships that controlled their countries, and we will analyze how they acted, what were the strategies used, both at personal and institutional level, having in account the police states in which they were living. In contrast, other mathematicians supported the dictatorships and they were benefited by them, with no shortage of professional conflicts between them.

Ruy Luis Gomes and Portuguese mathematics activity during the Salazar dictatorship

- Luis Saraiva, CIUHCT and Mathematics Dept, University of Lisbon, Portugal

Abstract: Portugal was under a dictatorship from May 28, 1926 to April 25, 1974. Until the mid 50s science, and in particular mathematics, was not a prime concern of the regime. It was thought that it would be useful for the dictatorship in order to reproduce itself, to have a few scientists doing their specializations abroad, so that after their return to Portugal they would be an added value for the regime, This did not happen as the regime forecasted. Many of the grant holders, in contact with the reality of democratic countries, with the vivid social and political debates in those countries during the 1930s, became aware of the crucial importance of freedom, and understood better both the Portuguese situation, and the state of backwardness of science in Portugal. They returned to Portugal with the resolute will to change the scientific level of the country, and to orientate it towards the big international community of scientists. In this talk we will develop an overview of the doings of the mathematicians of this generation of Portuguese scientists, up to 1946/47, when there was a massive set of expulsions from the Portuguese Universities. We will see their strategies to overcome the obstacles set by some of their colleagues and by the government. In particular we emphasize the work of Ruy Luis Gomes, and his achievements. We will also mention the activities in their new countries of those who were forced to emigrate, emphasizing Brazil and Argentina.

The influence of Julio Rey Pastor on Spanish mathematics during the Primo de Rivera dictatorship and the Second Spanish Republic

- Luis Español González, University of La Rioja, Logroño, Spain

Abstract: Julio Rey Pastor was at the University of Buenos Aires from 2021 on, with a leave of absence at the Central University of Madrid. In 1925 he obtained from the government of the dictator Primo de Rivera the privileged situation of combining his chair with his contract in Buenos Aires, he would only have to teach special courses in Madrid during the term of university vacations in Argentina. At that time, two of the three existing mathematical analysis chairs were occupied, and a fourth was going to be created, but only the chair of Luis Octavio de Toledo, dean of the Faculty and with retirement in sight in 1929, remained in effective exercise. From his Argentine position, Rey Pastor tried to influence the organization of mathematics in the Faculty of Sciences of Madrid against the dean's project. This influence was clear

in 1928 when a chair was awarded without opposition to Esteban Terradas Illa, a well-known issue. The purpose of my talk is to make known that another transfer from Barcelona to Madrid was attempted to increase Rey Pastor's influence group in Madrid, that of Antonio Torroja Menéndez. The arrival of the Second Spanish Republic aborted this project and that of the dean went ahead, although in the years before the civil war there was an agreement between both groups, then the chair of Rey Pastor in Madrid became vacant and was won by his disciple Ricardo San Juan Llosá.

PhDs in Mathematics in Spain in the period 1939-1954

- Maria Angeles Martínez Garcia, University of La Rioja, Logroño, Spain

Abstract: During the first decades of the twentieth century, Spanish universities claimed the ability to teach the degree of doctor, only authorized to the Central University of Madrid, and there were continuous attempts at decentralization that failed. The Second Spanish Republic even legislated for such a reform, but the outbreak of the civil war put a stop to such a possibility. Once the war ended, the Franco dictatorship began and doctoral studies were once again located in the capital until June 1954, when it was decreed that all these institutions had the capacity to offer the coveted degree. In this work we will try to study the doctorate in exact sciences between 1939 and 1954, compiling the legislation related to it, various data on the doctoral theses in mathematics that were presented and read during this period, as well as information on the working and academic life of those who defended these works.

7 The 'Other' Genius: A Historical Approach to Genius, Giftedness, and Gender (1/2)

Room: 40.004.

Organiser: Victoria Molinari, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC); Andrea Graus, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC); Violeta Ruiz, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC)

Chair: Annette Mülberger, University of Groningen

The figure of “the genius” has been traditionally defined in terms of the masculine Romantic ideal - a heroic individual who battles against all odds to achieve significant artistic, political, and scientific accomplishments. Historically, however, what constituted “genius” - and who was labeled as such - was (and remains) a question with multiple answers that did not always align with the traditional Romantic ideal. Be it an issue of gender, age, race, or even madness and disability, different categories have been used over time to understand exceptional talent and define genius and similar concepts (e.g. giftedness) in the history of science and medicine. Some studies have approached the concept of genius from different angles, from focusing on a sociological perspective and the social appreciation of genius, to exploring its historical ties to religion, literature, and culture. Although there have been some works on the intersection of genius and gender, it remains a research gap in historical literature. In this panel, we wish to explore alternative representations of genius throughout modernity and reflect on the multiple social, cultural, scientific, and political contexts that inform this phenomenon beyond hegemonic narratives. The abstracts included in this panel will analyze how the notion of genius was used throughout the nineteenth and twentieth centuries across Europe, Argentina, and the United States. The authors explore different representations of genius through the history of medicine, psychiatry, psychology, and biology, including notions such as “idiot savant,” “insomniac genius,” and “child genius.” These explorations will further emphasize the scientific and social implications associated with this category.

The Manufacture of the Insomniac Genius by Medical Discourses in the 19th Century (France)

- Sophie Panziera, Université Bretagne-Sud, TEMOS Laboratory

Abstract: Representations of the insomniac genius with exceptional energy, capable of devoting his nights to political, scientific or artistic work began to emerge at the end of the 18th century. Although there were earlier narratives exalting nocturnal wakefulness, it was from this moment that they became part of a common process of distinction. It was largely through medical discourse that the celebration of insomniac geniuses – essentially male – took shape and spread throughout the 19th century. Fascinated by unusual everyday rhythms, and/or wishing to popularise the

sleep times recommended by medical science, doctors looked for series and examples in the writings of the past, in order to construct a genealogy of these exceptional physiologies, which gradually became pathological, and signs of the degenerescence or the 'progenerescence' of nations. The aim of this contribution is therefore to examine the medical construction of the male insomniac genius as an out-of-the-norm, by comparing it with the medical and gendered discourse on sleep and its pathologies at the same time.

Idiots Savants: The medical construction of the Genius Disabled 'Other', c.1850-1950

- Violeta Ruiz Cuenca, Milà i Fontanals Institution, CSIC

Abstract: This paper explores the emergence of the medical category of the *idiot savant* in the mid-nineteenth and early-twentieth century, and how this figure was configured as a particular type of genius. Idiot savants were characterised by the capacity to excel in a particular ability (mathematical, musical, or artistic), while demonstrating an impairment in the rest of their mental faculties. In the words of the English physician John Langdon Down, the main proponent of the category, idiot savant was the term “applied to children who, while feeble-minded, exhibit special faculties which are capable of being cultivated to a very great extent” (1887, p.256). The idiot savant therefore occupied a very particular and ambiguous position in society: intellectually impaired, feeble-minded, they occupied the same category as beast, alienated and non-human; but their exhibition of their special skills made them super-human, highlighting the tension between nature and nurture. Debates centred on whether their skills could be educated and if they were a sign of creativity. Talent emerged as the central issue: was it a symptom of their intellectual disability, or was it a quality that could be trained? This paper explores the medical construction of talent in idiot savants, the fascination that existed around these individuals, and the implications this continues to have for present-day research into ‘savant syndrome’ and autism.

Social Status and Gender of Physicians in Medical Obituaries (Catalonia, 1890-1936): Representations of Geniuses or More Cross-Cutting Foci?

- Lluís Coromina Verdaguer, University of Girona

Abstract: Obituaries are a literary genre, emanating from biographies, which report the recent death of a subject; often such manifestations materialise in laudatory and apologetic terms. These are exercises of memory in which the socio-cultural patterns of a given collective interact. In the present case, and in congruence with the theme of the symposium, the aim of the paper is to study the social status, the virtues extolled and the gender of the individuals who were immortalised through memorial artefacts in the medical professional press of the late nineteenth and early twentieth centuries in Catalonia. The three questions that guide the paper are the following: was it merely the medical oligarchy and/or geniuses who were represented, or was there a certain transversality and interclassism? What were the virtues associated with medical practice exalted? Is a gender bias evident in the obituaries?

8 Toward a Computational History of Science: The Cultural Evolution of Early Modern Metaphors of Knowledge

Room: 40.006.

Organiser: Petr Pavlas, Institute of Philosophy of the Czech Academy of Sciences; Jo (Georgiana) Hedesan, University of Oxford

Chair: Cornelis J. Schilt, Vrije Universiteit Brussel

This symposium introduces the project TOME (The Origins of Modern Encyclopaedism: Launching Evolutionary Metaphorology, ERC CZ, 2023-2025) and its preliminary findings. TOME seeks to provide a unified exploration of early modern thought by the study of metaphors of knowledge and their role in the emergence of modern theory and practice of science and education. It employs current theories of cultural evolution to map out semantic change of early modern metaphors, thus aiming to reveal new dimensions in the understanding of history of science and intellectual history.

The first talk of the symposium presents our conceptual framework for the evolutionary study of cognitive metaphors (Lakoff and Johnson) and absolute metaphors (Hans Blumenberg). The TOME framework challenges traditional historical approaches, considering most of the cultural and scientific ideas as mental images expressed through language, thus proposing a novel method for understanding the development of concepts pivotal to the period often termed ‘the

Scientific Revolution'. The second talk presents the methodological foundation of the computational approach, employing diachronic word embeddings and distributional semantics to analyse early modern scientific texts. The presentation will feature our analysis of the existing NOSCEMUS corpus of ca. 1,000 Latin scientific prints, showcasing our approach to trace semantic shifts (e.g., of the cultural ideas of 'scientia', 'methodus', 'seminarium', 'encyclopaedia, etc.), hence demonstrating its potential to unveil the metaphorical landscape of knowledge during the period crucial for the rise of modern science (c. 1500–1850). The third talk delves into another component of the TOME project: its aim to create a comprehensive body of early modern Latin prints on the subject of alchemy (c. 1500-1716). The presentation will describe the approach to assembling the corpus as well as a preliminary analysis of the 16th century alchemical texts (corpus A) in view of identifying metaphors of knowledge and analysing their semantic change.

Capturing the Semantic Change of Cultural and Scientific Ideas. A Theoretical Framework for Evolutionary Metaphorology

- Petr Pavlas, Institute of Philosophy of the Czech Academy of Sciences

Abstract: The TOME project focuses on intellectual transformations of the early modern world that led to modernity. We are using cultural evolution theory to understand the development of ideas that lay at the basis of the formation of modern science and education. This presentation introduces our conceptual framework for such an evolutionary study of cognitive and absolute metaphors, or evolutionary metaphorology. The traditional history of ideas have been criticised as being ahistorical in nature. TOME proposes a solution that respects the historicity of cultural and scientific ideas while preserving their certain transhistorical unity: rather than being concepts precisely denoting a referent, ideas are mental images, which are expressed in language through a cognitive or absolute metaphor. By cognitive metaphor we mean the entity connecting in itself the mental image and its linguistic expression, whose metaphoricity we are aware of and whose rethinking may imply new knowledge (e.g. "encyclopaedia as circular knowledge"). By absolute or "dormant" metaphor we mean an expression whose metaphoricity we are not yet or no longer aware of (e.g. "encyclopaedia as a genre of scientific literature"). Cognitive and absolute metaphors, however, have only connotation, not denotation.

In this they differ (on the mental level) from concepts and (on the linguistic level) from terminological or "dead" metaphors. Concepts and terminological metaphors differ ontologically: the former are mental entities, the latter are linguistic entities. However, semantically they merge: e.g. "the arm of an angle" or "the magnetic field" are (logically) concepts and (etymologically) terminological metaphors.

Computational Explorations of Early Modern Metaphors of Knowledge: Diachronic Word Embeddings and Cultural Evolution in Scientific Texts

- Vojtěch Kaše, Institute of Philosophy of the Czech Academy of Sciences

Abstract: In this paper, I introduce the computational framework of the TOME project which we use to analyse early modern corpora of scientific and related texts. I demonstrate the potential of distributional semantics (DS) and diachronic word embeddings to capture semantic change of certain terms associated with the development of early modern science. DS posits that a word's meaning can be captured quantitatively by examining the linguistic context in which it appears within a language corpus. In a DS model, each word is represented by a multidimensional vector derived from its contextual usage, and the similarity between vectors indicates similarity in meaning between the represented words. Comparing DS models based on corpora from different periods, we can detect instances of semantic change through changes in relative similarities between vectors. Within our project, we use this framework to analyse the metaphors of knowledge flourishing in the early modern period and interpret the findings in terms of cultural evolution. For instance, the Latin word "seminarium" originally refers to a place where seeds ("semina") are sown. But later on, the term shifted in meaning to refer also to educational forms or institutions. We are able to trace this development using the DS models trained on large corpora of Latin texts from different periods. In this talk, I will primarily focus on our analyses based on the NOSCEMUS database, a collection of fully digitised and machine readable early modern scientific texts in Latin.

Metaphors of Knowledge in the Printed Corpus of Latin Alchemy

- Jo Hedesan, University of Oxford

Abstract: Alchemical texts are replete with metaphorical language ranging from simple metaphors (known to historians of alchemy as Decknamen) to elaborate

visions. The coding of language has led to many controversies as to what may lie behind it; interpretations have ranged from projections of a collective unconscious (C. G. Jung) to scientific laboratory processes (W. R. Newman and L. M. Principe). No matter what lay behind metaphor, what is important to recognize is that alchemy involved a level of direct experience that could and was apt to be communicated via metaphors. This led to a “greedy” absorption of terms and concepts from other fields of knowledge: medicine, agriculture, architecture, mechanics, metallurgy, mythology, religion, etc. It is this kind of tendency to play with images and words that makes alchemy both attractive and frustrating, familiar and elusive, but ultimately difficult to grasp. In this sense, alchemical text can be described as a rich generator of metaphors and a valuable source for a metaphorological analysis. As such, the TOME project has set itself the task of transcribing and analysing the Latin alchemical printed corpus (1500-1716). The investigation is focused on identifying candidates for metaphors of knowledge using both close (traditional) and distant reading techniques, especially the distributional semantic models developed in our project. This talk will summarise the preliminary findings of our analysis on corpus A of alchemical texts (1500-1599), with a discussion of specific examples that were particularly linked with ideas of new or comprehensive knowledge.

9 Rubber and Plastics

Room: 40.109.

Chair: Doubravka Olšáková, Institute of Contemporary History, Czech Academy of Sciences

The Metamorphoses of plastic: research and dissemination

- Maria Elvira Callapez, Mariana Galera Soler and Breno Borges, Centro Interuniversitário de História das Ciências e da Tecnologia, Faculdade de Ciências, Universidade de Lisboa; Maria da Luz Sampaio, Centro Interdisciplinar de História, Culturas e Sociedades, Universidade de Évora; Susana França de Sá and Artur Neves, NOVA School of Science and Technology, Campus Caparica

Abstract: This talk to introduce the project -MoPRA: Metamorphoses of Plastic. Addressing a critical research gap between industrial polymers, the need for environmentally safe products, and academic resources, the project aims to unravel

the historical, social, and environmental tensions inherent in plastics. The study explores the multifaceted nature of plastics, employing an interdisciplinary approach spanning the history of science and technology, anthropology, museology, industrial archaeology, conservation research, design studies, environmental history, chemistry, and engineering. The project combines different research methodologies, such as analyzing Portuguese social communication; identifying synthetic objects within Portuguese museums; and developing new approaches to plastic conservation techniques. The historical lens reveals the initial role of polymers in preserving endangered species, transforming them into substitutes for scarce materials in the global industrial economy. It aims to develop precise language and conceptual categories to address the complexities of understanding the introduction and changes of this material and the environmental paradox presented by synthetic polymers. So far, collections of plastic objects have been found in 17 of the 35 museums (identified by “DGPC” in Matriz.Net database), the majority of which include items associated with fashion, toys, fishing equipment, objects of devotion, household utensils and technological instruments. From these collections, objects will have been selected to tell the story of the metamorphoses of plastics throughout the 20th century in Portugal. Environmental controversies will be discussed with up-to-date data on the impacts of alternative materials and some solutions will be proposed based on viable semi-synthetic polymers already known in the history of science. Visitors can explore the history of plastics in Portugal through the biographies of objects, access data on the environmental impact of plastics and alternative materials, and explore proposals for new polymers. This content will be presented through videos, photographs, infographics, posts, and texts, ensuring accessibility to families and young adults.

Plastics: A symbol of Progress and Destruction

- Vera Dvorackova, Masaryk Institute and Archives of the Czech Academy of Sciences

Abstract: Plastics are polymers made from oil or natural gas. Their rise took place after the Second World War, although they were used earlier, for example in the manufacture of home radios. In the post-war period, plastics began to replace steel in cars, paper and glass in packaging and wood in furniture. They have also penetrated into clothing, footwear and household furnishings. As a modern phenomenon, they have in many ways simplified and improved the lives of countless people, offering

them a cheaper alternative to many previously unavailable items and services. Over time, their versatility, wide range of applications and almost unlimited mouldability have helped them to replace more expensive materials and gain independent functionality and aesthetic validity. Moreover, the scarcity of all materials after the war led to the rapid development of scientific research on polymers. In Czechoslovakia, this typically involved the development of materials for the production of Czechoslovak LPs, artificial ski pads or soft contact lenses, and in the 1960s the production of Czechoslovak silicone rubber began. However, the low cost of production and therefore the easy substitutability of plastic products inevitably led to a previously unimaginable accumulation of waste that resisted any degradable processes. Over time, the worrying issue of the toxicity of plastic particles has also become more widely known. The aim of this paper is to present – with the help of semiotic methods – the symbolic perception of plastic materials and products and its changes in the context of the Czechoslovak historical and socio-cultural reality of the first post-war decades.

10 Undergraduate Programmes in HPS, STS, STH (1/2)

Room: 40.008.

Chair: Xavier Roqué, Universitat Autònoma de Barcelona

Organisers: Xavier Roqué, Universitat Autònoma de Barcelona; Néstor Herran, Sorbonne Université

This symposium aims to present and discuss experiences in the creation and development of degree programmes in History and Philosophy of Science (HPS); Science and Technology Studies (STS); and Science, Technology and Humanities (STH). Despite the great variations in the organization of university systems in Europe and beyond, we believe there is scope for debate about how we, as historians of science, promote or engage in HPS, STS or STH undergraduate programmes and how they help our students address current issues. Among other questions, we will discuss the road to implementation; student requirements; appeal to prospective students; the social and academic aims; the relationship with other programmes; the structure of the curriculum; and the interaction with other disciplines.

From 'History and Method of Science' to 'STS': Science and Technology Studies at University College London

- Jon Agar, University College London

Abstract: This contribution to the symposium will begin with an overview of the hundred years of history that leads to today's Department of Science and Technology Studies at University College London. As the title suggests the department has widened from HPS to STS. I will discuss the current degrees and graduate programmes, the various strategies we have had to devise to attract prospective students, their diversity of background and post-degree careers, and an innovative approach to focusing on 'big problems'.

Teaching history of science at Sorbonne University

- David Aubin, Sorbonne Université; Néstor Herran, Sorbonne Université

Abstract: Sorbonne University was created in 2018 following the merger of two historical universities, one specialized in science and medicine (UPMC) and one specialized in the humanities and social sciences (Paris-Sorbonne). The minor in the history and philosophy of sciences offered by UPMC since 2015 was then extended to students in the departments of history and philosophy. In this presentation, we discuss the objectives and contents of this program and their evolution. We focus on the specific challenges we face from the local and national environments: the French two-tiered university system, the high density of the Paris research scene in these domains, and our university's tradition of compartmentalization in education.

Friday 6th 10:30 - 11:00 Coffee Break

Friday 6th 11:00 - 13:00 Sessions

1 A History of the International Biological Programme (1964 - 1974)

Room: 40.012.

Organiser: Mauro Capocci, Università di Pisa; Fabio De Sio, Klinikum Heinrich-Heine-Universität Düsseldorf

Chair: Doubravka Olšáková, Institute of Contemporary History of the Czech Academy of Sciences

Commentator: Soraya de Chadarevian, UCLA

This symposium invites scholars to think over the history of the IBP (International Biological Programme) which was carried out between 1964 and 1974. The IBP originated from discussions between Sir Rudolph Peters, president of ICSU (International Council of Scientific Unions), Giuseppe Montalenti, president of IUBS (International Union of Biological Sciences) and C. H. Waddington, who succeeded to Montalenti as President of the IUBS. After the success of the IGY in 1959 they aimed to set up an analogous programme for biological sciences. Although there were different aims and visions beyond the IBP, it was finally established that its aim was to study “the biological basis of productivity and human welfare,” encompassing a diverse array of disciplines and fields. The IBP studied how the biosphere “can be 'harnessed' by attempting to discover the biological bases of productivity and human welfare.” Within the IBP 7 programmes were established: Conservation of Terrestrial Communities; Human Adaptability; Productivity of Freshwater Communities; Productivity of Marine Communities; Production Processes; Productivity of Terrestrial Communities; Use and Management of Biological Resources. In 1965 two more programmes were added: Environmental Physiology; Systematics & Biogeography. To disseminate results and information two publications were set up: IBP News, a quarterly publication in English and Biosphere, a four-page journal in French and English. The project should last until 1972 but was extended until 1974. It was planned a planning phase from 1964 to June 1967 and an operational phase from June 1967 to 1972.

Acclimatising Humans to new and future environments: Physiology and the IBP

- Vanessa Heggie, University of Birmingham

Abstract: This paper will explore the ways in which physiologists and doctors engaged with the International Biological Programme within the theme of ‘Human Adaptation’. Often overshadowed by apparently more ‘cutting edge’ research in genetics and population studies (which are well explored by historians such as Joanna Radin & Soraya de Chadarevian) physiologists worked the IBP into much longer-standing research programmes. A relatively small clique of physiologists and

related scientists - including expeditionary doctors - engaged with the IBP based on their existing expertise in research into extreme environments, much of which reflected fears about climate change and overpopulation, and contributed to evolutionary and racialised understandings of whose bodies 'belonged' in various ecosystems. Often regarding themselves as a 'Cinderella' or neglected discipline, physiologists were keen to use this new international source of funding and support for what were often quite expensive scientific expeditions to hot, cold and high altitude climates – eventually extending to considerations of space travel. Rewriting them into the history of the IBP reveals several trends: a conflict with geneticists about the reality of racial adaptation to some environments; the tendency for funding to be used by scientists to continue existing special interests rather than stimulating new areas of research; ongoing international tensions within a cold war context; and the significance of quotidian challenges to research encountered during field work, and in the handling and sharing of data.

The National Academy of Science and the making of the IBP

- Daniele Cozzoli, Universitat Pompeu Fabra

Abstract: As early as 1959 a number of biologists began talking about the possibility of establishing an international collaborative programme in biology under the auspices of the ICSU along the lines of the IGY. The IBP was formally approved at the general assembly of the ICSU, which took place in Paris in July 1964. The National Academy of Science coordinated the participation of US biologists in the programme. Focusing on the archives of the NAS, this paper explores the role the NAS played in the internationalization of American science and in the making of the IBP with a view to the scientific relations with the USSR. As early as 1957 the NAS was asked by the Department of State to coordinate scientific exchange and collaboration with the USSR under the Lacy-Zaroubin agreement. It was within the context of the US/Soviet collaboration that the NAS acquired a pivotal position in the international scientific relations. A number of Soviet scientists discussed the project of the IBP during their exchanges with the Americans under the Lacy-Zaroubin agreement. It is worth noting that the Soviets played a pivotal role in orienting the aims of the IBP. The Soviet academicians, Engelhardt and Kursanov, submitted at IUBS meeting in Amsterdam a proposal arguing that the title of the IBP should be “the biological basis

of man's welfare,” which became the focus of the whole project, putting human beings at centre.

Italian Genetics in the International Biological Program. Giuseppe Montalenti between global trends and local traditions

- Mauro Capocci, Università di Pisa & Fabio De Sio, Klinikum, Heinrich-Heine-Universität Düsseldorf

Abstract: Our paper delves into the pivotal role played by Giuseppe Montalenti in the inception and leadership of the International Biological Program (IBP). Utilizing Montalenti's archival materials housed at Sapienza – Università di Roma, we scrutinize his dual role as a global and local influencer, connecting diverse scientific communities and disciplines. Our analysis sheds light on Montalenti's significant impact on shaping Italy's contribution to the expansive field of "big biology" during the IBP era, as coined by Blair in 1977. As the President of the International Union of Biological Sciences (IUBS), Montalenti played a key role in the preparatory stages of the IBP. Within the Italian context, an examination of his archives enables the reconstruction of his profound influence on the Human Adaptability section. Notably, Montalenti advocated for research into the genetic complexity of human populations in Sardinia. His work, paralleling Cavalli-Sforza's study of the Babinga Pygmies in Central Africa, serves as an illustration of the post-WWII evolution of human genetics. However, our paper also illuminates the emergence of divergent perspectives regarding the utilization of human genetics as a surrogate for anthropology. The tension between localized research traditions and global scientific trends forms a central theme in our analysis. Through Montalenti, we aim to explore and elucidate the intricate dynamics that characterized this period in the history of biological research.

Envoys for mankind. Participation of Soviet space scientists in the Human Adaptability section of the International Biological Program

- Laurence Roche Nye, Université Paris Nanterre - CRPM

Abstract: The aim of this research is to analyse the participation of the USSR in the “Human Adaptability” section of the International Biological Program (1964-1974) while developing its national human space flight programme involving protected

knowledge. Since the first space biomedicine programmes launched in the late 1950s, the USA and the USSR competed over the mastering of knowledge of humans working in extreme conditions. Human space flight missions, operated by the military sector in the USSR, took on a crucial character, particularly during the Moon race (1961-1969), whereas the success of training a crew “to go to the moon and returning them safely” on high technological space transportation systems, would determine the space supremacy of one of the superpowers. It was therefore of uttermost importance to collect, process and analyse biological, physiological and genetic data of humans placed in conditions analogous to the space environment. Competing within the space race then required assignment of Soviet scientists to classified national research, while also contributing to international programmes, as the IBP. We will examine how such cooperation was possible given the competitive nature of the two lunar programmes, within which limits, and how such exchanges supported or reinforced the strategic knowledge of the Soviet manned flight programme. This research is based on studies on the history of space science, focussing on transnational circulation of actors, innovation and technology between East and West (Asif Siddiqui, Slava Gerovitch, John Krige) and mobilises archived sources as well as interviews to carry out this investigation.

2 Astrological worldview and astrological practice in Western Islam: sources, techniques and debates

Room: 40.109.

Organiser: Montse Díaz-Fajardo, University of Barcelona; Cristian Tolsa, University of Barcelona

Chair: Julio Samsó, University of Barcelona

Western Islam developed a flourishing scientific culture since the 9th century due to the introduction of the sources translated from Greek and Syriac into Arabic in Baghdad. The main initial foci were, on the one hand, Kairouan in Ifrīqiyya (present-day Tunisia), the capital of the Aghlabids, and Córdoba in al-Andalus (Muslim Iberian Peninsula), ruled by the Umayyads. These dynasties were particularly interested in astrology, which was mostly considered at that time as a scientific discipline. In spite of the religious opposition, astrology became popular

and flourished in the Andalus-Maghribi courts, particularly from the late 10th century to late 11th century, when it attained a remarkable degree of technical sophistication, that included relatively complex mathematical computations. The practice of astrology in Western Islamic societies raises some questions that require careful study. The first is the development of the discipline considered in itself, from the Greek sources to the Islamic works. The analysis of *Kitāb al-Bārī‘ fī aḥkām al-nujūm* by the Tunisian Ibn Abī l-Rijāl (d. a. 1038) is essential in this regard, inasmuch as it was one of the most influential handbooks of astrology in Western Islam and, once translated into Latin and several vernacular languages, in Medieval and Renaissance Europe. The second is the extent to which a worldview based on the interrelation between stars and nature shaped the mentalities of the Western-Maghribi societies. The study of this question includes, on the one hand, how medical and natural astrology presented to the Andalus-Maghribi readers a rational account of the world; on the other, how this understanding was accepted by the society and, most particularly, the religious circles, where astrology was generally considered as an unlawful practice.

Astrology, astronomy and religion in al-Andalus under the Almoravids (first half of the 12th century)

- Miquel Forcada; University of Barcelona

Abstract: Even though astrology was generally condemned by the religious scholars of al-Andalus, its practice was very frequent in the Andalus courts from late 10th to late 11th century. During the 11th century, the religious scholars who worked for kings who also consulted astrologers developed a relatively homogeneous condemnatory discourse. In essence, astrology was condemned with arguments that also applied to the rationalist conception of the world. In this context, the religious scholars admitted the sciences according to their potential usefulness. Astrology was rejectable while astronomy could be acceptable if it could be useful to the believer establishing the calendar or determining prayer times. At the end of the 11th century, the advent of the Almoravid dynasty, defenders of orthodox religiosity, meant the end of the Taifa courts that had promoted astrology and mathematical astronomy and the consequent decline of these disciplines and other rational sciences. However, the attitude of the Almoravids towards the sciences was much more complex than is

usually admitted. To know it better, we must delve into the works of the religious scholars who served the Almoravids as legal advisors and ideologists. This paper aims to analyze the legal and theological works of the most important ulema of the Almoravid period, Abū Bakr ibn al-‘Arabī (d. 1148) in order to better understand, on the one hand, his discourse against astrology and other disciplines that could be considered heterodox, and on the other, the extent of the influence that this discourse had on Almoravid society.

Ibn Abī l-Rijāl on astrological questions

- Montse Díaz-Fajardo & Emilia Calvo; University of Barcelona

Abstract: In the astrology addressed to a person, the medieval astrologer had to establish a horoscope. There were three types of horoscopes depending on the personal request: for a nativity, a question, and an election. The Kitāb al-Bārī‘ fī aḥkām al nujūm (Book of what outstands in the judgments of the stars) of Ibn Abī l-Rijāl (fl. Tunis, died after 1038) is one of the most important works on astrology produced in the Middle Ages. The Volume One has never been studied. We present an analysis of this volume, which deals with astrological questions, based on the original Arabic manuscripts.

A survey of the references to Greek sources in Ibn Abī l-Rijāl’s Kitāb al-Bārī‘

- Cristian Tolsa, University of Barcelona

Abstract: Ibn Abī l-Rijāl’s Kitāb al-Bārī‘ fī aḥkām al-nujūm is a work of major importance for understanding the development of the astrological science in 9th/10th century Western Islam. In particular, it contains numerous references and quotations of Persian and Greek sources which remain to be studied. A careful examination thereof would provide us with a glimpse into the intricate question of the transmission of Greek and Persian astrology into Arabic. Some preliminary work in the context of the ongoing edition of the al-Bārī‘ by our research group has already evidenced the difficulties in assigning the references to concrete passages of the Greek surviving works of Ptolemy, Dorotheus, and Vettius Valens. In this paper, I will attempt to provide an overview of the references together with the problems they pose, some positive results, and plausible hypotheses.

Natural astrology across epistemic genres in the early Andalusī tradition

- Theo Loinaz, University of Barcelona

Abstract: Hippocrates' assertion that "the knowledge of the stars [ἀστρονομίη] contributes not a little but a very great deal to medicine" was adduced for centuries by astrologers and physicians alike in order to vindicate the status of star-lore vis-à-vis other sciences and most particularly medicine. If astrologers usually interpreted this legitimation to extend to most (if not all) branches of their trade, most physicians appear to have limited their concern to natural astrology, a sound knowledge of which they considered to be a requirement for a proper understanding of human physiology. This is at least the case for Andalus, where the particular interface between natural astrology and medicine is abundantly documented since the 10th c. across a variety of epistemic genres, from cosmology and astrology to calendrical literature and medicine. A look at this fairly rich written production shows that while they certainly differ widely with regard to their main matter and to their intended readership these texts share a significant part of the materials that their authors bring up to discussion. Doctrines of cosmic analogy and sympathy (mostly of the tetradic type) and melothesia, for instance, show up pretty much everywhere, which grants an invaluable opportunity for a comparison that may shed some light on the differential use of elements from a common stock as a reflection of both standard epistemic genre conventions and particular authorial intent.

3 Children in the History of Medicine

Room: 40.113.

Chair: Nurit Kirsh, The Open University of Israel

'Moved by feelings, not by doctrines'—Moral and Religious Training of Infants in Early Nineteenth-Century Anglo-American Child Health Discourse

- Elisabeth Yang, University of Leeds

Abstract: According to British physician, Andrew Combe (1797-1847), in his seminal work, *The Moral and Physiological Management of Infancy* (1840), "true

religion” addressed itself to our “highest and purest emotions”—“the keeping of “the heart”—and this would no more be “successfully prosecuted” than in infancy.[1] Religion of the heart or affections ought to be taught at infancy, in Combe’s view, consisting not in the intellectual attainment or understanding of creeds and dogmas, but rather, on “proper discipline and regulation of our moral nature.”[2] Religious training and moral regulation in Combe’s work signify not a sense of rote, emotionless, and authoritative teaching—characteristics often associated with these terms in contemporary discourse. Emotions figure prominently within the pages of infant hymnals, treatises, primers, child rearing manuals, pedagogical texts, and poetry for infants during the eighteenth and nineteenth centuries. In this paper, I will explore the role that emotions played in the minds of infancy pedagogues, physicians, and childrearing experts for infants’ moral and spiritual formation in early 19C Anglo-American health discourse. Emotions, rather than intellect, played a critical role in infants’ education and training, according to these experts, as discourses on emotions and distinction from passions and affections, began to develop in sophisticated ways during this time.

The “Miracle” of Cold Chain: China’s First Collaboration with UNICEF

- Yanan Jin, Beijing University

Abstract: Cold chain is a system for storing and transporting vaccines from production to usage points at recommended temperatures, crucial for maintaining vaccine efficacy. In 1981, the Chinese Ministry of Health embarked on a groundbreaking collaboration with the United Nations International Children’s Emergency Fund (UNICEF) and the World Health Organization (WHO) to construct and enhance the cold chain system. This collaboration, marking China’s inaugural partnership with UNICEF, initiated with a pilot project in Fujian, Hubei, Guangxi, Sichuan, and Yunnan in 1981 and expanded to encompass 14 provinces by 1985, achieving nationwide coverage by 1988. The implementation of the comprehensive cold chain system facilitated a transformative shift from conducting mass vaccinations during winter to year-round immunization planning. This transition had profound implications for the protection of children’s health in China, leading to a significant reduction in the prevalence of vaccine-preventable childhood infectious diseases, including measles, polio, tuberculosis, diphtheria, tetanus, and pertussis.

China's unwavering commitment to this pivotal initiative and its successful completion were acknowledged in 1989 with the awarding of the UNICEF Silver Medal. This article provides a comprehensive historical analysis of China's cold chain construction in the 1980s, emphasizing its critical role in advancing pediatric immunization efforts, mitigating health disparities, and unveiling the intersection of China's health and diplomatic strategies during this transformative period.

4 Circulation of Knowledge Through Mathematical Courses (16th - 19th centuries) (2/4)

Room: 40.002.

Organiser: Mònica Blanco & M. Rosa Massa Esteve, Universitat Politècnica de Catalunya; Davide Crippa, Czech Academy of Sciences, Institute of Philosophy

Chair: Sandra Bella, Université de Lorraine

One of the cornerstones in the history of mathematics is the process of algebraization, which involves the interaction between algebra and geometry that occurred from the 17th century to the early 18th century. The publication of *In Artem Analyticen Isagoge* (1591) by François Viète (1540-1603) marked an early milestone in this process with the development of the symbolic language and an analytic method for solving problems. Subsequently, the development of analytical geometry, boosted by the works of René Descartes (1596-1650) and Pierre de Fermat (1601-1665), as well as the development of calculus by Isaac Newton (1643-1727) and Gottfried W. Leibniz (1646-1716), allowed the mathematical community not only to address old problems, but also to tackle new ones, using these innovative analytical tools.

This newfound mathematical knowledge was disseminated through various mathematical courses that were used in diverse teaching contexts, including military academies and religious institutions, among others. The writing of these mathematical courses can be regarded as a form of communication that contributed to the shaping of “modern” mathematics. Their impact on mathematics education played a crucial role, the more so since these courses were widely circulated across different countries and institutions. Thus, exploring the readership of these courses and examining their actual uses, naturally leads to the study of local appropriation.

This symposium aims to provide a cross-national comparative analysis of the circulation of mathematics through a variety of mathematical courses written during the 16th to 19th centuries.

Teaching and disseminating mathematical ideas through mathematical courses in Spain in the XVIII century

- M. Rosa Massa Esteve, Universitat Politècnica de Catalunya

Abstract: Teaching and disseminating mathematical ideas through mathematical courses in Spain in the XVIII century Maria Rosa Massa-Esteve The study of how new mathematics was taught in the training of engineers and artillery, in 18th century academies, deserves to be known for a better understanding the evolution of the history of mathematical education. We will consider the activity of important teachers and scholars who, despite being side-lined in the common historiography of mathematics, played a major role in disseminating “modern” mathematical theories through mathematical courses. In Spain, as in other countries, the origins of “scientific” engineering lay in the Army, where officers informally acquired their training. After the War of Succession (1701-1714), the Spanish Bourbon Monarchy played a relevant role in the scientific and technologic development by establishing several institutions to promote a higher education for the officer corps, and mathematics constituted a pillar of academy’s curriculum. We focussed on the Barcelona Royal Military Academics of Mathematics (1720- 1803) set up in Barcelona. In 1739, a Royal Ordinance established the contents of the course in mathematics to be taught. This course, prepared by Pedro Lucuce (1692-1779), consisted of eight treatises with a total of approximately 2,200 pages on the main fields of mathematics, including “pure” mathematics (arithmetic, geometry, trigonometry and logarithms), and “mixed” mathematics (cosmography, statics, hydraulics, architecture, artillery, and fortification). Therefore, the purpose of this paper is to analyse the treatment given to mathematics in this course, emphasizing some relevant ideas in this original course.

The instruction of integral calculus in the Military Course of Mathematics (1753-1756) of Pedro Padilla

- Mónica Blanco, Universitat Politècnica de Catalunya

Abstract: In 18th-century Spain military institutions played an essential role in the teaching of higher mathematics. Toward the end of 1750, an Academy of Mathematics was established at the Royal Guards Barracks in Madrid and was ruled by Pedro Padilla (1724-1807?) until it was dissolved in 1760. In 1753 Padilla began publishing his *Curso Militar de Mathematicas* [Military Course of Mathematics]. The preface of his first volume shows that Padilla's primary aim was to show that understanding the basic principles of each branch of mathematics could be useful to not only infantry and cavalry regiments, but could serve engineers, artillery and navy personnel. Besides, the publication of Padilla's course was also an early initiative done during a time when the tradition of dictating was still very strong. Of the twenty mathematical treatises that Padilla originally intended to develop, only the first five would be published in the end (in four volumes). The fourth volume (1756) is the most innovative, since it contains the earliest educational works on analytic geometry and calculus published in Spain, namely: On Higher Geometry, or Geometry of Curves (Treatise IV) and On Differential and Integral Calculus, or the Method of Fluxions (Treatise V). The analysis of the treatises IV and V of Padilla's course contributes evidence of the study of modern mathematics in 18th-century Spain. In particular, this contribution analyses the treatment of integral calculus in Padilla's fifth treatise.

German mathematical courses in the Habsburg Lands

- Davide Crippa, Czech Academy of Sciences, Institute of Philosophy

Abstract: German mathematical courses in the Habsburg Lands Davide Crippa In this presentation, I will explore the dissemination and local adaptations of German mathematical courses within the framework of Jesuit and post-Jesuit mathematical education in Habsburg universities during the 18th century, with a specific focus on Prague. During the latter half of the 18th century, two German courses gained prominence in the Habsburg territories: Wolff's comprehensive text, *Elementa matheseos universae* and Kaestner's *Mathematischen Anfangsgründe*. Initially published in German (1710, Halle), Wolff's work was later translated into Latin and published in many editions to cater to a broader audience. Wolff's work played a pivotal role in redefining both the content and pedagogical approach of mathematics in the Habsburg lands already before the disbanding of the Jesuits in 1773. Later on,

the educational reforms of Joseph II which included the decision to adopt German as the language of higher education in the Habsburg Empire, mandated the use of new textbooks, and the official decision fell on Kaestner's course. My presentation will delve into the specific ways these mathematical courses were repurposed in the educational contexts of Prague and the Habsburg territories. Special attention will be given to the distribution of new editions, reductions and elaborations, tailored to fit the curricula and local practices of mathematical instruction, and their pedagogical innovations. Furthermore, I will examine how these courses were instrumental in structuring the division between elementary and advanced mathematics, a distinction that emerged in university syllabi during this period.

The introduction of European mathematics in eighteenth-century Spain through Tomàs Cerdà

- Joaquim Berenguer, Universitat Politècnica de Catalunya

Abstract: The introduction of European mathematics in eighteenth-century Spain through Tomàs Cerdà Joaquim Berenguer Tomàs Cerdà (1715-1791) was a Jesuit who taught in Barcelona and Madrid during the second half of the 18th century. He published two treatises on Arithmetic and Geometry respectively and his aim was to publish a complete course, in which he planned to include treatises on Differential and Integral Calculus, Application of Algebra to Geometry, Conics, Mechanics and Astronomy, among others. All these treatises that Cerdà wrote were never published, but they were most probably used in his classes both at the Colegio de Cordelles in Barcelona and at the Colegio Imperial in Madrid. One of these treatises, preserved in manuscript form at the Royal Academy of History in Madrid, is entitled "De la Aplicación de la Algebra a la Geometria" and, like others, it was ready both to be printed and to be used in teaching. In this paper we aim to present the basic lines of this treatise on the application of algebra to geometry, analysing the sources from which Cerdà took his inspiration to write it. Our purpose is to study the text of our author as an excellent example of the circulation of scientific knowledge in eighteenth-century Europe. In short, our goal is to analyse how Cerdà collects the texts of up to four different European authors, reorganizes them, selects them and adapts them in order to print this material and use it for his classes.

5 Cosmic Distances: Ideas and Techniques for Measuring the Celestial Realms in Medieval and Early Modern Times (1/3)

Room: 40.010.

Organiser: Dario Tessicini, University of Genoa

Chair: Dario Tessicini, University of Genoa

This interdisciplinary and cross-cultural symposium seeks to foster discussion on the theme of 'Distance' in the context of medieval and early modern astronomy and cosmology. The aim is to provide a platform for diverse perspectives and approaches on distance-related topics, bringing together scholars from various areas of expertise and theoretical background. Topics might include, but are not limited to:

- Planetary Distances: Papers exploring the measurement and understanding of the distances between celestial bodies in the pre-modern era. This may encompass different cosmological models (geocentric, heliocentric, geoheliocentric) and the methods used to estimate astronomical distances.
- Observation of Comets and New Stars: Investigations into how medieval and early modern astronomers observed, interpreted and visualized the distances, movements, and significance of comets and supernovae in the night sky.
- History of Scientific Instruments: Studies of the development and utilization of instruments, such as quadrants, and telescopes, in measuring astronomical distances, as well as their impact on the evolution of cosmological thought. Papers on the material culture of astronomy and cosmology are particularly encouraged.
- Measuring Techniques: Exploration of the methodologies employed by astronomers to estimate the distances to celestial objects, including parallax, trigonometric methods, and their role in shaping cosmological concepts.
- The Intellectual History of the Concept of Distance: Investigations into how distance was understood in the philosophical and cosmological context of the time, considering its influence on the evolving theories of the universe.

Why did calculating the distances of the planets become a research theme and a compulsory part of Arabic astronomical treatises in the ninth century?

- Guillaume Loizelet, Université Toulouse 3 – Institut de Mathématiques

Abstract: Greek astrology was not interested in planetary distances. Ptolemy, in the *Tetrabiblos*, merely indicated the arrangement of the wandering stars as seen from the Earth, an arrangement he obtained by means of a minimal estimate of distances in another of his treatises: *Planetary Hypotheses*. A few centuries later, the development of Indian astrology reached its peak. As in the case of eclipses, Indian astronomy focused on the duration of celestial phenomena, such as different types of conjunction. In this talk, I'll try to show how astronomers writing in Arabic at the end of the eighth century and the beginning of the ninth century set about resolving these questions linked to the duration of phenomena, questions directly stemming from Indian astronomy, and how this led them to interrogate the snippets of the *Planetary Hypotheses* that reached them in a very degraded form, thus opening up a veritable field of research whose results were then widely disseminated in the Latin West.

The function of paper in medieval astronomical tabulation: Iberian peninsula, 11th-13th centuries

- Bosco Garcia, University of California, San Diego

Abstract: Ever since Arab paper became an object of study in its own right, a long scholarly tradition associates the emergence of Islamic papermaking with the cultural flourishing of the early 'Abbasid caliphate. The reasoning goes something like this. Paper introduced a fundamentally cheaper writing support. This had downstream consequences in the economic cost of the whole process of knowledge production, from the development of map-making, to the generalization of Hindu numerals across the Muslim world. (Bloom, 2001) The historiography has traditionally carried over this reasoning to that of the development of the sciences (see Lindberg, 2014; Sabra, 1996); yet, we still have not studied just how a cheaper writing support might have led to a development in medieval science, wherever paper was generalized among its practitioners. To do this, I focus on the effects that paper might have had in astronomical practice in the Iberian peninsula, from the century of the first extant paper document (11th century) to that when Fabriano overtook Xàtiva as the Mediterranean center of papermaking (13th century). In particular, I consider the effects that paper might have had in the practices associated with astronomical tabulation. The main claim is that, by cheapening the costs of writing supports, paper

drastically improved the conditions of intermediary stages of scientific production: from observational note-taking, to mathematical computation, as well as communication among collaborators. For example, paper could have provided more writing surface on which to off-load laborious computations, significantly improving the astronomer's working memory.

Cosmos and Its Dimension as Outlined in Non-Astronomical Islamicate Sources: Ptolemy's Exponents, Skeptics, and Rivals

- Hamid Bohloul, Iranian Institute of Philosophy

Abstract: Modern scholarship in Islamicate astronomy has predominantly concentrated on Ptolemaic astronomy, as explicated and advanced by accomplished astronomers. Nevertheless, the knowledge developed by professional astronomers remains insufficiently explored from the perspectives of both ordinary people of the time and scholars from non-mathematical disciplines. To unveil these perspectives, primary sources such as encyclopedias and popular science accounts, particularly those addressing geography and marvels of the world, are crucial. Moreover, certain philosophical, theological, and religious books allude to the topic, offering insights into how mathematical astronomy was introduced to laypeople and which components of Ptolemaic and mathematical astronomy were embraced or rejected by individuals and specific groups within Islamicate societies. My presentation begins with examples from geographical books such as Ibn Rusta's (fl. 9th c) *Kitāb al-a'lāq al-naḥḥīya* (Book of Precious Records) and Mas'ūdī's (fl. 10th c) *Murūj al-dhahab* (Meadows of Gold). These examples underscore instances where these works provide an account of non-Ptolemaic beliefs regarding the cosmos and present a completely different set of results for planetary distances and sizes. Then, attention is directed towards Sharīf al-Murtaḍā's (965 - 1044) rejection of the utility of mathematical astronomy in general. This rejection serves as robust evidence of the conflict between Shī'ī Kalām and astronomy in the 10th century, among other considerations. Following this, the presentation illuminates intriguing information from Kūshyār ibn Labbān (921-1079) found in his *Zīj al-jāmi'* (Comprehensive Zīj). This information pertains to the reaction and disbelief of ordinary people in response to discussions by astronomers about stellar distances and sizes and explores how this narrative is reflected in later works. Lastly, the discussion delves into astrological anecdotes

found in al-Qazvīnī's (ca. 1203-1283) 'Ajā'ib al-makhlūqāt (The Wonders of Creatures) and similar works. The goal is to highlight the widespread acceptance of mathematical astronomy among the general public in the post-classical period of Islam.

Planetary intervals: Plinian and Copernican cosmologies in late-fifteenth-century Padua

- Stefano Gulizia, University of Milan

Abstract: This paper aims to offer a preliminary 'cultural history' of the notion of distance, understood not only as a building block to chart or account for metrical and spatial intervals in astronomy, but also for its significance in data-extraction and the overall construction of cosmology as an epistemic genre. The contents of original diagrams at the Bibliothèque Royale in Brussels (MS 10146, f. 85r) already suggest that distance, within the Carolingian reception of Pliny's *Naturalis Historia*, was conceptualized in terms of tones and semi-tones, and with a modeling inference of the Isidorean rota. Moving to the early modern period, as Dilwyn Knox and others observed, Pliny the Elder is one of the ancient authors who had a documented impact on the Copernican education. Indeed, it is reasonable to assume that Copernicus as a student could profit from a variety of curricular and intellectual resources available in Padua. However, the Paduan years continue to be comparatively less-known. This paper aims at locating the model of Plinian natural history in the context of its late-fifteenth-century Paduan revival, and also wants to ask the forms in which genres such as *castigationes* and *observationes* reacted to ideas of distance, that is to say, how philology influenced the rise of cosmology as a discipline. A particular point of interest here is a fragment of Pliny that was included in *De revolutionibus* and was also reused by Renaissance commentators.

6 Historical Epistemology

Room: 40.063.

Chair: Lino Camprubí, University of Seville

Epistemic Commitments Have No 'Off' Button: On the Embodiment of Commitments by Way of Model Formulation

- Zvi Hasnes Beninson, Tel Aviv University

Abstract: The ability to transfer models across scientific domains raises the following concern: what sort of commitments does a model embody, and what worldview do these commitments support? Addressing the question of embodiment has implications on yet another concern, namely, that when a model is used to explore a target system that is different from its original one, it carries with it the modelling assumptions that may have been appropriate for the original context, but when applied to the new context they can easily become implicit, or simply unexplored. As a result, the implications of these newly implicit assumptions may come to seem necessary.

The first step in addressing the question of embodiment concentrates on the characteristics of commitments. Once these characteristics are defined, the second step is to show how the practice of model formulation could introduce commitments with those features to an epistemic community. The third step is to demonstrate the analytical framework with a case study. My paper focuses on Richard Levins' approach to loop analysis, and especially the way it embedded his commitment to dialectical view of nature, a methodological commitment that derived from his interpretation of the Hegelian-Marxist tradition. Two general conclusions can be drawn for the case study: first, once a commitment is formalized, it can be rejected, but not on the grounds of the motivations behind it. Second, the terms of success or failure of an agent to persuade her community to adopt her commitments as general standards could be divorced from the agent's own terms of success.

Historical Critique of Knowledge: Recognition and Misrecognition as Cases of Epistemic Injustice

- Ekaterina Shashlova, Faculty of Humanities, Charles University, Prague

Abstract: Historical epistemology, as a critical theory of scientific knowledge, places emphasis on history. Historical epistemology, conceived as a critical theory of scientific knowledge, places a strong emphasis on historical analysis. Examining the historical development of scientific concepts reveals the intricacies of their formation, including the social and political conditions that influence their conceptualization. Broadening the scope of historical epistemology beyond the narrow confines of the French theories of Bachelard and Canguilhem, it becomes

evident that a network of complementary critical concepts emerges, aiming at a common goal known as "epistemic disobedience" (Walter Dignolo). This epistemic disobedience operates through the dual means of employing history as a critical tool and reimagining history, including a decolonial reinterpretation.

The concept of epistemic injustice (Miranda Fricker) signifies the development of this critical tendency concerning knowledge. The decolonization of knowledge and epistemic injustice represent branches of the evolution of historical critique in epistemology. The theory of recognition, encompassing an analysis of the concept of misrecognition, allows for the description of the structure of subject misrecognition, including through epistemic instruments. However, the theory of recognition and its model of symmetrization of subjects' experiences come under scrutiny from decolonial theorists. The recognition model, criticized by non-Western scholars, notably the hierarchical model by Honneth, reflects and perpetuates the oppression of subjects despite the initial dialogism inherent in this theory (Tlostanova). Asymmetry becomes symbolic of the relationships between subjects. Not only is there criticism of the asymmetrical configuration of knowledge, but there is also a postulation of asymmetry as recognition of diversity (Maldonado-Torres, Maesschalck). Examining historical epistemology in its relationship with the theory of epistemic injustice provides insights into the evolution of the subjectivation of epistemic experience and how we evaluate the process of recognizing excluded epistemic experiences in history.

What TMT Cannot See: Scientific Objectivity and Knowledge Prioritization

- Mallory Hrehor, University of Cambridge HPS

Abstract: My objective in this paper is to analyze the current controversy of the construction of the Thirty Meter Telescope (TMT) on Mauna Kea, a sacred mountain for Native Hawaiians. Much of the controversy surrounding this issue stems from concerns about the colonialist implications of the construction of TMT on Indigenous lands, and the harm this may be doing Native Hawaiians by not allowing for their own autonomy to make decisions as to what can or cannot be constructed on their sacred lands. One area, however, that has been neglected in the research surrounding this controversy is the role that beliefs about Western science have in the

prioritization of scientific knowledge (or scientific “progress”) over Indigenous religious concerns. In this situation, I have found that the arguments which are presented to inform how to answer the ethical question, “should we build this telescope on this sacred mountain?” are epistemic arguments, which rely on specific conceptions of the nature of scientific knowledge. Because of this, I will be looking at how certain perceptions of Western science can allow for the deprioritization of non-scientific knowledge and concerns (including both Indigenous and religious knowledge). I will conclude by suggesting that, in the case of the TMT controversy, the epistemic arguments which are currently used to justify the prioritization of “objective” Western scientific knowledge over “subjective” Indigenous religious knowledge systems are not based on an accurate conception of the nature of scientific knowledge. Therefore, these kinds of arguments are not enough to justify this kind of prioritization. In order to answer the ethical problem of what we should do in this case, we will have to look elsewhere and provide a different kind of justification.

7 Representing Science: Relics, Collections, and Museums

Room: 40.006.

Organiser: Paola Bernadette Di Lieto, University of Padua and Ca’ Foscari University of Venice

Chair: Maria Conforti, La Sapienza University of Rome

Commentator: Elena Canadelli, University of Padua

Between the nineteenth and twentieth centuries, the display of scientific heritage has been considered not only as a powerful means in the process of nation-building, but also as a privileged way to disseminate science. In the last decades, the debate on methods of representing the materiality of science in exhibitions and museums has been developed due to the material and visual turn in the history of science. By focusing on objects, from different perspectives, the symposium proposes to investigate how science and its history have been represented and narrated throughout time and places. This set of contributions will present case studies relevant to the Italian context. The symposium intends to address the following issues: What were the political and symbolic implications behind the musealisation of certain scientific objects? How were objects used and musealised to celebrate and

document “scientific progress”? How have these objects been used to foster the public understanding of sciences and disseminate scientific knowledge? How could the history of science have benefited from giving attention to scientific heritage?

Expertise and Enthusiasm: The Interplay of Knowledge in Prehistoric Studies and Museum Collections in Italy (1870s-1900)

- Fedra Alessandra Pizzato, University of Verona, Italy

Abstract: Prehistory constitutes a multidisciplinary field encompassing archaeology, geology, natural sciences, physical and cultural anthropology, and museum studies. Moreover, it serves as a focal point for political discord, providing an advantageous standpoint for examining historical sociability dynamics related to science. More precisely, prehistoric studies have been a contested terrain for various social groups, each exploiting prehistory as a platform to promote their distinct political and ideological agendas. Among these groups, discernible are Jesuits, members of the patriot clergy, progressive bourgeoisie (including women), politicians actively involved in nation-building endeavors, and others. Through the application of a transdisciplinary approach, this paper aims to delve into the intricate interplay between experts and amateurs, elucidating the influence of diverse ideological perspectives and private strategies on prehistoric research, the curation of museum collections, the mobility of objects, and the dissemination of knowledge. This will be accomplished through specific case studies related to the establishment of collections in select Italian museums during the 19th and 20th centuries.

‘Un santuario scientifico’: The Case of the Tribuna di Galileo and Italian Scientific Museology in Nineteenth-century Italy

- Zoe Lauri, University of Bologna

Abstract: This paper aims to present the first results of a research project on the creation of scientific museums and collections in nineteenth- and twentieth-century Italy. In particular, I will examine the case study of the Tribuna di Galileo, an exhibition room in the Royal Museum of Physics and Natural History in Florence, which was inaugurated in 1841 on the occasion of the Third Congress of Italian Scientists. Commissioned by Grand Duke Leopold II, the Tribuna is particularly significant for its hybrid nature, halfway between a museum hall and a celebratory

space. Vincenzo Antinori, the then Director of the museum, described it as a “scientific sanctuary”. It was part of a series of museum projects connected with the pre-unification congresses of Italian scientists and conceived in the framework of a nation-building process envisaging not only political, but also cultural and scientific unification, through the creation of a shared memory of Italy’s glorious scientific past. Looking at the case of the Tribuna, this paper aims to examine the way the initiative was promoted and the impact it had on congress participants and the general public. Based on this analysis, I also seek to understand whether it is more correct to attribute a genuinely Italian or, rather, Tuscan dimension to the project.

The Anatomy Theatre at the University of Padua: From the Musealisation of the Spaces of the Anatomy School to the Making of a Historical Monument

- Elena Maria Rita Rizzi, University of Padua

Abstract: Between 1594 and 1595, one of the first permanent anatomy theatres in Europe was built under the aegis of anatomy professor Girolamo Fabrici d’Acquapendente at the University of Padua. The theatre and its adjacent spaces slowly underwent a process of musealisation at least since the mid-nineteenth century, while they kept serving for pedagogical purposes and anatomy demonstrations until 1872. Since then, the theatre started being regarded as an “eminent monument of the glorious past of the university of Padua” and, in the first half of the twentieth century, especially in Fascist Italy, turned into a symbol of Italian scientific achievements. By analysing the written, visual, and material sources as to the theatre, the paper aims to shed light on the transformation of the theatre into a cultural object. It will address the continuing redefinition of the functions and meanings of the spaces of the anatomy school, as well as the main actors, the discursive and material aspects contributing to the resemanticization of the theatre as a historical monument. More broadly, this paper aims to provide some insights into the making, historicization and musealisation of scientific heritage in nineteenth- and twentieth-century Italy.

A Museum at the Service of History of Science: The View of Maria Luisa Bonelli

- Paola Bernadette Di Lieto, University of Padua and Ca' Foscari University of Venice

Abstract: The First National Exhibition of History of Science, which was settled in Florence in 1929, led to the foundation of the Institute and Museum of History of Science in 1930. The Institute and Museum's primary goal was to store and preserve the Italian historical-scientific heritage. The government did not recognize this kind of heritage as cultural heritage and, consequently, was not subjected to any regulation. In 1961, after the death of the founder Andrea Corsini, Maria Luisa Bonelli was appointed director of the Institute and Museum until 1981. The museum, under her direction, has grown considerably and has become well-known throughout the world. During her direction, she promoted studies on instruments stored in the museum, and she also founded the “Annali dell’Istituto e Museo di Storia della Scienza” (today “Nuncius”), a journal devoted to the material aspects of science and the history of instruments, whose first issue was published in 1976. Notwithstanding the attention given to the internationalization of the museum, Maria Luisa Bonelli took into consideration the general public by contemplating the museum as a space not only for experts but also for the dissemination of science. This contribution will examine the figure of the Sarton Medalist Maria Luisa Bonelli as director of the Institute and Museum of History of Science, considering her choices in the museum’s direction and her works as a historian of science in connection with her interpretation of instruments and material culture.

8 Material Practices of Chemical Analysis (2/2)

Room: 40.101.

Organiser: Armel Cornu, Uppsala Universitet, Sweden; Sarah Hijmans, Technische Universität, Berlin, Germany; Charlotte Abney Salomon, Science History Institute, Philadelphia, United States

Chair: Armel Cornu, Uppsala Universitet, Sweden

Eighteenth- and nineteenth-century chemists attempted to better understand the basic blocks of the material world, promising to explain how substances interacted with one another. During this time, chemical views of composition continuously evolved. Eighteenth-century analysis was used in a diversity of practical applications,

such as determining the amount of cream in a milk, the ingredients in a mixed remedy, or the amount of impurities in an ore sample. Nineteenth-century chemists further relied on analytical procedures for the development of chemical formulae and molecular structure. These chemical investigations took place in a context of tightening monarchies, imperial expansion, and social unrest, which in turn resulted in complex, multifaceted knowledge about the material world that was inconsistently utilised and trusted. Chemical analysis was practiced at both industrial and academic sites and sought applications that could serve the public, the economy, and the state. Chemical analysis, though relatively understudied, presents an opportunity to disentangle the relationship between the chemical sciences and the material world. Because of its large variety of applications, its ties to crucial developments in the history of chemistry, and its inherent practicality, it was shaped by material constraints, changing theoretical knowledge, as well as broader social changes. Chemical analysis thus showcases how ideas of matter were translated into practices, and conversely, how analytical practices shaped the theories of matter throughout the eighteenth and nineteenth centuries.

This panel is the second of two sessions dedicated to the history of eighteenth- and nineteenth-century chemical analytical practice. It explores chemical analysis and ideas of matter in the context of the growing chemical industry of different nineteenth-century European states. This symposium is sponsored by the Commission on the History of Chemistry and Molecular Sciences and the Working Party on the History of Chemistry of the European Chemical Society.

Analysis as Evidence – Chemical Expertise in 19th-Century Poisoning Cases

- Marcus Carrier, RWTH Aachen University, Germany

Abstract: During the 19th century, forensic toxicology established its important—perhaps even necessary—role in court cases concerning poisonings. Making the (by nature) invisible crime of poisoning visible and for everyone to see was the core strength and promise of chemical analysis in poisoning cases. This talk will focus on how 19th-century French and German chemists / toxicologists reflected on this task and on the consequences concerning method selection in their textbooks. Good toxicological analysis should not only give scientifically sound evidence—in

most cases against the defendant—but should also convince laypersons that this evidence was to be believed and to be followed. The discourse in the German textbooks especially stressed this point after the mid-century judicial reforms which introduced juries in most German states. By presenting case studies from France and Germany, this talk will then focus on the practical application of this textbook advice. I will argue that the act of making poisoning substances visible, i.e. the (re-)production and presentation of the “pure” poison, was only one of at least two strategies to convince laypersons in court. The other strategy was the presentation of an explicit comparison to establish similarity or even identity between the analyzed substance and the suspected poison. This allowed chemical experts to be convincing and establish their authority in poisoning cases even when making the poison visible in the above sense was not feasible.

Analytical Chemistry for Military and Industrial Safety in the Nineteenth Century Explosives Industry

- Ian D. Rae, University of Melbourne, Australia

Abstract: Nitrocellulose, first prepared in the 1840s and widely used as an explosive in mixtures like Cordite and Vieille’s Poudre B and as a propellant—hence the alternative name, “guncotton”—was a notoriously unstable material but of great importance to industry and the military in the second half of the nineteenth century. Britain’s Frederick Abel devised a stability test in which a small sample was warmed and the time noted for brown fumes of nitrogen dioxide to appear and to cause colour to appear in a starch-iodide test paper. Others proposed the use of test papers not involving iodine, but the tests always involved an element of judgment by the analyst. German chemists devised quantitative tests based on conversion of nitrogen oxides to nitrogen (Karl Wilhelm Will) or nitric oxide (Bergmann and Junk) and measurement of gas volume that harked back to the analytical methods of Liebig, Dumas and others. Britain stuck with the Abel test, despite their chemists demonstrating the measurement of nitrogen oxides by absorption spectroscopy in the visible region. The Abel test was obviated by the presence of mercury which reacted with iodine and prevented formation of the starch-iodine complex. Mercury came from mercuric chloride that had been added to prevent biological spoilage, although some thought its purpose was to increase the apparent stability of guncotton.

Analyses that were developed for trace mercury relied on its volatility, electrical deposition or formation of amalgams to separate it from mixtures. In one instance its visible emission spectrum was used for identification.

Nineteenth-Century Chemical Analysis and the Discovery of Elements

- Charlotte Abney Salomon, Science History Institute, Philadelphia, United States & Sarah Hijmans, Technische Universität Berlin

Abstract: In the first few decades following the widespread adoption of Lavoisier's new chemistry, chemists made claims to the discovery of numerous new elements. Many declared themselves to have found new metals, but without having produced any new metallic substances; instead, they combined longstanding techniques of analytical chemistry with deductive reasoning to establish the presence of new metals within compounds under investigation. In this paper, we will juxtapose the largely contemporaneous discovery processes of the tantalum and rare earth metals, respectively, examining the analytical tools and methods through which both lasting and failed claims to discovery were established. We will highlight the lasting influence of eighteenth-century mineralogical practice on European chemical analysis well into the nineteenth century, as exemplified by the central role played by the blowpipe in most discovery processes. In addition, we will compare this to the relatively few substantial changes in analytical practice brought about during the same period, firstly as a result of Lavoisier's new chemistry, and secondly of the reclassification of the so-called "earths" as metallic oxides. In doing so, we will demonstrate the ways in which a focus on material practices can enable the identification of implicit continuities in the characterization of metallic elements and their compounds, even through periods of major theoretical change.

9 Museums and Industry: Long Histories of Collaboration. Exhibiting Energy in Twentieth Century Europe (2/2)

Room: 40.213.

Organiser: Harry Parker, Science Museum, London

Chair: Jaume Sastre-Juan, Universitat Autònoma de Barcelona

The display of science, technology, engineering, and medicine (STEM) in museums, science centres, and international expositions has long depended on industry: as a source of artefacts, interpretive expertise, and financial support. Despite this close and ongoing connection, the causes and consequences of industry's patronage of STEM displays have been little explored. Under what circumstances, and for what reasons, has industry become involved in exhibiting STEM? How have the interests and institutional logics of industrial patrons on the one hand, and museums and cultural heritage organisations on the other, either meshed or caused friction? What limits has the patronage relationship imposed on the public presentation of science and technology? Conversely, what new kinds of exhibitory regimes has this relationship opened up? And how has this relationship reflected, reinforced, or helped to reshape sociotechnical imaginaries more broadly?

In this second of two symposia on the Museums and Industry: Long Histories of Collaboration (MaILHoC) strand, individual papers will be honing in more exclusively on the energy sector, one of the most long-standing and consistent sponsors of STEM museums in the twentieth century. The story of the energy industry's patronage of the science museum is, among other things, a story of nation-building, cultural diplomacy, and democracies in perpetual flux. It is also a story of attempts to work inside and across various dichotomies and border zones: between the public and the private, the pure and the applied, the visible and the invisible. These issues, and more, will be covered in papers that, by foregrounding industrial patrons in studies of the 'politics of display' and 'industrial heritage', will offer a new slant on established literatures. The nuclear energy industry, a long-standing and often controversial sponsor of STEM displays, will be a particular focus of the papers in this symposium.

The domestication of atomic energy: displaying a model of the Halden nuclear reactor

- Frode Weium, The Norwegian Museum of Science and Technology

Abstract: The Halden nuclear reactor, located in the city of Halden in Norway, was built by the Norwegian Institute for Atomic Energy in the years 1955-1958. As part of the project, a 1:20 scale model of the Halden reactor was ordered from one of the country's renowned model makers. The model was presented at international

exhibitions such as the “Het Atoom” in Amsterdam (1957) and the Brussels World’s Fair (1958). In the mid-1960s the model was donated to the Norwegian Museum of Science and Technology, and in 1971 it was made part of the museum’s new exhibition on atomic energy. Inspired by studies on the politics of display, and drawing on the method of object biography, this paper looks at how the model of the Halden reactor was presented, adapted, and perceived within these changing contexts and periods. In particular, the paper examines how the different institutions – primarily the Institute for Atomic Energy and the Norwegian Museum of Science and Technology – used the model in attempts to foster public understanding and promote domestic acceptance of atomic energy, and the ways this changed when the model was made part of a permanent museum exhibition. A closer examination of the ideas, values, and strategies behind the displays of the model also illuminates broader social and political transformations. The paper explores to what extent the displays reflected and addressed nuclear fear and increasing environmental concerns about nuclear waste and accidents.

Industrial patronage between public and private: atomic energy, British industry, and Expo ‘58

- Alice Byrne, Université Aix-Marseille

Abstract: At the centre of the British Industries Pavilion at the 1958 Brussels World’s Fair stood a scale model of ZETA, the British machine that for a short while achieved global fame (and notoriety) as ostensibly the first working nuclear fusion apparatus. In addition to the more obvious aim of supporting exports by British companies operating in the sphere of nuclear energy, the display was also a means of forging collaboration between public and private interests. Responsibility for organising the British contribution to Expo ’58 was otherwise split between, on the one hand, the government’s Central Office of Information (COI), and on the other, the private Federation of British Industries (FBI). Both used the considerable interest aroused by the ZETA model as bait to attract companies to the Expo, in the hope that they would pay for their space and hence compensate for the meagre official budget. The display also enabled the government-sponsored general commissioner to keep a tight rein on British industrial participation in the exhibition. This paper thus deploys the industrial patronage of scientific displays as an optic to explore the

interlinked histories of cultural diplomacy, postwar reconstruction, and British technoscience. Moreover, considering the ZETA display – and the British industrial contribution to Expo '58 more broadly – less as the result of institutional largesse than as the consequence of a careful dance between the postwar state and private industry can thus help us to rethink some of our assumptions about the role and meaning of industrial patronage of STEM displays.

Exhibiting the invisible: corporate patronage of energy displays in Barcelona's science and technology museums (1980s-1990s)

- Miquel Carandell Baruzzi, Universitat Autònoma de Barcelona

Abstract: As some scholars have argued, during the 1980s and 1990s, energy was perceived as something abstract, something invisible, something that helped us to heat or illuminate our homes – but something also far removed from environmental, social, or political issues. This paper examines how far energy companies' patronage of science displays in Barcelona contributed to this state of affairs. From the 1980s, two scientific museums were established in the Barcelona area that relied heavily on the support of energy companies. First was the National Science and Technology Museum, an institution established with a view to creating a collection demonstrating the relevance of the Catalan industrial past. A section of the Museum's permanent exhibition called "Enérgeia" opened thanks to the patronage of the main Spanish power companies. The second was a modern science centre established by La Caixa, one of the most powerful Catalan banks. A bank which had shares and interests in the main Spanish power companies and, at the same time, organised several temporal exhibitions on topics related to energy. Taking these two institutions together, this paper poses a set of interconnected questions: how did these museums present energy and its generation? How did the collaboration between power corporations and museums work? Did these companies push for specific displays of energy? Were these displays different in the public museum and the private science centre? Did they contribute (or not) to the invisibility of energy generation processes?

Nuclear reactions: patronage, credibility, and the politics of atomic energy exhibitions in late-twentieth century Britain

- Harry Parker, Science Museum

Abstract: Building on recent scholarly interest in ‘nuclear cultural heritage’, this paper explores how nuclear energy was exhibited to the British public in the late-twentieth and early twenty-first century. It examines two exhibitions resulting from collaboration between London’s Science Museum and Britain’s nuclear industry, and highlights the different strategies used in each case to secure credibility in the eyes of an increasingly fractious public. In the earlier of the two exhibitions – a new gallery about nuclear power at the Science Museum that opened in 1983 – these strategies mostly backfired, as the UK Atomic Energy Authority’s heavy-handed attempt to gain credibility by imposing a triumphalist, nationalist narrative on the exhibition prompted a vigorous debate about ‘bias’ in museums. By contrast, the later exhibition – the Science Museum’s 2002 takeover of the Visitor Centre at the Sellafield nuclear site – took the opposite tack. Now, credibility was to be attached to ‘impartiality’, and ‘impartiality’ was to be secured via a relentless focus on individual responses to the ‘nuclear debate’. Much had changed in the intervening years, including the end of the Cold War, the privatisation and break-up of much of Britain’s nuclear industry; an embrace of ‘entrepreneurialism’ in museums; and major shifts in British political culture. Comparison of the two cases thus allows for an examination of the co-construction of ‘nuclear heritage’ in the crucible of the late twentieth-century’s competing liberalisms. It also suggests the significance of bottom-up pressures in transforming heritage practices.

10 Of Barren Grounds and Spoiled Milk: How to Address Great Challenges Scientifically, ca. 1700-1820

Room: 40.154.

Organiser: Caterina Schürch, TU Berlin, Germany

Chair: Julia Bloemer, Europa-Universität Flensburg, Germany

This symposium explores responses from eighteenth- and nineteenth-century scholars to challenges related to human health and well-being, as they addressed issues such as crop failure, food spoilage, disease, and the disappearance of medicinal plants. The protagonists not only recognized the urgency of the situation but also were acutely aware of the intricacies of the phenomena they faced. Two papers

examine the efforts of these investigators in dealing with immediate crises – namely, food spoilage and the increasing scarcity of some medicinal plants. The remaining two papers explore how scholars sought to prevent potential famines and resource shortages in the future, either by improving forecasting methods or through systematic evaluation of agricultural products and practices.

We are particularly interested in the different approaches that they developed and in the types of expertise and resources that they mobilized. Given that the suggested solutions needed to be scientifically robust as well as pragmatic, we inquire about the normative and situational constraints that shaped the approaches: Would scholars emphasize the significance of adhering to standard procedures, or would the urgency of the situation lead them to opt for a methodologically riskier path, a more cautious approach, or might they even develop novel problem-solving strategies? Given that not only scholars but also practitioners such as farmers, traders, and foragers had vested interests in resolving the issues, we ask: Whose contributions to the discussion were deemed legitimate, and why? What types of explanations or approaches were disregarded from the outset, and how did these attitudes evolve over time? Our papers combine historiographical traditions that focus on methodological questions with those that highlight the practical and material dimensions of natural history and science. By doing so, we aim to contribute to a deeper understanding of the interplay between the environmental, practical, and methodological aspects of science.

Advancing Astrological Forecast: Collecting Weather Data for the Benefit of Humanity

- Caterina Schürch, TU Berlin/Germany

Abstract: This paper elucidates how the Kirch family in Prussia attempted to make astrological predictions more accurate through systematic daily weather observations. The aim was to employ reason to alleviate the perceived divine curse condemning the earth to bear thistles rather than fruit. The paper shows how Maria Margaretha Kirch dedicated herself, in the year 1701, to documenting daily weather patterns, combined with insights gathered from farmers concerning the state of their fields, as well as information from parishes regarding baptism and funeral statistics. Based on these data, Kirch speculated on the astrological aspects from which weather

changes might arise. Her objective was to refine the "Prognostica" and, consequently, aid farmers in more effectively cultivating their land. Understanding the impact of astrological aspects on Earth's weather, Kirch believed, could guide farmers in decision-making, improving yields, and preventing the onset of famine, pestilence, and war. After Kirch's death, her children continued the tradition of weather observation. In 1723, her son Christfried asserted that experiential evidence confirmed the influence of stars on Earth, and also sketched a potential mechanism. The paper concludes by outlining which elements of the Kirch family's project endured in the weather records of the late eighteenth century.

The Stubborn Persistence of Blue Milk

- Jutta Schickore, Indiana University Bloomington/USA

Abstract: This paper examines a strange phenomenon that puzzled eighteenth- and nineteenth-century farmers, sanitation officers, as well as researchers in different fields of study, including pathology (veterinary and human), organic and agricultural chemistry, and natural history: the colored spots that sometimes appeared on fresh milk and made it unsuitable for consumption. The phenomenon posed a significant threat to the economy. For decades, investigators tried to figure out what caused the blue spots and how they could be prevented. The endeavor was riddled with difficulties, and the inquirers despaired over the "stubborn persistence" of blue milk (Wiener 1850). The phenomenon was variable and elusive and could not be reliably produced in experimental settings. The discussion involved very different groups of actors, such as veterinarians, farmers, academic researchers, and the occasional clergyman. My paper examines what strategies the practitioners were using to tackle the issue and how they were dealing with recurrent failures to find a satisfying explanation, let alone a successful treatment for the problem. I trace how and in what venues they reported their investigations, whether academic researchers acknowledged the work of the other practitioners (and vice versa), and what kinds of explanations were excluded as „non-scientific“ from the outset.

The Advancement of Agricultural Practices: Cultivating Tea, Wheat, and Potatoes for the Benefit of Prussia

- Kärin Nickelsen, LMU Munich/Germany

Abstract: The production of “useful knowledge” (U. Klein) was a central goal of Enlightenment scholars, with the advancement of agricultural products and practices ranking high among significant objectives. Late eighteenth-century Prussia, in particular, strongly supported this engagement, and was heavily invested in securing food supplies for a growing population, and developing ways to achieve economic independence. The Berlin Academy of Sciences and Humanities played a pivotal role in this context. Academicians were not only tasked with generating pertinent suggestions themselves but also with evaluating proposals from external sources, submitted by practitioners in agriculture and related fields. This paper investigates the reviewing process at selected examples. Around 1800, for example, the academy’s botanist, Carl Ludwig Willdenow, was tasked with examining several cases. They included a proposal for a potential indigenous substitute for tea and coffee; a suggestion on avoiding potential spoilage of potatoes, Prussia’s enforced nutritional staple under Friedrich II.; and an indication of a potentially more resilient species of wheat. The paper delves into the strategies employed by Willdenow in his reviewing process, and the rationales he presented for his decisions. It argues that Willdenow clearly deemed the scientific examination process indispensable, but earnestly tried to render fair judgments without negative preconceptions of practitioners’ knowledge.

11 Science Diplomacy: searching for a deeper past (1/3)

Room: 40.152.

Organiser: Daniel Gamito-Marques, Department of Applied Social Sciences, NOVA-FCT; Lif Lund Jacobsen, Natural History Museum of Denmark

Chair: Dongxin Zou, The Hong Kong Polytechnic University

This 3-part symposium organized by the Science, Technology and Diplomacy (STAND) Commission promotes a historical and historiographical deepening of reflections on the role of science and technology in international relations. Across multiple geographies and historical times, international negotiations on responses to transnational health crises, technoscientific standardization and collaboration, and geopolitical power politics have affected human and physical environments. These themes are neither recent nor isolated from other critical spheres of global politics

and scholarly research. This symposium intends to stimulate an exploration of science diplomacy's deeper and complex past, problematizing the current characterization of science diplomacy as a post-World War 2 phenomenon and proposing novel connections between histories spanning various periods and disciplines. Each part of the symposium is devoted to a general theme in the deeper history of science diplomacy.

Part 1: Coordinated scientific and diplomatic responses to transnational threats. This symposium analyzes how scientific experts and diplomats from various states coordinated to contain the spread of different diseases of global reach, uncovering tensions that strained international conversations.

Catching Rats, Surveying the Plague Pandemic: Rat-Labs and the Emergence of a Global Network of Epidemiological Surveillance (1894-1945)

- Matheus Alves Duarte da Silva, University of St Andrews

Abstract: The historiography of infectious diseases has focused on post-WWII flu management as the best example of how science and diplomacy created a successful global epidemiological surveillance network. Reuniting experts from different regions of the globe and counting on the support of the Food and Agriculture Organization and the World Health Organization, this network was based on the sharing of information about flu outbreaks and epizootics, as well as on the circulation of virus samples. In this presentation, I map the construction of an epidemiological surveillance system that appeared in the first decades of the Third Plague Pandemic (1894-1959). The plague network emerged without any centralized organization or directive in the 1900s and 1910s, responding firstly to national and imperial concerns of knowing about the evolution of localized plague outbreaks. In the International Sanitary Conference of Paris, in 1926, these scattered bits of an epidemiological surveillance system were officially reunited under the auspices of the 'Office International d'Hygiene Publique'. The plague surveillance network then became founded on the global sharing of information about plague outbreaks and, namely, of epizootics among rats. I argue that despite being a scientific and diplomatic achievement, this older and far-less studied network only became a reality thanks to the prosaic catching and examining of rats in several specialized laboratories, which I

heuristically call the rat-labs. By focusing on the rat-labs and their global interconnections, this presentation sheds light on ignored features of the history of the connections between health, science, and diplomacy in a pre-WWII world.

From Geneva to Madrid: the international fight against cancer between 1923 and 1933

- Leoncio López-Ocón Cabrera, Institute of History-CSIC. Madrid; Alba Calzado García, Universidad Rey Juan Carlos, Madrid

Abstract: The purpose of this paper is twofold. On the one hand, to analyze the activities carried out by the League of Nations' Hygiene Organization in its first years of operation, aimed at raising awareness of cancer. On the other hand, to explain why what is considered the first international congress on the scientific and social fight against cancer was held in Madrid at the end of October 1933. Between 1923 and 1933, the League of Nations' Hygiene Organization set up various committees to promote the study of cancer by promoting international cooperation. Our contribution will present the main actors involved in this international initiative, such as the British Georges Buchanan, and will give an account of the main achievements in the field of public health. Among these, the celebration in Madrid of the first international congress on the scientific and social fight against cancer will be highlighted. This paper will show the reasons that favored the choice of the Spanish capital as the venue for this congress. Three will be highlighted: the role played by a number of Spanish doctors in the scientific diplomacy of the Second Spanish Republic, manifested in the holding of numerous international medical congresses in Madrid between 1931 and 1936; the important work carried out in the Committee of Hygiene of the League of Nations by the Italian-Spanish doctor Gustavo Pittaluga; and the international prestige of the National Cancer Institute directed during the Second Republic by the relevant histopathologist Pío del Río Hortega.

Sharing strains and knowledge: the establishment of global influenza surveillance

- Giacomo Simoncelli, La Sapienza, University of Rome

Abstract: My presentation aims at retracing the features of development of the WHO laboratory network for influenza surveillance when the first and main node,

the World Influenza Centre in London, was headed by Sir Christopher Howard Andrewes (1947-1961). Using mainly WHO and Wellcome Collection sources, I will show how the decision to share strains, reagents and methods marked a fundamental break with the previous system and how its expansion was promoted, often through informal and private efforts, despite the problems arising from the Cold War and decolonisation. The Spanish flu established the disease as a global problem. The International Sanitary Conference held in Paris in 1926 stated the impracticability of international quarantine, but at the same time it began to place the exchange of epidemiological information at the centre of disease control. In 1933, the influenza virus was isolated at the National Institute for Medical Research in London, ending the diatribe on the etiology of the disease and opening up new scenarios related to immunisation. The latter was the first concern of the US military, which in 1941 created a Commission on Influenza. But the failure of its 1947 vaccination campaign made it evident that, alongside epidemic intelligence, vaccination had an indispensable role to play, but for it to be effective, the antigenic variation of strains had to be tracked worldwide: the WHO network was conceived on this basis. Sharing materials and knowledge globally in the post-World War II world was the challenge that I will finally analyse in detail.

12 The “Other” Genius: A Historical Approach to Genius, Giftedness, and Gender (2/2)

Room: 40.004.

Organiser: Victoria Molinari, Milà i Fontanals Institution, CSIC; Andrea Graus, Milà i Fontanals Institution, CSIC; Violeta Ruiz, Milà i Fontanals Institution, CSIC

Chair: Annette Mülberger, University of Groningen

The figure of “the genius” has been traditionally defined in terms of the masculine Romantic ideal - a heroic individual who battles against all odds to achieve significant artistic, political, and scientific accomplishments. Historically, however, what constituted “genius” - and who was labeled as such - was (and remains) a question with multiple answers that did not always align with the traditional Romantic ideal. Be it an issue of gender, age, race, or even madness and disability, different categories have been used over time to understand exceptional talent and

define genius and similar concepts (e.g. giftedness) in the history of science and medicine. Some studies have approached the concept of genius from different angles, from focusing on a sociological perspective and the social appreciation of genius, to exploring its historical ties to religion, literature, and culture. Although there have been some works on the intersection of genius and gender, it remains a research gap in historical literature. In this panel, we wish to explore alternative representations of genius throughout modernity and reflect on the multiple social, cultural, scientific, and political contexts that inform this phenomenon beyond hegemonic narratives. The abstracts included in this panel will analyze how the notion of genius was used throughout the nineteenth and twentieth centuries across Central Europe, Argentina, and the United States. The authors explore different representations of genius through the history of medicine, psychiatry, psychology, and biology, including notions such as “idiot savant,” “insomniac genius,” and “child genius.” These explorations will further emphasize the scientific and social implications associated with this category.

Degenerate Genius: Intellectual Hermaphroditism in the Work of Carlos Octavio Bunge, Argentina 1900

- Victoria Molinari, Milà i Fontanals Institution, CSIC

Abstract: The 18th century saw the rise of Romantic Genius and the consideration of gender to define it. Usually, this did not include the belief that women could be geniuses, but that men of genius possessed both male and female mental characteristics. Male geniuses had to subordinate their innovative ideas and forceful personalities to the laws of nature and civilization. This presentation examines the perspective of Carlos Octavio Bunge (1875-1918), a prominent Argentine positivist, on the concept of genius through the lens of degeneration theory providing a biological interpretation of intellectual hermaphroditism that was popular in the previous century. Bunge, a distinguished figure in Argentine academia and law, developed a series of essays that intertwined extreme social Darwinism, law, and sociology. In Bunge's framework, degeneration manifested in three gradations: lower, middle, and upper, with geniuses occupying the upper echelon. Bunge defined the concept of intellectual hermaphroditism in geniuses and argued that the "complete" personality of genius stemmed from possessing both masculine and

feminine psychological traits. Male mental characteristics would ensure the innovative role of the genius, while female characteristics would provide temperance to be able to enforce their ideas. Bunge distinguished this feminized characterization from psychological and physical hermaphroditism, firmly rooted in naturalism and positivism rather than Romantic ideals. His perspective aligned with views on the average mass's reproductive, and "feminine" role and geniuses' innovative, "masculine" role in the advancement of society.

The Child Genius: Exhibiting Knowledge and Precociousness in Modern Europe

- Andrea Graus, Milà i Fontanals Institution, CSIC

Abstract: Since the Enlightenment, children who showed extraordinary knowledge and intellectual abilities were presented before savant societies and royal courts. With the Romantic association between genius and childhood, precocious children began to be displayed as popular cultural and scientific attractions. Children who were fluent in different languages, who learnt to read by themselves, who could recite by memory scientific and literary classics, or who were cultivated in matters such as history and geography, were exhibited in cafés, theaters, and science academies in European cities. This talk will examine this phenomenon focusing in cases such as the 2-year-old Otto Pöhler ("The reading child"), exhibited in the Berlin Panoptikum and studied by anthropologists and psychologists. What did these cases have in common? How were they discussed in scientific terms? How did they "perform" genius? In exploring these matters, I will show how these children incarnated modern views of the child genius beyond the Romantic construction of this figure canonized through personalities like Mozart and Rimbaud.

13 Undergraduate Programmes in HPS, STS, STH (2/2)

Room: 40.008.

Chair: Néstor Herran, Sorbonne Université

Organisers: Xavier Roqué, Universitat Autònoma de Barcelona; Néstor Herran, Sorbonne Université

This symposium aims to present and discuss experiences in the creation and development of degree programmes in History and Philosophy of Science (HPS); Science and Technology Studies (STS); and Science, Technology and Humanities (STH). Despite the great variations in the organization of university systems in Europe and beyond, we believe there is scope for debate about how we, as historians of science, promote or engage in HPS, STS or STH undergraduate programmes and how they help our students address current issues. Among other questions, we will discuss the road to implementation; student requirements; appeal to prospective students; the social and academic aims; the relationship with other programmes; the structure of the curriculum; and the interaction with other disciplines.

HPS in science teacher programs – the case of Norway

- Annette Lykknes, Norwegian University of Science and Technology

Abstract: In Norway, the field of history of science is not institutionalized. Scholars in the history and philosophy of science are spread in different departments and universities and with a few exceptions all have positions in other fields. As a consequence, undergraduate programs in HPS are not offered in the country. However, courses related to HPS may exist or be offered on an adhoc basis. At NTNU in Trondheim, a course entitled Episodes from the history of science has been offered for science teacher students since 2006. In this presentation, I will discuss the background for its implementation, how the course is organized, and how it relates to the rest of the science teacher curriculum. Finally, I will present the result of interviews conducted with students in 2019, about what they learnt from the course and the extent to which they felt it was useful for their future practice as teachers. Attention will be given to tensions between different disciplines (natural science, social science, humanities), and how I address these in my teaching.

Science, Technology and Humanities: a new joint degree at the UAB (Barcelona), the UAM and the UC3M (Madrid)

- Xavier Roqué, Universitat Autònoma de Barcelona

Abstract: This paper will discuss the creation and the first steps of a new degree in Science, Technology and Humanities, the first of its kind in the Spanish university system. I will review the main constraints on the proposal: the cooperation of

lecturers from a range of disciplines not necessarily conversant with science studies, and the inclusion of students with rather different academic backgrounds. The paper will then explain how we have addressed these issues and the students' perception of the academic and professional value of the programme. I will finally reflect on the lessons for our discipline and the prospects for our degree.

Round table with the participants in this two-part symposium

14 War medicine, transnational humanitarian action, and technological innovation in Spanish armed conflicts, 1870-1950

Room: 40.144.

Organiser: Jon Arrizabalaga, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC), Barcelona

Chair: Jon Arrizabalaga, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC), Barcelona

Originally, the international Red Cross movement focused its humanitarian interventions on international wars between signatory powers to the Geneva Convention of 1864, but very soon its national societies and the "Geneva Committee" itself (soon better known as the ICRC) were confronted with other violent conflicts (e.g., civil and colonial wars, insurrectionary movements) and their consequences, notably massive population displacements and political exiles.

Since the early days of so-called "emergency humanitarianism" (Barnett 2011), these interventions by the Red Cross and other aid organisations, and the debates surrounding them, represent a valuable observatory for analysing the interrelations between transnational humanitarian action, war medicine and technological innovation as well as their actors' interplays with political agencies. To be clearer, we take the notion of technological innovation in humanitarian war medicine in a very broad sense, in line with the taxonomic model of Habermas (1987-1988, 1989) and Foucault (1988), so that it includes not only medical instruments, devices or equipment and the associated health campaigns, but also any innovative measures with regard to military logistics or humanitarian law of war as well as to written or audio-visual procedures for mobilising compassion toward war victims.

The four proposed case studies examine these issues in four different scenarios of humanitarian intervention related to Spanish armed conflicts that were originally civilian or colonial in nature, though their dimensions were clearly international due to the alliances of the contending parties, and transnational in terms of humanitarian aid. There is no need to insist on the topicality of the subject, given the features characterising so many armed conflicts currently taking place on a global scale, starting with the two terrible wars, between civilian and neo-colonial, which are raging inside Europe or in its doorstep.

Transnational relief, Humanitarian Law of War, and the international movement of the Red Cross in the Carlist war, 1872-1876

- Jon Arrizabalaga, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC), Barcelona

Abstract: The third and last Carlist War (1872-1876) was a long and bloody civil war unleashed as a result of the armed uprising against the Spanish constitutional government by supporters of the return to the Ancien Régime led by a new dynastic pretender known as Charles VII. The warring parties agreed to respect the terms of the so-called Geneva Convention of 1864, by which the signatory powers undertook to guarantee the immunity of soldiers wounded on the battlefield, as well as that of the medical services and personnel who treated them. They did so for various reasons and without being obliged to do so, since the benefits of this Convention only applied at the time to international wars between signatory powers. In fact, things officially remained that way until a century later, when the ICRC agreed to dispense with the term 'war' (presupposing it to be international) in order to assume the need for its intervention when there was an 'armed conflict', internal or otherwise. This paper examines this unique circumstance, discusses the factors that made it possible, and analyses the conflicts and debates that arose within the international movement of the Red Cross over the possibility of intervening in this war, not least as a result of the proliferation, inside and outside Spain, of relief associations which, appealing to the new humanitarian values of the Geneva Convention, sought to assist sick and wounded combatants on one or both sides.

Rearmament vs. humanitarianism: an international approach to chemical warfare in Morocco's Rif War (1921-1927)

- Francisco Javier Martínez Antonio, Universidad de Zaragoza

Abstract: The Rif War, despite having been framed as a colonial conflict, had a clear international scope, especially in the phase following the Riffian offensive against the French Protectorate in April 1925. In this paper, we will explore it in relation to a relevant feature of the conflict: chemical weapons. The production and use of war gases in Morocco stood at the crossroads of two conflicting processes taking place in post-WWI Europe: arm-trafficking and rearmament, on the one hand, and a redefinition of international humanitarianism, on the other. Regarding the former, we will show how the French army reactivated wartime schemes to mobilize stocks and produce gas that were eventually used in Morocco. We will additionally examine how in the case of Spain, the weak development of the country's chemical industry resulted in the involvement of German private companies in setting up military and civil schemes of gas production. In this undercover way, Germany sought to rebuild its chemical warfare capacity to face an eventual extension of the Allied occupation of the Ruhr and Rheinland to new areas. Regarding international humanitarianism, we will analyze how the perceived limitations of the International Committee of the Red Cross (ICRC)-centered model for providing relief to unconventional violence or crises during WWI precipitated the emergence of new actors and new strategies of action during the interwar period. In the case of the Rif War, allegations of chemical weapons' use by Spain and France led to various unofficial or semi-official initiatives to try and push the ICRC to carry out a humanitarian intervention in Morocco. In particular, we will analyze the press campaign launched in the UK in late 1924 and the mission of Hans Langlet on behalf of the Swedish Red Cross in early 1926.

International medical aid in the field of hemotherapy during the Spanish Civil War (1936-1939)

- Alejandra de Leiva-Pérez, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC), Barcelona

Abstract: The use of blood transfusion technology for military purposes can be traced back to the First World War (1914-1918). Nevertheless, the feasibility of large-scale blood transfusions, the long-distance transport of blood bottles and the

development of wartime civilian blood donor campaigns was only demonstrated during the Spanish Civil War (1936-1939). The use of citrated blood was definitively established as a result of the innovations of Frederic Duran-Jordà, who directed the transfusion services of the Republican Army, and of Carlos Elósegui, on the Francoist army. This paper seeks to explore the international medical aid provided in the field of hemotherapy to both armies. Historiography has extensively studied the figures of Norman Bethune, creator of the Canadian Blood Transfusion Unit that was funded by the Canadian Committee to Aid Spanish Democracy; and of British doctor Reginald Saxton, one of the first volunteers to serve with the Spanish Medical Aid Committee. Both worked under the leadership of Duran-Jordà. Less well-known aspects are that the Republican Transfusion Service received a consignment of preserved blood from Switzerland, after a trip Duran-Jordà undertook to this country in December 1938; or that on the rebel side Italian doctors set up a transfusion service at the Italian University Hospital. This communication will discuss these medical contributions in the context of the international intervention in the Spanish Civil War.

Friday 6th 13:00 - 14:00 Lunch

Room: 40.002.

Stand Commission

Room: 40.004.

ERC - Granting opportunities

Room 40.008

Presentation of Centaurus las issue

Friday 6th 14:00 - 16:00 Sessions

1 Alchemy, Pharmacy and Early Modern Medicine

Room: 40.047A.

Chair: Lauren Kassell, European University Institute

Stones, Salts, and Calculi in Early Modern Medicine and Alchemy

- Elisabeth Moreau, University of Cambridge

Abstract: In the medical tradition, kidney and bladder calculi were a common illness which raised a prolific literature as to their cause, ways of formation, and treatment. Characterized by painful symptoms, they were difficult to heal as the main cure consisted of diuretics and dangerous surgical interventions. In the early modern period, the rise of Paracelsian alchemy led physicians to renew the traditional approach to calculi by considering them as stones and salts proper to the bodily “microcosm.” In this paper, I will explore the alternative treatment of calculi proposed by students for the newly founded alchemical medicine (chymiatría) program at the University of Marburg (Germany) in the early seventeenth century. Through dissertations, their views were collected and edited by their supervisor, the German physician Heinrich Petraeus, in his *Nosologia harmonica* (1616). As will be argued, their understanding of calculi drew both on the alchemical writings of Paracelsus (ca. 1493-1541) and on the ancient tradition in medicine (Galen), surgery (Celsus), and natural philosophy (Aristotle). Such an amalgamation of ancient and novel sources served early modern Paracelsian physicians to establish alchemy as part of the medical curriculum, and to suggest a new method of treatment based on drugs made by distillation.

Medicinal thermal waters in the early modern Hispanic world. Benefits of the earth and care technics

- Mariana Sánchez, KU Leuven

Abstract: In the early modernity different techniques (not only galenic) for the treatment of diseases are put into practice and minerals and distillation products such as waters and essential oils acquire certain notoriety. In the same way the baths in thermal waters gain in popularity for the treatment of diverse illnesses and this according to the type of minerals present in the water and the temperature of this one. In the territories of the Hispanic world, both in Europe and in the colonial territories, this practice is also reputed.

In this work we are interested in the medical knowledge about thermal baths and the practices of baths and lavatories used in Hispanic territories in the New World and in the Pacific archipelagos, both by the population of European origin and by the

indigenous and mestizo population. Of the American lands we study the descriptions that appear in the Natural Histories of José de Acosta and Gonzalo Fernández de Oviedo and in less researched accounts such as the Descripción de los pueblos de la jurisdicción del corregimiento de Villar Don Pardo that deal particularly with mountainous and volcanic territories of the Andes, such as the Tungurahua Volcano in the territory of present-day Ecuador. In the case of the Hispanic territories in the Pacific, as in the Philippines and the Mariana Islands, we are interested in the exposition in *El libro de las medicinas caseras* by Fray Blas de la Madre de Dios that also explains the uses of the baths prepared for the treatment of diverse illnesses such as asthma or crippling.

2 Bibliographies: production, materiality, circulation, uses (1/2)

Room: 40.004.

Organiser: Edgar Lejeune, Centre Alexandre Koyré, CNRS, France; Clément Bonvoisin, SPHERE, CNRS, France

Chair: Edgar Lejeune, Centre Alexandre Koyré, CNRS, France

This symposium aims to discuss bibliographies from a history of science perspective. Usually defined as lists of references gathered beyond a single collection, bibliographies are major elements in scientific activities, as well as familiar objects for historians of science. On the first look, they may seem to be an uniform textual device. However, we argue that they come in a diversity of forms and have a variety of functions, that have been overlooked in spite of their interest for the history of science. More precisely, it is the view of the organisers of this symposium that too little is known about their production, their materiality, their circulation and their uses.

The contributions gathered in this symposium are based on case studies, with a variety of disciplines and periods. By doing so, we wish to address a series of issues we have identified during two workshops organised in Paris: how are bibliographies constructed and published in different contexts? On what previous work did the bibliographies' producer(s) build? What are the functions performed by bibliographies within scientific activities (epistemological, documentary, social, ethical, etc.)? How did the internal organization and the material aspects of a given bibliography reflect the functions of these texts? How did these texts circulate? Who

published them, and for what purpose? How did actors use bibliographies in their scientific activities? Together, the contributions will help us shedding light on the diversity of bibliographies among scientific activities.

From author lists to databases: the case of medical bibliography in Portugal (17th- 21st centuries)

- Hervé Baudry, CHAM-Centro de Humanidades, Universidade Nova de Lisboa

Abstract: The aim of this paper is to illustrate the evolution of the cataloguing of medical authors and works, adopting the following approaches: 1. historiographical: genesis and evolution, bifurcations (resident authors, Sephardic diaspora); 2. epistemological: the frontiers of medical bibliography; 3. bibliographical: assessment and prospective. In the absence of a local Van der Linden, pre- or proto-bibliographical practices are to be found in the paratexts of works published from the 17th century onwards, which marked the rise of printed production, but also of inquisitorial book control procedures. The historiographical approach thus sees a clear break between cataloguing practices and the implementation of information systems within a modern scientific framework. Hence the second approach, which aims to demonstrate the establishment of common bibliographic practices from the 19th century onwards. Finally, we look at the tools made available during this period.

The history behind the Bolzano-Gesamtbibliographie 1804–1999 and the guidelines for its use

- Elías Fuentes Guillén; Institute of Philosophy of the Czech Academy of Sciences

Abstract: The dissemination and reception of Bernard Bolzano's ideas were not only mediated by his personal circumstances and context, but also by the vicissitudes of his work. I will trace the fate of his works from his death in 1848 to the publication of the first volume of his Gesamtausgabe in 1969 with the help of one of the last published volumes of this edition, namely the Bolzano-Gesamtbibliographie 1804–1999. As I will show, this book is more than a mere “list of publications”, as dictionaries define a bibliography, and constitutes a highly valuable resource for anyone interested in Bolzano studies, the use of which I will explain in detail.

The historical bibliography inserted into the tables of contents of Sylvestre-François Lacroix's *Traité du calcul différentiel et du calcul intégral*

- Karine Chemla; SPHERE Laboratory, CNRS, Université Paris Cité

Abstract: Between 1797 and 1800, Sylvestre-François Lacroix (1765-1843) published several textbooks devoted to virtually all branches of mathematics. Among them, the three volumes of the *Traité du calcul différentiel et du calcul intégral* are unique. Indeed, in contrast with Lacroix's other books as well as with the other textbooks on the same topic, Lacroix inserts into the tables of contents of each volume a bibliography (Caramalho Domingues 2008: 23-25). In this talk, my aim is to shed light on how this bibliography was composed. This question can be subdivided into several sub-questions: how were the items cited selected, and how is this choice correlated with the history of this branch of mathematics offered in the foreword to the book? Moreover, how had Lacroix access to the various publications mentioned, and which uses did he make of these publications in his own book? I also intend to examine the relationships between Lacroix's treatment of different topics and the references mentioned for this topic. My general aim is to explore the correlation that could be established between Lacroix's approach to analysis and the peculiarity of his book as compared with other textbooks.

Medieval and Renaissance Historiography in the Mirror of Russian and Soviet Sources Citation in an Italian Specialized Journal

- Dimitri Bayuk; SPHERE Laboratory, CNRS, Université Paris Cité

Abstract: Throughout its existence, the annual journal *Albertiana* of the publishing house Casa editrice Olschki has placed on its pages bibliographic selections on the journal thematic. One of these regular selections is devoted to publications in Russian. The reason is obvious: since the middle of the XIX century on the territory of the former Russian Empire there have been important studies published in Russian. A striking example is the translation of Alberti's *De re aedificatoria* by Basil Zubov, together with a 600-page commentary and related works. Preparing of such a selection traditionally raises both general and specific problems. An important general problem is that of the Romanization of a non-European alphabet: there are

many widely accepted systems, and the choice is not always evident. Another problem is renaming of journals and renumbering of their issues. Renaming and renumbering often reflect political changes in the country. My talk focuses on the case of Lidiya Braguina's publication list for the next, 2024, Albertiana's volume. Lidiya Braguina (1931–2021) was a professor at Moscow University in the department of history of the Middle Ages. She left behind a significant number of publications covering the period from 1955 to 2023. During this period ideological and ethical norms changed repeatedly. Many of the changes can be traced back to bibliographic descriptions of similar publications made at different historical stages.

3 Climate, weather and meteorology

Room: 40.047C.

Chair: Jon Agar, University College London

Has Western science changed Chinese weather? A view from the nineteenth-century

- Xinyue Li, Manchester University

Abstract: This paper explores how traditional Chinese understanding of weather reflected the social and intellectual changes during the nineteenth century as a result of more intensive communication with European scientific knowledge. In particular, how did the Chinese tradition of reading the weather as a realm of heavenly signs imbued with moral purpose and intentionality react to the wider spread of the Western mechanistic and materialistic representation of the skies? Did physical theory change how the Chinese experienced weather? The Western understanding of weather as a set of interacting aerial processes governed by the laws of matter in motion created a significant difficulty among the Chinese scholars involved in the translation of Western scholarship into Chinese. In other instances, weather was associated with earth sciences and physical geography. I argue that the disagreement on whether weather belongs to the earth or the sky indicates a conflict between Western and Chinese knowledge. This was further complicated by the evolving content of celestial study itself and the language issues involved in nomenclature. Despite this, the efforts to construct new categories of knowledge and accommodate

weather knowledge suggest that weather has to some degree decoupled from the moral realm as in ancient cosmology.

The Origin of Today's Energy Transition: How the Synthesis of Scientific Communities Created Our Climate Protection Strategy

- Benjamin Johnson, Max Planck Institute for the History of Science, Max Planck Institute for Chemical Energy Conversion

Abstract: The merging of scientific communities drives science forward by exposing previously inaccessible directions of research. Within the context of novel application, the new field may appear finely tuned or as if its emergence were directed. Today's unified strategy of energy production and climate protection, developed in the 1960s, is an example of this fusion. The modern explanation of climate change initiated by S. Arrhenius and T.C. Chamberlain had lain dormant for decades when it was revived in the 1930s. The Earth's surface may be warming due to increased carbon dioxide concentrations. Though tentative scientific consensus on the consequences of burning fossil fuels was reached in the 1950s, no systemic solution was proposed by those studying the problem. Also in the 1950s, in the wake of the Atoms for Peace Conference, a different community of scientists seized upon the new peacetime atomic power source. In the face of exponential population growth and limited fossil fuels, a lasting energy source was of utmost importance. Though this group was aware of the environmental effects of chemical pollution on the biosphere, climate change was not an explicit concern. Their emphasis remained on securing a high standard of living within a reasonable economic framework. The solution was to electrify the energy economy with nuclear power and use hydrogen and other synthetic chemicals to power what could not be electrified. The two scientific communities merged over the course of the 1960s as it was understood how replacing the fossil energy regime through nuclear-based electrification was not only the solution to over-population and limited resources but also to the carbon problem and the possibility of climate change. The result was the integrated climate and energy solution we recognize today as the energy transition (though nuclear power has now been replaced by renewable solar and wind).

Lakes and climate in science and history of science

- Alexandra Rizhinashvili, S.I. Vavilov Institute for the History of Science and Technology of the Russian Academy of Sciences

Abstract: Climate changes are severe recent challenges. Can history of science help us in resolving them? In my presentation I will emphasize the history of the investigation of the response of aquatic ecosystems on global air warming. Frequently scientists think that this question has appeared on the agenda only in recent two-three decades. However, more than one century ago limnologists and ecologists were asking -how temperature and rainfall influence primary link in freshwater ecosystem- the phytoplankton? From the end of 19th century zoologists and botanists paid more attention to temperature as the main factor of freshwater algae development. Evidently, this was a tribute to "physiological" tradition of biology of that time. Later a focus shifted toward rainfall as general and also joint (with the temperature) factor which determines water "bloom". It happened approximately at the verge of 1910-1920. More later (1930-1940) nutrient salts were began to consider as primary drivers for the phytoplankton. Since the 1990s temperature is considering again as a very important variable which explains lake ecosystem behaviour under recent global change. This is due to the facts of winter warming and prolongation of ice-free period. Unfortunately, the information about connections between water microalgae and temperature which we have is contradictory. It will remain the same if we continue to ignore historical genesis of the problem.

The Loneliness of the Meteorological Observer: Aqaba, 1947-1948

- Tuvaal Klein, Tel Aviv University

Abstract: The history of science is in the process of correcting its past focus on the history of Great Men: genius individuals making great discoveries in solitude. The discipline is shifting emphasis to the collective, social nature of scientific knowledge production, describing it as network- and cooperation-based.

The history of meteorology provides fodder for this shift: meteorological networks needed to be as broad as possible to increase the accuracy of weather forecasts; thus, meteorological observations in remote locations were particularly valuable. Thus, other kinds of solitude and seclusion were important for meteorological knowledge production: those experienced by meteorological observers, often native, the invisible contributors to the recording of valuable weather data.

Through a remote meteorological station in Aqaba and its operator, this paper explores the intertwining of isolation and loneliness with collective, albeit hierarchical, knowledge production. Situated in a secluded area between Mandate Palestine and Transjordan, characterized by extreme climate – the station was a vital location for meteorological observation. Thus, the Palestine Potash Limited (PPL) company, based in the Dead Sea, requested to erect a meteorological station in Aqaba to expand its mineral-mining activities. The PPL posted a Transjordanian worker to conduct meteorological observations, under harsh living conditions, who between 1947-1948, corresponded regularly with his manager, sending data and requests for equipment or reimbursements. These correspondences, translated from Arabic to Hebrew and vice versa, disclose the loneliness and family tragedy the observer endured. Thus, they provide a rare opportunity to probe the emotional and quotidian labor deployed in meteorological knowledge making. Highlighting the marginal and peripheral offers at once a decentralized approach, beyond the old emphasis on individual scientists, which emphasises marginalised actors in the production of scientific knowledge, while attending to aspects of human experience and emotion.

4 Circulation of Knowledge Through Mathematical Courses (16th - 19th centuries) (3/4)

Room: 40.002.

Organisers: Mònica Blanco & M. Rosa Massa Esteve, Universitat Politècnica de Catalunya; Davide Crippa, Czech Academy of Sciences, Institute of Philosophy; Sandra Bella, Université de Lorraine

Chair: Thomas Morel, Université de Lorraine

One of the cornerstones in the history of mathematics is the process of algebraization, which involves the interaction between algebra and geometry that occurred from the 17th century to the early 18th century. The publication of *In Artem Analyticen Isagoge* (1591) by François Viète (1540-1603) marked an early milestone in this process with the development of the symbolic language and an analytic method for solving problems. Subsequently, the development of analytical geometry, boosted by the works of René Descartes (1596-1650) and Pierre de Fermat (1601-1665), as well as the development of calculus by Isaac Newton (1643-1727) and

Gottfried W. Leibniz (1646-1716), allowed the mathematical community not only to address old problems, but also to tackle new ones, using these innovative analytical tools.

This newfound mathematical knowledge was disseminated through various mathematical courses that were used in diverse teaching contexts, including military academies and religious institutions, among others. The writing of these mathematical courses can be regarded as a form of communication that contributed to the shaping of “modern” mathematics. Their impact on mathematics education played a crucial role, the more so since these courses were widely circulated across different countries and institutions. Thus, exploring the readership of these courses and examining their actual uses, naturally leads to the study of local appropriation. This symposium aims to provide a cross-national comparative analysis of the circulation of mathematics through a variety of mathematical courses written during the 16th to 19th centuries.

Teaching l'Analyse des infiniment petits : Reflections of Jean-Pierre de Crousaz (1710-1722)

- Sandra Bella, Université de Lorraine

Abstract: Teaching l'Analyse des infiniment petits : Reflections of Jean-Pierre de Crousaz (1710-1722) Sandra Bella The first treatise on differential calculus, *Analyse des infiniment petits pour l'intelligence des lignes courbes*, was published in 1696 by Guillaume de L'Hospital. Around 1710, the Lausanne teaching professor Jean-Pierre de Crousaz, who had learned differential calculus from L'Hospital's treatise, planned to write a commentary to make it easier to understand, as in his opinion its presentation is too laconic and can only be understood by connoisseurs. Although relatively isolated in Lausanne, Crousaz has an important epistolary network - including Réaumur, Johann Bernoulli and Fontenelle - with whom he conducted epistemological and pedagogical reflection on the new differential calculus for his project. *Commentaire sur l'Analyse des infiniment petits* is published in 1722. It is 320 pages long, with four plates containing 49 figures in addition to those in the original treatise. In this contribution, we first analyze the choices made by this teacher to present the new analysis of infinitesimals, in particular the way in which he helps to justify the operating rules of differentials as well as the interpretation of

analytical results in geometrical terms. Between 1700 and 1723, Crouzas held the chair of philosophy at the Académie de Lausanne, where he mainly taught elementary mathematics rather than advanced mathematics to his students. We therefore question the identity of the readers to whom Crousaz addresses his commentary.

Malebranche and mathematical analysis in Eighteenth-Century Italy

- Claire Schwartz, Université de Paris Nanterre

Abstract: Malebranche and mathematical analysis in Eighteenth-Century Italy
 Claire Schwartz At the end of the 17th century, Malebranche and a number of mathematicians around him, all members of the Oratoire congregation, followed in Descartes' footsteps in defending a method based on advances in algebra and infinitesimal calculus, and tried to incorporate it into new mathematics courses. Built on the theoretical foundations laid down by Malebranche in *The Search after Truth*, this method was characterized by a certain style of solving mathematical problems. The result was the publication of a series of treatises and textbooks that were widely distributed in France, like Louis Carré's *Méthode pour la mesure des surfaces, la dimension des solides, leurs centres de pesanteur, de percussion et d'oscillation par l'application du calcul intégral* (1700) and Reyneau's *Analyse démontrée* (1708), a fairly comprehensive introduction to Cartesian algebra and differential and integral calculus. However, these subjects were hardly ever taught in Oratorian colleges, and did not begin to feature in French mathematics courses until late in the 18th century, mainly in military schools. Although this Oratorian programme did not always find its way into educational institutions, the Malebranchist style did spread through other channels, and seemed to have appealed beyond France, and particularly in Italy, on a more individual basis: we propose to study its reception by M. Agnesi and G. Fagnani especially, and the reasons for their interest in the mathematical style of Malebranchist texts on analysis.

How to teach fluxional calculus around 1740 in Great Britain: Maclaurin's course?

- Olivier Bruneau, Archives Henri Poincaré, Université de Lorraine, Nancy, France

Abstract: How to teach fluxional calculus around 1740 in Great Britain: Maclaurin's course? Olivier Bruneau In the special collection of the Edinburgh University Library, one can find a manuscript entitled "An Introduction of the method of Fluxion". This manuscript, although not in the hand of the Scottish mathematician Colin Maclaurin (1698-1746) but in that of an amanuensis, is indeed his introductory course in Newtonian fluxional calculus - I shall justify this assertion. In the historiography on this topic, the study of textbooks dealing with this subject is present and relatively abundant, but very few are based on what was actually taught. In this paper, I therefore plan to place this manuscript chronologically in its author's teaching career, and more broadly in his scientific output, especially in relation to his Treatise of Fluxions, which appeared in 1742 but began to be written around 1737. I also plan to present the epistemological presuppositions and broad outlines of Maclaurin's text, highlighting what is important for him to teach. It will also be necessary to identify possible sources of inspiration, either in Newton's work or in textbooks on fluxional calculus of the time. Finally, I will attempt to answer the question of the originality of this text in terms of the dissemination of mathematical knowledge.

5 Cosmic Distances: Ideas and Techniques for Measuring the Celestial Realms in Medieval and Early Modern Times (2/3)

Room: 40.010.

Organiser: Dario Tessicini, University of Genoa

Chair: Stefano Gulizia, University of Milan

This interdisciplinary and cross-cultural symposium seeks to foster discussion on the theme of 'Distance' in the context of medieval and early modern astronomy and cosmology. The aim is to provide a platform for diverse perspectives and approaches on distance-related topics, bringing together scholars from various areas of expertise and theoretical background. Topics might include, but are not limited to:

- Planetary Distances: Papers exploring the measurement and understanding of the distances between celestial bodies in the pre-modern era. This may encompass different cosmological models (geocentric, heliocentric, geoheliocentric) and the methods used to estimate astronomical distances.

- Observation of Comets and New Stars: Investigations into how medieval and early modern astronomers observed, interpreted and visualized the distances, movements, and significance of comets and supernovae in the night sky.
- History of Scientific Instruments: Studies of the development and utilization of instruments, such as quadrants, and telescopes, in measuring astronomical distances, as well as their impact on the evolution of cosmological thought. Papers on the material culture of astronomy and cosmology are particularly encouraged.
- Measuring Techniques: Exploration of the methodologies employed by astronomers to estimate the distances to celestial objects, including parallax, trigonometric methods, and their role in shaping cosmological concepts.
- The Intellectual History of the Concept of Distance: Investigations into how distance was understood in the philosophical and cosmological context of the time, considering its influence on the evolving theories of the universe.
- Comparative studies that explore the theme of distance across different theoretical frameworks, cultures and regions are welcome. Proposals from early career scholars, with different geographical origins, and from underrepresented groups are particularly encouraged.

Distance and Proportion: the Problem of the Distance of the Stellar Sphere in the Copernican Cosmology: Rheticus, Brahe, Rothmann, Maestlin, Kepler

- Miguel A. Granada, University of Barcelona

Abstract: The annual motion of the Earth implied necessarily the Existence of an immense void space between Saturn and the sphere of the fixed stars. This void space, when confronted with the extension of the planetary region, questioned the Copernican assertions of the ‘symmetry’, ‘proportion’ and ‘harmony’ of the heliocentric world system, which had been advanced as evidence of its truth. We will present the answer given by *Rheticus in the Narratio prima* (1540), introducing Copernicus’ work, and the following discussion by Brahe, Rothmann, Maestlin in the 1580s and 1590s and Kepler (*Mysterium cosmographicum* and *De stella nova*).

The great cometary divide: comets and parallax in the aftermath of Galilei's *Il Saggiatore* (1623)

- Dario Tessicini, University of Genova

Abstract: This paper investigates the use of parallactic measurement for cometary observations in the wake of the disputes around the comets of 1618. Galilei's intervention in *Il Saggiatore* (The Assayer, 1623) and its alleged scientific *faux pas* marked a pivotal moment in the evolving discourse on parallax, steering the course of subsequent debates among prominent astronomers of the 17th century. Drawing upon a diverse array of primary sources, this paper will try to reconstruct the intricate web of discussions and disagreements that unfolded in the aftermath of the debate on the comet of 1618. By examining the responses and counterarguments put forth by both contemporaneous and later scholars (such as Orazio Grassi, Scipione Chiaramonti, Giuseppe Biancani, Geminiano Montanari), the paper sheds light on the multifaceted nature of the use of parallactic observations, and their implications for the broader understanding of comets and other celestial phenomena.

6 Instruments and representations in the late modern period

Room: 40.063.

Chair: Henk Kubbinga, University of Groningen

A Coulomb balance in the showcase

- Júlia García, Universitat de Barcelona; Joan Manel Hernández, Universitat de Barcelona; Enric Pérez, Universitat de Barcelona; Santiago Vallmitjana, Universitat de Barcelona

Abstract: In the historical collection of scientific instruments of the Faculty of Physics of the University of Barcelona several objects that were part of the Science Cabinet of the nineteenth century are preserved. As happened in other European countries in the second half of the nineteenth century, the Spanish government provided its teaching centers (secondary schools, universities) with instruments and various objects for the teaching of natural sciences. In our paper we will focus on a Coulomb torsion balance acquired from a French builder in the 1850s. Probably designed for qualitative demonstrations, we have restored it to try to reproduce Coulomb's original experiments, much discussed by historians of physics. We will

show how through the biography of this object we can approach different aspects of the history of science: the state of physics in Spain (both in teaching and research), the manufacture of scientific instruments, the controversies surrounding the role of the experiment in Coulomb's works, and also the phases through which this object has passed, currently in a showcase of the Faculty in which the most emblematic instruments of the collection are displayed.

Plateau, Faraday and the Logic of Spectral Motion

- Rod Bantjes, St. Francis Xavier University

Abstract: In this paper I discuss how the materiality of experimental apparatuses shaped the conversation that led to the invention of cinema and its illusions. My method involved reconstructing four of the devices used by Joseph Plateau and Michael Faraday so that I might explore the interplay between the scientists' written observations and their materially embedded thought. The two scientists communicate in part through reconstructing and tinkering with each other's devices. Plateau and Faraday hoped to uncover the mathematical logic of "spectral" objects generated by the interactions of industrial gears and spoked wheels. By reconstructing and reanimating their apparatuses I show how serendipity and error in design shifted their attention toward spectral motion and the principles of cinematic animation.

Through reconstruction I am also able to demonstrate how observational report was an unreliable element within an experimental assemblage including human observer, apparatus and theoretical paradigm. Plateau assumed that the spectral object had "real" existence on the retina through "persistence of vision" and that to refresh the image accurately the disks on his devices had to rotate at precise ratios. He observed that changes in that ratio caused the image to change its shape and position, but what he saw was caused instead by unobserved changes in the speed and acceleration of his hand on the drive crank. "Persistence of vision" could not, of course, have explained spectral motion. Plateau's device creates a temporal sequence of points that is constructed as an "object" by the mind, and the perception that the object moves is a false interpolation of a discontinuous series. At fractional ratios the assemblage produces unstable moving images that are likely pareidolia. This case is

one of many in this period where the constructed character of perception confounded empirical observation.

The visual regime of a hidden brain iconography. Hans Berger's electroencephalographic explorations

- Carlos Sierra, University of Antioquia

Abstract: The main purpose of this paper is to provide, in a synoptic way, certain hermeneutic keys for analysing the transformation of the epistemic-visual parameters produced in the field of modern neurophysiology from the pioneering studies on the recording and graphic representation of electrical activity in the human brain by the German psychiatrist Hans Berger (1873-1941). His tireless search, during the first decades of the 20th century, for the mysterious physiological correlates of psychic activity led him to successfully develop the first human electroencephalogram (EGG) in 1924. This technology for recording bio-signals associated with neuronal activity not only contributed to modifying the parameters of ocular inspection and the very regime of visibility or iconographic expression of what happens inside the skull (making it possible to translate physiological particularity through abstract patterns of universal standardisation), but also decisively changed the way of understanding the functional organisation of the brain and mental activity. In this sense, the EEG can be understood as a referential artefact, an «epistemic object» (Hans-Jörg Rheinberger), playing a leading role in the construction of the contemporary cultural «imaginary», insofar as it echoes nuclear questions that run through the history of Western science (for example, the question of deciphering the language of the living or the nature of human thought). But not only that. By evoking also a fascinating analogy between the brain and an electrical machine, it is possible to glimpse surprising connections of this medical diagnostic technique with the field of computation and artificial intelligence (William Grey Walter). From this point of view, the history of the electroencephalogram highlights the importance of delving into a kind of «cultural and social neuroscience» (Cornelius Borck).

Making the Invisible Visible: The Art of Bringing Out Diagnostic Details in Paleontological Photography, 1900–1960

- David Ceccarelli, Roma Tre University

Abstract: The alteration of photographic images has long been a fundamental tool for paleontological research. Despite image manipulation being commonly associated with improper or fraudulent practices in science, since the early 20th century, visual alteration techniques have allowed paleontologists to construct, share, and transmit knowledge about fossils, revealing morphological characteristics that are often imperceptible. The underlying goals in the development of such techniques have been manifold: attempting to overcome the technical and optical limitations of photographic instruments, the need to highlight the anatomical features of specimens to facilitate taxonomic classification, and the desire to create images with a significant aesthetic impact. The use of visual alteration in paleontological photography raises numerous epistemological questions, starting with the tension between the pursuit of visual realism and the need to alter the subject or its representation to highlight otherwise invisible details. It is also, and not least significantly, an intriguing case study that illuminates the complex interplay of material and visual cultures within paleontological practices. This contribution aims to examine in particular two visual languages that characterized paleontological illustration during the first half of the 20th century: photographic retouching and the so-called “covering” techniques. In particular, I aim to:

- a) Analyze the dissemination and reception of these techniques, considering the material aspects and professional contaminations in the debate on paleontological illustration.
- b) Highlight how, even though covering techniques were considered more reliable than photographic retouching by many paleontologists, both coexisted for much of the first half of the 20th century.
- c) Demonstrate how advancements in high-resolution digital photography, computational analysis, and electronic imaging have amplified the potential of visual alteration, making image manipulation even more central in contemporary scientific debate.

7 Knowing, Protecting, and Saving the Earth: Exploring Materials, Earth History, and a Sustainable Future (1/2)

Room: 40.012.

Organiser: Christopher Halm, Deutsches Museum Munich / University of Regensburg, Germany; Marcin Krasnodębski, Instytut Historii Nauki PAN Warsaw, Poland; Brigitte Van Tiggelen, Science History Institute, USA

Chair: Ernst Homburg, Maastricht University, Netherlands

Commentator: Annette Lykknes, Norwegian University of Science and Technology, Norway

The chemical, molecular, and material sciences are grounded in practical learning and experimentation. Throughout history, humans have interacted with and modified the physical and organic world, gaining a profound understanding of matter and life over various time scales. Knowledge has empowered us to exert significant influence over our environment. However, this power entails great responsibility and has given rise to ecological sensibility. In the field of chemistry, for example, the emergence of Green Chemistry, Environmental Chemistry, and Sustainable Chemistry are prominent examples of how ecological awareness has permeated policies, industries, and research. Further scientific spin-off disciplines have developed while our awareness of anthropogenic impact has either increased or been challenged.

Our session aims to investigate the connection between knowledge and environmental preservation in engineering, life, earth, and material sciences, often employing chemical and molecular methodologies. We invite scholars to submit papers that examine examples of implicit and explicit interactions between scientific research and sustainable thought in the last 400-plus years. This spans a wide array of branches and subfields within industry and science: geology, petrology, hydrogeology, palaeontology, archaeology, climatology, soil science, mining, botany, forestry, and other subfields interconnected with environmental research.

The symposium is organized by Christopher Halm, Marcin Krasnodębski, and Brigitte Van Tiggelen and is sponsored by the Commission on the History of Chemistry and Molecular Sciences (CHCMS) and the Working Party on the History of Chemistry of the European Chemical Society (EuChemS).

‘Une rançon du progrès’ in the Early 20th Century French Sciences: Henri Devaux (1862-1956) and Wooden Railroad Tie-Related Pollution

- Benjamin Le Roux, SPH Université de Bordeaux, France

Abstract: In this study, I will focus on the case of the French physiologist Henri Devaux (1862-1956), member of the Académie des sciences and professor at the Faculty of sciences of Bordeaux. Trained as a botanist and holder of a chair in plant physiology, Devaux crossed the disciplinary boundaries and gained an international reputation thanks to his work on the physico-chemistry of thin layers, contributed – with others like Lord Rayleigh (1842-1919), Agnes Pockels (1862-1935) or Irving Langmuir (1881-1957) – in the emergence of surface science in the first half of the twentieth century and played a role in the molecularization of life sciences. In addition to his rich academic life, Devaux regularly carried out expertise missions for the French state. For almost 20 years, for example, he conducted experiments to chemically improve the preservation of wooden railroad ties. In this context, Henri Devaux was confronted with the problem of the environmental impact of chemicals such as creosote, and the need to limit how it affects neighbouring crops and to develop techniques and protocols for “décréosoter” tie storage sites. Initially, these issues seem to have been neglected by the authorities, but they have become increasingly important following complaints from local residents. I intend to study how these expertise missions were able to give a rise to an environmental sensibility for Henri Devaux, that led him to question the impact of research and industry but without undermining his faith in scientific progress.

Making Soil a System: Hans Jenny’s State Factor Model of Soil Formation and the Preservation of California Soils

- Sara Tridenti, Princeton University, USA

Abstract: This paper delves into the development and dissemination of Hans Jenny’s State Factor Model of soil formation, shedding light on its significance in the context of sustainability and ecological history. Jenny’s perspective offered a unique lens through which to view soil, one that positioned it as a living, dynamic entity deeply integrated into its ecosystem. However, for soil to assume this active role within ecosystems, it had to undergo a process of delineation, dissection, and abstraction. This study examines how Jenny grappled with the definition of his state

factors, particularly the biotic and the human factor, as independent actors. In moments of definition and classification, Jenny resorted to establishing arbitrary boundaries, differentiating between individual soil plots as well as between soil and vegetal matter. These demarcations, combined with Jenny's systematic characterization of soil, rendered his State Factor Model particularly attractive to soil taxonomers and classifiers, especially those engaged in the United States soil survey. Much more significantly, however, Jenny's scientific interest in biotic soil characteristics dovetailed with his lifelong efforts to conserve unique soil profiles of California. This paper explores how Hans Jenny's State Factor Model of soil formation, which viewed soil as a living and integral component of ecosystems, incorporated the language of classification and boundary-making to define soil as a valuable and distinctive resource, thus demonstrating the interplay between ecological thought, soil surveying, and conservation and environmental history.

‘Having no counterparts in nature’: Clarifying the Concept of ‘Nature’ in Public Debate About Chemicals in the Environment Since Silent Spring

- Christian Schnurr, TU Munich / University of Augsburg, Germany

Abstract: At least since Rachel Carson's bestseller *Silent Spring* (1962), public discourse on chemicals in the environment has centered around the concept of 'nature'. The talk offers a conceptual analysis of different notions of 'nature', based on excerpts from *Silent Spring* as well as critical backlashes to it. The respective positions in the debate about the '(un-)naturalness' of synthetic chemicals will be situated in broader traditions of thought about nature, namely a scientific-naturalistic versus an Aristotelian understanding of 'nature'. A critique of both stances is outlined, pointing out ecological shortcomings in the first, and failure to grasp nature-identical substances in the latter case. A synthesis of different opinions on the relationship between 'nature' and chemistry is then given. I suggest an 'ecological turn' by understanding '(un-)naturalness' of chemicals in light of Jens Soentgen's ecological definition of nature (*Der ökologische Naturbegriff*). Further, in a 'practical turn', I recommend a shift of attention away from individual substances per se and more onto chemical practices in situ. Thereby, the talk reconciles different positions in the discourse on chemistry and nature, and restructures the debate in a

way that is philosophically sound, politically relevant and faithful to its original ecological concerns.

8 Materiality and Memory in the History of Science

Room: 40.101

Chair: Ana Cristina Martins, IHC-Polo Universidade de Évora / IN2PAST, Portugal

Chile tabiche: a story of loss and re-encounter through memory, embodied practices, and community

- Daniela Sclavo, University of Cambridge

Abstract: The chile crop is iconic due to its flavour, cultural, and symbolic qualities. As such, it has been conceptualised, researched, lived, and valued differently by different people. Albeit the recent boom in biocultural heritage initiatives, situated types of knowledge remain overlooked by institutional conservation science and food policy, especially that of peasant and indigenous women. Despite the long history of state rural abandonment, of capitalism, and of dispossession, local practices around food networks and landraces persist in many communities around the world. There is still much to tell, to remember, to protect. Through the depiction of individual and collective narratives, in this presentation I will account for the peculiar story of loss and recovery of the chile tabiche in Santo Domingo Tomaltepec, a Zapotec community in the Central Valleys of Oaxaca, Mexico. This chile, lost to the town five decades ago, was recovered as part of a collective endeavour between community habitants and the local food sovereignty project Cocina Colaboratorio, where I have collaborated for the past three years. By exploring how women cooks and habitants of Santo Domingo Tomaltepec assigned value to chile as crops, as ingredients, and as elements of memory, I will argue that aspects such as affection, systems of care, embodied practices, nostalgia, taste, and community life, are equally valid and necessary for defining and defending patrimonies and territories – beyond the resource-based visions usually employed by institutions and conservation programmes. In this sense, this story aims at expanding the horizon of the history of crop conservation and food security by employing tools from anthropology and ethnography, and by engaging with a community both intellectually and emotionally.

A Felt and Measured Threat: Understanding Material (and Existential) Issues in Natural History Collections

- Elaina Foley, Alexander von Humboldt Stiftung; Yale College

Abstract: Within the natural history museum, many of the same forces which produced specimens outside the museum now represent an existential threat to their preservation. Finalized in 1995, the “Ten Agents of Deterioration” are considered to be those actors most threatening to museum collections. While it primarily exprobrates elemental forces, the list also includes thieves and neglectful custodians. Categorized under “Pollutants,” one such agent is toxic remnants of historical preservation treatments on objects. With a focus on botanical collections, this paper considers the contrast between how toxicity and humidity are imagined, known, and addressed within the United States National Herbarium collections. In particular, how do lived and felt representations of humidity influence relationships in the herbarium—including specimen-curator relationships, specimen-specimen relationships, and those involving other queer actors, such as historically toxic treatments on preserved plant bodies within the collection. Drawing on the work of Lotte Arndt (2022) and Mel Y. Chen (2011), this paper will consider the disruptions of remnant mercury treatments on the Smithsonian’s botanical archive, a scientific preservation method now imagined to be long outdated, in conjunction with current responses and relationships to the existential threat of humidity. By bringing herbarium staff interviews and hands-on herbarium maintenance into conversation with queer, feminist STS and museum studies, this paper disrupts the binary between natural and artificial threats to collections in order to reckon with the throughlines of colonial logic that continue to influence natural history preservation.

A short-lived legacy of environmental concern at the Geophysical Institute of the University of Coimbra: The challenge for scientific collections

- Pedro Casaleiro, Coimbra Chemistry Centre (CQC) & Geophysical and Astronomical Observatory of the University of Coimbra (OGAUC); Fábio Monteiro, Centre for Earth and Space Research of the University of Coimbra (CITEUC) & Faculdade de Letras da Universidade de Coimbra; Mariana Brum, Centre for Earth and Space

Research of the University of Coimbra (CITEUC) & Faculdade de Letras da Universidade de Coimbra

Abstract: The Geophysical Institute of the University of Coimbra (IGUC) was established in 1864, with meteorological and magnetic data study and collection forming its foundational areas. Seismic observations commenced towards the end of the 19th century. These three domains have been central to the IGUC's work, resulting in the accumulation of centenary observations. In the 1960s, the new director, Fernando Pinto Coelho (1912-1999), a full professor of chemistry, emerged as a leading advocate for change and progress. He demonstrated great dynamism in the research fields of radio and nuclear chemistry, while expressing deep concerns for the environment and the protection of citizens' health. In addition to his role, he served as Portugal's delegate to UN International Conferences on the use of atomic energy for peaceful purposes in Geneva (1955; 1958; 1964). Pinto Coelho established the Centre for the Study of Physical Chemistry of the Atmosphere and Environmental Radioactivity at IGUC. He repurposed a building previously used for astronomy activities into the laboratories of the centre, introducing a new research area. This space was equipped with state-of-the-art instruments, including an Applied Photophysics microsecond flash photolysis apparatus with a nitrogen laser and single photon counting, a vacuum line, and a photoreactor. The library began receiving journals such as Photochemistry and Photobiology, and Molecular Photochemistry. In 1974, the Carnation Revolution brought an end to the dictatorship rule, causing a significant impact on key directorship positions within the University and interrupting the new line of research. This analysis examines the establishment of the new laboratories and their equipment, as well as the dispersion of the instruments following the director's forced departure, from the perspective of museum collection studies and management. It also explores the significance of his research and its relevance for integrating this collection into the Observatory Museum.

White Fears: Race, Gender, and Savant Self-Fashioning in the 18th c. French Empire

- Meghan Roberts, Bowdoin College, Brunswick; Mathias Valverde, University of Strasbourg

Abstract: In 1762, Isabel Godin des Odonais left Riobamba, Ecuador in the company of 42 individuals, including dozens of indigenous guides. She planned to rejoin her husband, the French cartographer Jean Godin des Odonais, from whom she had been separated for twenty years due to his scientific commitments and, especially, political crosswinds that had stranded him in French Guyane. But her misfortunes had just begun: beset by one tragedy after another, everyone attached to the voyage besides Isabel died or absconded. Isabel somehow managed to press on, despite myriad dangers. Jean Godin des Odonais published his version of his wife's story in 1773, thrilling eighteenth-century readers and inspiring generations of fiction writers. Historians, however, have almost entirely ignored this episode, perhaps because it does not fit their image of European explorers or the French empire. In this paper, we propose a close reading of the Godin des Odonais narrative alongside extant archival sources to rethink the role of women in the French empire, especially those on the edges of scientific expeditions. Jean Godin des Odonais crafted the story of his wife's suffering and misfortune for very particular purposes: advancing his career, seeking royal pensions, and even defending himself in a lawsuit. While women have been largely invisibilized in the historiography on colonial French science, the relative bounty of sources around Isabel Godin des Odonais allows us to think capaciously about women in the French empire: what different kinds of work (scientific, political, affective, reproductive) did they perform? How does the history of French Enlightenment colonial science look different when viewed through the scholarly lens of race and gender studies? What stories did male savants tell about their wives, and how did these help construct new gender norms and new scholarly ideals?

9 Medieval Knowledge

Room: 40.109.

Chair: Erika Luciano, University of Torino, Italy

A study of the stars catalogue in AL-BATTĀNĪ'S ZĪJ

- Mònica Mont, University of Barcelona

Abstract: The book on which al-Battānī's fame rests, in the East and in the West, is the Sābi' Zīj, his great work on astronomy. In the preface to the Zīj, al-Battānī tells us

that errors and discrepancies found in the works of his predecessors had led him to compose this work, in accordance with Ptolemy's admonition to later generations, to improve his theories and inferences on the basis of new observations. The aim of my paper is to present a comparison between Ptolemy's stars Catalogue, the commentary by al-Ṣūfī, the manuscript A (Ms. 8322, Arsenal's library) that contains the Castillian translation made under Alfonso X, E (Ms. 908, Escorial's library) which contains the only copy preserved of the Arabic text of the *Sābi' Zīj* and Nallino's edition. I discovered that the constellations Hydra and Argo Navis are not included in Ms. E. My conclusion is that translators of Alfonso X had at their disposal a manuscript different than E that included both constellations. Moreover, I have tried to reproduce the content of these constellations in the original Arabic manuscript.

Understanding the European adoption of Hindu-Arabic numerals (12th-14th c.)

- Raffaele Danna, European University Institute (Florence)

Abstract: Hindu-Arabic numerals first appeared in ancient India, spread west with the Arabic civilisation and reached Latin Europe in the late Middle Ages. Following their adoption, the ten figures provided an essential visual and algorithmic tool for the emergence of the “algebraic mode of thought”. However, their adoption among European mathematicians and practitioners was far from immediate. This paper will discuss both the theoretical and the contextual reasons that help to explain why Hindu-Arabic numerals were eventually adopted in European mathematics.

Combining a global perspective and a micro-founded approach, the paper argues that the combination of the positional notation and the symbolism for fractions made Hindu-Arabic numerals better tools to handle rational numbers in problems that emerged both in astronomy and commercial practices. As European proto-symbolic algebra originated in the vernacular tradition of practical arithmetic, a particular attention is given to the adoption of Arabic mathematics among European practitioners, starting from the merchants of the so-called “commercial revolution” of the 13th century. This paper combines a micro-founded analysis with an outlook on global transfers of mathematical knowledge from the Arabic civilisation to western Europe.

We will reconstruct the calculations that emerged from the world of commerce delving into the economic structures of Italian late-medieval city states (their units and measures and their monetary systems) and into the economic practices of the commercial revolution (accounting and financial). Because of the emergent need to solve these computations, in late medieval Italy the adoption of the ten figures among practitioners became not only possible, but also useful. As Hindu-Arabic numerals became the main numeral system used in Europe thanks to their diffusion in vernacular contexts, reconstructing this story is essential to understand how Europe eventually transitioned to a symbolic numeral system that had emerged in India and reached the Mediterranean through the Arabic world.

Aspects of Medical Geology in Medieval Andalusian and Moroccan Manuscripts

- Khallaf El Ghalbi, Moulay Ismail University of Meknes. Morocco

Abstract: Human use of mineral and rock materials in the medical field dates back to a distant past. Many Arab-Islamic heritage sources have contributed to introducing the medical benefits of a group of minerals, whether those that focused on studying minerals and their properties (mineralogy) or those that focused on inventorying medicines and describing their compounds (medicine and pharmacy). Based on some Medieval Moroccan and Andalusian medical manuscripts, Such as : the book "Al-amrad al-wabaiya" or "Epidemic Diseases", by Ibn Heydur al-Tadli ; the book "Al-Istiqsa wa al-Ibram fi 'ilaj al-jirahat wa al-awram" or "Investigation and Conclusion in the Treatment of Wounds and Tumors", by Muhammad bin Ali bin Faraj al-Fihri ; the book "Majmu' al-Munafi' fi Attib Anafi'" or "Total benefits in beneficial medicine", by al-Bua'qili al-Susi, the book "Al-Tasrif liman 'ajaza 'ani ta'lif" or "The Arrangement of Medical Knowledge for who is unable to Compile a Book himself", known in English as "The Method of Medicine", by al-Zahrawi (Abulcasis) ; and the book "Jami' Asrar al-Tib" or "Compilation book of medical secrets" by Ibn Zuhri (Avenzoar)... etc.; we sought In this research, to inventory the minerals used in medical treatments (single or combined) and identify the medical fields in which these medications are prescribed (ophthalmology; dentistry; cardiology; urology; dermatology...), with mentioning the Methods of using prescribed medications and their forms (ointments, tablets...). Finally, we pointed out some of the harmful effects

of minerals that can affect human health. We also discussed the lack of awareness of the medical applications of minerals, in the Arab-Islamic medical heritage, by some contemporary Western historians of science, who are interested in the history of the use of minerals in medical treatments.

Library Borrowing Registers as a New Tool in History of Science

- Erwin Neuenschwander, University of Zurich

Abstract: The borrowing registers of libraries represent a new source genre and thus a new approach in the history of science. They provide important information about library use and reading behaviour in different times and locations and enable to reconstruct the influences and stimuli on scientists working in the places in question. In recent years, a remarkable number of new works and projects have appeared in the field of humanities and especially in book and library sciences, which have hardly been noticed by historians of science. It therefore seems to me useful to briefly present these works here and to demonstrate its utility also in the history of science. Borrowing registers existed already in the Middle Ages at the Sorbonne as the publication *Le Registre de prêt de la Bibliothèque du Collège de Sorbonne* (1402–1536) [Vielliard et. al. 2000] demonstrates. Similar documents have been preserved at several other medieval institutions (Merton College, the University of Erfurt, the Vatican, the Charterhouse of Basel, the library of the Cathedral of San Marco in Venice, today's Marciana), as has been summarized and documented in recent papers by Emmanuelle Chapron. The borrowing registers of the Herzog August Library in Wolfenbüttel, the Herzogin Anna Amalia Library in Weimar and the University Libraries of Erlangen and Göttingen have been examined in detail since 1931 by a great number of scholars. Recently, at St Andrews University in Scotland, the "Borrowing Registers Transcription Project" has been launched with the aim of transcribing these registers and making them digitally searchable. Similar projects have now been started in Glasgow and in France, among others.

10 Replicate, Renew or Innovate? Historiographical Foundations and Methodological Reflexivity for the History of Science (1/2)

Room: 40.008.

Organiser: Lluís Coromina Verdaguer, Universitat de Girona; Anxo Vidal Nogueira, Universitat de València

Chair: Lluís Coromina Verdaguer, Universitat de Girona

Commentator: Anxo Vidal Nogueira, Universitat de València

In this panel, we reunite researchers to reflect on the production of historical knowledge and the potentials and limitations of the approaches and methods currently employed in the history of science. Our framework is the broader discussion surrounding the utility of historical works in science, technology and medicine, and their implications for reconsidering and assessing the co-construction of humanity and nature. When approaching a historical investigation, a tension arises between the challenge of creating a new knowledge and the (imperative) need to draw on and engage with previous works, more or less directly related to the topic at hand, sometimes in a pretentiously innovative manner. Consequently, we find ourselves at a crossroads between replicating methods and approaches that have proven effective in the past, seeking a renewal of these, and/or proposing an innovation that contributes different perspectives or results. We seek to engage in a fruitful (and needed) historiographical and methodological debate around these tensions. Since the goal of this symposium is to create a space for historiographical and methodological debate, we have contributions with different scales of study, diverse approaches and methods —intellectual (Fabrizio Bigotti), social (Julen Ibarburu), material culture (Anxo Vidal, Lluís Pascual), oral (Sofiya Kamalova), economic (Rafael Perez-Jimenez, Lidia Aguiar-Castillo, and Francisco Quintana-Navarro), and political-cultural (Pau Font)—, and with a diverse panel of speakers with different academic backgrounds, career stages, and universities. Some of the general questions that will be treated for sure on the panel are the following: The replication of approaches and methods: Does it contribute more than a stagnant repetition? Are they suitable for a reshaping of the initial responses and contribute to a broader vision? Renewal efforts: Are they replications disguised as new approaches? Innovation: Is it advisable, or, indeed, possible?

Approaches to the History of Tattooing

- Julen Ibarburu Antón, Universidad de Granada

Abstract: This paper examines the factors contributing to the varying successes of ports in the late 19th and early 20th centuries, a period characterized by the advent of steam navigation and the expansion of the submarine cables and radiotelegraph networks. The primary focus is introducing the Service Implementation Analysis Model (SIAM), a tool designed to assess the impact of communication technologies on historical sea trade. SIAM evaluates the integration and effects of these technologies using a methodology derived from Technology Acceptance Models (TAM). This approach incorporates a cost/benefit analysis supplemented by a retrospective view, enhancing the understanding of technology adoption in maritime commerce. The model also includes various evaluation factors such as scientific advancements, regulatory changes, geostrategic circumstances, and societal responses. These elements form a dynamic feedback system, enabling an in-depth analysis of how technological changes influence economic models within the interplay of science and society. The application of SIAM has been demonstrated in the study of the Macaronesian archipelagoes' maritime trade evolution before World War I. Its versatility allows for broader applicability in other historical contexts where technology has played a significant role. This comprehensive model offers a novel perspective in understanding the co-evolution of technology and maritime trade across different historical epochs.

Technology acceptance model as an historical analysis tool: the case of telecommunications in Macaronesian ports

- Rafael Pérez Jiménez; Universidad de Las Palmas de Gran Canaria

Abstract: This paper proposes a renewed approach to the study of modern epidemics, based on the analysis of the 1918 influenza pandemic as a particular case study. It is proposed to combine the historiographical tradition of the history of medicine –and the social history of the medicine– with political and cultural historiography. The aim is to approach the political and cultural impact that epidemics have on societies. The recent COVID-19 epidemic has shown us the enormous political consequences of a global pandemic in a modern society, which can be extrapolated from other epidemics of the past. Yet most studies that have dealt with epidemics pay too little attention to these implications, mostly confined to the field of social history of medicine or medical history *stricto sensu*. How do

epidemic emergencies affect societies in a broad sense? What do governmental responses imply for policies not strictly related to the epidemic? How does an epidemic impact on cultural collective identity? The proposed methodological combination may help to answer these questions. However, the potential difficulty of dialogue between one historiographical tradition and the other must be considered. And, at the same time, how to use them in a balanced way in order to obtain successful explanatory and analytical results.

Analysing modern epidemics through political and cultural history, in the light of the 1918 influenza pandemic

- Pau Font Masdeu; University of Girona

Abstract: This paper proposes a renewed approach to the study of modern epidemics, based on the analysis of the 1918 influenza pandemic as a particular case study. It is proposed to combine the historiographical tradition of the history of medicine –and the social history of the medicine– with political and cultural historiography. The aim is to approach the political and cultural impact that epidemics have on societies. The recent COVID-19 epidemic has shown us the enormous political consequences of a global pandemic in a modern society, which can be extrapolated from other epidemics of the past. Yet most studies that have dealt with epidemics pay too little attention to these implications, mostly confined to the field of social history of medicine or medical history *stricto sensu*. How do epidemic emergencies affect societies in a broad sense? What do governmental responses imply for policies not strictly related to the epidemic? How does an epidemic impact on cultural collective identity? The proposed methodological combination may help to answer these questions. However, the potential difficulty of dialogue between one historiographical tradition and the other must be considered. And, at the same time, how to use them in a balanced way in order to obtain successful explanatory and analytical results.

11 Science and the Nation

Room: 40.113

Chair: Silke Körber, Institute Vienna Circle, University of Vienna

Will science solve everything? The image of science in the forthcoming atomic age in Czechoslovakia 1948–1960

- Michaela Šmidrkalová, Masaryk Institute and Archives of the Czech Academy of Sciences

Abstract: For Czechoslovakia and other countries, the 1950s marked a boom in the popularization of nuclear energy and the peak of atomic optimism and, from today's perspective, unrealistic expectations about the peaceful use of the atom. This contribution focuses on the image of science during the expected dawn of the atomic age in Czechoslovakia, which was ideologically inseparable from the expected arrival of communism. What did the nuclear popularization campaign say about the place of science and scientists in society? What should be their role in the atomic age? What should be the relationship of science to nature and the environment in the dawning Anthropocene? The contribution concludes by pointing out the paradoxical position of science: on the one hand, it was expected to develop rapidly and to apply its results immediately in practice, because it was in the interest of society and was to ensure its well-being and the "bright tomorrows". On the other hand, it was supposedly prevented from doing so by society's lack of preparedness, or at least this problem was pointed out by some contemporary authors. Thus, in the 1950s, when atomic optimism prevailed, the main problem for science was not perceived to be the difficult research questions that it was supposed to solve – such as how to achieve nuclear fusion, but people themselves.

Science with a Swagger: The AD-X2 Controversy and Scientific Self-Image in Early 1950s America

- Joseph Martin, Durham University

Abstract: In March of 1953, Allan Astin, Director of the US National Bureau of Standards (NBS), lost his job. He was summarily fired by Sinclair Weeks, the newly confirmed Secretary of Commerce in the Eisenhower administration. Astin had found himself in Weeks's sights after the NBS published a report concluding that the additive marketed as AD-X2, which was advertised as extending the life of automotive batteries, was ineffective. Weeks, a personal advocate of the product and admirer of its chief promoter, Jess Ritchie, regard the NBS's verdict on AD-X2 as an

attack on small business and sought to install a friendlier regime at the bureau. The American scientific community was outraged. Astin, a career NBS scientist who had been with the organization for over two decades, was not particularly well known outside of a few specialist circles. His removal nevertheless sparked a frenetic mobilization of the American scientific community, which quickly organized censures by the National Academy of Sciences, the American Physical Society, and other organizations and succeeded in forcing Weeks to back down. Astin was reinstated and remained at the head of the NBS until his retirement in 1969.

By exploring how American scientists responded to the controversy, and organized to exert political pressure, this talk explores the complex relationship between industry, government, and science in the postwar United States. It reveals the rapid postwar emergence of a widely shared self-image among American scientists, based on a pure-science ideal, which they thought sanctioned their institutional clout and justified their influence in public affairs.

Preserving the Preserved: advanced digitization of the photographic documentation of the First National Exhibition of the History of Science (Florence, Italy, 1929)

- Francesco Barreca, State University of Milan

Abstract: The First National Exhibition of History of Science held in Florence in 1929 was a pivotal event for Italian history of science. For the first time, a general survey of the extent and condition of Italian scientific collections was undertaken, and proposals for its preservation and valorisation were issued. The event was photographically documented by the famed Alinari studio, and the two resulting sets of photographs are now preserved in the Alinari Archives of Florence. The Museo Galileo, together with the Alinari Archives, is now launching a major project of advanced digitization with the aim of valorising the collections and helping scholars and stakeholders preserve both the physical artefacts and the intangible data they enshrine, putting them in dialogue with historical research, museum practices, and digital humanities.

Scientific Expeditions and National Emotions

- Nurit Kirsh, The Open University of Israel

Abstract: Soon after the establishment of the Hebrew University of Jerusalem in 1925, its zoologists, botanists and geologists participated in research tours, not only within the official borders of Mandatory Palestine, but also in neighboring countries. To a great extent, these research tours were based on the European project of identifying, classifying and collecting the flora, fauna, and soil of previously unstudied territories. In addition, the Hebrew University researchers sought to partake in the Zionist construction of a collective national identity. Thus, creating scientific knowledge included elements of the discovery of biblical landscapes and the conquest of the land, affording the scientists an opportunity to develop deep sentiments towards local nature. Sometimes the research tours involved dangerous challenges and, as such, also played a role in shaping the "new Jew" - a brave man with no fear. After the establishment of the State of Israel in 1948, the geographical areas available for researcher tours became far more limited. However, when the Six-Day War was over in June 1967, the borders were expanded, and a few of the researchers felt the urgency to seize the opportunity to explore the territories that were occupied, with particular interest in the Sinai Peninsula. My proposed paper will examine research tours conducted by Hebrew University's scientists between 1927 and 1967 in order to identify and analyze the scientific motives and national emotions related to the study of the Middle East's flora, fauna, and landscapes.

12 Science Diplomacy: searching for a deeper past (2/3)

Room: 40.152.

Organiser: Daniel Gamito-Marques, Department of Applied Social Sciences, NOVA-FCT; Lif Lund Jacobsen, Natural History Museum of Denmark

Chair : Roberto Lalli, Polytechnic University, Turin

This 3-part symposium organized by the Science, Technology and Diplomacy (STAND) Commission promotes a historical and historiographical deepening of reflections on the role of science and technology in international relations. Across multiple geographies and historical times, international negotiations on responses to transnational health crises, technoscientific standardization and collaboration, and geopolitical power politics have affected human and physical environments. These

themes are neither recent nor isolated from other critical spheres of global politics and scholarly research. This symposium intends to stimulate an exploration of science diplomacy's deeper and complex past, problematizing the current characterization of science diplomacy as a post-World War 2 phenomenon and proposing novel connections between histories spanning various periods and disciplines. Each part of the symposium is devoted to a general theme in the deeper history of science diplomacy.

Part 2: Negotiating technoscientific standardization and international cooperation. This symposium delves into the dynamics of technoscientific experts from diverse states and nationalities as they navigated negotiations on scientific units, nomenclature, instruments, and practices for mutual adoption. Functioning as informal diplomats advocating for their countries' interests, scientists played a pivotal role in constructing international collaborations, fostering joint research projects, or asserting influence over research agendas.

Science Diplomacy, internationalism, and the formation of the International Seismological Association (1895-1922)

- Lif Lund Jacobsen, Natural History Museum of Denmark

Abstract: Research on early international scientific unions and congresses has traditionally emphasized collaborative efforts among scientists to overcome national conflicts, fostering discipline development and the advancement of knowledge. The perspective of science diplomacy provides insights into the power dynamics between nations and individual scientists' capacities for trust-building. The focus is on understanding these dynamics in the context of negotiating technoscientific standardization and the exchange of data within internationalization efforts. This paper explores the establishment of international cooperation and the negotiation of technoscientific standards in seismology during the first two decades of the 20th century, with a specific focus on the formation of the International Seismological Association (ISA) in 1901. The establishment of ISA was prompted by the development of reliable seismographs in the late 19th century, which enabled the recording of distant earthquakes. This technological advancement led scientists to recognize the benefits of comparing seismograms from various locations, highlighting the necessity of global cooperation. Once established the ISA played a

pivotal role in providing an international framework for standardization, compilation, and distribution of seismic data. Additionally, it initiated a program for the development of the discipline. Despite being founded to address a scientific imperative for global cooperation, the ISA faced challenges due to national rivalries between Germany and Britain. The paper concurrently explores the interplay between the concepts of internationalism and the principles of science diplomacy, for a more nuanced and novel understanding of 20th century institutionalisation of international science.

The 1919 total solar eclipse. Astronomical encounters as instances of science diplomacy

- Ana Simões, Interuniversity Center for the History of Science and Technology (CIUHCT), University of Lisbon; Maria Paula Diogo, Interuniversity Center for the History of Science and Technology (CIUHCT), NOVA University of Lisbon; Luís Miguel Carolino, CIES, ISCTE – University Institute of Lisbon

Abstract: In this talk we revisit from the perspective of science diplomacy the British astronomical expeditions which observed the 1919 total solar eclipse and tested Einstein's prediction of light bending. It has been already analyzed in the literature how Eddington and British astronomers voiced arguments in favor or against the maintenance of relations between British and German scientists during the Great War. While the former case may be classified as informal science for diplomacy, we address in this talk another instance of informal science diplomacy, falling under the heading diplomacy for science. We refer to the actions practiced by expeditioners and/or communities of local/national astronomers in Brazil, associated with astronomical observations carried out by Charles R. Davidson and Andrew C.C. Crommelin in Sobral, the second city of the state of Ceará. We analyze the complex process of mediation involving not only formal channels of Brazilian diplomacy but also informal diplomatic relations between British and Brazilian astronomers (and even an American astronomer operating in Argentina) which prepared the ground for the astronomical observations. We detail how, orchestrated by Henrique Morize, director of the National Observatory of Rio de Janeiro, under the authoritative role of Charles Dillon Perrine, director of the National Observatory of Argentina, in Córdoba, collaboration between scientific experts of different

nationalities was achieved. We also address the various dimensions of the mediation process' outcome (political, diplomatic, scientific, etc.), focusing on its profound impact on the promotion of the Brazilian scientific community abroad and the affirmation of astronomy in Brazil.

Scientific and Diplomatic Objects: The Development of Radiation Instruments in the Inter-War Period

- Aske Hennelund Nielsen, Chair of Science, Technology and Gender Studies, Friedrich-Alexander-University Erlangen-Nuremberg

Abstract: With this paper, I contend that scientific objects are not only inherently scientific, but also inherently diplomatic. As highlighted by the emerging field of Science Diplomacy, science is co-produced through diplomatic activities and scientific practices. Scientific objects can therefore be viewed as embedded with scientific practices and diplomatic negotiations. To illustrate this, I highlight the case of the International Radiological Congress in the inter-war period. Within the Congress and its scientific committees, recommendations and initiatives on the standardization of radiation units and radiation protection were drawn up and disseminated globally. This process was inherently diplomatic, with national actors using diplomatic tools in order to gain backing for their own scientific proposals, openly feuding at the congresses, and seeking to curry favour with other groups to push their agenda. As the technical exhibitions held with the congresses showcase, the radiologists were acutely aware of the importance of scientific objects. As new instruments and equipment were calibrated and constructed in accordance with the recommendations of the Congress, other standards were marginalized, unable to be embedded in new equipment. Through the recommendations of the International Radiological Congress, national scientific groups could exert global, normative claims through instruments, that were imbued with the co-production of science and diplomacy carried out at the congresses. Internationally accepted scientific standards and recommendations, that are also embedded in scientific objects, have a decisive influence on global scientific practice, as objects limit scientific questions and research to what is recognizable and measurable by the used instruments and equipment.

The Diplomacy of Standardization: How the SUN Commission negotiated standards during the interwar period

- Sara Bassanelli, Northwestern Italian Philosophy Consortium (FINO)/University of Pavia

Abstract: Standardization has been recognized by historians as a major undertaking of international scientific organizations during the interwar period. Despite the undeniable relevance of this endeavor, little has been done to explicitly address the science diplomacy dimensions of the negotiations on international scientific standardization. In my talk, I aim to uncover this diplomatic facet within international organizations of physicists active between the two World Wars, with the most representative being the International Union of Pure and Applied Physics (IUPAP). Specifically, I focus on the historical case of the Working Commission on Symbols, Units, and Nomenclature (SUN). Established by IUPAP in 1931, this commission operated in a complex landscape of political, economic, and scientific tensions. The 1930s were a crucial period during which SUN, at the request of the International Research Council (IRC), endeavored to overlook the influence of war seeking the involvement of German scientists hitherto been excluded. Additionally, SUN's standardization activities faced state interests in obtaining standards that favored their industries. Even on a strictly scientific level, reaching international agreement was challenging; a case in point was the Commission's attempt to establish common electrical and magnetic units for physicists and engineers. The relevant work done by SUN in this historical context reveals that it represents an important case study for the science diplomacy domain. Drawing on the examination of documents of ICSU, IUPAP, and SUN, I shed light on key players (scientists, institutions, countries), the instruments used, and the final results in terms of standards achieved in SUN's diplomatic activities.

13 Transmission and adaptation of knowledge and skills

Room: 40.213.

Organiser: Carole Hofstetter, SPHERE CNRS, SAPRAT, EPHE-PSL; Guillaume Loizelet, Université Toulouse 3, IMT

Chair: Carole Hofstetter, SPHERE CNRS, SAPRAT, EPHE-PSL

This symposium is linked to the general theme of "between global histories and microhistories of science". This symposium aims to explore the driving forces behind the articulation between global histories and microhistories of science, viewing them as dynamics. The aim is to examine the relevance of the distinction between these two scales. It is customary to distinguish between two different scales: on the one hand, histories of science considered globally, within which we place periods, civilizational areas and degrees of scientific progress on the one hand, and microhistories on the other.

The chosen perspective is that of transmission, understood in a very broad sense. This transmission may have taken place from one cultural sphere to another, from one scientific discipline to another, or from one era to another. It may concern knowledge, methods or ideas. Papers address the following questions, on a non-exclusive basis: What is the transmission of knowledge? How can we analyze the traces of such transmission? How are these transmissions carried out? How can they be characterized? Do they involve specific tools? Can they be associated with other mechanisms (teaching, trade)? How do they relate to the business of translating from one language to another? Do they coincide? What are the consequences of these transmissions? Contributions to this symposium are based on case studies of works composed between Antiquity and the modern period. Both manuscript and printed sources will be examined.

From the arithmetic of Diophantus?

- Carole Hofstetter, SPHERE CNRS, SAPRAT, EPHE-PSL

Abstract: The science of calculation in Byzantium was at the crossroads of two trends, wrote André Allard. The first was the Greek tradition inherited from Antiquity and represented for the most part by the works of Heron and Theon. The second resulted from the irruption into the Byzantine sphere of Indian calculus, which reached the West thanks to the Arabs. In Byzantium, it was transmitted both through Western sources and through direct links with the Arabic-speaking part of the Mediterranean basin. In this paper, I will present a relatively short unpublished text found in a medieval Byzantine manuscript. It presents several methods for extracting the square root. The text is associated with the famous Greek mathematician Diophantus, but its content is clearly of medieval origin. Firstly, I will

place this brief treatise in the scientific context outlined by the group of texts of mathematical content with which it is transmitted in this manuscript. Secondly, I will look at the methods it proposes and analyse how it is adapted to the Greek science of its time. To do this, I will try to relate it to other treatises on the same theme written in Byzantium during this period, such as that of Isaac Argyros.

Are the traces of transmission the evidence of a transmission?

- Guillaume Loizelet, Université Toulouse 3, IMT

Abstract: Numerous astronomical treatises written in Arabic in the 9th and 10th centuries are dedicated (or contain a chapter dedicated) to the question of celestial dimensions. Since 1967 and the rediscovery of a lost part of Ptolemy's Planetary Hypotheses, it has become clear that the distances and sizes of the planets mentioned in these Arabic treatises derive from Ptolemy's text. However, the authors of the Arabic texts explicitly state that Ptolemy never worked on these questions... In this talk, I will attempt to show what a close analysis of several Arabic texts reveals about the "transmission" of Ptolemy's Planetary Hypotheses, and, on a larger scale, about the "transmission" of knowledge from one context of production to another.

Pronic: twisted powers

- Arilès Remaki, CNRS-Université Paris Cité (SPHERE)

Abstract: In an unpublished mathematical draft, probably dating from 1679, Leibniz developed a new concept of powers, which he called "pronic powers". Unlike the classical powers, which are made up of a certain number of copies of the same factor, the pronic power is made up of a product of factors in arithmetic progression. These powers of a new kind have remarkable properties that led Leibniz to see them as primitive elements of numerical calculation. Leibniz attributed the term "pronic" to what he called the ancient arithmeticians. Following this historiographical thread reveals an extremely complex history that blends algebra, geometry and number theory. In fact, the concept seems to have emerged from the writings of medieval algebraists, and more specifically from the Abacus School at the end of the 15th century, and would flourish during the 16th century in the German, French and Italian contexts. Daniel Schwenter, one of Leibniz's main sources, establishes a link between this medieval notion and the Pythagorean notion of heteromecic number

found in Nicomachus of Gerasa and transmitted to the Latin world through the works of Boethius. Examining the history of this notion of the 'pronic' over the long term provides a new perspective on the emergence of the notion of power in the West, but also raises the question of reference in the history of science.

The Mathematical Induction in the Pensées

- Thibaut Bagory, Université Lyon II (IHRIM); Université Toulouse III (IMT)

Abstract: The geometric nature of the *Pensées* (Thoughts, 1669-1670) is admitted, though not always precisely determined. While it is evident in some texts, such as the famous “Pari de Pascal”, it is implicit in others, since Blaise Pascal (1623-1662) is addressing honest people without technical jargon. A major aspect of the thesis is to identify this deep imprint of the geometer on the thinker. This line of research has led to the identification of traces of mathematical induction in the *Pensées*. Pascal is often credited with being the first to give a general formulation of this type of reasoning. This fundamental principle of mathematical induction goes beyond arithmetic, and can be used to ensure the transmission of other types of truth by succession. Some sections of the *Pensées* are enlightened by the recognition of this model of reasoning. This presentation deals with the theme of transmission in two ways. On the one hand, it is an example of transfer from one field of thought to another: Pascal uses a structure of reasoning discovered in mathematics in his apologetic proofs. On the other hand, by this means, Pascal is trying to prove the transmission of truths or knowledge through the ages of humanity.

14 Waves, mountains, oceans and thunderstorms: The study of natural phenomena

Room: 40.144.

Chair: Floris Winckel, Rachel Carson Center, LMU

Modelling a World of Waves - The Ship Model Towing Tank in Trondheim and the International Circulation of Knowledge, 1930s-1950s

- Thomas Brandt, Norwegian University of Science and Technology

Abstract: This paper investigates the establishment and activities of the Norwegian Ship Model Towing Tank in Trondheim, Norway. The towing tank in Trondheim

opened in 1939, after years of planning and fundraising. Naval architects had been using model towing in open basins since the early 18th century, and by the start of the 20th century, modern tanks were established that could simulate ocean waves in a laboratory setting. To some extent, the towing tanks attempt to re-create the world's oceans in a laboratory setting to enable the development of marine and maritime technologies. Towing tanks are a format of oceanic knowledge. By investigating the scientific and engineering activities related to towing tanks, and their institutional setup, this paper contributes to discussions about the challenges of mapping, charting, and modelling the world's oceans.

Based on archival records and published proceedings, the paper explores what motivated the construction of the towing tank in Trondheim and to what extent it was aligned with the discussions taking place at the International Towing Tank Conferences (and predecessors) from the mid-1930s until the mid-1950s. The towing tanks congregated communities of practice that encompassed university professors, engineers, naval architects, and military officers, discussing hydrodynamics, ship propulsion, and construction standards. Shipbuilding and maritime knowledge were national security issues, which meant that international meetings were limited during the war. Approaching the development of the towing tanks as a history of knowledge, the paper seeks to understand how knowledge about modelling the world of ocean waves in a laboratory circulated within the towing tank community, what limits and boundaries existed, and to what extent the construction and development of the laboratory facility in Trondheim were entangled in that circulation of knowledge.

The making of the world's deepest piers - matrix analysis and model testing for seismic design in the Tagus River Bridge project (1959-1962)

- Henrique Oliveira, Institute of Contemporary History - NOVA School of Social Sciences and Humanities

Abstract: This paper focuses on the work carried out by Tudor Engineering Company (TEC) and its consultants (led by George Housner), for the seismic design of the foundations for the towers of the Tagus River Bridge (today the April 25 Bridge). Built between 1962 and 1966, the bridge was one of the biggest project's carried out by the fascist New State regime (1933-1974). It was also a project in which

digital computers were used by the National Laboratory for Civil Engineering (NLCE) – the public institution responsible for reviewing public works projects, whose international reputation was based on work using physical models. As such, I devote my attention to TEC and NLEC relations during the seismic design process, highlighting their methodological differences, resulting in instances of cooperation and conflict which, in turn, illustrate the political and economic nature of the history of computing in engineering. By focusing on this aspect of the larger design and review process of the project, I argue that digital computers were instrumental in shielding TEC from NLEC's oversight, providing them with greater autonomy in the process. This was done in two ways: from a technical perspective, given the laboratory's lack of capacity to properly evaluate the contractor's project, and a technological one, considering the limited capabilities of the computer they owned. Thus, I argue that TEC's autonomy ultimately contributed to differences between the project's initial and final cost, following the contractor's presentation of a geological study (halfway through construction) deeming structural reinforcements (for withstanding seismic stress) necessary. Lastly, I finish my paper by contextualizing this specific case in larger issues of the post-war New State political economy, and the transnational history of American engineering business, to reflect on the political and economic nature of the history of computing.

Mountain Multiple: Snow Scientists, Mountain Guides, and State Institutions in Swiss Avalanche Control, 1960-1999

- Lucas Mueller, University of Genève

Abstract: In the early 1960s, Swiss officials began dividing inhabited mountain areas in three zones: white zones with no risk of avalanches; blue zones, in which buildings had to comply with certain standards to resist avalanches; red zones, in which building was basically prohibited. This cartography was based on the risk calculations of the engineers at the Federal Institute for Snow and Avalanche Science in Davos. The engineers trained local officials to do the zoning, refusing to do so themselves to remain a neutral arbiter in case of conflict. Conflicts arrived quickly. Private owners or local authorities contested zones that diminished land value, and unexpected avalanches challenged the science itself. When an avalanche hit a white zone in the engineers' backyard Davos in 1968, the engineers had to publicly

defended their science. Municipal authorities employed local experts, such as mountain guides, to make decisions about order to close roads and to evacuate—or not, such as in Evolène in 1999, when an avalanche killed 12 people, leading to questions about the fractured political and epistemic authorities. Ultimately, the number of avalanche victims declined steadily in the second half of the twentieth century. This paper argues that it was exactly the fractured expertise of snow and avalanches with its relationship to a multifaceted Swiss state that made it a successful science. The plurality of experts and the state-internal contestation enrolled ever more actors in the avalanche control effort, while providing avenues for generative controversies and refinement of knowledge and protection practices.

Ocean Nexus: Science, Data, Governance, & Law

- Sam Robinson, University of York

Abstract: Data is essential to ocean science. Oceanographers gather data on the marine environment using a variety of tools: satellites, remote sensors, and ship-borne instruments. For centuries knowledge of the ocean, historically captured on hydrographic charts, was a closely guarded state secret, key to geopolitical and geostrategic power at sea. Although there was limited bi-lateral cooperation and ocean data sharing, information access was often restricted and costly. The concept of free-at-source global ocean data sharing emerged only during the Cold War. Following on from the International Geophysical Years “big data collecting binge” (Shapley, 1960), the United Nations created the Intergovernmental Oceanographic Commission and the International Oceanographic Data and Information Exchange in 1961. Intended to create only oceanography guidelines, the IODE struggled to enforce the free flow of data into the World Oceanographic Data Centres. Global South nations were also sceptical about the true equity of an ocean governance regime created whilst they were not yet independent, and at the UN Conferences on the Law of the Sea (1973-82) ocean science itself came under scrutiny. The heart of these debates around the “freedom” of marine science was the equity and justice that did or did not exist in the ocean data-sharing regime. When the new Law of the Sea opened for signature in 1984, the ocean data regime had evolved from one of moral imperative to share and collaborate, through a system of intergovernmental governance, and finally entered a politico-legal regime of mandated ocean data

sharing. This paper will outline this three-stage shift in ocean science data diplomacy—the opportunity, then the onus, and finally, the obligation to share ocean data—and examine what this meant for ocean justice, ocean data accessibility, and Global South participation in ocean science.

Friday 6th 16:00 - 16:30 Coffee Break

Friday 6th 16:30 - 18:30 Sessions

1 Bibliographies: production, materiality, circulation, uses (2/2)

Room: 40.004.

Organiser: Edgar Lejeune, Centre Alexandre Koyré, CNRS, Paris; Clément Bonvoisin, SPHERE, CNRS, Université Paris-Cité

Chair: Clément Bonvoisin, SPHERE, CNRS, Université Paris-Cité

This symposium aims to discuss bibliographies from a history of science perspective. Usually defined as lists of references gathered beyond a single collection, bibliographies are major elements in scientific activities, as well as familiar objects for historians of science. On the first look, they may seem to be an uniform textual device. However, we argue that they come in a diversity of forms and have a variety of functions, that have been overlooked in spite of their interest for the history of science. More precisely, it is the view of the organisers of this symposium that too little is known about their production, their materiality, their circulation and their use. The contributions gathered in this symposium are based on case studies, looking at a variety of disciplines and periods. By doing so, we wish to address a series of issues we have identified during two workshops organised in Paris: how are bibliographies constructed and published in different contexts? On what previous work did the bibliographies' producer(s) build? What are the functions performed by bibliographies within scientific activities (epistemological, documentary, social, ethical, etc.)? How did the internal organization and the material aspects of a given bibliography reflect the functions of these texts? How did these texts circulate? Who published them, and for what purpose? How did actors use bibliographies in their scientific activities? Together, the contributions will help us shedding light on the diversity of bibliographies among scientific activities.

Renaissance Google: The Uses of Medical Bibliographies in Early Modern Europe

- Silvia Maria Marchiori, Department of History and Philosophy of Science, Trinity College, Cambridge University

Abstract: From the Renaissance onwards, scholars and physicians attempted at retrieving and systematising the medical knowledge that was circulating in books through the medium of printed bibliographies. By focusing on case studies in late-sixteenth- and mid-seventeenth-century Protestant Europe, this paper will argue that printed bibliographies were essential in aggregating, organising, and shaping the dissemination of medical knowledge before the emergence of journals and reviews, and even afterwards. The compilers of these bibliographies, such as Israel Spach, Pascal Le Coq, and Johannes Antonides van der Linden, are little known today, but their agency in including and excluding what counted as knowledge was equivalent to the role of those who design search engines today. Some of them listed only works in Latin, others included publications in vernacular languages; some focused exclusively on printed books, while others censed the manuscript holdings of libraries across the continent. In doing so, these compilers drew on and transformed the pre-existing literature in print and handwritten surveys of books in southern Europe. A close reading of these bibliographies reveals the different strategies these editors employed, and it shows the variety of ways in which the early modern information economy could work.

The Global History of Bibliographic Practice in Mathematics

- J.P. Ascher, Michael J. Barany, Jan Vrhovski, University of Edinburgh

Abstract: Our presentation outlines the global history of bibliographic practice in mathematics, a discipline with distinctive bibliographic traditions whose historical implications may offer striking problems and ramifications for the wider history of bibliography in science. We connect the historical work of constructing bibliographies as an element of mathematical research, communication, and professional practice to related activities including abstracting, abridging, problem and result encapsulation, and directory compilation. Our discussion centers on the two most significant international mathematical abstracting journals, the German

Zentralblatt für Mathematik (from 1931) and the American Mathematical Reviews (from 1940). We reconsider these bibliographic projects' significance in the globalization of mathematical research using historical connections and comparisons to older (especially early modern British) and more peripheral (especially Eastern European and East Asian) bibliographic enterprises. Emphasizing the role of bibliographic work in the construction of cognitive and epistemic communities in mathematics across long distances in international, transnational, and global contexts, we examine how a bibliographic lens can explain critical dimensions of the significant transformations in the scale, scope, and content of mathematics from late antiquity to the present, with a focus on the twentieth century. Linking these examinations to relevant methodological considerations, we close by outlining a program of research our team anticipates pursuing over the next several years to develop a critical and global account of mathematical bibliography and its historical implications.

Highlighting the epistemological issues of bibliography through the practical problems of building a philosophy of science database: the SIPS case study

- Fabien Ferri, University of Franche-Comté

Abstract: The simple hypothesis that we wish to put forward in this contribution is the following: the specific experience of building and managing a bibliographical database in the philosophy of science opens up the possibility of questioning the multiple facets of the bibliographical order in general. A first review of our experience, patiently reflected upon after twelve years of work within such an enterprise, allows us to formulate a certain number of questions relating to the epistemological issues inherent in the bibliographic activity itself, beyond the simple observation of an inescapable evolution in the media for publishing its products. How does one go about delimiting the temporal, historical and disciplinary boundaries of a field such as the philosophy of science before embarking on a bibliographical project such as the construction of a database listing the documents produced in this philosophical field? Even if a corpus of documents associated with a finite temporal sequence is by definition always materially finite, how do we actually go about making a complete inventory of it? Moreover, in the face of the intensification and

multiplication of publications resulting from the digital revolution, what are the appropriate tools to be appropriated and manipulated, and what new monitoring strategies to be implemented, in order to inventory the products of editorial news in such a vast field on a planetary scale? In order to outline the answers to these questions, we will present an example of a contemporary bibliographical research tool: the Philosophy of Science Information System (SIPS).

2 Circulation of Knowledge Through Mathematical Courses (16th - 19th centuries) (4/4)

Room: 40.002.

Organiser: Mònica Blanco & M. Rosa Massa Esteve, Universitat Politècnica de Catalunya; Davide Crippa, Czech Academy of Sciences, Institute of Philosophy

Chair: M. Rosa Massa Esteve, Universitat Politècnica de Catalunya

One of the cornerstones in the history of mathematics is the process of algebraization, which involves the interaction between algebra and geometry that occurred from the 17th century to the early 18th century. The publication of *In Artem Analyticen Isagoge* (1591) by François Viète (1540-1603) marked an early milestone in this process with the development of the symbolic language and an analytic method for solving problems. Subsequently, the development of analytical geometry, boosted by the works of René Descartes (1596-1650) and Pierre de Fermat (1601-1665), as well as the development of calculus by Isaac Newton (1643-1727) and Gottfried W. Leibniz (1646-1716), allowed the mathematical community not only to address old problems, but also to tackle new ones, using these innovative analytical tools.

This newfound mathematical knowledge was disseminated through various mathematical courses that were used in diverse teaching contexts, including military academies and religious institutions, among others. The writing of these mathematical courses can be regarded as a form of communication that contributed to the shaping of “modern” mathematics. Their impact on mathematics education played a crucial role, the more so since these courses were widely circulated across different countries and institutions. Thus, exploring the readership of these courses and examining their actual uses, naturally leads to the study of local appropriation.

This symposium aims to provide a cross-national comparative analysis of the circulation of mathematics through a variety of mathematical courses written during the 16th to 19th centuries.

The mathematical course *Elements of Mathematics* by Benito Bails (1731-1797), an original example of the circulation of European scientific knowledge in 18th century Spain

- Domingo Martínez Verdú, University of Murcia

Abstract: The mathematical course *Elements of Mathematics* by Benito Bails (1731-1797), an original example of the circulation of European scientific knowledge in 18th century Spain. Domingo Martínez Verdú The Spanish mathematician Benito Bails (1731-1797), born in Sant Adrià de Besós (Barcelona), published (1779-1799) his mathematical course *Elements of Mathematics*. This work composed of 11 volumes, of which the first three were devoted to pure mathematics and the remaining ones to mixed mathematics, see [Martínez-Verdú, 2022]. Bails introduced in the *Elements of Mathematics* the currents of the European mathematical thought of the time, being textbook of reference in military Academies and civil Institutions. Bails carried out a process of selection, extraction, active appropriation, adaptation and enlargement in order to compose his course from the best and most updated European works, more than 150 references among which we highlight Guillaume François Antoine, Marqués de l'Hôpital (1691-1704), Gabriel Cramer (1704-1752), Leonhard Euler (1707-1783), Vincenzo Riccati (1707-1775), Jean le Rond D'Alembert (1717-1783), Étienne Bezout (1730-1783). As an example of Bails' work, he presented one of the most complete mathematical developments of logarithmic calculation methods of his time, by using the infinity through infinite series, see [Martínez-Verdú, Massa-Esteve and Linero-Bas, 2023]. The aim of our article is to demonstrate that the *Elements of Mathematics* were an original example of the circulation of knowledge, to conclude that Bails played a key role as a disseminator of European scientific and technical production during the eighteenth and early nineteenth century not only in Spain, but also in Spanish America.

Courses and curricula: two mathematical traditions in mid-18th century Portugal

- João Caramalho Domingues, CMat, Univ. Minho, Portugal

Abstract: Courses and curricula: two mathematical traditions in mid-18th century Portugal João Caramalho Domingues In the 1750s and 1760s, in Portugal, mathematics was taught mainly in two types of school: colleges (mostly Jesuit, until the Jesuits were expelled in 1759) and military schools. Although there was much overlap between the subjects taught in the two types of school, the textbooks adopted tended to be different: the military systematically followed French authors (Lamy, Ozanam, Bélidor), while the Jesuits and their successors used or took inspiration from several European writers, particularly (in this period) Christian Wolff (and especially his short *Compendium Elementorum Matheseos*). This difference in which courses were used partly resulted in, and perhaps partly resulted from, different perspectives on the organization of mathematics. Unlike the colleges, military schools had a (recent) tradition of putting algebra in the foreground, but that did not lead to the incorporation of calculus in their curriculum.

The Curso Completo de Matemáticas Puras (1827-1828) by José Odriozola (1785-1864)

- Juan Navarro Loidi, Universidad del País Vasco-Euskal Herriko Unibertsitatea;

Abstract: The *Curso Completo de Matemáticas Puras* (1827-1828) by José Odriozola (1785-1864) Juan Navarro Loidi This Course of Mathematics has four volumes. The first is on elementary geometry, the second on plane and spherical trigonometry, the third on sublime algebra and algebra applied to geometry, and the fourth on infinitesimal calculus. José Odriozola wrote it when he was separated from the corps for having supported the liberal government and the College of Artillery was closed. But it was very well received by the heads of the Spanish artillery and became the official textbook for mathematics when the College was reopened in 1830. The Course represented an important change in the teaching of artillery officers if compared to Giannini's previous course, the official text in theory until 1820, although the change is not so important if compared with the translations of Lacroix's books used in the College during the Liberal Triennium, or with the course prepared, following Lacroix, by Datoli to replace Giannini's in 1804, which remained unfinished. Odriozola takes a more theoretical approach to his course than Lacroix, "following Laplace's advice" as he says in the introduction to volume I. In general, he

draws on French authors of the early nineteenth century, and for differential calculus, in particular, he is a supporter of Lagrange's approach. These books were used in the College of Artillery for many years, and as late as 1860 the volume on algebra was still recommended.

A Minorcan Mathematical course (1803?): a particular vision on technical education

- Marta Jordi-Taltavull, Institut Menorquí d'Estudis; Santiago Vallmitjana-Rico, Universitat de Barcelona; Antoni Roca Rosell, Universitat Politècnica de Catalunya

Abstract: A Minorcan Mathematical course (1803?): a particular vision on technical education Marta Jordi-Taltavull, Santiago Vallmitjana-Rico, Antoni Roca-Rosell Pasqual Calbó I Caldés (1752-1817) was a Minorcan painter who devoted some time to mathematical education of the “young artisans of Minorca”. There is a manuscript containing the notes in Catalan of his course. At present, an edition of these notes is currently in progress. It would consist of three volumes with the transcription and studies on its context and on its contents. In this paper, we would like to offer the results of the preliminary analyses. First, the orientation of the text is practical, it avoids the non-needed theoretical statements. Second, the structure of the course, including pure mathematics and mixed mathematics, is fully in the line of most of the contemporary courses. Third, the Course included Experimental Physics, a really singular option, but not strange after 1780, according to authors as Peter Dear or John Heilbron. Fourth, the identified sources -not always cited- of the Course are contemporary Spanish authors, except for the Experimental Physics, based on the handbook of Giuseppe Saverio Poli. Fifth, several experiments are exposed that could be related to some experimental instruments preserved in the collections of Minorca. Finally, the Calbo's Course is another evidence of how higher scientific and technological knowledge circulated in the Western Mediterranean.

3 Early Modern reflections on Nature

Room: 40.047.

Chair: Milada Sekyrková, Institute of the History of Charles University and Archive of Charles University in Prague

Giordano Bruno's cosmology

- Eve-Aline Dubois, University of Namur

Abstract: This paper has the ambition to present Bruno's cosmological ideas in his historical context in regard of the conception of the infinity used in modern cosmology. At the end of the 16th century, Giordano Bruno built his philosophy during his wandering through Europe, from Italy to Germany, passing by France and England. Doing so, he developed a very personal view of the universe. Bruno defended a visionary cosmological worldview based on Copernican heliocentrism. To this (then not so well-known) theory, Bruno added a radical idea, namely the infinity of the universe. This contribution will present this hypothesis and underline its audacity in the historical context of religious wars and Inquisition. Based on the Brunian cosmological trilogy, *The Ash Wednesday Supper*, *On Cause, Principle and Unity* and *On the Infinite, Universe, and Worlds*, written during his stay in England (1583-1585), the concept of infinity as used by Bruno and his cosmological consequences, both spatial and temporal, will be studied. Furthermore, alongside infinite space, Bruno introduced the infinity of worlds, a very early precursor of the models of multiverses. Bruno's ideas, often thought as in rupture with the ones of his predecessors, will be put in front of other conceptions of the infinite universe defended during the last Middle-Age or the Renaissance, such as Nicholas of Cusa's universe or Thomas Digges's interpretation of Copernicus. Finally, the resumptions of Bruno's cosmology up to the temporally infinite universe posed by Hoyle's steady State Theory will be exposed

The Illustrations as Monuments: A Study of the Frontispieces and Title Pages of Early Modern European Planetary Tables and Star Catalogues

- Yiming Gu, University of Science and Technology of China

Abstract: As one of the earliest groups to recognize the significance of printed images, astronomers actively engaged in the production and supervision of printing and publishing of images. In the early modern period in Europe, frontispieces and title pages of planetary tables and star catalogues present a unique monumentality. In terms of content, the illustrated title pages and frontispieces of planetary tables and star catalogues tend to showcase the long-term development process of the history of astronomy across time and space; in style, the artwork is more realistic than the

contemporaneous book images filled with meanings and symbols. Starting from the 'monumentality', this paper attempts to analyze how astronomers used these images to narrate the history of astronomy development, and to delineate their own positions and contributions within it. The research suggests that the illustrations on the frontispieces and title pages of planetary tables and star catalogues serve as visual summaries of literature and reviews of academic history, which epitomize the historiographical ideas of astronomers.

4 Eugenics

Room: 40.047C.

Chair: Álvaro Girón Sierra, Milá y Fontanals Institution for Research in Humanities - Spanish National Research Council (IMF-CSIC)

Eugenics and social control in post-revolutionary Mexico

- Alicia Villela Gonzalez, Evolutionary Department, UNAM, Mexico

Abstract: In the early 20th century, eugenic ideas developed by Francis Galton became important among Mexican scientists to control population growth. Eugenics focused on rebuilding the population and lessening the effects of social ills such as prostitution, epilepsy and venereal diseases among indigenous groups. From 1900 onwards, the medical community became concerned about public health problems related to hereditary factors. Particularly the transmission of syphilis, tuberculosis and epilepsy, as well as the control natal conditions of women and chronic alcoholism. In 1910 a pamphlet was published called Hygiene of the species: brief considerations on human stirpiculture, by Francisco Hernandez and a year later, a first article on how to develop a eugenic program in Mexico for racial improvement, so it would be important to develop a sanitary policy persuading the population to be treated. It was sought to use different methods of persuasion and propaganda campaigns in public buildings, schools, theaters, markets, hospitals and other places such as cemeteries. The Mexican Eugenics Society was used to address the Mexican press in its meetings in support of the negative eugenic hygiene campaign and

although it did not have a great transcendence, only in the state of Veracruz in July 1932 was a sterilization law approved, which in practice had no effect. This project seeks to show how the interpretation of Darwinian evolutionary theory in Mexico on biological inheritance developed a eugenic explanation in line with similar arguments of the late nineteenth century that justified the social control of inferiorized populations.

Miscegenation and the Scientific Support of Portuguese Late Colonialism

- Alexandra Cabrita, Centro Interuniversitário de História das Ciências e da Tecnologia, Faculdade de Ciências, Universidade de Lisboa

Abstract: Early 20th-century scientific views on race were tied to ideas of hierarchy and racial improvement based on the field of eugenics. In this context, the shared international opinion regarding miscegenation veered toward opposing it. This was based on the idea that human races were too different, and the “mixing” of their inheritable traits led to uncertain results, potentially biologically harmful. After the Second World War, in the aftermath of Nazi atrocities, these views started to be more actively rebuked. The Portuguese scientific debate on race and miscegenation was intense. In the 1930s and 1940s, the general opinion was to oppose it despite nuances in the discourse of some scholars. However, in the decades following the Second World War and with the international pressures from the rising decolonization movements, Portugal’s dictatorial regime adopted a rhetoric that aligned with its colonial ambitions in the face of the international political environment – Luso-tropicalism. It claimed a unique way in which Portugal employed a pacific form of colonization through the exchange of cultural values, expansion of the Christian faith, and a propensity for miscegenation.

This talk proposes an analysis of how the approximation between the disciplines of anthropology and ethnology and the emergence of cultural anthropology, may have contributed to a scientific validation of Luso-tropicalism through its glorification of miscegenation. Despite a separation between physical and cultural anthropology, notions of inheritance and human evolution were present in both subfields. This may have opened way for an increased relevance of environmental, cultural and social influences in human development, in contrast with biological determinism. Considerations will be made on how anthropological studies, and a balance between

cultural, social and biological “inheritance”, may have led Portuguese scholars to consider miscegenation as beneficial for human development.

From Oxford Embryology to Julian Huxley’s Evolutionary Humanism, 1901-1936

- Stefan Bernhardt-Radu, University of Leeds

Abstract: Many in the early 20th-century thought that evolution had done a death blow to traditional religions. But in his 1927 ‘Religion Without Revelation’, Julian Huxley (1887-1975) famously thought that biological advances in the early 20th-century were the beginning of a new secular religion. My argument is that these advances were neither just in evolution nor genetics, but in embryology. I claim that at the basis of Huxley’s evolutionary humanism stood his education in embryology at Oxford. The problem for W.F.R. Weldon (1860-1906), and J.W. Jenkinson (1871-1915), Weldon’s pupil and Huxley’s future tutor, was to explain how organisms developed without recourse to preformationist theories like August Weismann’s, or to vitalist theories like Hans Driesch’s. From 1906, Jenkinson taught Huxley to think that a developed cell, rather than its development having already been preformed in its nucleus, could have developed any other way than it did: that it was, in our terms, emergent. The way any cell developed depended on its context. I show how Huxley was around the time of his Oxford education exposed to J.S. Haldane’s (1860-1936) organismal philosophy, and that he combined the notion of context-dependent cells with the idea of organisms. In 1907, he also read Henri Bergson’s *Creative Evolution*, which he likely thought that, unlike Haldane’s work, showed how organisms could evolutionarily become harmonious wholes of context-dependent cells. This biological and philosophical background is crucial to understand Huxley’s argument, since 1912, that human societies could unite in more co-ordinated organisations (bound by a unitary secular belief in science), that they could live more harmoniously with the environment, and that, strange though it may be for us, eugenics could bring global unity.

5 ‘Great scientists’ in transnational perspective

Room: 40.063.

Chair: Antonia Karaisl, Waseda Institute for Advanced Study, Waseda University, Tokyo

Galileo in China between the Seventeenth and Twentieth century: the origin and diffusion of myth about science and religion

- Xu Jun, Tsinghua University

Abstract: In 1942, the Italian sinologist and Jesuit Pasquale M. D’Elia (1890-1963) reconstructed the history of Galileo's correspondence with the Jesuits in China during the Ming and Qing dynasties, showing that the dissemination of scientific information between Europe and Asia was very rapid in the early seventeenth century, and that Galileo's trial in 1633 had a direct influence on the limitation of the Jesuits to publicly recognize Copernicus in China afterward. While the historical writings about Galileo and his trial by Chinese scholars can be traced back to Ruan Yuan's Chourenzhuan "Biographies of astronomers" in the 19th century, after which scholars in different fields, such as Fang Hao (historian and Catholic priest), Jiang Daoyuan (Catholic priest), Zhou Hsu-liang (translator of literature), Xie Junmin (physicist), and Yan Dunjie (historian of science), were all involved in introducing Galileo to China. However those literature haven’t been studied in a systemic way and we have limited knowledge about the reception of Galileo and his science and myth in China. Waving the social and cultural memory, identity theory, this article has showed the historical and scientific myths about Galileo were largely shaped along with the Chinese intellectuals and public’s identities about “science,” “philosophy,” and “religion”. But once these concepts have become common in Chinese, their demarcation and meanings does not necessarily follow the original map in the West. This paper thus proposes an interpretation of the circulation and barriers to the global circulation of knowledge based on a memory and identity perspective, and suggests that the history of science and religion needs more non-Western case studies to help us understand how ordinary people think about the world, their lives, and themselves.

The Myth of Joseph Priestley in America

- John Powers, Virginia Commonwealth University

Abstract: In the Summer of 1874, a group of chemists descended upon the town of Northumberland, Pennsylvania to commemorate Joseph Priestley's discovery of oxygen a century earlier. They met in the place where Priestley settled after his departure from England and, in the minds of the gathered chemists, brought modern chemistry to America. This paper will examine the origins and reasoning behind this commemoration of Priestley, specifically how Priestley was portrayed as a founder of American chemistry at a time when American chemists were constructing a professional identity for themselves both in relation to other scientific disciplines in the United States and in trying to compete with European chemical institutions. I compare this myth of Priestley as founder of American chemistry to Priestley's experiences in America as an immigrant (c. 1794-1804) as documented in the historical record. While Priestley wished to continue his defense of the phlogiston theory (against Lavoisier's «antiphlogistic» chemistry built around oxygen), he found that by the 1790s even the provincial, American chemists had embraced the new chemistry and were eager to rebuff his claims and arguments. Thus, the Priestley commemoration in Northumberland in 1874 was an invention, created to suit the professional needs and disciplinary narratives of that time and place.

Gernsback's Tesla: How the father of American science fiction published Nikola Tesla's autobiography

- Ivan Flis, University of Rijeka

Abstract: “[Y]ou seem to lose sight of the fact that we are trying to build you a monument by publishing these articles,” pleadingly wrote Hugo Gernsback, the editor of the magazine *Electrical Experimenter*, to Nikola Tesla on September 8, 1919 as he was trying to persuade the aging inventor to continue cooperating with his magazine. Gernsback failed in persuading Tesla, but what they did manage to publish still haunts the memory cultures that clashed over Tesla's legacy in the US, Yugoslavia, Serbia, and Croatia in the 20th century. The six texts admixture personal anecdotes, showcases of devices, philosophical and political speculation, Tesla's vivid descriptions of his mental life, and discursively construct the scientific persona of an inventor. Gernsback's magazine, as a platform, represented a new type of medium, a publication that built a community of readers around it who shared specific interests (radio amateurs, hobbyist electricians, and budding inventors). In a sense, it was a

magazine with a fandom. In editorial genealogy a descendant from Gernsback's electrical supplies mail order catalogue and a predecessor of the magazine *Amazing Stories*, the *Electrical Experimenter* cut across genres, offering to its audience long reads on scientific topics, interviews with famous "electricians," fictional short stories that would later be called science fiction, letters-from-the-readers sections, patenting advice columns, and a tsunami of ads for self-improvement. In this paper, I will historicize the autobiographical texts in their original paratextual context of Gernsback's magazine on one hand, and on the other in Tesla's attempt to rehabilitate his neglected scientific reputation. Against the grain of professionalizing American industrial laboratories and inflecting the sensationalist press hungry for fantastic pronouncements of new technological progress that would change the world, Gernsback's Tesla articulated a conflicted legacy as a "man of science" and an unhinged futurist.

6 Historiography of the human sciences

Room: 40.010.

Organiser: Annette C. Mülberger, University of Groningen; Lisa Malich, Universität zu Lübeck

Chair: Annette C. Mülberger, University of Groningen

Sarton presented History of Science as the study of the development of science. Like a living organism, he argued, science grows and unfolds itself. Moreover, did he argue that the development of each science should not be studied separately. "All the sciences together", was his historiographic call, because they grow together and mingle continually in innumerable ways (Sarton, 1916, p. 322). Despite the global scope of his call, for many decades historians of science have worked mainly on the history of the "natural sciences", outlining milestones dealing with topics related to astronomy, physics, chemistry and biology. Within the history of science and despite

the more interdisciplinary (social techno-scientific) approach of today's historiography, there is still a tendency to prioritize certain histories over other kinds of research, professions and perspectives. Looking up any entry on history of science usually leads to selection of material and topics, that tries to be broad and embracing, but always excludes "some other". Given such a historical neglect, many fields still pursue today their historical research within specific professional communities. Some examples are the associations and the societies uniting historians of medicine, education, psychology and other so called "social" or "human" sciences (ESHHS, ISCHE, etc.). But can the narratives and techniques of the historiography of the natural sciences - if there ever was "the one historiography" - simply be transferred to the humanities and clinical sciences?

The organizers of this symposium (discussion forum) feel that there is currently not enough critical reflection on historiography in the history of science(s) in general and on its boundaries, in particular. There still exists a gap between the different historiographic trends and disciplinary traditions which have not been sufficiently addressed and discussed. The question is not only how we should write the history of science - for example as institutional history, entangled history, gender history, actor-network history - but also which differences between disciplines and in the field of applied sciences become relevant. Thus, the session wants to trigger a broader discussion on the topic. Four historians stemming from different (traditionally marginalized) disciplinary and institutional background will give their view on current trends and on the different ways of dealing with more and less common historiographic challenges. The talks are planned as short overview ending with (provocative) statements or questions to be discussed.

Microhistory yesterday and today: A critical assessment

- Annette C. Mülberger, University of Groningen

Abstract: Microhistory offers unique possibilities for historical research, but it is also has some problems and limitations. It is a kind of research that started with Ginzburg's and Levi's path-breaking microhistories in the 1970s and 1980s. The pre-fix "micro" is explained by Levi using the technical metaphor of a "microscope". It puts into the hands of the historian a tool that promises a new vision into the underlying dynamics within human society. To what kind of insight does such a microscopic view lead? Levi's *Inherited Power* (1985) showed the economic trades of a village in the Piemonte region in 17th century Italy. His inquiry, although very much focused on a small locality, was highly ambitious, aiming at answering one of the big historical questions about how society changed from the Old Regime to the nation state. His book addresses the topic of human rationality, an interpretation that is linked to his general conceptual framework and the contextualization he makes of the case. Since the 1980s, the historiography of the sciences has changed, but the micro level is still a dominant research style. Together with the limited focus, also the geographic and metaphorical "locality" and "regionalization" of scientific practice have become relevant. Livingstone's work (2003) contributed, together with others, to the "spatial turn", linking historiography to geography. After commenting on the differences between Levi's and Livingstone's works, I will use a present day (practical) research in the field of psychology to point out some methodological problems and expose the reasons why I consider microhistory a useful tool.

Histories of education: historiographic perspectives on educational science, policy and practice

- Christian Lundahl, Örebro University

Abstract: The field of educational science displays some specific features that are closely intertwined with temporal and spatial contexts, historical and educational knowledge, the need for reform, and scientific self-reflection. This paper investigates the impact of various contextual factors on the history of educational science in Sweden, covering the period from the 1910s to the 2020s. In the early 20th century, the first education professors primarily came from backgrounds in psychology and philosophy. Their scholarly work focused on exploring the historical evolution of educational thought, delving into influential figures such as Descartes, Rousseau, The Jesuits, and various teaching and learning practices. This early historical discourse played a key role in legitimising education as a structured domain of knowledge with a rich tradition.

Another notable aspect of historiography in education arose concurrently with the comprehensive school reforms of the mid-20th century. The story that enveloped these reforms, particularly in the 1970s and 1980s, was closely tied to the idea of 'social engineering' in education. This branch of historiography aimed to corroborate the reforms and the ever-growing nexus between educational science and policy. Over the subsequent decades, there was a rising interest in education within the History faculty, with a focus on micro and social aspects. However, there was little attention paid to the role and development of educational science. Currently, there is a new approach to the history of educational science that can be seen, encompassing its knowledge production from both a global, transnational perspective and a social constructivist viewpoint and thus introducing a self-reflection both in educational science and historiography.

‘He was notorious among the female employees.’ On challenges of avoiding a history of psychological psychotherapy in Germany (1960s-1990s)

- Lisa Malich, Universität zu Lübeck

Abstract: How can gender be integrated into the historiography of psychology and psychotherapy? The historical relationship between psy-knowledge and gender categories is complex. Early on, psychology was considered a women's domain at universities, and psychotherapy was often practiced by women. However, professorships and leadership positions were predominantly held by men, reflecting the gendered power dynamics in academic institutions. With this in mind, I would like to discuss the challenges of considering the category of gender in my own research on the history of psychotherapy. By analyzing the history of psychotherapy at the Max Planck Institute of Psychiatry in Munich between the 1960s and the 1990s, I focus on a central scientific institution that has decisively shaped the research and practice of psychotherapy in the German-speaking world. Examination of this history reveals a remarkable imbalance of sources, with extensive records of male actors in publications and personnel files, while little survived about female actors, who were often relegated to subordinate research positions. The analysis of sources documenting mainly the perspective of men reveals three dominant characterizations of women: a) as civilizers and caretakers of scientists; b) as secretaries; c) as victims of sexual harassment by other scientists. In my talk, I will address these characterizations and highlight the challenge of addressing the historiographical absence of women. The overarching question is how to deal with this gender gap in the sources to gain a comprehensive understanding of the history of psychotherapy without repeating a male-centered his-tory.

Human evolution and human history are the same thing”: John Dupré’s claim and the historiography of psychology

- Henderikus Stam, University of Calgary

Abstract: Although the founding figures of the discipline of psychology had certain misgivings about the nature of the experimental enterprise, they sought to find some expression of their psychology in a broader conception of human being whose full potential is found in its capacity to live as social creatures. Subsequent generations however did not share these hesitations and built an experimental science of the individual and her functional capacities embedded in a biological framework whose most enduring and endearing qualities could all be reduced to natural, functional categories. I want to address this divide using John Dupré’s claim as a springboard, namely “human evolution and human history are the same thing.” What is evolution/nature in this case and what is history that it can bear the burden of such a broad claim? I will take Dupré’s claim to task by examining what psychology has lost by not taking seriously the historical nature of human existence. Simultaneously I ask if we can, in that light, examine just what kind of science psychology was, is, and could be. This requires a serious examination of such problems as human practices, our lingual and linguistic capacities and our narrative containments.

7 Knowing, Protecting, and Saving the Earth: Exploring Materials, Earth History, and a Sustainable Future (2/2)

Room: 40.012

Organiser: Christopher Halm, Deutsches Museum Munich / University of Regensburg, Germany; Marcin Krasnodebski, Instytut Historii Nauki PAN Warsaw, Poland; Brigitte Van Tiggelen, Science History Institute, USA

Chair: Ernst Homburg, Maastricht University, Netherlands

Commentator: Annette Lykknes, NTNU Trondheim, Norway

The chemical, molecular, and material sciences are grounded in practical learning and experimentation. Throughout history, humans have interacted with and modified the physical and organic world, gaining a profound understanding of matter and life over various time scales. Knowledge has empowered us to exert significant influence over our environment. However, this power entails great responsibility and has given rise to ecological sensibility. In the field of chemistry, for example, the emergence of Green Chemistry, Environmental Chemistry, and Sustainable Chemistry are prominent examples of how ecological awareness has permeated policies, industries, and research. Further scientific spin-off disciplines have developed while our awareness of anthropogenic impact has either increased or been challenged.

Our session aims to investigate the connection between knowledge and environmental preservation in engineering, life, earth, and material sciences, often employing chemical and molecular methodologies. We invite scholars to submit papers that examine examples of implicit and explicit interactions between scientific research and sustainable thought in the last 400-plus years. This spans a wide array of branches and subfields within industry and science: geology, petrology, hydrogeology, palaeontology, archaeology, climatology, soil science, mining, botany, forestry, and other subfields interconnected with environmental research.

The symposium is organized by Christopher Halm, Marcin Krasnodebski, and Brigitte Van Tiggelen and is sponsored by the Commission on the History of Chemistry and Molecular Sciences (CHCMS) and the Working Party on the History of Chemistry of the European Chemical Society (EuChemS).

Mandating Greenness: History and Epistemology of Green and Sustainable Chemistry Codifications

- Marcin Krasnodebski, Instytut Historii Nauki PAN Warsaw, Poland

Abstract: The famous 12 Principles of Green Chemistry formulated by Anastas and Warner in 1998 serve today as a benchmark that good green chemical research, mindful of the planet, its resources and its environment, should strive for. They trace the perimeter of the discipline, set the direction of future research, and are the baseline didactic tool for chemistry students interested in sustainability and the place of chemistry in addressing environmental challenges. In this, however, they are not

unique. The 12 Principles are representative of an entire host of guides, rulesets, and codes that emerged over the last three decades and strive to make chemical research more sustainable, e.g. 9 rules of production-integrated environmental protection and waste management (1999), additional principles of green chemistry (2001), 12 Principles of Green Engineering (2003), 12 principles of CO₂ chemistry (2015), 12 principles of circular chemistry (2019) and guidelines for chemistry in circular economy (2020). These are just the tip of the iceberg of similar codifications that complement, extend, override, compete with, or are independent of Anastas's and Warner's ruleset. What are they exactly from an epistemological point of view? What is their purpose? What is the source of their popularity? This paper is an attempt to sketch some tentative answers to these questions and offer a more cohesive understanding of this new phenomenon.

Sustaining the Earth: Cold War Transnational Conferences of Women in Science and Engineering

- Graeme Gooday & Emily Rees Koerner, University of Leeds, England

Abstract: Faced with the calamitous prospect of science and technology driven increasingly by militaristic arms race agendas, from the mid-1960s women's S.T.E.M. organisations around the world instead pursued a collaborative peaceable policy focused on science for human and planetary well-being. This was epitomised in the International Conferences for Women in Science Engineering that have run every 3-4 years since the first such in the USA in 1964, organised with support from the US President who sought to embolden American plans to draw on women's labour power to win the Cold War. The second such conference held in the UK in 1967 was organised much more globally and irenically by women scientists and engineers in France, Italy, Japan, Philippines, Egypt, Syria as well the UK and USA. Attended by women (and some men) from both sides in the Cold War, that second conference focused not only on women's globally shifting position in STEM subjects, but also gave them opportunities to showcase earth-centred science as applied to sustainable food supply and land management. For example, Pakistani microbiologist Umrana Ahmed (PhD Leeds) discussed multiple techniques for preventing food waste and spoilage; Ghanaian Botanist Letitia Obeng (PhD Liverpool) analysed how artificial lake environments of hydroelectric plants could nurture responsible fish farming for

newly-independent African nations, while Ms K Saruhashi led a delegation of eight Japanese women scientists with extensive expertise in marine life management. Overall these women's approaches showed how transnational conferences could create a global platform for sciences of human-environment sustainability.

Sustaining the Moon: The Chemistry Behind Concepts of Lunar Habitation and Cosmic Age

- Christopher Halm, Deutsches Museum Munich / University of Regensburg,

Abstract: Commencing with the analysis of lunar samples, the quantitative examination of the Moon's chemical composition and the dating of lunar materials have been integral to both our understanding of and our envisioned interaction with the Moon. The field of selenology and cosmochemistry reached its heyday in the 1970s, buoyed by financial support and media attention, leaving behind a lasting legacy. This paper scrutinizes the enduring significance of chemical analyses of lunar soils and rocks, particularly in the light of contemporary plans for lunar habitation and cultivation, encompassing potential utilizations of lunar regolith for forming bricks or in the use of 3D-printing. Intrigued by KÄRIN NICKELSEN's and DAVID MUNNS' (2021) assertion that early spaceship research gave rise to ecological awareness and holistic conceptions of life before the environmental movement, this paper investigates the implicit role of sustainability in post-Apollo era chemical investigations of lunar materials. Moreover, beyond the lunar challenges of resource scarcity and extreme conditions, this presentation ponders how the analytical gaze on extended time frames has shaped an awareness of eternity and impermanence of our cosmic surroundings.

8 Nuclear Science and the Cold War

Room: 40.101.

Chair: Daniela Monaldi, York University

Forging Alliances and Building Diplomatic Paths: Thailand's Atomic Diplomacy, Science, Strategy, and Resilience in the Cold War (1950s-1980s)

- Kwanchanok Kittiwonich, Chiang Mai University, Thailand

Abstract: This study delves into the intricacies of science diplomacy in Thailand during the Cold War era, specifically focusing on atomic diplomacy from the 1950s to the 1980s. In contrast to prevailing narratives of USA-Americanization within Thai Cold War policies, which often portray Thailand as a passive recipient, this research elucidates how science diplomacy influenced Thailand's strategic positioning and shaped its interactions with wartime allies' decisions. It focuses on the significance of science diplomacy from Eisenhower's "Atoms for Peace" policy to the 1978 Nuclear Non-Proliferation Act in maintaining Thailand's diplomatic posture, characterized as "bending with the wind" akin to the resilience of bamboo, amidst the dynamic landscape of world affairs, aiming for flexibility and adaptability. Drawing upon analysis of archival materials and primary sources from the National Archives of Thailand, the Office of Atoms for Peace, and the Ministry of Foreign Affairs, this study reveals Thailand's strategic evolution in science diplomacy across four distinct phases. In the 1950s, Thailand utilized science diplomacy to safeguard its independence and foster alliances with the United States, while concurrently engaging in scientific collaboration, particularly in atomic information sharing, with the Soviet Union and China. Subsequently, in the 1960s-1970s, Thailand integrated atomic diplomacy with economic development efforts and counteracted communism, marking a transition towards leveraging science diplomacy for both national security and socio-economic advancement. By the 1980s, Thailand had further integrated atomic diplomacy with economic development and solidified its position within the East Asia Miracle. Each phase reflects a strategic recalibration of Thailand's diplomatic approach, shaped by both domestic imperatives and international exigencies. Through a transnational lens, this study illuminates the dynamic interplay between science, diplomacy, and national identity, shedding light on Thailand's nuanced diplomatic maneuvers in response to Cold War geopolitics.

Plutonium's phantoms: The Palomares nuclear accident (Spain, 1966) in the setting of international standards for radiological protection

- Clara Florensa, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC), Barcelona

Abstract: In the mid-1960s, while the effects of high doses of radiation were well recognized and understood, long-term, low dose radiation exposure—the most likely

exposure for more people—was not. Meanwhile, growing numbers of workers were exposed to low-doses of plutonium, and public concern about environmental contamination with this element was raising. “The plutonium problem”, labelled as such, was considered to have high priority. The technology for the in vivo measurement of plutonium, however, was only in its initial phase. Several laboratories were working on its detection to deal with cases of internal contamination, usually in the lungs. The attenuation of the detectable emissions from outside the body depended on the chest thickness of the subject, and this varied from person to person. To solve this problem, the idea was to calibrate the detection instruments with so-called phantoms. These devices, essentially dummy human bodies, would imitate the structure, shape, and measures of the “standard man” as well as the texture of the body tissues, the lungs and the chest tissues surrounding them. Several of these phantoms were designed at the time. But each laboratory used self-made instruments, and calibration methods, leading to non-comparable data. A “worldwide reference standard for in-vivo counting” of plutonium was of great need and urgency. A race to set it started. The aim to control calibration standards in Europe was part of a bigger fight for hegemony worldwide embedded in the Cold War dynamics, in which the US sought to dominate the “Free World” through science. In this paper, I provide a first step towards a history of the plutonium’s phantoms through analyzing the role the Palomares nuclear accident (Spain, 1966) played in the process to establish the Lawrence Livermore National Laboratory phantom as the so-called “Free World's standard phantom”.

Miniature Canvases of Nuclear Discourse: Unveiling Cold War Science Communication Through Greek Stamps

- Loukas Freris, Friedrich-Alexander-Universität Erlangen-Nürnberg

Abstract: In exploring the intricate realm of science communication during the Cold War era, this paper delves into an unconventional prism—the depiction of nuclear science on Greek stamps from the 1960s. While examining the modest envelope and postage stamp, often overlooked in their significance, I propose a profound understanding regarding the representation of science within a specific socio-political context. These diminutive government artifacts, meticulously designed and circulated under state supervision, serve as carriers of succinct messages that

transcend their size. Embedded within these miniature canvases are messages of national cultural identity, influencing citizens and shaping a country's international image. Through an analysis of two stamps issued in 1961 to commemorate the official opening of the Greek Nuclear Research Center, I contend that these seemingly inconspicuous pieces of paper provide a unique lens through which the Greek authorities communicated their scientific achievements. Within the subtle imagery and symbolism, one discerns the Greeks' pride in nuclear advancements, their entry into the International Atomic Energy Agency, and the aspirations of Greek scientists to rekindle national scientific prowess and revive the echoes of ancient glory. The Science Communication prism, thus, refracts insights into the nuanced ways in which scientific achievements are portrayed and perceived through the unassuming yet powerful medium of postage stamps.

9 Paraobjects: Writing History through the Margins of Natural History Heritage

Room: 40.109.

Organiser: José Beltrán, CNRS, France; Nathalie Richard, Le Mans Université, France

Chair: José Ramón Marcaida, CSIC, Spain

Historians of science have perhaps never paid as much attention to objects and to the materiality of knowledge as they do nowadays. And yet artefacts often still remain elusive historical sources. This is particularly true for natural historical heritage. What can we do, as historians, with a stuffed chimpanzee, a dried fern, a pickled fish, or a fossil bone? What can we do with century-old specimens when they are preserved for their value to today's natural sciences at the expense of their historicity? How can historians even find their way in the institutions that care for natural historical heritage in cases in which these are not designed primarily to be historical repositories? One way to address these questions is through "paraobjects". With this neologism, we designate what surrounds museum artefacts: boxes and flasks, labels and wrapping material, display cabinets and bases... Like paratexts to texts, paraobjects also shape the ways we use, preserve, and understand specimens—just as they did in the past. They offer, in other words, a key point of

entry for historians to interrogate the social, cultural, economic, and political lives of specimens.

This panel is the third public installment of the project “Paraobjects: Natural Historical Heritage through the Margins,” launched in the framework of the MSCA project SCRIBSCIE (“Scribal Science: Naturalists’ Paper Empire in France, ca. 1660-1770,” 2019–2022). In collaboration with the RISE project SciCoMove (“Scientific Collections on the Move: Provincial Museums, Archives, and Collecting Practices (1850–1950),” 2021–2025), it brings together historians who deal with paraobjects as historical sources and reflect on the possibilities and the challenges that natural historical heritage presents to the writing of history.

Peripheral Heritage as Historical Sources in Natural History Museums: Introductory Notes

- José Beltrán, CNRS

Abstract: The aim of this presentation is to offer an overview of the main possibilities and challenges that “paraobjects” offer to historians as a way to better understand and value specimens’ historicity. From a historiographical, a methodological, and an institutional point of view, the time is ripe to do so. Debates about restitution currently urge historians of collections to tell more complex, less triumphalist stories of the heritage in Western museums. Provenance research or the history of the book and of information have recently reminded us that there are ways to do so through non-narrative sources, which sometimes help us circumvent the biases of more traditional documentation. Digitization and the lack of storage space force curators to think fast and hard about what is lost when collections are revamped. For historians, time is pressing, as a matter of fact. Past paraobjects are essential traces of past knowledge practices, sometimes the only ones to reconstruct the lives of a specimen. Yet they remain often neglected as curious without scientific value or accessories to be replaced by more efficient conservation devices. Worse yet: since paraobjects are rarely accessioned in natural history museums (as in many other sort of museums, for that matter), they lie in a dangerously ambiguous legal and patrimonial status. It is, we believe, through historical research that we can highlight not only the value of paraobjects as sources but also of specimens’ historical dimension.

Tied with Wire: The Stability of the Temporary in the Case of Pedro de Angeli's Fossil Mammal Collections, Buenos Aires in the 1840s

- Irina Podgorny, CONICET and Universidad Nacional de La Plata

Abstract: In this paper I will present the results of my research on the collections of South American fossil mammals that were sold or donated to different European museums in the 1830s and 1840s. Some of these pieces integrate the skeletons that are still exhibited today in London, Berlin or Paris. Others, however, remain in their boxes in the state in which they were sent, revealing the ways in which they were prepared and packaged, an aspect that complements the information provided in the letters written in the context of these transactions.

“CL”. About a Tag and Specimens on the Move

- Nathalie Richard, Le Mans Université

Abstract: In many collections of prehistoric artefacts around the world, from Mexico City to Buenos Aires, from Paris to Barcelona and Neuchâtel, specimens carry a similar tag. In this communication, I argue that this tag fits well the definition of a "paraobject" put forward by José Beltrán. The "CL" tag is an object which is distinct from the specimen but comes with it. It gives information that is not given by the specimen itself, especially on its history and past moves. Based on research in the collections and archive of different institutions in Latin America and Europe, this paper will first explain what the capital letters "CL" stand for. It will analyse the specific scientific background that justified the travels of specimens carrying such a tag from France to many institutions abroad, as well as the various social and material contexts in which these travels took place. In accordance with one of the main research hypotheses in the EU project SciCoMove, my paper will exemplify that the circulation of scientific specimens was not a one-way process from non-Western "exotic" countries to the Western museums, but that collections also travelled the other way round.

10 Replicate, Renew or Innovate? Historiographical Foundations and Methodological Reflexivity for the History of Science (2/2)

Room: 40.008.

Organiser: Lluís Coromina Verdaguer, Universitat de Girona; Anxo Vidal Nogueira, Universitat de València

Chair: Lluís Coromina Verdaguer, Universitat de Girona

Commentator: Julen Ibarburu Antón, University of Granada

In this panel, we reunite researchers to reflect on the production of historical knowledge and the potentials and limitations of the approaches and methods currently employed in the history of science. Our framework is the broader discussion surrounding the utility of historical works in science, technology and medicine, and their implications for reconsidering and assessing the co-construction of humanity and nature. When approaching a historical investigation, a tension arises between the challenge of creating a new knowledge and the (imperative) need to draw on and engage with previous works, more or less directly related to the topic at hand, sometimes in a pretentiously innovative manner. Consequently, we find ourselves at a crossroads between replicating methods and approaches that have proven effective in the past, seeking a renewal of these, and/or proposing an innovation that contributes different perspectives or results. We seek to engage in a fruitful (and needed) historiographical and methodological debate around these tensions.

Since the goal of this symposium is to create a space for historiographical and methodological debate, we have contributions with different scales of study, diverse approaches and methods —intellectual (Fabrizio Bigotti), social (Julen Ibarburu), material culture (Anxo Vidal, Lluís Pascual), oral (Sofiya Kamalova), economic (Rafael Pérez-Jiménez, Lidia Aguiar-Castillo, and Francisco Quintana-Navarro), and political-cultural (Pau Font)—, and with a diverse panel of speakers with different academic backgrounds, career stages, and universities. Some of the general questions that will be treated for sure on the panel are the following: The replication of approaches and methods: Does it contribute more than a stagnant repetition? Are they suitable for a reshaping of the initial responses and contribute to a broader vision? Renewal efforts: Are they replications disguised as new approaches? Innovation: Is it advisable, or, indeed, possible?

Beyond Archives: Unveiling Untold Narratives through Oral History in the History of Science

- Sofiya Kamalova, University of Valencia

Abstract: Oral History redefines the landscape of historical inquiry within the history of science by introducing a novel approach to research methodologies. Employing oral history methods the historians of science could critically examine the production of historical knowledge and challenge established paradigms. In my research I document the voices of individuals involved in Ardystil Case an industrial poisoning at airbrushing textile factories that occurred in Alcoy region (Spain) in 1990s. I would use oral history interviews I conducted to show how they allow to contrast opinions of two different groups: people who had personal experience with the occupational poisoning and expert who performed epidemiological and toxicological studies as part of public health monitoring. Embracing oral history as a central tool enables the construction of a richer historical narrative by amplifying the narratives. Traditionally the concept of oral history facilitated the excavation of hidden histories by providing a platform for voices that have been marginalized. However Oral History goes beyond this idea. A more innovative use of oral history invites to embrace a more democratized view of knowledge production by challenging the role of experts. It is important to acknowledge the challenges associated with oral history methods, including issues of memory, subjectivity, and potential bias, and explores ways to navigate them effectively. Despite it challenges, Oral History allows to construct a more accurate and representative historical narrative, engaging with a broader spectrum of voices to promote a more inclusive and diverse approach to historical methodologies.

Well, Clarice, have the objects stopped screaming? About the possibilities of the material culture as a historical source

- Anxo Vidal Nogueira, University of Valencia

Abstract: Sometimes it is difficult to differentiate academic jargon from the words of a psychopath. When it comes to the material culture field —where not-no-so-new approaches try to develop new forms of studying and displaying objects— it is even harder. It is not unusual to read calls to “let the objects talk” or “hear what the objects have to say”. But what do these words mean? Even though they may sound crazy,

they point out an interesting topic within the history of science. In this paper I will explore a historiographical tension around the use of material culture in the history of science research, which consists in the ambivalence of the material culture both as a method and a theme. The debate is summarized in the next two possibilities: to do research about the objects or to do research with the objects. The two options are usually defended by two differentiated group of intellectuals, respectively: those from the academic field, and those from the museological world. Within this framework I will present the pros and cons of the two options, paying special attention to the promises and pitfalls of the application of the Winterthur model to the material culture of science. Finally, I will reflect on my current work, centered in recuperation, study and musealization of the material culture of Physics in the Universidade de Santiago de Compostela, and the possible coexistence of the two approaches.

11 Science Diplomacy: searching for a deeper past (3/3)

Room: 40.152.

Organiser: Daniel Gamito-Marques, Department of Applied Social Sciences, NOVA-FCT; Lif Lund Jacobsen, Natural History Museum of Denmark

Chair: Sam Robinson, University of York

This 3-part symposium organized by the Science, Technology and Diplomacy (STAND) Commission promotes a historical and historiographical deepening of reflections on the role of science and technology in international relations. Across multiple geographies and historical times, international negotiations on responses to transnational health crises, technoscientific standardization and collaboration, and geopolitical power politics have affected human and physical environments. These themes are neither recent nor isolated from other critical spheres of global politics and scholarly research. This symposium intends to stimulate an exploration of science diplomacy's deeper and complex past, problematizing the current characterization of science diplomacy as a post-World War 2 phenomenon and proposing novel connections between histories spanning various periods and disciplines. Each part of the symposium is devoted to a general theme in the deeper history of science diplomacy.

Part 3: Negotiating science and technology for colonial and imperial purposes. This symposium analyzes how different scientific and technological initiatives were utilized as instances of informal or formal diplomacy to produce and reinforce asymmetries of power between European colonial powers and colonized territories and peoples, and how these imperialist relations persisted after the latter attained independence.

Scientific missions and colonial diplomacy: Portuguese expansionist strategies during the early Scramble for Africa, 1877–1890

- Daniel Gamito-Marques, Interuniversity Center for the History of Science and Technology (CIUHCT), NOVA School of Science and Technology (NOVA FCT)

Abstract: In recent decades, historians have criticized assumptions on imperial omnipotence, showing that although responsible for producing inequality and disseminating brutality, empires were contingent and unstable. This is especially true of colonial empires, in which underfunded administrations and limited personnel exercised restricted control on colonial ground, with the use of force being an extreme option in a long history of diversified interactions with natives. Local negotiations were often more important for the construction of colonial empires than metropolitan policies. In this communication, I analyze Portuguese scientific missions to Africa from 1877 to 1890, in which its leaders also played diplomatic roles, engaging in negotiations with African rulers on behalf of the Portuguese Crown. These agents not only produced geographical, geological, and anthropological knowledge, but also agreements that formalized political alliances, preferably in unequal terms by including sovereignty transfers to Portugal. Such documents served important functions in Europe, where they could be presented as proof of the occupation of particular territories on African soil and used to block the expansion of rival colonial powers, namely in international conferences that gathered representatives of various European colonial interests. In this communication, I analyze in more detail the colonial negotiations during the Berlin Conference of 1884–1885 and the diplomatic strategies pursued by the Portuguese delegation.

Science, Technology, and Mediterranean Integration/Disintegration: Maritime Infrastructures and Borders

- Lino Camprubí, University of Seville; Ada Ferraresi, University of Seville

Abstract: As a semi-enclosed sea, the Mediterranean is unique for assessing the place of science and technology in the making and unmaking of imperial alliances and borders in maritime spaces. In the last 150 years, maritime infrastructures, submarines, and resource anxiety have transformed old anxieties about sovereignty, piracy, and security in that sea. While before WWI only a handful of nations set limits between 3 and 6 nautical miles, and only one was claiming 12, about 16 Mediterranean countries were already asking for 12 nm during UNCLOS negotiations in the early 1970s. A triggering factor for this process of marine territorialization was decolonization: The Mediterranean ceased to be a European Sea through which metropolises controlled their North African and Middle Eastern interests. Focusing on telegraph cables between Italy and Libya, this paper tackles three interconnected questions: 1. What was the role of imperial diplomacy in enabling submarine cables in the interwar period? 2. As Mediterranean empires retreated, what was the place of technology and technological promises in the process of territorialization? 3. What does maritime territorialization mean for the usual decolonization narrative?

Data for fading empires? Sketching the deeper past of research data diplomacy

- Simone Turchetti, University of Manchester

Abstract: We have now entered an age of data overload fueling a number of planetary concerns including heightened surveillance, invasive predictive technologies, and even scientific uncertainty in tackling global warming. Yet, while the current data deluge might be new, international organizations administering data in general, and scientific data more specifically, have been around for no less than a century. In turn, this elicits important research questions, namely: why, when and how did research data become a focus for the work of international research agencies? Who did pioneer these international coordination efforts? This paper attempts to sketch a narrative situating the deeper ancestry of international research data coordination in the first three decades of the 20th century. There are studies already emphasizing this early coordination as an important example of what we call today science diplomacy. This paper attempts to further enlightening on the global economic and political drivers of this coordination in a key phase of the colonial era

that urged imperial powers to consider joining forces in a variety of areas of shared interest especially at the end of World War One. I show in the paper how these efforts extended to the sciences too hence creating the diplomatic synergies for propelling data coordination at the international level.

Technical assistance, overseas development and ‘ex-colonial types’: The British Council’s science initiatives in the imperial spheres

- Alice Naisbitt, Centre for the History of Science, Technology and Medicine (CHSTM), University of Manchester

Abstract: There were “plenty of ex-colonial types” in the British Council, Brian Vale, Ex-Assistant Director General, reflected decades later. Vale, previously a member of the Colonial Service himself, highlights how the British Council became an institution which facilitated continuities in the ‘ideas, practices and people’ across the rupture of independence (Hodge, 2010, 43). Founded in 1934 as a cultural relations organisation, The Council underwent a significant shift in the 1960s when the introduction of Overseas Development Administration (ODA) funding repositioned it as an agent of postcolonial overseas aid; allowing for their science initiatives to increase in size and scope. The literature on postcolonial overseas development has shown how Britain’s aid programme and technical assistance was rooted in its pre-1945 colonial history (Aden, 2011) (Krozevski, 2015). But the Council’s place within these infrastructures of development has not been unpicked. This paper positions the Council as an agent of science diplomacy and highlights how the Council used such initiatives, which focused on the build-up of educational and scientific infrastructure in Britain’s ex-colonies, to maintain a British presence in the old imperial spheres. In Africa, the Council adapted processes of development that had been started with the Colonial Development and Welfare Acts (1940, 1945), continuing to emphasise technical or vocational education to combat socioeconomic problems. The Council’s science initiatives, more so than any of their other work, were reframed away from ‘the cultural sphere’ to help Britain manage the transition from imperial power to foreign aid donor; yet still maintain asymmetrical colonial power dynamics.

12 Science Popularization as Cultural Diplomacy: UNESCO (1946-1953)

Room: 40.113.

Organisers: Jaume Sastre-Juan, UAB, Barcelona; Andrée Bergeron, Centre Alexandre-Koyré & Muséum National d'Histoire Naturelle, Paris; & Agustí Nieto-Galán, UAB, Barcelona

Chair: Agustí Nieto-Galán, UAB, Barcelona

This session, which gathers some of the authors of the forthcoming edited volume *Science Popularization and Cold War Diplomacy: UNESCO, 1946-1958* (Amsterdam University Press), explores the pioneering effort at establishing an international science popularization program at UNESCO in the early years of the Cold War, analyzing it as a political tool for governance and a cultural diplomatic tool for international relations. After WWII, science and its popularization became a crucial tool in the reestablishment of international relations, but, at the same time, an open battlefield in which different nations and ideologies struggled for hegemony. It is precisely the ambiguous diplomatic nature of science and its popularization that this session aims to approach through the historical reconstruction of UNESCO's science popularization policies and practices from the leadership of Julian Huxley and Joseph Needham, as first General Director and first Director of the Natural Sciences Division, respectively, to Pierre Auger's turn as new head of the Natural Sciences Division, with Jaime Torres-Bodet as General Director. What began as an ambitious project of scientific humanism, rooted in the prewar period, with a special emphasis in the "social implications of science" and its moral duties in international relations, in the logic of the Cold War, progressively evolved towards a more technocratic approach to science and its "method" that better pleased the interests of the US in its anti-Communist crusade. The papers of this session – which cover issues such as the continuities and discontinuities between UNESCO's seminal science popularization programs and those of the League of Nations, the activities of the Division for Science and its Popularization, or the materiality of itinerant exhibitions and their plural appropriations- contribute to the recent scholarship on "science diplomacy" by approaching systematically the role of science popularization as a tool for cultural diplomacy during the Cold War.

Science Popularization as Cultural Diplomacy

- Andrée Bergeron, Centre Alexandre-Koyré & Muséum National d'Histoire Naturelle, Paris

Abstract: This talk will propose a general presentation of our collective project and its main theoretical achievements. Clearly in line with the political turn in the historiography of science popularisation, our project emphasises that it is never politically neutral. Specific views of the social order are embedded in the literary forms in which science is narrated. Building on the pioneering works that have recently included science in the history of cultural diplomacy, and in particular of the cultural diplomacy of the Cold War, our collective work explicitly aimed to explore science popularisation as cultural diplomacy. We have chosen a privileged field to do so: Unesco's actions in the field of science popularisation during the first years of its existence. It has been clearly shown that the USA actively tried to shape UNESCO towards an anti-communist position from the very beginning (Graham, 2006 & 2015). However, these studies did not deal with science, which was considered "a less controversial area of UNESCO's programme compared to information and culture". On the contrary, by looking at the very practices of science popularisation, we show how cultural dispositifs such as exhibitions, science clubs, fairs, magazines and children's books are political battlegrounds shaped by international power relations and through which diplomacy is also conducted, thus helping to move this historiographical tradition towards a more global approach beyond the national framework.

Staging International Science for Peace: Science Popularization in Action at UNESCO Month 1946

- Thomas Mougey, Aix-Marseille Université

Abstract: In November 1946, Paris hosted a month-long diplomatic and cultural summit to officially launch UNESCO. Next to the General Conference (GC), the Preparatory Commission of UNESCO ran UNESCO Month, a combination of artistic, cultural and scientific events and exhibitions to publicly display what the new agency was about. Unlike the existing historiography, this paper approaches the origins of UNESCO and its science program by emphasizing for the first time the cultural twin to the GC, the UNESCO month and more specifically the International Scientific Exposition (ISE). Zooming in on the making of the exposition and its displays, this

paper examines the forms and functions of science popularization in the very beginning of UNESCO. It appears that the ISE was not just a display of Joseph Needham's vision for UNESCO science, but already his vision in action. Besides promoting the socially conscious scientist as harbinger of peace, the exposition constituted a first experiment in science popularization for Needham's newly formed Natural Science division. By scrutinizing the content but also the making, forms and personnel of the exposition, this paper provides insights into the exhibitory regime Needham hoped to implement to popularize the social and international function of science.

UNESCO as a teacher of norms in science popularization: Science dissemination, cultural diplomacy and global-norm-setting 1945-1955

- Kristian Hvidtfelt Nielsen, Center for Science Studies, Aarhus University; Casper Andersen, School of Culture and Society, Aarhus University

Abstract: UNESCO's science popularization program, initiated under the guidance of influential scientists like Joseph Needham, was designed not only to disseminate scientific knowledge but also to act as a "teacher of norms." This pivotal role aimed to influence global discourse, setting standards on how science intertwines with society. Its ambition was to engage with both the apparent and the intricate dimensions of science, laying foundational norms. With its establishment, the special program for science popularization, often referred to as the Division for Science and Its Popularization, played a crucial role in navigating this mission. While various factors, including the influence of US cultural diplomacy, impacted the program's approach, its core commitment to global norm-setting within the field of science popularization remained evident. In this paper we follow key actors such as Danish science journalist Børge Michelsen – head of the UNESCO Division for Science and Its Popularization 1948-1951– to delve into UNESCO's unique positioning in science popularization, its norm-setting aspirations, and the external influences that have shaped its trajectory. We discuss the influence of US cultural diplomacy on UNESCO's approaches to science popularization during UNESCO's early years and compare with the norm-setting ambitions of UNESCO's programs in science policy instigated from the late 1950s.

13 Scientific instruments

Room: 40.154.

Chair: Erika Luciano, University of Torino, Italy

Microscopy 1886-1932, a joint venture of Science and Technology

- Henk Kubbinga, University of Groningen

Abstract: In 1886 Carl Zeiss AG, Jena, introduced the first microscopes equipped with a so-called ‘apochromatic’ objective. These had been the result of a research programme launched, in 1866, by Carl Zeiss and his freshly nominated R&D associate, the physicist Ernst Abbe. Abbe’s call for new kinds of glass was answered by Otto Schott, who settled in Jena (1882) to start up a Glass Works. The new glasses allowed for a further reduction of chromatic aberration and their success was almost immediate, that is, in the domain of the Life Sciences (pathology, bacteriology; cytology, cell division, heredity). Later on, dark field illumination allowed to study Brownian motion, more particularly the Tyndall effect, in detail (ultramicroscope; 1904, Zsigmondy and Siedentopf, under the wings of Carl Zeiss AG). It earned Zsigmondy the Nobel Prize for Chemistry (1925). Microscopy became a fashionable academic discipline sui generis and indeed worldwide. Accidentally, about 1930, Frits Zernike (Groningen University) touched upon a particularity of the brandnew Rowland grating of his department, a particularity which reminded him of Abbe’s diffraction theory of imaging (1873). From his find he deduced a new way to improve the result of the imaging process, the so-called phase contrast technique. Microscopy entered the world of the in vivo. It earned Zernike the Nobel Prize for Physics of 1953. I will sketch the technicalities of the Zeiss-Abbe-Schott innovations with due attention for Abbe’s imaging theory and what Zernike made out of it.

(*) This paper is part of a project aiming at the Collected Papers of Frits Zernike (1888-1966), more particularly the fifth and last volume.

Portable instruments for field measurements

- Santiago Vallmitjana-Rico, Joan Manel Hernández-Ferrás, Enric Pérez-Canals, Departament de Física de la Matèria Condensada, Facultat de Física, Universitat de Barcelona

Abstract: The need to find trade routes and explore new lands was always the true driving force behind all voyages of exploration and discovery in the Age of Exploration. The first navigation instruments were essential in travel and during later explorations, maps were created to improve later incursions. But these maps were very inaccurate because of huge errors in the geographic longitude measurement. To solve this problem, key figures from politics, the Navy, astronomy, and mathematics created in Britain in 1737 The Board of Longitude. Also the French institution Le Bureau des Longitudes, was founded in 1795 for the same historical reason. These institutions contributed significantly to obtaining effective methods, especially the improvement of the development of chronometers. Land surveying continued to use a mixture of triangulation and astronomical methods, to which were added the use of chronometers once they became readily available. The invention of the marine chronometer is an excellent example, with historical significance, of how an instrument has been adapted to make it portable. Between the beginning and mid XIX Century the University of Barcelona acquired the first instruments for the teaching of Physics and more precisely Experimental Physics, in a similar way to other countries of Europe. Now the Faculty of Physics of the University of Barcelona has a collection of six hundred scientific instruments. In general, the devices and measuring machines are designed for use in the laboratory. However, there are applications in which the instruments must be portable, or pocket sized for outdoor use. This study focuses on those devices adapted to be used in the field. Some examples of the collection are shown.

Solar Insights: Unravelling the History and Challenges of the Spectroheliograph at the University of Coimbra

- Mariana Brum, Centre for Earth and Space Research of the University of Coimbra (CITEUC), Faculdade de Letras da Universidade de Coimbra; Pedro Casaleiro, Geophysical and Astronomical Observatory of the University of Coimbra, Coimbra Chemistry Centre (CQC); Fábio Monteiro, Centre for Earth and Space Research of the University of Coimbra (CITEUC), Faculdade de Letras da Universidade de Coimbra

Abstract: This presentation aims to deepen the understanding of the Spectroheliograph at the University of Coimbra, a solar telescope in operation from 1926 to the present day. The installation of the Spectroheliograph in Coimbra was

conducted on the initiative of Professor Doctor Francisco Miranda da Costa Lobo in a process that spanned 19 years (between 1907 and 1926) and resulted from strict collaboration with the Meudon Observatory in Paris, France, the place of origin of the first spectroheliograph (Henri Deslandres, 1853-1948). The long process of installation can be attributed to two main factors: the First World War, which delayed the acquisition of materials (that were mostly produced in France, England, and Germany); and the bureaucratic obstacles faced amidst the political instability during the first half of the twentieth century in Portugal, that delayed its development until 1926. A shortage of financial resources and personnel, exacerbated by the political instability of the First Republic, was a constant challenge. Documents such as the Observatory's Annals, expense files, and correspondence highlight difficulties in acquiring essential parts, affecting the spectroheliograph and the entire Faculty of Sciences. This study contributes to understanding the spectroheliograph's history in Coimbra, emphasizing the challenges of its construction. Accessing those issues is important for managing the Historical Scientific Collection from the Geophysical and Astronomical Observatory of the University of Coimbra, underscoring the historical context's influence on the evolution of scientific instruments.

14 The sky and Earth in the 18th century

Room: 40.213.

Chair: Arianna Borrelli, TU Berlin and Bielefeld University

Timekeeping Traditions of Quadrants in Two Cultures

- Enes Tepe, Europa-Universität Flensburg

Abstract: Portable quadrants are instruments that were used for several terrestrial and celestial mathematical disciplines such as astronomy, navigation, surveying, maritime, artillery for about a millennium. In my previous project, I analyzed the role of this class of instruments in classical astronomy by cataloguing the surviving instruments from the Islamic World and Western Europe. As a result, different traditions are identified in Mamluk dynasty, Western Islamic world (Andalus and Maghreb), Iran, Ottoman Syria, Ottoman mainland, Continental Europe, Italy and England. One conclusion is that the astrolabic quadrants, which are varieties of

portable quadrants whose principles are obtained from plane astrolabe, arguably has reached to a peak in Mamlukate Damascus and Stuart Period London. For my PhD project, I directed my research inquiry of role of astrolabic quadrants in the timekeeping traditions of two cultures towards two particular state-of-the-art instruments. Therefore, I will practice with reconstructions of an almucantars / trigonometric quadrant by Muḥammad ibn Aḥmad al-Mizzī (d. 1349), which is in the Copenhagen David Collection, and a large quadrant by Henry Sutton Londini (d. 1665), which is in the Oxford History of Science Museum, in accordance with the replication method. In this talk, these two quadrants will be presented within the timekeeping context of the 14th century Damascus and the 17th century London.

Celestial Translations: The Transcultural Lives of a Pearl-Inlaid Celestial Globe (c. 1750) in EurAsian Histories of Science

- Sylvia Tongyan Qiu, UCLA

Abstract: In his poem “Diving for Pearls”, the Qianlong Emperor wrote, “They dived into the water and carried the mussels to me, cutting open the shells: each gleamed like silver. Sometimes they are iridescent; one in a hundred times, can you find such a treasure!” At the Palace Museum in Beijing, a celestial globe inlaid with pearls confronts us as an astronomical instrument embodying overlapping systems of knowledge from the East and West. As the only pearl-inlaid celestial globe among the eight extant celestial globes from the Palace collections, this unique object generates questions about the processes of translation – visual, material, scientific, and religious – at the cosmopolitan court of the Qing. Why were pearls used to represent 300 constellations and what role did the global extraction and trade of natural resources play in the creation of this transcultural, “EurAsian” object? In 1701, the pearl fisheries of the Qing court were assigned the quota of “16 luminous pearls of the first and second grades” yearly. These regulations reflect how Manchurian pearls – a natural resource on the verge of extinction – were converted into objects of luxury and wonder, and into materials agents of knowledge production. Inspired by Jonathan Schlesinger’s discussion on the ecological intervention of the court to extract Manchurian pearls, and the vast scholarship on exchanges in astronomical knowledge between early modern EurAsian courts, this paper investigates how this anomalous globe was embedded in “overlapping cosmologies” of extractive empires.

Examining this object in the context of Ferdinand Verbiest' Instruments of the Observatory, astronomical treatises by written Jesuits, and similar celestial globes in Europe, this paper re-positions the celestial globe in its contingent space-time where art and science, technology and imperial rites, Jesuits and emperors worked together, conflicting with, reinterpreting and altering the courses of one another.

Firing at the Firmament. Thunderstorm Protection Practices in the 18th Century

- Julia Bloemer, Flensburg University

Abstract: The lightning rod is considered one of the most important products of the Enlightenment in the eighteenth century: It materialised the benefits of experimental philosophy and marked a liberation from superstition. The narrative of the contemporaries and in the historiography as well emphasizes the replacement of older practices with the lightning rod, defeating the irrational and the unenlightened. Contrary to such dichotomous narratives, the older practices continued not only to be used but also to be discussed in academic institutions even after the lightning rod became widespread. In the foothills of the Alps, these were the so-called thunderstorm ringing and thunderstorm shooting. How did the supposedly rejected practice contribute to the academic discourse? Starting from two prize questions of the Bavarian Academy of Sciences, this paper examines the investigation of meteorological relationships in the second half of the eighteenth century. Ongoing debates about thunderstorm shooting were not only possible due to uncertainties about the functioning of the lightning rod, but also fostered the investigation of different types of air and the causes of thunderstorms. This paper contributes to the question of changing knowledge and its applications: It was not just a matter of persuasion to replace the old practices, but of ongoing discussions about the underlying principles that both new and old practices have contributed to understanding.

Thunderstorms underground: the interesting case of the “electric earthquake” in the 18th and 19th centuries

- Salvatore Esposito, Università degli Studi di Napoli Federico II

Abstract: We present the case study of the “electric hypothesis” of the causes of earthquakes, which emerged in the second half of the eighteenth century as part of the first studies of seismology. This hypothesis was related to Franklin’s views on atmospheric electricity and developed in a period when electric phenomena were widely studied, and was essentially based on solid empirical evidence and confirmed by model experiments. Even though it resulted from scientific reasoning, the theory remained strongly empirical, and was supported especially by Italian scholars who were familiar with seismic events. We then outline here the emergence, the development, and the later evolution (up to the beginning of the nineteenth century) of the “electric earthquake” paradigm. The present case study offers the opportunity to illustrate how electrical science shaped earthquake science to a degree not usually appreciated in the literature, and is also supported to some extent by the transition from Enlightenment scientific ideals to the Romantic conception of unity in the natural world, in search of common causes among phenomena belonging to different fields.

Friday 6th 18:45 - 21:00

ESHS General Assembly

Saturday 7th

09:00 - 10:30 Sessions

1 Beyond Knabenphysik: Women in the History of Quantum Physics (1/2)

Room: 40.002.

Chair: Patrick Charbonneau, Duke University

Organiser: Patrick Charbonneau, Duke University; Margriet van der Heijden, Eindhoven University of Technology

The moniker “boys’ physics” (Knabenphysik) originally emphasized the youthfulness of the early quantum physics protagonists. Its gender connotation long remained unchallenged, in part because of the twin stereotypes that physicists would be men, and that scientific genius would be a “masculine” trait. This symposium brings to light the remarkable yet long-overlooked contributions of women to the development of quantum physics.

Over the last three years, the group Women in the History of Quantum Physics (WiHQP) has brought together historians, scientists, and philosophers of science to reconstruct and analyze the lives and contributions of dozens of women from the early days of the old quantum theory to quantum field theory, and their associated philosophical conundrums. In anticipation to the 2025 centennial of quantum mechanics, this symposium presents a subset of these herstories to capture the richness and diversity of scientific life that has grown from researching the quantum. Through presentation of individual histories and microhistories, the symposium offers a historical perspective into the persisting challenge of increasing gender diversity in physics, as more generally discussed in a capstone roundtable.

Laura Chalk and the Stark Effect

- Daniela Monaldi, York University

Abstract: Laura M. Chalk (1904-1996) was the first woman to complete a PhD in Physics at McGill University in Montreal, Canada. The results of her doctoral research on the quantum phenomenon called Stark effect were the first published experimental data to validate Erwin Schrödinger's wave mechanics. This chapter reconstructs her life and work, seeking to recover what the quantum revolution

looked like from the standpoint of a young woman toiling in a sub-basement lab and striving to be, as she later wrote, "one of the boys".

Jo van Leeuwen, the other physicist behind the Bohr-Van Leeuwen theorem

- Margriet van der Heijden, Eindhoven University of Technology

Abstract: The first four women to obtain a PhD in physics at Leiden University all graduated with Nobel laureate Hendrik Lorentz. Hendrika Johanna (Jo) van Leeuwen (1887–1974) was one of them. She and her younger sister Cornelia (Nel) van Leeuwen finished their undergraduate studies in physics in Leiden in the early twentieth century. Whereas the younger sister left physics in 1917, Jo van Leeuwen went on to earn a PhD in 1919. Her thesis elucidates that magnetism is exclusively a quantum phenomenon – a result that was independently also obtained by Niels Bohr and that is now commonly known as the Bohr–van Leeuwen theorem. From 1920 onwards Van Leeuwen worked at the Technische Hoogeschool in Delft (now Delft University of Technology). Initially serving as an assistant, she was appointed as a reader in theoretical and applied physics in 1947, becoming the first female reader in Delft. This talk outlines the foray into physics by the two sisters, focusing specifically on Jo van Leeuwen, detailing her work and early contributions to the quantum theory of magnetism – and putting it in the broader context of women in physics in the Netherlands during the 20th century.

Grete Hermann: From Quantum Physics to Ethics and Politics

- Andrea Reichenberger, Technical University of Munich

The need for a reevaluation of the contributions that women made to quantum physics and its philosophical interpretation is currently becoming increasingly visible. While Grete Hermann (1901– 1984) has been prominently featured as a principal figure here, historians and philosophers of quantum physics have so far merely provided a partial picture of her work by focusing mostly and more or less one-sided on Hermann's Neokantian interpretation of quantum mechanical indeterminism. Grete Herrmann's active involvement as a social reformer and political activist in the anti-fascist resistance and for the reconstruction of the Federal

Republic of Germany in the post-war period, and her views on politics, ethics, and pedagogical issues—in light of an open and democratic society movement—have not yet received the attention they deserve. We aim to explore how Grete Hermann's twofold role as philosopher-scientist and policy-maker influenced her understanding of rationality in both science and politics. In this context, the Socratic method comes into play. For Grete Hermann, the Socratic method served as a good practice guide for reasoning without the need for absolute foundations and dogmatic justifications. We will analyze how Grete Hermann applied this method in her critique of Johann von Neumann's no hidden variable proof, in the indeterminism- free will debate, and the question concerning the universality of human rights. Grete Hermann never went so far as to call for quantum politics, or quantum physical democracy. However, she was well aware of how science and technology influence politics and, conversely, how politics steers science and technology.

2 Chemistry and industry in small wars of the 20th century

Room: 40.012.

Chair: Javier Martinez-Antonio, University of Zaragoza

Organiser: Javier Martinez-Antonio, University of Zaragoza

During WWI, chemistry at its largest sense became a major warfare asset for the main belligerents. Frightening toxic weapons such as phosgene and yperite, helpful sanitary products such as morphine or the Dakin-Carrell solution and powerful fertilizers and insecticides such as nitrates and hydrogen cyanide were displayed in an ambiguous show of scientific progress and industrial efficiency. Private industries mobilized for the war effort accounted for a significant part of the production of these substances. Many studies have thus explored the role played by big firms such as Bayer, BASF, ICI, Rhone-Poulenc or DuPont, first in WWI, later in WWII.

However, much less historiographical attention has been paid to the production and use of gases, drugs, fertilizers or insecticides in the many small wars that occurred throughout the world during the 20th century (colonial wars, revolutions, south-south conflicts, asymmetric wars). With exceptions such as the Vietnam War, there is little literature exploring the role of chemistry when one or several parties in

a minor conflict presented a weak development in that particular sector of their local academy and industry.

Topics potentially explored will comprise:

- Local chemical companies that played significant roles in minor conflicts
- Local scientists, technicians, army officers, entrepreneurs or any other actors who played key roles in the production and use of chemical products in minor conflicts
- Differences and similarities in the manufacture and use of chemical products between large and small wars, including innovations specific to the latter
- Connections of local chemical companies with big multinational industries of Western countries during minor conflicts
- Circulations of chemical knowledge, processes, technology and experts between more and less developed countries during minor conflicts

Toxic secrets. The making of war gases and drugs in Catalonia's chemical industry during the Rif War

- Javier Martínez-Antonio, University of Zaragoza

Abstract: The Rif War was a harsh conflict that involved France and Spain against an uprising of local populations in the north of Morocco between 1921 and 1927. In the Spanish case, the conflict led to a strong development not just of the military industry, but also to the mobilization of private companies. In this paper we will study how chemical industries in Catalonia, Spain's most industrially developed region, supplied the Spanish army with drugs and war gases.

Testing toxic chemicals in France and Colonial Algeria during the Algerian War (1954-1962): Business as Usual?

- Etienne Aucouturier, Commissariat à l'énergie atomique et aux énergies alternatives (CEA-Saclay), France

Abstract: During the Algerian War (1954-1962), the French institutions in charge of chemical warfare carried out weapons and toxicity tests on a range of chemical compounds with seeming indifference to the extremely tense political context of the end to French colonization of Algeria. These institutions, with the Centre d'Études du Bouchet at the forefront, carried out weapons tests in France and in the Algerian Sahara, but also assessed the toxicity of industrial and agricultural dual-use

chemicals for French companies, such as chloropicrin, a phytosanitary product, but also a chemical warfare agent. We will review the origins of this link between French military institutions and the main testing site in the western Algerian Sahara. We will then analyze the archival information available on trials carried out during the Algerian war, as well as the manner and nature in which this work continued after the decolonization of Algeria: following the end of the war and the signing of the Evian Accords (1962), this work continued for several years in good cooperation with the Algerian authorities, which was exceptional compared with other French military programmes that were terminated with the independence of Algeria.

It's All About Chemistry: Alleged Uses of Poison Gas by France against its Colonial Populations During the Rif War and Great Syrian Revolt, 1925

- Aurore Kamichetty, Université de Montréal - Université Paris 1 Panthéon-Sorbonne

Abstract: This proposal is part of my doctoral research on rumors of chemical warfare in interwar France. Between 1919 and 1939, despite the armistice being signed, France like many other European powers maintained its chemical industry in activity to ensure its readiness in the advent of a chemical attack from the enemy. While France ended up not resorting to chemical weapons during World War II, it would still use – or at least consider using – poison gas when the authority of the French empire happened to be challenged, namely in Morocco during the Rif War, and in Syria during the Great Druze Revolt. This communication intends to put in parallel both conflicts and reveal the range of factors that would lead France to mobilize its chemical industry for the purpose of these minor conflicts. I will first attempt to present the state of the chemical industry at the end of the Great War and to briefly contextualize both conflicts; then, drawing from diplomatic and military archives, I will present some of the available information on the chemical attacks which occurred in the Rif War and the Druze Rebellion; and finally, I will show how the complaints following both events have been discarded as rumors and to this day, still carry the same status.

3 Communicating medical issues

Room: 40.047A.

Chair: Jon Arrizabalaga, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC), Barcelona

Education as a means of tackling the mental health crisis? Discourses on the professionalization of psychiatry in nineteenth-century Hungary and the dissemination of psychiatric knowledge

- Janka Kovács, HUN-REN Research Centre for the Humanities, Institute of History

Abstract: From the second half of the eighteenth century onwards, with the increasing influence of anthropological thinking, there was a growing interest in the “sciences of man” in Hungary, particularly in psychology. The question of the influence of the human soul on the body became an integral part of discourses. At the same time, the perceived increase in the number of the mentally ill within society and providing care for them posed unprecedented challenges for official authorities and the medical community.

In terms of knowledge production and the socialization of physicians, in the arena of medical education, independent courses dedicated to the study of mental illnesses emerged relatively late. This was due to the lack of an institutional background that could have provided a space for medical students where they could have gained practical knowledge. This circumstance fundamentally influenced the prolonged process of psychiatric institutionalization in Hungary, with the first public asylum opening in 1868. However, this did not mean that there was no demand for the more prominent representation of psychological-psychiatric knowledge in the prescribed curriculum in Hungary that could have in return generated a more intense discourse on the necessity of establishing an asylum.

The presentation traces this process in medical education up until the 1860s, following the emergence of new types of knowledge, leading to the introduction of the first institutional psychiatry courses. Using a variety of sources, the presentation explores the entangled process through which psychological-psychiatric knowledge evolved from a “sub-discourse” in various medical fields into an independent and comprehensively taught discipline. The presentation also addresses the political, social, and institutional changes in the context of which the knowledge presented in

medical education contributed to both the socialization of psychiatric knowledge and the establishment of professional frameworks for the institutionalization process.

Cholera in Smyrna: Communication Channels and the Knowledge Flow

- Konstantinos-Nektarios Baloutsos, Panteion University of Social and Political Sciences

Abstract: The appearance of Cholera in Europe during the 19th century caused tremendous fear during its five successive epidemics. Cholera led to violence and social upheavals, as the fear interrupted all commercial activities, and the disease primarily affected the poor and densely populated neighborhoods of the early industrial cities, that lacked water and sanitation systems. The same pattern is observed in the case of Smyrna in 1893, where the outbreak of the epidemic significantly suspended the city's commercial activity.

The emergence of Cholera created a health crisis that required cooperation between the state, the scientific community, and the citizens of Smyrna to solve the social challenges that had arisen. The urgency and uncertainty caused by this health crisis led to the enhancement of the communication channels between the authorities of Smyrna and the scientific community, and the need to provide information to citizens, primarily accomplished through the press.

The Ottoman State, facing an increasing number of suspicious cases of Cholera, acted swiftly, implementing measures such as quarantine, cleansing, and disinfection, as well as surveillance and crisis management. These measures activated and, to some extent, shaped the Ottoman state's welfare and control system.

Keywords: Cholera epidemic, Smyrna, health crisis, cooperation, communication flows, scientific community, Ottoman State, citizens.

Medical Associations in the Czech Lands: a Specific Paradigm

- Tereza Kopecka, Charles University

Abstract: The process of professionalization of academic professions, although it has taken place in parallel in many countries of the Western world, had features specific to local social conditions. Topics that resonated with the professional and general public of the given country were accentuated in this process.

The unification of the healing and medical professions, the anchoring of scientific medicine in the public health system, and the establishment of functional self-regulation are overarching and common processes. In the Czech lands, however, medical chambers were established on the national / ethnic / language principle and followed the similarly based division of Charles-Ferdinand University. This principle was linked to the five-hundred-year-long conflictual community of Czechs and Germans in the Czech lands, which also had its specific expressions at the university. Professionalization everywhere became a tool for defining professional identity, but in these conditions, it co-created the modern national identity and became one of the key frameworks where Czechs and Germans defined themselves against each other as alterities, stimulating both to further development.

The goal of this paper is to present the process of medical professionalization in Bohemia through the prisms of Talcott Parsons' and Eliot L. Friedson's works, together with theories of modern nation created by Ernest Gellner and Miroslav Hroch and specified for the Czech-German struggle by Jan Kren. Historical sources are used to show the background of the different (and oftentimes complimentary) national perspectives and offer an insight into who were the bearers of the forming ideas of the era, as collective actors and as individuals.

4 Diagnosing disease and disorder

Room: 40.047C.

Chair: Mauro Capocci, Università di Pisa

The co-production of PTSD

- José Antonio Pérez-Escobar, University of Geneva

Abstract: Post-traumatic stress disorder (PTSD) is a diagnostic category with a convoluted history involving social, political and scientific factors. The study of this condition has its origins in the 19th century and was reframed historically in the context of the Vietnam War. This talk is concerned with an analysis of the conceptual change of PTSD after the Vietnam War and its subsequent conceptual development from the perspective of the co-production of knowledge.

The “rediscovery” of PTSD as a diagnostic category after the Vietnam War was not just conditioned by the observed symptoms and behaviors of war veterans (like

suffering and criminality), but also by Selye's pioneering work on physiological stress (later extrapolated to the mental realm) and social and political agendas that aimed to justify such behaviors by considering them normal responses to an unfair treatment in need of compensation. These factors influenced each other in complex ways and led to the formal recognition of PTSD in the DSM-III in 1980 addressing both social and scientific agendas. Just like Selye's discovery may have influenced expert and – more indirectly - public opinion on PTSD, in turn, expert and public opinion may have influenced the extent of the validity of Selye's discoveries beyond his experimental settings.

The story continues with its subsequent conceptual evolution, new scientific evidence, the use and highly variable success of this category for criminal defense, its increased incidence (e.g., in the Gulf War vs in Vietnam), and its spread into popular culture, all factors still influencing each other. For instance, the conceptual evolution of PTSD after 1980 is underdetermined by new scientific evidence, its effectiveness for criminal defense in court was partly dependent on folk notions of PTSD, and new scientific evidence like the neural bases of PTSD were framed by a critical agenda on this diagnostic category.

The early days of digital computer in medical diagnosis: the cases of Computed Tomography and Pap Test

- Konstantinos Raptis, National and Kapodistrian University of Athens

Abstract: In this paper, I discuss the results of the research I conducted for my dissertation titled “The integration of computers in medical technologies and the concept of death”. Drawing from an STS approach and the notion of “opening the black box”, I examined the early period (1950s-1970s) of the introduction of digital computer into medical technologies as a representative case for my research questions. Firstly, I analyzed papers from emerging scientific journals in the USA, Europe, and the USSR during that period. These papers were devoted to the mathematization and computerization of diagnosis and biological/living systems (a process that also required experiments on living animals). Secondly, I conducted a comparative analysis of case studies on two automation attempts of medical diagnosis in which the first (Computed Tomography) was successfully established while the second (Pap test) did not. I examined the impact of computerization on

diagnosis and I show how the object of diagnosis is redefined after computer introduction, what the criteria for this computerization are and how it has reshaped the concept of death and life. I argue for an organizational character of digital computing compared to a descriptive medical diagnosis. Through the historical analysis of the two attempts for automating diagnosis I identify what the critical elements for successful computer integration are. Specifically, I highlight the definitive role of scientific consensus in this process. Finally, I discuss the role of digital computer in the production of scientific medical knowledge and/or the relation of medicine, science and the computer under the post-Second World War environment.

5 Ecology, Land Management and Horticulture in Early Modern Italy (1/2)

Room: 40.004.

Chair: Pietro Daniel Omodeo, Ca' Foscari - University of Venice

Organisers: Fabrizio Baldassarri, Ca' Foscari - University of Venice, Monica Azzolini, University of Bologna

Although ecology lacked a clear definition in pre-modern times, an underlying attention and interest in nature and the environment surfaced in the 16th century, revealing a compelling interconnection between different fields, and a new attention to nature. Soil, air, and water were not only a matter of nature, but also a subject of investigation, both intellectual and speculative, experimental and practical. In all these cases, nature slowly became something one could construct with the help of experts reproducing the same natural operations and managing the environment. This is especially evident in botanical studies, the subject of this first symposium, although botany was not a fully-fledged discipline. The famous case of the arrival of new specimens from the New World spurred experts and scholars to recognise the role of environmental differences in producing bodily variety. Still, variation also applied to horticulture in general, spanning the production of flowers and fruits, to timber and other resources. In all these cases, the role of gardeners, horticulturalists, untrained experts, engineers, and land surveyors appeared crucial to accommodate and cultivate plants.

In this panel, we aim to explore the role of these experts in the construction of the environment in pre-modern Italy. In the first paper, the focus is given to the cultivation of olives in sixteenth-century Medici Tuscany, where air and climate were major features to propel plant cultivation. The second paper focuses on the scholarly attention to the soil and the expertise and labour of gardeners and horticulturalists in cultivating plants and shaping botanical science. The third paper explores the role of experts such as engineers, land surveyors and lawyers to manage the environment and increase the production of key resources in the State of Milan.

Building on the Arno: Early modern Florence, Pisa, and Livorno as sedimented cities

- Davide Martino, Universität Bern

This paper reconsiders the history of urban expansion in the early modern Tuscan cities of Florence, Pisa, and Livorno from an environmental perspective. It focuses on the hydraulic knowledge and technology necessary to build along the Arno, the river connecting all three cities. Already celebrated by artists at the court of the Medici Grand Dukes, the centrality of the Arno has also been recognised by historians of early modern Tuscany, from Giorgio Spini onwards. Scholars, however, have studied primarily reclamation projects for agricultural use, neglecting the urban reaches of the Arno. Focusing on these, this paper will show that (re)moving water was an indispensable feature of early modern urban expansion in Tuscany. Key technologies included the use of piles to secure foundations, as well as other imported building materials such as sand. Flowing water needed to be replaced, or at least covered over, with dead matter to (literally) sustain urban life. The histories of Florence, Livorno, and Pisa are often considered separately. In the early modern period, however, the three cities formed an integrated urban system, with complementary functions: Livorno was the maritime harbour, Pisa the regional marketplace, and Florence the administrative and cultural capital. They can therefore be understood as the three vertices of a Tuscan triapolis. This paper will also suggest that they were sedimented cities. The epithet refers both to the accumulation of layers of urban expansion and to the sedimentation of sand, timber, and other building materials where water had previously stood.

Renaissance Architects, Engineers, and Experts Grappling with Climate Change. A case study

- Irene Bevilacqua, University of Bologna

In the early modern period the management of the southern delta of the Po River, between the Volano and the Primaro branches, and the longstanding issue of diverting the Reno River into the Po, produced extensive discussion among architects, engineers, and mathematicians. Yet, this issue also involved a new attention to nature. While historians have studied extensively the case of hydraulic experts, such as Giovan Battista Aleotti, their sensitivity toward the environment and nature appears far less explored. For instance, at the end of the 16th century, the entire lower course of the Po River experienced a period of climate change attributed to the Little Ice Age. Understanding how technicians and “water experts” attempted to cope with the increased precipitation and floods during those years reveals new attention to combination of nature and weather. During the Clementine reclamation, Aleotti’s concern for the territory surfaces in his criticism toward those engineers consulted by the pontiff who had proposed a series of unnecessary and costly interventions. These measures, he argued, would have ended up worsening the complex hydrology of the region rather than reducing it, as indeed it happened. In examining figures like surveyors, experts, and technicians, in this paper, I aim to capture the perception of nature possessed by these individuals, whose knowledge was primarily acquired through practical experience rather than academic studies, discussing how they reached important decisions about nature and the environment in the process.

Contested Expertise: The “issue of the Reno” after the Great Flood of Ferrara of 1705

- Monica Azzolini, University of Bologna

Between early October and early November of 1705, a terrible flood invested a large swath of land stretching from Pavia to Ferrara in 1705. It is said that the raging waters of the Po and its tributaries claimed around 15.000 lives. The event was so dramatic that news of it travelled fast: Electress Sophie of Hanover (1630-1714), informed by her niece, the Duchess of Hanover, Benedicte Henriette, (1652-1730) wrote to the famous philosopher and naturalist Gottfried Wilhelm Leibniz

(1646-1716) asking him to comment on the causes. As scholars highlighted in recent years, Leibniz could flaunt a solid reputation in geological matters. However, Leibniz was only one of many early moderns who tried to explain the catastrophic events of 1705 through their expertise. This paper will use the 1706 detailed map drawn by the Ferrarese cartographer and land surveyor Giuseppe Tomaso Bonfaldini to analyse the wealth of documentation written in the following decades as engineers, mathematicians, land surveyors and churchmen were asked to express their views of the event and present solutions to long-standing problems with the management of the Po in what came to be known as the “issue of the Reno”. The Ferrarese catastrophe will be used as a catalyst to analyse the range of expertise at play in discussing hydrological problems and highlight the underlying struggles for authority among ‘experts’ in a charged political and social environment that saw many political players contend for the right to change the water landscape of Lombardy and Emilia-Romagna to their benefit.

6 Networks of knowledge transmission in times of crises

Room: 40.063.

Chair and organiser: Evangelia Chordaki, National and Kapodistrian University of Athens

Commentator: Jan Surman, Masaryk Institute and Archives of the Academy of Sciences of the Czech Republic.

The COVID-19 pandemic is the most recent example of a global health crisis that revealed multiple social challenges and called for cooperation between different domains, such as scientists, governments, policy-makers, science communicators, and the publics. Considering the continuous and growing challenges our societies face and the crucial role of science in the organization of knowledge and the shaping of public policies, our panel aims at studying the networks through which knowledge flows are communicated and exchanged in times of crisis. The complex processes that characterize times of crisis highlight the need for understanding the features of knowledge circulation (practices, spaces, materialities) in a context of scientific uncertainty. While research and literature have paid much attention to the networks

of knowledge beyond the academic sphere, issues concerning the production and circulation of knowledge and the processes of validation and legitimization within the boundaries of scientific communities remain obscure and understudied.

Our panel presents three papers that discuss the above issues in different national, geographical, historical, and cultural contexts, bringing to the fore complementary methodological approaches. These range from the collective medical failures of the past in managing chronic conditions, like hemophilia, to the flood of medical information during the COVID-19 pandemic and its communication. Central among the issues of our panel is the ambivalent attitude of scientists towards certainty and evidence-based knowledge, as well as the political and social premises upon which the operation of their communication networks is based.

Becoming credible, communicating (un)certainty in times of crisis

- Evangelia Chordaki, National and Kapodistrian University of Athens; Maria Zarifi, National and Kapodistrian University of Athens

Abstract: The covid-19 pandemic brought to the center of attention both the notions of expertise, communication, and trust. Within this global health crisis, expertise and science are back in high demand for sharing information and instructions on how to deal with the crisis. University scientists, research institutes, laboratories and clinics started to generate, summarize, share and communicate research findings in real time. However, this "data blitz", created a compound phenomenon of science communication that included practices of knowledge circulation within the scientific community associated with processes of scientific verification that challenged the construction of credibility in science. Focusing on the case of Greece, our paper discusses the flows of knowledge through the communication networks created during the Covid-19 pandemic and the qualitative characteristics of these networks that affected the data flows. We particularly focus on certain scientific laboratories that were involved either in the production of primary scientific knowledge or in the assessment of valuable but imperfect and unfiltered data transforming them into credible knowledge that would inform medical action in the field. Within this framework we are particularly interested in discussing the presuppositions for the characterisation of new knowledge as certain, i.e. how scientists are managing the

concept of (un)certainty and how their selective thinking works in conditions of crisis.

Roles and perceptions of publication genres in times of crisis

- Alexander Schniedermann, Deutsches Zentrum für Hochschul- und Wissenschaftsforschung, DZHW

Abstract: The Covid-19 pandemic substantially changed scientific communication. The demand for quickly available, accessible, and intervention-ready knowledge not only reshaped science-society relations but also put scientific publishing into new modes. The scientists' need to immediately share and discuss results led to a surge of non-reviewed preprints and the development of new genres such as "rapid reviews". At the same time, the effortful and time-consuming construction of comprehensive meta-analyses and review articles seemed nearly impossible. For a moment, the decades-long paradigm of reliability and robustness through constant and comprehensive appraisal was paused and it seemed that science can meet timeliness and topicality for crisis response only by lowering its quality standards. But a system-wise overview about how the scientific community dynamically reshuffled the interplay of epistemic values and requirements during the course of the pandemic is still lacking. Our quantitative analyses of around 2.9 million publications from the German Kompetenznetzwerk Bibliometrie (www.bibliometrie.info) and PubMed, as well as our quantitative and qualitative media analysis of over 390,000 German news stories reveal how during the pandemic scientists and journalists alike juggled and struggled with different epistemic modes of science, in particular uncertain science, normal science, and highly robust science. Our results show not only the high usage of preprints by scientists and the media. In addition, we show how biomedical researchers made high use of case reports, editorials or news as other uncommon genres to negotiate the frontlines and trajectories of pandemic research in times of urgency and uncertainty.

How a Crisis Expedited Comprehensive Hemophilia Care in Canada

- Fedir Razumenko, University of Calgary, Canada

Abstract: In the 1950s, only a small minority of persons with hemophilia (PWH) survived into adult life. Within three decades, however, PWH successfully

transitioned into a category of patients with largely manageable chronic conditions, however still potentially lethal without treatment. This paper examines the historical development of hemophilia care in Canada to provide a better understanding of the events that led to a near normalization of life of the individuals with blood-clotting disorders. I contextualize this Canadian history of hemophilia within its scientific, social, and technological milieu to demonstrate that patients, their families, physicians, researchers, and politicians contributed to a new conceptualization of the disorder and its management. This history represents a process of regeneration and resiliency which has become sustainable due to a major iatrogenic catastrophe. Products of large-scale fractionation as therapeutics were manufactured from large volumes of starting plasma, and composed of pools of many thousands of individual donations. I argue that there was a collective failure to appreciate the risks of established or emerging pathogens contributed to technological measures being delayed or ignored at specific points in this historical progression. Analyzing a variety of sources – from archival records and published literature to oral interviews with patients and healthcare practitioners in Canada, I build on the work of Stephen Pemberton and Keith Wailoo to examine a “living history” encompassing advances, challenges, and barriers in the evolution of hemophilia care.

7 Science and Religion, Atheism, Secularism: Entangled histories (1/3)

Room: 40.006.

Chair: Jaume Navarro, University of the Basque Country

Organiser: Jaume Navarro, University of the Basque Country; Kostas Tampakis, Institute of Historical Research, National Hellenic Research Foundation

In the burgeoning field of science and religion historical studies, atheism is a newcomer, but secularism has been a staple. This panel aims to identify and bring to the fore the many ways that science has historically interacted with atheism, the religious underpinnings and anticlerical stances of such interactions, and the reciprocal relations of secularism with science, religion and atheism. We are interested not only in the theological and philosophical modes of engagement, but also in the lived experiences of the people involved. What avenues of research emerge when we consider not only religion, but also religiosity, not only science but scientific

practice, not only secularism but also laïcité, and not only liberal atheism, but also Marxist and (anti)communist struggles?

The idea of Life, attacks on religion and the politics of the insurgent early in the 20th century

- Robert Bud, The Science Museum, London

Abstract: This paper is concerned with how scientists have understood Life. It argues that during the first half of the 20th century this was a profoundly religious issue. For thousands of years previously religious people and particularly Christianity had understood that there was something special about living beings. Against this view scientists who were atheists or did not believe in a personal God argued that living beings could be understood in terms of physics and chemistry. Indeed they argued that a demonstration of the materiality of life would be a weapon in the battle against religion. However this paper will suggest that theological issues cannot be considered in isolation when considering the relationship between science and religion. This paper will argue that for many biologists in Britain and France waging a reductionist campaign, the attack on religion served as an integral part of a broader insurgent culture. I shall argue moreover that the British and French were closely connected. But, in the very different context of the United States by contrast, an analogous and apparently similar campaign was instead part of a fightback against an insurgent culture. Typically atheism has been seen as a theological issue, however in Britain and France with their established churches of Anglicanism and Catholicism respectively assault on religion was just part of a broader cultural reform movement. This paper will look in particular at the friends and associates of Jean Perrin in France who established the Institut de Biologie Physico-Chimique and the British materialist biologists associated with the so-called 'Visible college' including J B S. Haldane, Hogben, Bernal and more broadly Julian Huxley and others. Even the religious and communist Joseph Needham was associated with a very rebellious part of the Anglican church. In the United States it will point to Hermann Muller, Oscar Riddle, and Clarence Darrow.

Afterlife Research and the Double-Edged Sword of Experimental Science

- Bastiaan van Rijn, University of Bern

Abstract: For the last two centuries, persons from a variety of backgrounds have tried to use scientific and experimental means to prove the existence and content of life after death. This development can be traced back to at least 1784, in which the alternative healing practice of animal magnetism developed the notion of ‘magnetic somnambulism,’ which led several magnetizers to believe their somnambulists could contact spiritual entities and visit superempirical realities such as heaven. Ever since, magnetizers, spiritualists, psychical researchers, parapsychologists, and near-death experiencers have tried to experimentally investigate life after death. This talk will thematize the problems they all ran into, and specifically how their reliance on experimental methodology has been a liability as well: the aura of legitimacy it brings with it is offset by the lack of results, which leads to the necessity to use extra-experimental sources as well—thereby inviting skepticism from outside.

“Two religions in struggle”. Clémence Royer, Charles Darwin and atheism

- Florian Laguens, IPC-Facultés Libres (Paris, France)

Abstract: Clémence Royer (1830-1902) was a French philosopher and scientist, and a leading figure in feminism at the end of the 19th century. She was responsible for the first French translation of Charles Darwin’s *On the Origin of Species* (1859), and for introducing Darwinism to France in 1862. She preceded her translation with a long preface, in which she invoked Darwinian theory against the Christian concept of original sin. In the final lines, she confessed her atheism: “Mr Darwin’s doctrine is the rational revelation of progress, set in its logical antagonism to the irrational revelation of the fall. These are two principles, two religions in struggle. It’s a categorical yes and no between which you have to choose, and anyone who declares himself in favour of one is against the other. For me my choice is made. I believe in progress.” This paper aims to present the figure and thought of Clémence Royer, highlighting her views on atheism in relation to Darwin’s theory.

8 Styles of Thinking & Doing in the Ecological History of Scientific Knowledge and Practices (1/3)

Room: 40.008.

Chair: Luca Guzzardi, University of Milan

Organisers: Matteo Vagelli, Ca' Foscari University of Venice; Joseba Pascual Alba, University of the Basque Country

Ian Hacking (1982) initiated the project of exploring 'styles of scientific reasoning' by drawing from Alistair C. Crombie's (1994) historical investigation on 'styles of scientific thinking in the European tradition.' Through this project, Hacking emphasized that 'reason has a history' and how standards of rationality emerge and evolve historically. Recognized as a valuable historical and philosophical tool for analysis (Hacking 1992), various historians and philosophers of science began incorporating this concept into their research (e.g., Davidson 1987; Gavroglu 1990; Schweber 1997; Radick 2000; Reck 2009; Elwick 2007; Winther 2012, 2013, 2015).

In later installments of his style project, Hacking (2012) related what he came to call 'styles of thinking & doing' to a cognitive and an 'ecological' history of reason (Atran 1990; Netz 1999). The aim of this symposium is to provide a reassessment of Hacking's project, by engaging closely and critically with Hacking's arguments on scientific styles. In this respect, some of the questions that this symposium will discuss are: What are the implications of Hacking's theory of scientific styles at the level of language, truth, and understanding? What roles have styles played throughout the history of the sciences? How effective are styles as a historical-philosophical tool for comprehending scientific knowledge and practices? In what philosophical and historical ways could this project be further developed, especially within the context of an ecological history?

Panel 1 of our symposium will draw insights from physics, chemistry, volcanology and the computational sciences in order to further develop the adequacy and accuracy of the notion of styles of thinking and doing.

Styles of Scientific Practice: The Importance of Scale

- Theodore Arabatzis, University of Athens

Abstract: Ian Hacking's notion of styles of thinking and doing was a major contribution to understanding science historically and philosophically. Hacking's styles (e.g., the axiomatic style, the laboratory style, the statistical style) are global ways of reasoning and practice that cut across different scientific fields and extend across the *longue durée* of scientific history. In this paper we would like to suggest

that styles of reasoning and doing operate at various scales, from the individual to the collective levels. On the individual level, the notion of a personal style may capture, among other things, the characteristic approaches of individuals to particular problems. On the collective level, styles may operate at three different levels of generality. At the first level, the scope of a personal style may extend to a whole group of people working in a research center or laboratory. At the second level, the style of a group may turn into a national style that is entangled with particular cultural and pedagogical traditions. At the third level, the level that Crombie and Hacking had in mind, a style may transcend national and disciplinary boundaries and pervade different sciences. We will argue that thinking of styles across different scales is necessary for turning that philosophical construct into an operational historiographical tool so that specific cases can be probed into. We will illustrate our arguments with examples from the history of modern physical sciences, including late 19th century physics, early 20th century low-temperature physics, and late 20th century quantum chemistry.

Phlogistic Style of Thinking and Doing” in the 17th and the 18th Centuries

- Matteo Vagelli, Ca' Foscari University of Venice

Abstract: In my paper, I will outline how recent conceptions of style in science interact with early modern questions and sources. In particular, I will show that the notion style allows us to trace the existence of both a unifying and a diversifying drift in science to the 17th century. The idea of a “Galilean style” belongs to the 20th century, when this “style” was identified as the most lasting achievement of the scientific revolution and taken to imply a monist and reductivist understanding of the scientific method as a hypothetico-deductive model leading to the mathematization of the physical world. Contrary to this received view, in the first part of the paper I will show how an alternative, diversifying trend in science that represents a non-reductivist style of thinking can also be traced back to the 17th century. It is in these terms that I will account for pre-Lavoisierian theories of phlogiston, which sought to defend chemistry from the quantitative, corpuscular-mechanist philosophy of the 17th century. Rather than relying on mathematics, proponents of this “phlogistic style of thinking and doing” interrogated the synthetic aspects of chemistry and explored the possibility of artificially creating substances that cannot

be found in nature in a purified state. In my reconstruction, I will integrate Ian Hacking's theory of "styles of scientific reasoning" (Hacking 1982, 1992, 2012) with Hasok Chang's notion of "systems of practice", considered in the more general framework of his "active normative epistemic pluralism." (Chang 2012)

Investigating Volcanoes. A History of Volcanology as Integrating Styles

- Joseba Pascual-Alba, University of the Basque Country

Abstract: The general aim of this paper is to show how "styles of thinking and doing" (Hacking 2012) have been employed historically in the research on volcanoes. My main thesis is that contemporary volcanology, as a scientific research system, is the historical result of the integration of the six styles (Crombie 1994; Hacking 2012). In September 2021, a volcanic eruption in La Palma (Canary Islands) shocked Spanish people. It was the first time that a whole country was witnessing in real time the genesis and development of a volcanic fact (Fleck 1935). Departing from this recent episode in the history of the sciences, I will briefly show how old ways of investigating volcanoes have evolved and crystallized into the actual style-integrated scientific research. The study of the Tajogaite (Cumbre Vieja) eruption will allow me to shed light both on a concrete example of style integration and on its role on the history of modern volcanology. For Hacking (1991) it was a "truism" that styles cooperate in "any modern inquiry". But what it is not obvious is how they do it: if styles are "self-authenticating", how have they been integrated to form coherent research systems like volcanology? The "interweaving" of styles became more important in his last writings (Hacking 2015), but it remained undeveloped. Following this intuition, I shall argue that the constitution of volcanology as scientific research came through the integration of the six "styles" over the last century.

9 The gender of things and spaces in the sciences: Knowledge Production and Practice (1/3)

Room: 40.010.

Organiser: Brigitte Van Tiggelen, Science History Institute; Maria Rentetzi, Friedrich-Alexander-Universität; Annette Lykknes, Norwegian University of Science and Technology

Chair: Brigitte Van Tiggelen, Science History Institute

Gender and Space in the Colonial Panjab: Marginalization of Subaltern Therapeutics
- Kamlesh Mohan, Panjab University

Abstract: This paper investigates the ongoing negotiations between Gender and Space for Dias (traditional birth attendants), following a two-fold argument.

Firstly, in post-1857 India, the broad compact between the colonial state, Utilitarian - cum -Evangelical ideologues and Western science spokesmen (specifically the medical fraternity) played a decisive role in freezing the dialogue between two knowledge systems, technologies and cultural mores.

Secondly, rigidification and dichotomization of spaces into private and public confined women to reproductive functions and symbolic roles as mothers without power to chastize their sons. Such a reformist agenda coupled with the imperialist strategy destroyed fluidity of religious, cultural and gender identities. Implications of the application of new scientific techniques such as craniometry, pelvimetry and racial-mapping, which led to widening of gaps between gender and space in science through patriarchal constructions, shall be discussed.

Moving to the marginalization of subaltern thereuptics of dias, I shall discuss the politics underlying the introduction of scientific midwifery. Its two major motives were: (1) to promote the establishment of missionary and Government institutions for the formal training of midwives, nurses and doctors in order to neutralize the mounting pressure of the British women for medical education and employment and (2) to highlight the intrusive role of the Dufferin Fund and Victoria Memorial and Scholarship Fund (1926) in marginalizing the practitioners of indigenous obstetrics and gynaecological skills.

Finally, I wish to tease out the nature of relationship between exogenous and endogenous forces which may yield insights regarding colonial anxieties about Punjabi women's reproductive health.

Women Scientists and Masculine Spaces in the Production of Climate Knowledge

- Frank Amico, Florida State University

Abstract: This paper investigates gender in geoscience spaces through both the lenses of masculinity and women scientists within these spaces. Scholars have noted ways in which climate knowledge and the effects of climate change have been gendered, however, this paper will focus on the spaces wherein knowledge is developed and legitimized. During the post-war period from 1950 - 1980, when climate science research and modelling made significant advancements, American geophysics disciplines limited women's participation in these fields. Military patronage in funding geophysics research as well as leading figures in these fields being either former military or involved in military projects, caused this specific gendering of the science. Male geophysicists also had generally conservative affiliations and practices, with some disciplines, like oceanography, outright limiting women's participation on research trips.

Using evidence from climate science initiatives and committees of the 1960s and 1970s, as well as from women's geophysics organizations such as the Association for Women Geoscientists, this paper argues that the masculinization of geophysics spaces have stymied scientific progress and effectiveness of science's influence on climate policy. By examining the role of gender in spaces of knowledge production, this work interrogates issues of climate science policy action and activism that have continued to plague initiatives.

Gendered Spaces and Robotics Research: Two Case Studies of Two Different Lab Cultures at Carnegie Mellon University, 19980s and 2010s

- Andrew Meade McGee, National Air and Space Museum, Smithsonian Institution

Abstract: This project explores gendering of laboratory space, lab culture, and lab practice, intentional and otherwise, among roboticists in two representative sites of scientific inquiry at Carnegie Mellon University separated by thirty years of time. The Field Robotics Center, directed by William "Red" Whittaker, and the CORAL ("Cooperate, Observe, Reason, Act, and Learn") research group, led by Manuela Veloso, have been two of the research crown jewels at Carnegie Mellon University, an institution that touts itself as "Robot U." Together, these working roboticist spaces provide fascinating insight into transformation and continuity in gendered approaches to sites of scientific inquiry and suggest surprising ways in which attitudes towards gender shaped engineering approaches to conundrums around

artificial intelligence and technological substitutions for human bodily autonomy through robotic practice.

Drawing from oral histories, archival research, news coverage, and site observations of lab space and team behaviors, I contrast explicit and hidden gendered attitudes towards scientific practice and innovation, spatial organization of laboratory activities, and public interactions with outsiders. Not merely a narrative of progression of attitudes over time, I detail accounts of how unintentional gendering of tools, team dynamics, and institutional structures leads to unexpected consequences in seminar discussions, published works, and the lab floor, while opening doors for broader ranges of gender expression in student explorations of work and self.

10 Nineteenth and early Twentieth Century Astronomy

Room: 40.105.

Chair: Hugo Soares, University of Lisbon

Luminous Matter in the Celestial Realm: Studies on Material Conditions of Solar System Bodies in the early 19th Century

- Janna Katharina Mueller, Cambridge University

Abstract: While much attention has been given in historical scholarship to transformative mid-19th century developments in astronomy marked by the advent of spectroscopy and advancements in telescope technology, I will propose a shift in focus, examining transformations in astronomical practices aside from positional astronomy and celestial mechanics in the early 1800s. With the discovery of the first asteroids (or minor planets) between 1801 and 1807 as well as the realisation that comets are part of the solar system, the universe as it had been known became messier. Established notions of planets and comets were challenged, sparking debates on the classification of solar system bodies. Focusing on speculative theories regarding celestial matter prior to spectroscopy, my research analyses cosmogonic theories of the astronomers Herschel, Laplace, and Olbers, while also investigating the influences of geology, mineralogy, and chemistry on their work, revealing how observations on and theories of the Earth as the primary model shaped their understanding of planetary objects. In connecting ideas of matter (formation), light

and heat with astronomical observations, these astronomers were able to form hypotheses of compositions and functions of bodies in the overall structure of the solar system. My paper will thereby not only show how these conceptualisations of celestial matter and matter theories shaped systems of classifications of solar system bodies in a time of classificatory messiness, but also how entanglements of several domains of science and their practices shaped the path for what only much later became known as the 'new' physical astronomy and planetary sciences.

Thoughts by (and for) women on their roles in Astronomy (1850-1919)

- Kaliana Dias de Freitas, University of Aveiro, Universidade Federal do Oeste da Bahia; Vitor Hugo da Rosa Bonifácio, University of Aveiro; João Manuel de Moraes Barros Fernandes, University of Coimbra

Abstract: In this work, we analysed women's statements about their participation in science and particularly in astronomy. In the time period analysed women's access to higher education increased and some started to be hired to observatories due to the creation of large astronomical projects, such as Carte du Ciel (1887) and the Henry Draper Catalog (1886). In an 1876 speech at the Women's Congress, Maria Mitchel (1818-1889), professor and director of the Department of Astronomy at Vassar College, argued: "I should like to urge upon young women a course of solid scientific study in some one direction for two reasons: 1st. The needs of science; 2nd. Their own needs". Mitchell brought a vision for what women could become in science, and influenced many in the following decades. In a 1919 communication 'The Work of Women in Astronomy', Dorothea Klumpke Roberts (1861–1942), responsible for the Paris Observatory Bureau des Mesures, said: "Women like Phoebe Hearst, like Catherine Bruce, like Anna Palmer Draper, women like Williamina P. Fleming, Annie J. Cannon, Harriet S. Leavitt were and are equally necessary to extend human knowledge far into space and time." In this excerpt, Klumpke highlights the importance of so many women involved in astronomy albeit in different manners. In this work we aimed to bring to the fore women's "voices" concerning their roles as students, teachers, communicators and benefactors. We concluded that in this period there was a growing awareness of the role that could and should be played by women and of the difficulties encountered by pioneers in accessing scientific employment on equal terms.

Capturing the Stars: Women's Networks and the Astronomical Community at Yerkes Observatory, 1900–1930

- Kristine Palmieri, University of Chicago / IZEA

Abstract: A particular story is often told about women in the history of American astronomy and astrophysics. In the early twentieth century, so it goes, the best position a woman could hope for was that of (human) computer, working at an observatory to process the data from positional observations, photographs, or spectrograms that had been produced by men. Yet new research by an interdisciplinary team at the University of Chicago has revealed that women working at Yerkes Observatory did far more than this. They earned advanced degrees, conducted their own research, collaborated on projects with peers of both sexes, authored publications in their own names, and advanced the work of the observatory in substantive rather than merely quantitative ways. In this paper, the group's historian, Dr. Kristine Palmieri, will explain how the Capturing the Stars Team has been working to reconstruct the scientific research and lived experiences of the Yerkes women by focusing predominantly on figures the figures of Dorothy Block, Caroline Furness, Alice Farnsworth, Vera Gushee.

These women, moreover, did not wind up at Yerkes by happenstance. A significant majority had degrees from eastern women's colleges or co-educational institutions such as Carlton and Swarthmore Colleges. Kris will thus also highlight the most recent stage of the group's research, which has focused on reconstructing the larger scientific, educational, and personal networks in which the Yerkes women participated through research in the archival collections of women's colleges such as Smith, Mt. Holyoke, and Vassar, Columbia and Harvard Universities, as well as the papers of Mt. Wilson and Lick Observatories. For while the lives and labor of the Yerkes women are all but invisible in public records, the scientific work— and the voices — of these women remain preserved in archives across the United States.

11 Understanding Mushrooms (15th–20th centuries)

Room: 40.101.

Chair: Elena Canadelli, University of Padua

Organiser: Barbara Di Gennaro Splendore, Independent Researcher

The elusive nature, sporadic appearances, and uncertain edibility of mushrooms has troubled scholars for centuries. In the West, mushrooms were regarded as lower life forms—or more precisely, as "imperfect plants"—with such views having a direct impact on Western understanding of fungi. Linnaeus viewed them as a “scandal to art” and throughout herbal and botanical treatises, mushrooms were typically relegated to brief, recycled information in short paragraphs. Subsequently, mushrooms have also been understudied by historians of science.

However, the importance of fungi as integral components of the ecosystem is increasingly being recognised. Fungi constitute an entire kingdom, encompassing not just macroscopic and microscopic species of a diverse range of shapes and sizes. Modern scholarship recognizes fungi not only as pivotal contributors to life on Earth, primarily through their role in recycling deceased organisms, but also as metaphorical organisms that can inform our understanding of ourselves. This newfound perspective on fungi's significance necessitates a reevaluation of mushrooms within the history of science.

This panel focuses on exploring the texts, queries, imagery, materials, and locations linked to mycological knowledge across a wide historical spectrum, spanning from the fifteenth to the twentieth century. The various presentations will delve into the ways in which mushrooms have provoked debates among scholars and the symbolic meanings they have held. What was, for example, the enigmatic nature of the fungal stone puzzled scholars for centuries? Was it solidified urine, a root, a stone, or a truffle? What can we know about the consumption of mushrooms at the court of Emperor Rudolph II in sixteenth-century Prague? And how were fungal collections understood by provincial mycologists of the decades surrounding the turn of the twentieth century? The inherent uncertainties surrounding mushrooms serve as a reminder of the need to refine our approaches to understanding the natural world.

Fossil, Urine, Plant, or Stone? Decoding the Stone Fungus in Early Modern Italy

- Barbara Di Gennaro Splendore, Independent Researcher

Abstract: In the sixteenth and seventeenth centuries, aristocratic families in Southern and Central Italy kept stone fungus in their cellars to grow mushrooms

and serve them on their tables. Stone fungus, or *Polyporus tuberaster*, is a solid body of fungal tissue (sclerotium) that yields delectable mushrooms, if adequately kept and watered. Notably, Federico Cesi, the founder of the Accademia dei Lincei, even cultivated a fungal stone on his windowsill. Despite its presence in ancient records, the stone fungus baffled naturalists with its enigmatic nature. This paper delves into the scholarly debate surrounding stone fungus, exploring the diverse perspectives that persisted for centuries. Was it truly solidified lynx's urine, as ancient sources maintained and some modern scholars reported? Or, as Pier Antonio Micheli—the acknowledged pioneer of mycology—contended, were these assertions mere unfounded conjectures? Should stone fungus be classified as a stone, truffle, mushroom, or simply a mass of debris? Eminent scholars, including Giovanbattista Della Porta, Marco Aurelio Severino, and others, engaged in a prolonged debate, contributing varied theories before a consensus emerged. This research investigates the boundaries between living and non-living entities in the context of stone fungus, shedding light on the forms of inquiry employed by scholars. The examination encompasses experiments, illustrations, treatises, and correspondences, revealing the evolution of methodologies and the eventual convergence toward a shared understanding.

Mycological Collections as Legacy in Early Twentieth Century Yorkshire

- Nathan Smith, National Museum Wales

Abstract: Mycology, the study of fungi, is an extremely young discipline that lacks the institutional presence afforded to its sister disciplines of botany and zoology. As such, its practitioners were more dependent on other avenues to ensure a continued mycological heritage and to secure their influence. This paper will explore the role of mycological collections and records (including letters, photographs, and published texts) as means of cementing individual and organisational legacy. It will focus on Yorkshire at the turn of the twentieth century and explore how mycologists of the region collaborated to ensure maximum exposure to both their collections and records during a period of seismic change in the wider field of nature study, focusing particularly on the collections of Henry Thomas Soppitt and Charles Crossland, and explore the differential values ascribed by mycologists to physical and written collections.

10:30 - 11:00 Coffee Break

11:00 - 13:00 Sessions

1 Beyond Knabenphysik: Women in the History of Quantum Physics (2/2)

Room: 40.002.

Chair: Patrick Charbonneau, Duke University

Organiser: Patrick Charbonneau, Duke University; Margriet van der Heijden, Eindhoven University of Technology

The moniker “boys’ physics” (Knabenphysik) originally emphasized the youthfulness of the early quantum physics protagonists. Its gender connotation long remained unchallenged, in part because of the twin stereotypes that physicists would be men, and that scientific genius would be a “masculine” trait. This symposium brings to light the remarkable yet long-overlooked contributions of women to the development of quantum physics.

Over the last three years, the group Women in the History of Quantum Physics (WiHQP) has brought together historians, scientists, and philosophers of science to reconstruct and analyze the lives and contributions of dozens of women from the early days of the old quantum theory to quantum field theory, and their associated philosophical conundrums. In anticipation to the 2025 centennial of quantum mechanics, this symposium presents a subset of these herstories to capture the richness and diversity of scientific life that has grown from researching the quantum. Through presentation of individual histories and microhistories, the symposium offers a historical perspective into the persisting challenge of increasing gender diversity in physics, as more generally discussed in a capstone roundtable.

The Spectrum of He⁺ as a Proving Ground for Bohr’s Model of the Atom: A Legacy of Williamina Fleming’s Astrophysical Discovery

- Bretislav Friedrich, Fritz-Haber-Institut der Max-Planck-Gesellschaft

Abstract: In 1896, Edward Charles Pickering (1846-1919), Director of the Harvard College Observatory (HCO), reported in a trio of publications the observation of “peculiar spectra” of the southern star ζ Puppis, which he attributed to an “element

not yet found in other stars or on earth.” Supported by laboratory spectra obtained by Alfred Fowler (1868-1940), Niels Bohr (1885-1962) showed in 1913 that this “element” was, in fact, ionized helium, He^+ . Its spectrum has become known as the Pickering Series, even though Pickering credited in the same publications Williamina Fleming (1857-1911) for the discovery. Fleming was one of HCO’s “computers” and the future Curator of the Astronomical Photographic Glass Plate Collection. The series of spectral lines associated with Pickering’s name played a unique role on the path to quantum mechanics by serving as a proving ground for Bohr’s model of the atom. Our examination of how the discovery of the Pickering series had been made relied on the records held at the Center for Astrophysics | Harvard & Smithsonian, the successor institution to the Harvard College Observatory, especially the Notebooks and Diaries of Williamina Fleming and others as well as on the Center’s Glass Plate Collection. Insights about the “peculiar” sociology of a research institution, half of whose staff were women employed on grossly unequal terms with men, are provided in the course of the narrative.

Untangling Entanglement History: Early Quantum Contributions of Chien-Shiung Wu

- Michelle Frank, Leon Levy Center for Biography

Abstract: Chien-Shiung Wu (1912-1997) is often referred to as “the Chinese Marie Curie” even though she conducted most of her research in the United States. She was a crucial, if conflicted, participant in the Manhattan Project. Her discoveries were early steps toward the Standard Model of particle physics, and her little-known 1949 experiment with anti-matter became the first to demonstrate entanglement – a fact that went unmentioned seventy years later when the 2022 Nobel Prize in physics recognized decades of entanglement experimental work. Wu is best known, though, for toppling a fundamental law of physics in the 1950s - a decade when American gender expectations for women placed a much stronger premium on relationships than on scientific rigor. In honor of her 1956 experiment disproving the principle of parity for weakly interacting particles, two men received the 1957 Nobel Prize. Wu was not included. This presentation explores Wu’s scientific work, the historical events that shaped her, and the cultural expectations that threatened to erase her.

Roundtable discussion with the symposium participants about the historical perspective on the persisting challenge of increasing gender diversity in physics.

2 Concepts in the history of biology

Room: 40.047A.

Chair: Stefan Bernhardt-Radu, University of Leeds

“A good man cannot teach zoology”: Molecular biology and the existential crisis in biology in the 1960s and 1970s

- Apostolos Gerontas, Coburg University of Applied Sciences

Abstract: For the greatest part of their existence, the biological disciplines have been solid bastions of natural-historical thought: vigorously collecting, describing, and classifying. Starting as an idea before the Second World War and progressively becoming a reality afterward, molecular biology brought a broad restructuring of the life sciences and irreversibly altered their relationship with chemistry, physics, technology, and industry. Numerous practitioners of biology welcomed the dawn of this era enthusiastically as if longing for it to come for quite some time: prepared even to proclaim their own special disciplines to be outdated "bird watching" or "butterfly collecting". Starting from the opinions of the geneticist and evolutionary biologist Theodosius Grigorievich Dobzhansky (1900-1975), this paper documents the relevant discussions among biologists, demonstrating that the self-canceling enthusiasm hid a deeper and long-standing existential doubt in the heart of the life sciences. Furthermore, the paper documents the introduction to biological (and medicinal) discourses of ideas, originating in chemistry and physics, and discusses the self-perceived gaps that these were meant to cover. The paper is also of use to readers interested in an introduction to the first steps of modern molecular biology, and the path(s) that led to its canonization and eventual dominance.

Species and Supracategories: The Parallel History of Their Reality

- Demián Missael Muñoz Jiménez, Universidad Nacional Autónoma de México

Abstract: Around the year 2000, authors like Devitt, Kempt and Brigandt proposed a revision of the role of the higher categories in evolutionary biology, but we can trace

the history of this discussion since 1927. Back then, Filipchenko conceived the micro and macroevolutionary processes as independent. In 1937, Dobzhanski, and other authors, neglected this idea arguing that the population dynamics are the actual and only mechanisms of evolution (extrapolation of the microevolutionary processes). This marked a turning point in the conceptualization of species and higher taxa. The species became the only entity whose actions and role in evolution conferred ontological reality.

The aim of this work is to show the development of the reality of species and higher taxa through their parallel history, starting from the micro-macroevolutionary extrapolation.

I will recognize the main arguments that contributed to differentiate between higher categories and species based on the Modern evolutionary synthesis movement from the first half of XX century.

Therefore, we can assume the impact that had Dobzhanski's ideas in other authors such as Mayr (1942) and Simpson (1944) by seeing their interpretation of the macrophenomena of change (like the discontinuity in the alive taxa and also in the paleontological record). Even though there were authors that didn't join that thought, like Goldschmidt (1940), Schindewolf (1950) and Løvtrup (1974), the majority of evolutionists get along with the extrapolation and, consequently, with the sole identification of the species as the real entity. This was reinforced with the introduction of the punctuated equilibria in 1972, the species selection in 1975 and the species individuality in 1976.

Parallely, the phylogenetic systematics emphasized the historical and pragmatic reality of the supraspecific categories. Then, our view of them depended on our method, our tools and our aim to characterize them.

From the evolutionary past to the future? E.O Wilson, sociobiology and societal challenges, 1968-1975

- Cora Stuhmann, LMU Munich - LMU München

Abstract: When E.O. Wilson was interviewed in 1975, he shared his belief that “mankind is at a crucial point in its social evolution.” He expected humanity to reach an “ecological steady state” at the end of the 21st century “with zero population growth, continuous recycling of all resources and ‘a pretty tightly controlled and

regimented physical world.” Sociobiology was not only a scientific endeavor but also a guide for navigating the challenges of this societal transformation.

Wilson's vision for the future in "Sociobiology: The New Synthesis"(1975) addressed pressing issues of the 1960s, such as overpopulation, loss of biodiversity, and resource allocation. It also reflected a growing concern about the stability of social order as societal cohesion was perceived to be under strain, with various movements challenging established norms. In exploring the nature of social organization, Wilson's "Sociobiology" questioned the possibility of fundamentally changing human society, be it through environmentalism, communism, or feminism.

He argued that while human societies exhibit greater complexity than insect colonies, they are still subject to similar evolutionary pressures and constraints, suggesting that certain aspects of social organization might be resilient to change. To explore the continuity of social behavior across different species, he started his sociobiological trilogy with "The Insect Societies" (1971) and ended "On Human Nature" (1978). There, Wilson reached his famous verdict about society's adaptability: "Genes hold culture on a leash" – and only through sociobiology could humanity finally understand this leash.

Despite criticism following its publication, Wilson consistently maintained that sociobiology was apolitical. However, before the controversy, he envisioned a significant role for sociobiology in guiding the transformation of human society. This paper delves into Wilson's response to the societal challenges of the 1960s, his vision for the future, and how sociobiology was supposed to steer humanity through its evolution.

3 Dealing with the environment

Room: 40.152.

Chair: Jon Agar, University College London

Helping to advance environmental monitoring history: engagement in biodiversity recording in Portugal

- Cristina Luís, CIUHCT, Faculdade de Ciências, Universidade de Lisboa

Abstract: In the Anthropocene era, human impact on the environment poses significant risks to life on Earth. Environmental concerns have persisted throughout

history and monitoring the state of the environment is a fundamental aspect of human existence. Currently, there is a growing trend in environmental monitoring involving citizen science initiatives for biodiversity monitoring, which involve various participants, including those with no scientific expertise. Nevertheless, challenges such as the participants initial and continued engagement prevent some of these efforts from being more effective. The lack of recognition of participants' contributions is one of the main obstacles to sustained engagement in citizen science initiatives related to monitoring practices. However, this process of engagement is not new as the famous Christmas Bird Count initiative in North America shows. But were these practices also common in countries where biodiversity monitoring by non-experts is still residual nowadays, as is the case of Portugal? The analysis of historical documents, such as biological collections and catalogues in museums, or old field notebooks and manuscripts, can provide valuable information about past engagement strategies in biodiversity recording and monitoring initiatives to help inform current practices. This presentation will demonstrate that by analysing historical materials, particularly focusing on the establishment of zoological collections in natural history museums in Portugal in the 19th century, we can discern effective engagement strategies used in the past. These strategies range from valuing local knowledge to emphasizing inclusivity in participation, regardless of formal training. This presentation highlights the importance of integrating historical analysis into contemporary citizen science studies to enrich our understanding and enhance current practices, thus contributing to more sustained and effective environmental research.

Floods and droughts in the Po basin: a history of land management and risk communication in post-unitary Italy

- Marco Bresadola, University of Ferrara, Italy

Abstract: The paper deals with the history of water-related disasters in the Italian north-east area, where the major river of the country has its delta. It focuses on how the management of the territory was organised in post-unitary Italy, the role of the technicians in this organization, and what was, if any, the communication of related risks to the population. A major event in this history is the flood in the "Polesine" in

1951, and the paper deals with the impact of this disaster on the above issues, and especially on people's perception of their territory.

4 Dialogues between Science, Technology, Arts and Literature (1/2)

Room: 40.101.

Chair: Ana Cristina Martins, IHC-Polo Universidade de Évora / IN2PAST, Portugal

Organisers: Ana Cristina Martins, IHC-Polo Universidade de Évora / IN2PAST, Portugal; Hannah Star Rogers, University of Copenhagen, Medical Museion

Science and technology have always used art and literature in several ways: as a source of information, ways of building, setting and wide spreading narratives and representations, as well as ideas and making them prevail. Narratives and representations that change according to the development of scientific and technological knowledge and the very heritage that it generates and is associated with. But they also change in accordance with the space and time in which they are produced, being (re)constructed, destroyed, replaced, adapted, or confronted depending on prevailing or emerging agendas, be they ideological, political, social, economic, cultural, ethnic, ageist, sexual or gender based.

But are we, the ones engaged with different forms of science and technology fully aware of this reality?

How have different literary and artistic contexts influenced the construction of scientific and technological narratives and representations over time? In what ways do these same narratives and representations contribute to underpin agendas (including scientific, personal, and institutional, public, and private), while breaking paradigms and prejudices (namely sexual, gender, ethnic, class and ageist)? What is the nature and scope of this ongoing dialogue between science, technology, art, and literature? How does this constant interweaving (i)materialise? Who dictates, feeds, and manages it? To what end(s)? And what about the creative freedom of the author, whether artistic or literary, where and how does it remain? How are narratives - written and iconographic - constructed from science and technology? How to make scientific knowledge reach different types of audiences? And what space do the new social realities - migratory, nomadic, etc. - occupy in this increasingly interwoven complex?

This is a vast set of questions to which we seek to answer during this symposium.

Archaeology, archaeologists, and bookplates: the Portuguese context

- Ana Cristina Martins, IHC-Polo Universidade de Évora / IN2PAST, Portugal

Abstract: The relationship between science, technology, art, and literature is relatively well-known. At least, in general. Furthermore, as far as artistic production is concerned, this connection has been worked on mainly in the fields of painting, drawing, sculpture, theatre and cinema. Still, the necessary attention has not been given to different typologies of the so-called ‘Miniatural Art’. This is the case of bookplates, despite the much-diversified information contained in each of its specimens, true marks of possession, in the specific case of books. Looking over its surface often becomes an authentic iconographic and iconological reading exercise that allows us to penetrate details (sometimes unmentionable) of the life and work of its holders. We propose, therefore, to demonstrate how, like any other work of art, the bookplates allow a stratigraphic analysis of the person who owns it, using, for this purpose, Portuguese examples, namely from scientists, and scientific institutions. This exercise will allow us to unveil a little more about the scientific path of each author, including personal networks while establishing parallels with the presence of science in other artistic categories and typologies.

Science and Literary Imagination: “Influence” vs. “Correspondence”

- Gi Taek Ryoo, Chungbuk National University, Korea

Abstract: The seventeenth century is characterized not just as the age of scientific revolution but as the age of political and social revolution (in England). Many historians of science claim that, at that time, politics, religion, and science were not isolated but integrated; they were mutually transformed and shaped by their interaction. If science was influenced by society, how can we understand the “influence of science” on literature, particularly John Donne and John Milton whose works were profoundly shaped by their enduring commitment to religious and political causes? It is notable that historians of science (Thomas S. Kuhn, Alexandre Koyré, Steven Shapin, Bernard I. Cohen) often draw on literature citing Donne and

Milton as support for the existence of ‘revolutions’ in science—as literary evidence of “anxiety” and “epistemological uncertainty” brought by the radical changes in knowledge. However, as this paper argues, Donne and Milton viewed the cosmic revolution not just as demonstrated by science but based on the cultural doctrine of “correspondence” between microcosm and macrocosm that brought together the earthly (social/political) matters and the heavenly matters. Their astronomical world-views (while influenced by science) emerged out of concrete social, political, religious experience, rather than out of the anxiety or uncertainty ensued by the scientific epistemological rupture. This paper explores the ways in which Donne and Milton establish their own visions of the universe by incorporating science into their own social, political, religious belief systems that encapsulate new relations among the universe, humanity, and God.

Eggs and External Wombs: The Persistence of a Fantasy

- Aline Ferreira, Universidade de Aveiro

Abstract: My purpose in this paper is to trace the roots of a reproductive fantasy, that of women laying eggs and incubating their babies, from its origins in the eighteenth century to a cluster of fictional and visual representations in the early twentieth century. The persistence of the egg as a metaphor for female reproductive autonomy in literature and art suggests the relevance of this deep-rooted ambition. Particular attention will be paid to James-Brown Ashton’s *An Essay on Increasing the Inhabitants and Riches of Ireland, and Propagating Mankind by Incubation* (1747) which, engaging in a satirical vein with William Harvey’s notion “ex ovo omnia” and Swift’s *A Modest Proposal* proposes as a swifter and more efficient reproductive method that of incubation of eggs laid by women. It elicited a number of responses one of which, Richard Roe [John Hill]’s “A Letter To Dr. Abraham Johnson, On The Subject Of His New Scheme For The Propagation Of The Human Species” (1750) includes what may be the first reference to “artificial Uteri”. Despite the satire that characterizes these texts, read through a contemporary lens their fanciful procreative scenarios do not seem so far-fetched and speak to many woman’s desire to have children with recourse to less time consuming and sometimes painful methods as pregnancy and childbirth. Salient examples of texts that contain examples of oviparity and will be briefly examined include Edgar Rice Burroughs’s *A*

Princess of Mars (1917), George Bernard Shaw's Back to Methuselah (A Metabiological Pentateuch) (1921) and Djuna Barnes's Ladies Almanack (1928). Eggs are also present in the art and writings of Leonor Fini and Remedios Varo, symbolizing women's independence and reproductive autonomy. The persistence of this fantasy, where the egg can be metaphorically associated with an artificial womb and thus with a radically different procreative method, ex utero, bears witness to the deep-seated wish for an easier way to bear children, which science may enable in the not so distant future, with eggs and sperm created from any cell in the body, combined with ectogenesis.

5 Early Modern Cosmology and Astrology

Room: 40.047C.

Chair: Tayra MC Lanuza-Navarro, Universitat Pompeu Fabra

Cosmological Questions in Central Europe

- Adam Mosley, Swansea University

Abstract: Recent scholarly work has suggested that the modern disciplinary category of 'cosmology' emerged in a cultural milieu usually overlooked by historians of the science: confessionally-diverse German and Germanic universities and colleges of the seventeenth century. We can trace the characteristics of 'cosmology' in this setting, and its relationship to earlier scholastic thinking about the universe, through published university disputations and treatises which raised and answered cosmological questions, or advanced and defended cosmological theses. Examples include Johan Heinrich Alsted's *Cosmologia* (1611), Caspar Bartholin's *De Mundo Quaestiones* (1625), and Johannes Scharfius's *Cosmologia, seu Disputata Physica de Mundo* (1625). This paper will explore some of these texts and their contents, teasing out the relationship between confessional identity and cosmological doctrine, exploring the intertextuality of these works and the interrelations of their authors, and discussing the extent to which their existence changes our understanding of how cosmology evolved over the course of the early modern period.

“É Astrologia, ma non é Astrologo.” John Aubrey’s Brief Lives and Astrology

- Jakub Ochocinski, European University Institute

Abstract: This paper explores John Aubrey's (1627-1697) extensive use of astrology in his biographical collection *Brief Lives* (1680-81), which has been widely celebrated for its vivid portrayal of seventeenth-century English culture and society. Aubrey's life writing was not only informed by his antiquarian pursuits, the vibrant coffee-house culture of his time, and his lively scientific community, but also the practice of astrology. Through Aubrey's horoscope collection, *Collectio Geniturarum* (1674-1680?), and his correspondence with a wide astrological network, we can trace his deep engagement with the practice. In squarely focusing on these two sources, I argue that Aubrey greatly relied on astrological methods to inform his life writing. In making his collection of horoscopes, Aubrey drew on a long tradition of astrological data gathering. Aubrey's careful collation and calculation of data to verify birth times, identify major life events, and determine 'ingenous' traits also contributed to a wider effort to reform astrology considering the nascent experimental philosophy. By examining Aubrey's multifaceted astrological writings, this article clarifies one of Aubrey's key techniques used in his early sketches of *Brief Lives*. More broadly, it further complicates the historical narrative that astrology was largely marginalised in late seventeenth-century English intellectual and scientific communities.

6 Ecology, Land Management and Horticulture in Early Modern Italy (2/2)

Room: 40.004.

Chair: Fabrizio Baldassarri, Ca' Foscari - University of Venice;

Organizers: Fabrizio Baldassarri, Ca' Foscari - University of Venice; Monica Azzolini, University of Bologna

This panel is connected with the twin-panel Land Management and Horticulture in Early Modern Italy (I). It similarly argues that although ecology and sustainability lacked a clear definition in pre-modern times, an underlying attention and interest to nature and the environment surfaced in the 16th century, revealing a compelling interconnection between different fields, and a new attention to nature. Soil, air, and water were not only a matter of nature, but also a subject of investigation, both intellectual and speculative, experimental and practical. They also, moreover, became

objects of economic, social and political contention among communities and polities. In particular, water increasingly became a resource to be managed and channelled to improve transportation, irrigation, and fishing. This panel deploys a series of case studies to study in turn, how Tuscans reclaimed land not just for agricultural use, but also urban development; how different perceptions of nature and the weather were at play among surveyors, experts and technicians in sixteenth-century Emilia-Romagna; and finally how catastrophic events such as floods allow historians to explore the way early moderns conceptualised water, nature, and human expertise concerning events that were largely out of their control.

Lacking the Benefit of the Air': An Olive Tree-Focused Perspective on Climate in Sixteenth-Century Medici Tuscany

- Anca Delia Moldovan, I Tatti

Abstract: My paper proposes a multifaceted investigation into the environmental, artistic, and intellectual history of the olive tree in sixteenth-century Medici Tuscany. It brings new insights into a plant intrinsically connected to the construction of the 'Tuscan' identity, while highly sensitive to the climatic fluctuations of this land. In recent times, increased aridity and altered seasonal patterns have questioned the future of the olive in the Mediterranean—the same territories that, according to historian Fernand Braudel, this tree helped define. Already in 1569, the humanist Pietro Vettori noticed how diligent study ensured the 'bountifulness' of this 'noble plant' in Tuscany, despite it lacking the appropriate climate. Diaries and ordinances proclaimed in years of harsh winters, such as in 1590, highlighted anxieties and efforts to mediate environmental conditions. At the same time, the sixteenth century was a period of expansion of the olive into the Tuscan landscape, encouraged by important politico-economical, scientific, religious, and social shifts. Looking at the history of this tree implies, therefore, looking at how Early Modern people understood, represented, and interacted with the environment. I will analyse visual sources (such as Giovanni Stradano's olive-making print), textual, and material evidence about plants and climate at the interconnection of multiple factors in Early Modern Italy to explore tensions between city and countryside; propagandistic imagery and environmental governance; classical frameworks and empirical developments in botany, agriculture, and dietetics.

Knowing the Soil, Knowing the Environment: The Role of Horticultural Knowledge in Early Modern (Philosophical) Botany

- Fabrizio Baldassarri, Indiana University, Bloomington

Abstract: In Renaissance botanical treatises, in the account of each plant there is a paragraph devoted to the places—loci—of cultivation. Besides the medical exploration of plants, especially surfacing in the voices about temperament and virtues [Temperamentum and Vires], scholars were attentive on the ways one should cultivate a plant in order to produce the suitable pharmacon or fruit. For instance, in Leonhart Fuchs' *Historia stirpium*, place and time were 2 important features of any natural historical description of specimens. Somehow, this was not inconsistent with Hippocratic medicine, focusing attention on the role of airs, waters, and places in medical knowledge, and with Galenic description of four elements, air, fire, water, and earth. Yet, the attention to soil gained momentum as botanical knowledge moved from fieldwork and collection to cultivation and experimentation. When *orti botanici* were built in Europe, the expertise and labor of gardeners and horticulturalists importantly shaped the knowledge of plants, as scholars faced the challenges of the different grounds, soils, air and habitats as they attempted to cultivate specimens and accommodate plants. In this presentation, I aim to reconstruct this connection and deal with a few cases of scholars who recognized the importance of soil and climate in diversifying the production of plants, ultimately experimenting on these differences. I discuss the case of Italian naturalists Ulisse Aldrovandi, Pietro Andrea Mattioli and Andrea Cesalpino, their connection with horticulturalists, and I shed light on the role of the environment as a strategic feature in shaping botanical science.

Experts in Environmental Resources: training and role in the disputes over water and woods management in the State of Milan (1600-1800)

- Matteo Di Tullio, University of Pavia; Martino Lorenzo Fagnani, University of Pavia

Abstract: Water and wood were two of the main natural resources on which European societies drew during the early modern period. Precisely because of their key importance, these resources, their use, and their possession were the object of great attention in ground rent contracts, just as they were at the centre of conflicts between communities, beneficiaries, and owners who drew on them. For this reason,

there was an increasing need for experts to manage access to water and wood, determine their value in the drafting of tenure contracts, and contribute to settling disputes between different beneficiaries. Our paper analyses the profile of pre-modern engineers, land surveyors, and lawyers with expertise in environmental resources, specifically water and wood. Studying the case of the State of Milan from the sixteenth to the eighteenth century through primary sources, we examine some cases that highlight how scientific and technical knowledge emerged in the work of these experts. Where possible, we try to understand these professionals' educational background, whether their knowledge was based on theoretical or merely empirical training, and whether, over time, some of them benefited from new teachings in technical institutes and universities in natural history, engineering-related subjects, and cameralism.

7 Exploring the mind and human relations

Room: 40.105

Chair: Annette Mülberger, University of Groningen

Boundaries and Spaces of Science in Nineteenth-century Explorations of the Mind

- Emese Lafferton, Central European University, Vienna

Abstract: My proposed presentation relates to the larger theme suggested by the conference organizers: "The changing epistemic limits of science throughout history: astrology, phrenology, pseudoscience, post-truth, and so on".

The paper takes us to the realm of 19th-century fascination with the mind and research into its hidden recesses and powers. By relying on original Central-Eastern European historical sources, the paper discusses aspects of mesmerism / animal magnetism from the first part of the 19th century, the spiritualist movement from the 1850s, experimental medical and psychiatric hypnosis research in the 1880s and '90s, and psychoanalysis after 1900 in order to ask questions about the space, role and borders of science in the period. How were the boundaries of science questioned, blurred, negotiated or maintained in the face of potentially subversive explorations into elusive psychic phenomena? What could these explorations possibly offer at the time of religious uncertainty, and in the era of materialism and positivism?

The complex treatment of the above areas will allow one to redraw the boundaries between science and the social, the scientific and the popular, the orthodox and the marginal, the professional and the amateur, and the respectable and the disreputable. Finally, by focusing on hypnosis and related practices in distinct settings in which they were practiced, studied and interpreted, the analysis will link the social spaces of psychiatric clinics, courtrooms, provincial castles, café houses, etc., and thus illuminate the wider exchanges (and their costs) between science, society and culture in 19th century Europe.

Worlding Rorschach

- David Bucheli, Universität Basel

Abstract: The Rorschach test is globally known as a psychometric instrument providing insight into people's minds through their interpretation of ten— and only ten—inkblots, originally created by the Swiss psychiatrist Dr. Hermann Rorschach. Whether one believes in its efficacy or not, it's not an overstatement to say that the test was (and in many cases still is) utilized by institutions and researchers worldwide. Despite the widespread usage of these inkblots over more than a century, the challenge of transportation and dissemination presented their greatest obstacle during the test's development years. The need for mobility and technological reproducibility posed significant difficulties to the introduction of the blots as a scientific instrument, shaping their final form in unexpected ways.

In my paper, I aim to explore the history of the Rorschach test in light of what economic geographers call the "friction of distance," referring to the risks of damage, spoilage, or loss inherent in transportation due to factors such as topography, climate, or territorial politics. I argue that Dr. Rorschach's concern about the test's mobility in a hostile environment not only influenced the technical aspects of the test but also reflects his broader theoretical understanding of the psyche's integration within a complex cultural and psycho-physical environment.

To explore the production of blots and subjects within Rorschach's theoretical framework, I draw from Gayatri Chakravorty Spivak's critical reinterpretation of Martin Heidegger's concept of "worlding." Spivak highlighted the colonial dimension inherent in the extractive notion of worlding, which also informs my analysis of

Rorschach's unfinished psychogeographical project and the ethnopsychological utilization of the Rorschach test during the Cold War.

Delay of Gratification, Epistemic Sweets, and Race in Cross-Cultural Psychology, 1950–today

- Susanne Schmidt, Humboldt-Universität zu Berlin

Abstract: This talk is about Hershey Bars, mini marshmallows, and multi-colored M&M's. I look at how the US-American psychologist Walter Mischel and other social scientists used sweets in deferred-rewards experiments conducted in the period since 1950. This research involved thousands of children from different cultural and socio-economic backgrounds in Latin America and the United States. I show how candy's social meanings connected constructions of delayed gratification to debates about racial inequality. Special attention will be paid to marshmallows and family values. Substantial scholarship showed that scientific phenomena are importantly constituted by the material settings of experimentation. Yet laboratory studies also consolidated a stylized, narrow vision of modern experimental practice and the resources assembled to produce proof. By paying attention to the experimental uses and functions of common objects, I show that recent laboratory science cannot be explained by looking only or primarily at expensive, specialized equipment. Consumption, domesticity, and everyday life provide key paradigms for understanding the production of knowledge in the period after 1945.

The talk will integrate the history of social and behavioral science and the social and cultural history of food. In tracing delay-of-gratification experiments from the Caribbean to the iconic Stanford marshmallow test, I will show how sweets connected laboratory studies to debates about racial disparities in academic attainment.

Ultimately, I challenge a focus on the cultural specificity of laboratory life by demonstrating how experimental systems were implicated in social and political debates.

The wounded subject: illness narratives in the age of trauma

- Enric Novella, University of Valencia; Inmaculada Hurtado, University of Alicante

Abstract: In recent years we have witnessed a growing cultural interest in illness narratives and a remarkable boom of autobiographical literature focused on the experience of the most diverse physical or psychological ailments and/or the stay in different medical institutions. This interest has crossed disciplinary boundaries and has inspired, for instance, a rich amount of ethnographical studies of healthcare processes, philosophical contributions to the phenomenology of health and illness, a significant revival of structural and hermeneutic approaches to psychopathology, or even the very project of doing medical history “from below”, i.e., paying special attention to patients’ personal accounts and testimonies of their lived acquaintance with disease.[1] To be sure, this phenomenon has to be seen in the context of our strong individualistic societies and the increasing cultural relevance and projection of the first-person perspective and what has been dubbed late modernity’s “expressive self”, [2] but it is surely not by coincidence that it has simultaneously evolved with the instauration of trauma as the main psychiatric narrative of our time. As is known, the current relevance of trauma as an overarching category for understanding human suffering is the result not only of conceptual developments in psychopathology, but also of changing sensibilities and values (on victimhood, responsibility, vulnerability, etc.). [3] From this point of view, it is not surprising that illness experience (whether physical or mental) tends today to resonate with a framework of intelligibility that

places the emotional turbulences, the psychic imprint and the altered sense of self inflicted by an external or internal “traumatic event” at the core of its narrative articulation. In this presentation, we will try to advance some preliminary thoughts on this (perhaps constitutive) affinity -most probably reinforced after the unexpected shock of the COVID-19 pandemic-[4] through the analysis of some samples of ethnographical research and autobiographical sources.

8 Mathematics and its conceptual frontiers in 20th century Europe

Room: 40.109.

Chair: Raffaele Danna, European University Institute (Florence)

Aurel Voss on mechanics: A mathematician's view

- Hajime Inaba, Meiji University, Tokyo

Abstract: At the beginning of the 20th century, as modern physics was being established, so-called classical physics did not come to an end. Indeed, mechanics, a branch of classical physics, ceased to be regarded as the ultimate theory of physics at that time. However, it continued to play a significant role in physical education and established a distinct research area known as dynamical systems within mathematics, with considerable efforts made towards its axiomatization. Exploring the status of traditional mechanics during the same period, in addition to examining the evolution of quantum theory and relativity, will lead to a more comprehensive understanding of the genesis of modern physics at the dawn of the 20th century.

This paper explores the perspectives on mechanics of mathematician Aurel Voss (1845-1931), who made significant contributions to differential geometry and the variational principles of mechanics. In 1901, he authored "The Principles of Rational Mechanics (*Die Prinzipien der rationellen Mechanik*)" for Felix Klein's "Encyclopedia of Mathematical Sciences (*Encyklopädie der mathematischen Wissenschaften*).". This review reports on the foundational aspects of mechanics, such as D'Alembert's principle and the variational principles, and incorporates Voss' own insights. In addition to this review, the paper investigates Voss' works on the variational principle of mechanics, his general lecture "On the Essence of

Mathematics (*Über das Wesen der Mathematik*)" (first edition 1908, second edition 1913), and his popular exposition "On Mathematical Knowledge (*Über die mathematische Erkenntnis*)" (1914). Through these works, it examines how Voss defined mechanics as a branch of both physics and mathematics, his foundational views, and his perspective on the relationship between mechanics, quantum theory, and relativity, thereby presenting an instance of a mathematician's view on mechanics at the beginning of the 20th century.

Kolmogorov, Lysenko, and mathematics in the life sciences An episode in the Soviet Union (1939-1940)

- Isabella Fascitiello, Università di Roma III; Ana Millán Gasca, Università di Roma III

Abstract: The tension between state patronage and the freedom of research accompanied the deployment of the cultural power of transformation of science in the 20th century. During the so-called golden age of theoretical biology, in the early stages of Trofim D. Lysenko's rise in the Soviet establishment, there were USSR scholars working on the two rival pioneer approaches to apply mathematics to life phenomena: one inspired by classical mechanics and one applying the fresh views on randomness (Israel, Millán Gasca 2002). A 1936 paper (in Italian) by the mathematician Andrej N. Kolmogorov (1903-1987) on Vito Volterra's theory of the struggle for life appears as linked to his interest in the emerging general theory of dynamical systems. In 1939, from his new position as member of the USSR Academy of Sciences, in its «Proceedings» (Doklady), he re-analyzed with statistical techniques empirical data on heredity from a collaborator of Lysenko, A.N. Ermolaeva, opposing her critique of Mendelism (Stark, Seneta 2011). The subsequent reactions by Lysenko and Ernst Kolman (a guardian of materialist dialectics in the area of mathematics), in 1940 notes in the Doklady, highlight Lysenko's opposition to mathematics in the life sciences. Thanks to Stalin's increasing support, he hindered the expression of a fertile epistemological "dialectics" in biomathematics in the USSR.

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Mathematical Logic: Between Its Global History and Microhistories Alfred Tarski's Cooperation with Heinrich Scholz Based on Their Correspondence

- Gabriela Besler, University of Silesia in Katowice

Abstract: Both Alfred Tarski (1901–1983) and Heinrich Scholz (1884–1956) were prominent figures working in mathematical logic. They were in contact by letters at least between 1938 and 1953, as we know from correspondence found in a collection called Nachlass Scholz (Universitäts- und Landesbibliothek Münster, Germany). It contains eight letters written by Tarski and nine carbon copies of letters written by Scholz. One of the letters was sent to a Polish logician A. Mostowski via Scholz. At least five of Scholz's letters have been lost. Based on two survived Scholz's correspondence diaries we know about the next two letters written by Tarski to Scholz or vice versa.

Only excerpts from Tarski's three letters to Scholz have been published so far. My aim is to inform about the content of the unknown correspondence, which could be helpful in reconstructing the development of mathematical logic in Germany and the USA (since 1939 Tarski lived in the USA).

Some topics from the letters:

Academic cooperation: Tarski made 15 remarks on Scholz's student H.Hermes's unpublished work Semiotik (1938); early version of relations calculus, later published as On the Theory of Relation.

Prospects for publications, future publishing plans: since 1941 an English edition of Tarski's concept of truth had been considered.

Current research topics: decision problem, Boole Algebra, completeness of Euclidean geometry.

Organization of the scholarly environment: Tarski promised to read a work of Scholz's Chinese student Hu Shihua (1912–1960); Tarski wrote about his doctor-student L.Chin and J.Robinson.

Academic trips: due to health problems Scholz refused to stay as a visiting professor in Berkeley (1950) and proposed H.Hermes as a participant of International Congress of Mathematicians (Harvard University, 1950); Tarski's lecture on relation algebra in Münster (1953).

Others: didactic activities; exchange of papers, information about common friends (including J.Łukasiewicz), personal matters, Scholz's health problems.

G. Polya's reception of I. Lakatos' "Proofs and Refutations"

- Miklos Redei, London School of Economics

Abstract:

In his "Proofs and Refutations" Imre Lakatos' mentions three intellectual sources of his work: Hegel's dialectic, Popper's falsificationism and Polya's heuristics. Lakatos was corresponding with the mathematician G. Polya both during and after the publication in the British Journal for the Philosophy of Science of "Proofs and Refutations" in four parts in 1963-1964. In this correspondence Polya expressed his views on Lakatos' work. This correspondence, which was in part in Hungarian (the native language of both Polya and Lakatos), is still unpublished, the original letters are in the archive in library of the London School of Economics. The talk recalls some of Polya's views on "Proofs and Refutations" expressed in his letters to Lakatos. It will be shown that Polya's comments were mainly very appreciative, praising the wittiness and originality of the work, but he also voiced some criticism, which was motivated by the practicing mathematician's preferences. The talk also comments on Polya's views from the wider perspective of the reception of Lakatos's work by his contemporaries.

9 Science and Religion, Atheism, Secularism: Entangled histories (2/3)

Room: 40.006.

Chair: Kostas Tampakis, Institute of Historical Research, National Hellenic Research Foundation

Organisers: Jaume Navarro, University of the Basque Country; Kostas Tampakis, Institute of Historical Research, National Hellenic Research Foundation

In the burgeoning field of science and religion historical studies, atheism is a newcomer, but secularism has been a staple. This panel aims to identify and bring to the fore the many ways that science has historically interacted with atheism, the religious underpinnings and anticlerical stances of such interactions, and the reciprocal relations of secularism with science, religion and atheism. We are interested not only in the theological and philosophical modes of engagement, but also in the lived experiences of the people involved. What avenues of research emerge when we consider not only religion, but also religiosity, not only science but scientific practice, not only secularism but also *laïcité*, and not only liberal atheism, but also Marxist and (anti)communist struggles?

Darwinism in Greece: The 1980s public dispute and its roots in the past (1930s-1970s)

- Sandy Sakorrafou, Post-doctoral researcher, NHRF, Greece

Abstract: In 1981, with the election of the Panhellenic Socialist Movement (PASOK) in Greece, a series of initiatives were launched to secularize the state and diminish the influence of the Orthodox Church in society. Amidst these transformative efforts, the longstanding debate over Darwinism in Greece, involving Greek Orthodox Christian circles and the scientific community, resurfaced. In 1984, the introduction of Lefteris Stavrianos' book, "History of the Human Race," in the school curriculum ignited a controversy; the book was criticized for incorporating the theory of evolution and adopting a Marxist perspective. By 1985, biologists were actively protesting against the religious opposition to Darwinism. This public dispute unfolded through the publication of books and articles in both Orthodox Christian and left/centre-left journals. This paper aims to explore the dynamics of this dispute, shedding light on the agendas and the challenges posed within the prevailing political environment.

Tracing the Popularization of Anthropogenesis in Polish Science Magazines

- Katarzyna Jarosz, The International University of Logistics and Transport in Wrocław

Abstract: Wanda Stęślicka-Mydlarska a renowned paleontologist and one of Poland's foremost science popularizers, wrote the following on the popularization of anthropogenesis: "The issue of human origins is one of the most passionately engaging biological problems, fascinating not only naturalists but society as a whole since ancient times." The aim of my presentation is to analyze how anthropogenesis was popularized in Polish popular science magazines from the mid-19th century to the 1970s of the 20th century. The chosen time frame, from the publication of "The Origin of Species" (1858) to the establishment of the Paleoanthropology Society (1992), is symbolic. For the analysis, five popular scientific journals were selected, two of which have a religious-social-scientific profile, while the other three declare themselves as worldview-neutral. In total, 314 articles were analyzed. In questions regarding human origins, there is a clear diachronic shift in the magazines under consideration, moving from conventional biblical concepts about distinct human origins to a more naturalistic explanation that connects the world's races to a shared organic ancestry with plants and animals. In religious magazines, the creationist trend persists for a significantly longer duration (until the late 30s of the 20th century), with a greater number of articles adhering to this perspective. The articles cover an extensive range of topics, including the course of human evolution, the theory of anthropogenesis, the path that led to *Homo sapiens*, the position of *Homo sapiens sapiens* in the genealogical tree of hominids, its potential connections with Neanderthals, evolution of human speech, or the architecture of the skull. The great majority of the authors were renowned paleoanthropologists or archaeologists, both Polish and foreign. Among the authors featured were Bryan Vaughan, Philip Lieberman, specializing in the origin of language and human evolution, and Richard Leakey

Freethinking, anarchism, materialism and sociability in Barcelona: La Luz (1883-1896)

- Álvaro Girón Sierra, Milá y Fontanals Institute on Humanities Research-Spanish National Research Council (IMF-CSIC), Barcelona

Abstract: After a long period of clandestine activity (1874-1881), the libertarian movement revived through trade union activity (the Federation of Workers of the Spanish region, FTRE). Success soon faded, and already in 1883, due to repression and internal debates, anarchist activity entered a deep crisis. In Barcelona, it was the freethinking and masonic circles that offered refuge to the anarchists during this profound crisis. “La Luz”, founded by one of the leaders of Free-Masonry in Catalonia, Rosend Arus, was defined by its radical atheism, becoming the most important and long-lived circle of the freethought movement of the 1880s in Barcelona. This freethinking society brought together people with different political profiles, establishing bridges between middle class republicans and well-known anarchist leaders. Collaboration was particularly relevant in the secular schools that were founded in various areas of Barcelona. Some of these anarchists who actively participated in La Luz, fundamentally Fernando Tarrida del Marmol, were on paper fierce defenders of materialism, and openly defended Darwin's theory. This, theoretically, differentiated them from those freethinkers more inclined to establish collaboration with spiritualists. Materialism was not only a matter of eroding the authority of the Catholic Church, but of articulating an alternative overview. But beyond theoretical discourses, La Luz promoted an alternative sociability, a true calendar of activities that articulated some of the most important vital events, from birth to death.

“Like another St. Basil”: Astronomy, anticommunism and atheism in 20th century Greece

- Kostas Tampakis, Institute of Historical Research, National Hellenic Research Foundation

Abstract: Dimitrios Kotsakis (1909-1986) and his mentor Stavros Plakidis (1893-1990) were the two main astronomers working in Greece for more than half a century. Having studied in some of the best European observatories, Plakidis and later Kotsakis trained most of the astronomers who came after them, fought for and helped create a new Astronomical Observatory and published astronomical observations in international journals. Alongside their scientific work, they had time to write popular books and to organize and deliver lectures for the general public. It is thus noteworthy that both astronomers were not only militant anticommunists, but

were also deeply involved in Orthodox para-ecclesiastical organizations. This paper aims to discuss the relations between their astronomical work, their religious affiliations and their militant anti-materialism, in the context of pre-WW2 and Cold War era Greece.

10 Styles of Thinking & Doing in the Ecological History of Scientific Knowledge and Practices (2/3)

Room: 40.008.

Chair: Matteo Vagelli, Ca' Foscari University of Venice

Organisers: Matteo Vagelli, Ca' Foscari University of Venice; Joseba Pascual Alba, University of the Basque Country

Ian Hacking (1982) initiated the project of exploring 'styles of scientific reasoning' by drawing from Alistair C. Crombie's (1994) historical investigation on 'styles of scientific thinking in the European tradition.' Through this project, Hacking emphasized that 'reason has a history' and how standards of rationality emerge and evolve historically. Recognized as a valuable historical and philosophical tool for analysis (Hacking 1992), various historians and philosophers of science began incorporating this concept into their research (e.g., Davidson 1987; Gavroglu 1990; Schweber 1997; Radick 2000; Reck 2009; Elwick 2007; Winther 2012, 2013, 2015).

In later installments of his style project, Hacking (2012) related what he came to call 'styles of thinking & doing' to a cognitive and an 'ecological' history of reason (Atran 1990; Netz 1999). The aim of this symposium is to provide a reassessment of Hacking's project, by engaging closely and critically with Hacking's arguments on scientific styles. In this respect, some of the questions that this symposium will discuss are: What are the implications of Hacking's theory of scientific styles at the level of language, truth, and understanding? What roles have styles played throughout the history of the sciences? How effective are styles as a historical-philosophical tool for comprehending scientific knowledge and practices? In what philosophical and historical ways could this project be further developed, especially within the context of an ecological history?

Panel 2 of our symposium will feature historical and philosophical studies of styles in evolutionary biology and biomedicine, the mechanical sciences, Gaia Theory and clinical psychology.

“Styles of reasoning” in evolutionary biology and biomedicine

- Silvia De Cesare, Université de Genève; Nicola Bertoldi, UCLouvain; Michele Luchetti, Max Planck Institute for the History of Science

Abstract: This contribution aims at exploring the role that “styles of reasoning” have played in a particular domain of history of science: evolutionary biology and biomedicine. In “Two explanations of Evolutionary Progress”, Radick (2000) claims that evolutionary progress *qua* increase in complexity over the history of life can be explained either through natural selection or happenstance. In his view, these explanations are the product of the influence of two different styles of reasoning identified by Hacking: the laboratory style and the statistical style. Starting from Radick’s insight, we will show how different styles come into play in the emergence and development of evolutionary concepts and theoretical frameworks in contemporary biology and biomedicine. First, we will apply Radick’s approach to a sense of “evolutionary progress” that he did not consider specifically, viz. adaptation as local improvement of traits (De Cesare 2019). This concept seems to require that natural selection has operated “in isolation” from other factors (*ceteris paribus*, Lewontin 1978). We will explore the idea that this requirement is influenced by the laboratory style of reasoning. Second, we will show how the emergence of human population genetics exemplifies how different styles can converge into a unified disciplinary matrix. To explore this convergence, we analyse the theoretical framework developed by Cavalli-Sforza (2001) and others for studying the co-evolution of genes and cultural traits. Finally, we will focus on the emergence of evolutionary medicine as an explanatory framework (Méthot 2011), and we will show how different styles of reasoning contributed to its development.

Hacking's styles of reasoning and Kuhn's lexicons. A comparative look

-Constantin Stoenescu, University of Bucharest

Abstract: In his “Language, Truth, and Reason” (1982), using comparatively his idea of “styles of reasoning”, Ian Hacking highlights the relativistic consequences of Kuhn’s incommensurability thesis. He also expresses his worry that “the very candidates for truth or falsehood have no existence independent of the styles of reasoning.” and argues that “some styles of reasoning have been so firmly displaced that we cannot even recognize their objects”. I think that Kuhn has given an answer to this concern in his “The Road since Structure” (1990) where he proposes the concept of lexicon and the idea of lexicon-dependence and concludes that „the way of being-in-the-world which a lexicon provides are not candidates for true/false”. We may discern between statements that are or are not rationally assertable according to the rules of evidence associated to a language game. In “Language, Truth, and Reason, 30 years later” (2012) Hacking didn’t come back to this kuhnian suggestion, but he agreed with the idea of an ecological cognitive history to explain the formation of the styles of reasoning. I think that if we look at the concept of lexicon from the same perspective, we will find that, linguistically and cognitively, we will be able to explain not only the possibility of differently structured lexicons, but also the congruences between them, including taxonomic ones. The entire research will be developed starting from the case study of the Copernican Revolution based on the book written by Thomas Kuhn on this topic.

A Matter of Style: John Wheeler, a Man for All Seasons

-Stefano Furlan, Max-Planck-Institut für Wissenschaftsgeschichte in Berlin

Abstract: A number of distinguished personalities of 20th-century physics have made use of some notion (similar to common parlance and with individualistic overtones) of "style": from J.Schwinger to F.Dyson, from S.Weinberg to J.Wheeler. That seems quite different from the collective/supra-individual notions of style of historical epistemology (Fleck's *Denkstil*, Hacking's styles...). In this paper, I will suggest that, thanks to Wheeler's rich archives, it is actually possible to see an articulated reflection on "style" partly similar to those of historical epistemology. More specifically: - In his long life (1911-2008), Wheeler reinvented himself more than once, each time with a conscious effort to adopt a different *modus investigandi*. This made him aware of (and comment on) the different “styles” of other physicists, but also made clear in the eyes of his colleagues that different “styles” characterized

different phases of his career. - In his last decades, his attention was driven to the preconditions of physical knowledge, the circumstances that "climate" a discovery (his expression), the historical dimension of science, and so on: this awareness, coupled with the above considerations on "styles", actually leads to transcending the latter word's ordinary meaning and getting closer to one such as Hacking's, where historicity is made explicit. - Given all the changes that science underwent during Wheeler's long career (and when he was not personally involved, he was still an exceptional witness), these considerations also raise questions about the emergence of new styles, their combination, and their possible co-existence.

11 The gender of things and spaces in the sciences: Performance and Scientific Personae (2/3)

Room: 40.010.

Organisers: Brigitte Van Tiggelen, Science History Institute; Maria Rentetzi, Friedrich-Alexander-Universität; Annette Lykknes

Chair: Maria Rentetzi, Friedrich-Alexander-Universität

The gendering of fan culture

- Annette Keilhauer, Friedrich-Alexander-Universität Erlangen-Nürnberg

Abstract: Today, the fan is mostly looked at as an emblematic, even if outdated, female fashion attribute in French and European history up to the nineteenth century. The contribution is going back to the object's history and aims to emphasize on the fact that the fan always was and still is simultaneously a paramedical aid and a highly subtle means of ostentation and communication not only used but for a long time also produced by women. In the 17th and 18th centuries, French court culture influenced its distribution all over Europe while the nineteenth century culture popularized the now affordable object in lower classes of society. Pragmatic and symbolic but also strategically political uses of the fan are intertwined up to the twentieth century when air conditioning almost entirely took over its pragmatic function. The focus of the contribution will lay on the changing performative gendering of the object interacting with the body in key moments of French cultural history with some excursions to other countries

Out of the kitchen: Agnes Pockels and the gendering of scientific personae

- Brigitte Van Tiggelen, Science History Institute, USA

Abstract: Born at a time when women were not allowed on the university campus in the Brunswick Duchy, not to mention laboratories in the German speaking states, Agnes Pockels (1862-1935) contributed pioneering experimental work in the field of surface science from the domestic settings of her parent's household. Her case is among the many used to celebrate the presence of women in science, illustrate their struggles and victories, and provide role models or instances of past gender imbalances. In particular, the object of inquiry (the phenomena at the surface of water linked to dishwashing) and the supposed space of practice (the kitchen) have converged in later analysis on ways in which women were able to enter a masculine profession all the while remaining confined in traditional domestic roles.

By revisiting the case of Pockels, I identify layers of meaning starting with the (auto)biographical material in which she shaped a scientific persona that suited both her recollection of her life, and the social limitations imposed by her gender in her time. I will then confront her self-description with the early testimonies from contemporary and eyewitnesses and later historical scholarship devoted to Pockels to flesh out how these gendered narratives were based on familiar objects and domestic space. In particular, the interplay of things and space in both her research and publications will be compared with accounts of her work and life through the historical narratives.

The professionalization of nursing, their performance in the public space and the “genderization” of their spaces

- Alba Masramon, University of Barcelona

Abstract: In Barcelona in the first third of the twentieth century, the development of the professionalisation of nursing coincided with the development of a new female labour market: archivists, librarians, typists, etc. However, the work of nurses has been undervalued by the dominant socio-economic and political history traditionally focused on blue-collar workers rather than the white-collar professions, and less so, on nurses. An analysis of photographic sources preserved in the archives of

Barcelona, both public and private, gives us an idea of how healthcare spaces are gendered - the places of training, the clinic rooms, the laboratories, the Maternity Home. The aim of this communication proposal is to show, through the study of visual sources, the presence and activities of women trained as nurses, and to understand the meanings and representations of the professionalisation of nursing in Barcelona in the first third of the 20th century. In 1915 in Spain, a Royal Decree created professional training for women nurses. Certainly, this was an ancestral profession, but this institutional change catalysed several transformations that became evident in other social and cultural spheres. For example, a new form of self-representation in the public space appeared or the new urban-labour spaces dedicated to nursing, both were based on the established gender order.

It is interesting to see how, in this historical process, the gender discourses and practices that set the guidelines as to what a nurse should and should not converge, while at the same time observing how the different political moments widened or reduced the social agency of these women.

Gendered Funding: The Rockefeller Foundation and the development of the scientific persona in Brazil (1945-2000)

- Indianara Silva, State University of Feira de Santana (Universidade Estadual de Feira de Santana: UEFS), Brazil

Abstract: Throughout the 20th century, the Rockefeller Foundation played an important role in the construction of the Brazilian scientific community. Its history, intertwined with the history of the sciences in Brazil, has been analyzed from various theoretical perspectives and methodologies based, for example, on transnational and science diplomacy studies (Freire and Silva, 2020; Freire and Silva, 2014), addressing the categories of race, illness and health, and ranging from public policies (Cueto, 1994; 1990; Faria, 2007; Korndörfer, 2015; 2020; Kobayaski, Faria and Costa, 2009; Farley, 2004; Campos, 2020; and Kropf and Howell, 2020) to scientific funding for the development of research, the circulation of people and objects, and the development of human resources (Freire and Silva, 2020; Marinho, 2001; 2020). Despite new perspectives about the Rockefeller Foundation's role in Brazilian science, possibilities for new analyses and narratives remain, reflecting on the foundation's contribution to the construction of an ideal scientific persona arising

from its funding policies. Since funding practices appear to shape both a male and female scientific persona based on gender stereotypes, my talk investigates the scientific persona shaped and promoted by the Rockefeller Foundation in Brazil, between 1945 and 2000, according to the categories of persona and gender.

12 Visual Practices of Ancient and Mediaeval Astral Sciences (1/3)

Room: 40.012.

Chair: Eleonora Andriani, Institut de recherche et d'histoire des textes, Paris

Organisers: Eleonora Andriani, Institut de recherche et d'histoire des textes, Paris;
Stefan Zieme, Humboldt-Universität zu Berlin

(Sponsored by the Commission for the History of Ancient and Medieval Astronomy.)
Different written artifacts in the domain of astral sciences, including tablets, papyri, manuscripts, up to early printed editions, can often be readily distinguished by their unique visual features, which encompass geometrical, instrument, and horoscopic diagrams, as well as numerical tables. A closer examination of even small sections of texts in this domain also reveals varying numerical notations, predominantly based on the sexagesimal system though shaped for different purposes. Therefore, spanning from the minute aspect of numerical notations to the grander framework of manuscript layout and organization, practitioners of the astral sciences have distinctive ways of visually structuring their documents. The study of these visual practices can provide fundamental clues to grasp source traditions and long-range circulation of knowledge and, as a result, enable a broader understanding of the development of astral knowledge across different geographical regions, historical eras, and cultural contexts. Finally, because diagrams and numerical tables, similar to prose texts, are also subject to the transformations induced by the mere 'copying/printing' processes, analyses of these variations and of the way they are potentially manipulated by historical actors can offer invaluable insights for historians as they engage with these source materials.

The contributions of this symposium will touch upon the above variety of visual practices, spanning from the production to the transmission of astral knowledge. Some papers will therefore focus on astrological schemes and astronomical diagrams, their connection with diagrams and illustrations from neighbouring disciplines, their

genetic relationships and their transformations as the interests or methods of astral science practitioners change. Other papers, however, will have as their subject matter numerical tables and/or the texts accompanying them with reference to their visual or diagrammatic properties, including general layout, use of colors, of different sizes and forms of characters.

Tabular Formatting as a Tool for Analysis within Babylonian Astronomy

- John Steele, Brown University

Abstract: We generally think of tables in astronomy as either being instantiations of astronomical theories to be used in calculation or as containing the results of such astronomical computations. For example, Ptolemy's *Almagest* contains many tables derived from his geometrical models which allow the user to calculate the position of the moon, sun, or a planet at a given time without the need to engage with the geometry of those models themselves, and we have many tables from Babylonia, Egypt, and the Greco-Roman world containing computed lunar and planetary positions (e.g. ephemerides containing daily positions, synodic tables containing the calculated dates and positions of a planet at given synodic phenomena). Another type of table was frequently used in Babylonia as well: tables containing reports of lunar or planetary observations arranged according to the characteristic period of repetition of that body's phenomena. These tables were apparently used to study the cyclical behaviours of the moon and planets, looking at the small discrepancies between phenomena separated by these characteristic periods in order to determine how the periods can be corrected and improved. In this presentation, I will examine several such tables, looking at their formal characteristics (layout, use of rulings and other visual markers, tables spread over more than one cuneiform tablet, etc), contents, textual history, and possible uses in order to better understand this genre of astronomical table.

Ptolemy's Horizon Diagram in the Greek Manuscript Tradition

- Olivier Defaux, University of Trento, Italy

Abstract: In Ptolemy's astronomical treatises, the horizon diagram (ἡ τῶν ὀριζόντων καταγραφὴ) serves to calculate the rising and setting positions of zodiacal sign endpoints across the seven klimata, that is, for different latitudes of observation.

These positions prove instrumental for eclipse computations. Departing from his customary tabular presentation (κατάστιχον), Ptolemy opted for a different visual approach, presenting the information as a circular diagram, and included it in both his *Almagest* and *Handy Tables*. Theon of Alexandria (4th century) describes and uses the diagram in his work; a version tailored to the latitude of Constantinople was seemingly crafted by Stephanos, the 7th-century commentator on Ptolemy's *Handy Tables*. Preserved in a many Greek manuscripts of Ptolemaic astronomy, including a recently scrutinized palimpsest (Vat. sir. 623), the diagram is also discussed in late antique and medieval scholia. This diagram played an important role in the transmission of Greek astronomy and the understanding of Ptolemy's works. This paper aims to illuminate the manuscript transmission of Ptolemy's horizon diagram, shedding light on its interpretation by various scribes and analyzing some of the innovations and transformations introduced to the original diagram as conceived by Ptolemy.

On the Transmission of the *Almagest*

- Stefan Zieme, Humboldt-Universität zu Berlin

Abstract: As one of the most important sources of mathematical astronomy Ptolemy's *Almagest* was copied and translated for more than one and a half millennia. Today, there are about 150 manuscript witnesses still extant through which knowledge about the *Almagest* has been transmitted in different cultures, languages, and times. These include, beyond Greek and Byzantine sources, translations from Greek into Arabic, Arabic into Latin, Greek into Latin, and Arabic into Hebrew. Over centuries, translators, scribes, or owners of these manuscripts compared, annotated, or corrected their manuscript sources. Especially mathematical tables and geometrical diagrams, numerous within the *Almagest*, feature manifold variations among different manuscript traditions. I will use tabular and diagrammatic variations from the entire corpus of manuscript witnesses for a network analysis that aims to analyse and visualize the transmission of the *Almagest* across space, time, and culture. My main idea is to analyse cross-cultural exchange of knowledge based on mathematical and geometrical structures and, thus, independent of language specific frameworks.

13 Women in Scientific Institutes and Universities in Crucial Years in the 20th Century in Central and Eastern Europe (1/2)

Room: 40.063.

Chair: Adéla Jůnová Macková, Masaryk Institute and Archives of the Academy of Sciences, Prague

Organisers: Adéla Jůnová Macková, Masaryk Institute and Archives of the Academy of Sciences, Prague; Milada Sekyrková, Institute of the History of Charles University and Archive of Charles University in Prague

The proposed symposium aims to uncover the changes in opportunities for female scientists during the crucial years of the 20th century in Central and Eastern Europe. Especially Central and Eastern European countries fundamentally changed their research policies and the newly established scientific institutions after the WWI, as well as after the WWII, and in the 1970s.

New state institutes, new universities and later on the Academies of Sciences were founded. State scientific politics thus broadened the possibilities for academic positions for women. The symposium aims to analyze the influence of changes during crucial years on the academic community, especially on the change of the role of female scientists at universities and other academic institutions. We would like to follow the changes that presented more academic opportunities for a new generation of scientists, especially for women as well as influence of the transformation of the science politics during political changes in different countries.

Symposium presents continuity of the important research on the role of women in science and it is held on behalf of a Commission on Women and Gender in Science, Technology and Medicine.

Reopening of Czech universities in 1945 and the status of female students and teachers there

- Milada Sekyrková, Institute of the History of Charles University and Archive of Charles University in Prague, Czech Republic

Abstract: During the Nazi occupation in the years 1939–1945, Czech universities in the territory of the Protectorate of Bohemia and Moravia were closed. After the liberation of the country in the spring of 1945, teaching resumed with an

extraordinary summer term. Even between the wars, girls predominated in some faculties (philosophical, natural sciences). More and more of them studied in technical fields as well. However, there was still a minimum number of female pedagogues in all types of faculties. The contribution deals with comparison of developments before 1939 and after 1945. Using the case study of the second Czech female university professor Růžena Vacková (1901–1982), archeologist and classical philologist who was imprisoned under the Nazis 1944–1945 and the communist regime 1962–1967 again. It will show the real situation and possibilities of university female teachers for scientific and pedagogical work and the obstacles that the post-war development in Czechoslovakia brought.

Polish female mathematics students in Göttingen before the First World War

- Danuta Ciesielska, Institute for the History of Science, Polish Academy of Sciences, Warsaw

Abstract: University in Göttingen is well known for the special attitude for women. Here in 1787 Dorothea von Rodde-Schlözer passed doctorate exams, including mathematics. Almost a century later in 1874 Sofya Kovalevskaya earned a doctorate in mathematics *summa cum laude*, and in 1919 Emmy Noether earned *vieniam legendi*. They were the very first women entering the way for women studies in mathematicis. The most known female Pole with degree in mathematics is a double Nobel laureate Maria Skłodowska-Curie who in 1894 earned licence in mathematics from Sorbonne. Following year two young women, of Polish origin, started their studies in Göttingen. In those days Georg-August University was the leading centre in the world. It attracted people from all the world to study science, mostly from US and Central Europe. In 1885–1914 more than 100 Americans and 80 young Poles studied mathematics, physics or astronomy in Göttingen. Among mathematics students there were women, including six Poles. Two, mentioned before, Helena Bortkiewicz and Alexandra Stebnicka from St. Petersburg, graduated from Bestuzev Courses, went to Göttingen to study with Klein. Ten years later four Poles arrived to the university to study with David Hilbert and Edmund Landau. Their story is complicated. Even though some of them earned doctorates, none had a scientific career later. The history of Polish women in Göttingen, their future fate and an outline the educational

situation of women in Germany and Russia at the turn of the 20th century will be the topic of my presentation.

14 Theories and Practices of Health, Eugenics, Disability, and Fitness in Transnational Historical Perspective

Room: 40.113

Chair: Julia E. Rodriguez

Organiser: Julia E. Rodriguez

Constructing Disability in Late Colonial Lima, Peru: Enslaved Petitioners, Medics, and Early Modern Legal Principles

- Adam Warren, University of Washington

Abstract: This paper considers eighteenth-century Peruvian civil cases involving enslaved Africans as sites for articulating and negotiating ideas about bodies, disability, and fitness. Afforded permission to sue their owners in the Spanish Empire's courts, enslaved litigants navigated legal channels to gain what historian Michele McKinley describes as "fractional freedoms," incremental improvements in their circumstances such as permission to seek new owners, prevention of separation from kin, or the provision of medical care. Enslaved litigants petitioned for these gains by accusing owners of cruelty, neglect, or overwork and by claiming existing or resulting bodily injury, disease, or mental unwellness. Central to their legal strategies was the act of drawing attention to their own bodies, describing them in detail and asking that they be examined for evidence of the debilitating effects of slavery and mistreatment. To substantiate these claims, enslaved litigants petitioned to have physicians and surgeons inspect them to confirm the presence or absence of disability. Focusing on the central role that these medics played as arbiters of disability and enslaved litigants' own testimony, I argue these civil cases gave rise to a concept of disability based not on liberal notions of universal rights, but rather on enslaved litigants' claims to early modern legal principles that recognized forms of corporate status based on vulnerability, exclusion, and suffering that under Spanish law could warrant and require protection. Informed by medics' testimony, this idea of disability differed from later North Atlantic concepts of disability linked to industrialization and workplace injury legislation.

Evolutionary Hierarchies of Childhood, Race, and (Dis)ability in Early Anglophone Psychology

- Nicola Sugden, University of Edinburgh

Abstract: This paper is framed in terms of some of the current concerns in ELSI, or the Ethical, Legal and Social Implications, of genetics and genomics and how a close examination of nineteenth century history of science provides crucial historical context to these discussions. First, I set out some of the historical context and intellectual climate for the ideas about childhood and psychology. Next, I explain how British researchers observed and theorized about children's development and human communication, what this meant in the context of Empire and how this all related to evolutionary ideas. Finally, I conclude by showing all of this is brought together in the case of deaf-mute children, and the fascination they held for some early psychologists.

Between Eugenics and Child-rearing: The Uses of the Term Puericulture in International Congresses in Europe (1900–1938)

- François Secco, Uppsala University

Abstract: This paper discusses three points. Firstly, it argues that the majority of the uses of the term puericulture equated it with a set of knowledge related to the care of infants and children, which may have contributed to a discrepancy between the understanding of the field of action of puericulture by puericulturists and that of non-specialist actors for whom puericulture corresponded to child rearing. Secondly, it examines how puericulture was part of the discourse promoting the medicalization of women and children, as well as colonized populations. Thirdly, it shows that congresses were a space where physicians tried to promote other eugenic sciences and sciences of the child by defending their legitimacy in relation to puericulture understood as a science of child rearing.

13:00 - 14:00 Lunch

Room: 40 S. Pati Roger de Lluria.

Business meeting of the ESHS institutional members

Room: 40.039

Chair: Hugo Soares

Editorial Anillo de Sirio - Presentation of the comic book series *Colección Científicos -Scientists comics-* with the authors.

Room: 40.008

14:00 - 16:00 Sessions

Saturday 7th 14:00 - 16:00 Sessions

1 Dialogues between Science, Technology, Arts and Literature (2/2)

Room: 40.101.

Chair: Ana Cristina Martins, IHC-Polo Universidade de Évora / IN2PAST, Portugal

Organisers: Ana Cristina Martins, IHC-Polo Universidade de Évora / IN2PAST, Portugal

Science and technology have always used art and literature in several ways: as a source of information, ways of building, setting and wide spreading narratives and representations, as well as ideas and making them prevail. Narratives and representations that change according to the development of scientific and technological knowledge and the very heritage that it generates and is associated with. But they also change in accordance with the space and time in which they are produced, being (re)constructed, destroyed, replaced, adapted, or confronted depending on prevailing or emerging agendas, be they ideological, political, social, economic, cultural, ethnic, ageist, sexual or gender based.

But are we, the ones engaged with different forms of science and technology fully aware of this reality?

How have different literary and artistic contexts influenced the construction of scientific and technological narratives and representations over time? In what ways do these same narratives and representations contribute to underpin agendas (including scientific, personal, and institutional, public, and private), while breaking paradigms and prejudices (namely sexual, gender, ethnic, class and ageist)? What is

the nature and scope of this ongoing dialogue between science, technology, art, and literature? How does this constant interweaving (i)materialise? Who dictates, feeds, and manages it? To what end(s)? And what about the creative freedom of the author, whether artistic or literary, where and how does it remain? How are narratives - written and iconographic - constructed from science and technology? How to make scientific knowledge reach different types of audiences? And what space do the new social realities - migratory, nomadic, etc. - occupy in this increasingly interwoven complex?

This is a vast set of questions to which we seek to answer during this symposium.

Penning Progress: The Aristocratic Lens of Maria Constança da Câmara on European Science and Technology (1826-1842)

- Pedro Urbano, IHC – NOVA FCSH / IN2PAST

Abstract: Maria Constança da Câmara (1801-1860), Marchioness of Fronteira by marriage, was one of the thousands of Portuguese supporters of the constitutional regime who was forced to leave the kingdom of Portugal after Infante Miguel took the throne and restored the absolutist regime in 1828. On the other hand, she is one of the few Portuguese women from the first half of the 19th century to have written a diary (1826-1842), predominantly a travelogue, which has only recently been published, having remained unpublished in her family archive until then. The United Kingdom, France, Switzerland, Austria, the various German and Italian kingdoms, are some of the places she travelled to. This diary thus becomes an invaluable source for the story of the daily life of an aristocrat, in contact with different geographical and social realities, while maintaining her usual lifestyle, typical of a transnational aristocracy. In addition to her individual interests, especially in music and literature, she was not indifferent to the technological and scientific innovations of her time, recording them with a critical eye. We therefore want to assess this aristocrat's sensitivities towards the science and technology that was developing in Europe at the time demonstrating how the women ego documentation and non-scientific authorship can also be an important source for the history of these themes.

Robert F Kennedy Jr's Contemporary Anti-Vaccination Thriller

- Katherine Shwetz, Rice University, United States

Abstract: Enterprising individuals pursuing an elaborately concealed “truth” in the face of powerful vested interests: a longstanding trope of the political thriller and also, this paper argues, increasingly a mode by which anti-vaccine conspiracies are communicated. The skilled use of narrative techniques in anti-vaccination storytelling is well established (Shelby & Ernst), but the complex ways anti-vaccination advocates deploy specific genres has yet to be parsed. In this paper, I argue that the history of political thrillers as a literary genre illuminates how contemporary anti-vaccination narratives emphasize individualism and encourage anti-science suspicion by establishing a narrative touchpoint in the 1960s and 1970s, the era in which the political thriller genre emerged. To argue this point, I take as a case study the three-hour podcast interview with American presidential candidate and notable anti-vaccination activist Robert F. Kennedy Jr on Joe Rogan’s popular podcast. Kennedy Jr’s interview initially appears to be a circuitous conversation but a careful examination unearths Kennedy Jr’s narrative dexterity and canny use of genre. In the interview, Kennedy makes use of the key features of a political thriller: conspiracy, political consequences, paranoia, and government involvement (Castrillo & Echart). Kennedy Jr outlines an elaborate and dangerous conspiracy about government involvement, pharmaceutical companies, and legal implications, using the familiar language of political thrillers in film and literature to reframe the vaccine debate as a cryptic cover up. This strategic deployment of political thrillers and their original historical context undermines public confidence in science and positions official science communications as devious and suspect.

2 Exploring novel perspectives in science diplomacy: conceptual, narrative, and historiographical innovation (1/2)

Room: 40.002.

Chair: Grigoris Panoutsopoulos, Universitat Autònoma de Barcelona, Institut d’Història de la Ciència

Organisers: Matthew Adamson, McDaniel College, Budapest, Hungary; Barbara Kirsí Silva, Universidad Católica de Chile

The symposia aim for a new historical assessment of science diplomacy, probing received notions of knowledge transfer, alliance-building and disciplinary

boundaries, via novel narratives and historiographical settings. The papers challenge traditional accounts of science diplomacy's advocates, who claim a predictable and equitable technoscientific diffusion. These symposia integrate presentations offering novel means of constructing technoscientific narratives, linking different disciplines in unexpected examples of cause and effect and discovering new historical actors involved in science diplomacy. While falling into the post-World War II period most often associated with science diplomacy, the panelists diverge from traditional Cold War frameworks to consider various south-south relations as well as previously unexplored regional and global dynamics. In this sense, rather than a strict focus on a given timeperiod, these panels illustrate how novelty and historiographical innovation can be embedded in narratives focused on new actors, elements, places, and global connections. These symposia are sponsored by STAND (DHST Commission for Science, Technology, and Diplomacy).

Southern star showers. Scientific exchange in radio waves between Chile and Australia

- Barbara K. Silva, Universidad Católica de Chile

Abstract: This presentation explores the multifaceted approach to the history of science, serving as a bridge between scientific disciplines, time periods, and geographic locations. Examining these connections concurrently provides insights into the global circulation of scientific knowledge and the nuances of science diplomacy. The focus of this paper is the link between astronomy and rainmaking in the southern hemisphere during the 1960s. An initiative in Australia, supported by CSIRO, aimed to induce rain through cloud manipulation using silver iodide within the realm of 'radiophysics.' Chile, inspired by this effort, received Australian training and applied similar experiments, navigating the complexities of international collaboration and addressing water availability. Rainmaking, one of various water availability initiatives, prompted Chile to delve into radiowaves, fostering ties with Australia, studying diverse US experiences, and managing cross-border tensions with Bolivia. Getting into radiowaves was a challenge with varying results across different timelines. The rainmaking program had a short lifespan, but radioastronomy continued to grow in the country. Although at first it was overshadowed by the spectacular progress of optical astronomy, the late 20th century witnessed the birth

of one of the world's largest radioastronomy projects, located in Chile. By intertwining diverse scientific fields, experiments, objectives, and collaborations, this presentation broadens our temporal perspective, shedding new light on how humans build international scientific relations.

Space diplomacy and the origins of NASA's activity in Spain

- Óscar J. Martín-García, INGENIO, CSIC–Universitat Politècnica de València; and Pedro Ruiz-Castell, University of València, López Piñero Institute for Historical and Social Studies of Science, Technology, Medicine and Environment

Abstract: Science was a cornerstone of superpower foreign policy in the Cold War. During this period, the United States (US) and the Soviet Union (USSR) engaged in an intense struggle for global scientific supremacy. Space was one of the main battlegrounds in this contest and both superpowers used related achievements to claim for technical, economic and political strength and superiority. It was in this context that the US created NASA in 1958, the flagship intended to propel America to the forefront of the space race. In the following decades NASA promoted space cooperation with several countries to build a world community dedicated to the exploration of space under American leadership. Such network also included Franco's dictatorial regime in Spain. Indeed, such cooperation was intended and expected to fully incorporate Spain into the Western bloc. However, little is known about the origins of the US space program in Spain during the 1960s and 1970s. This paper aims at presenting the official actors who articulated the US–Spanish space alliance, as well as the role played by various non-governmental groups. It also explores the intersection of scientific, strategic, ideological, commercial, and psychological reasons that shaped NASA's activity in Spain, as well as Spanish attitudes towards NASA's deployment in the country from the early 1960s onwards.

From Adam and Eve to the World Wide Web: Computers and International Data Sharing in Physics and at CERN

- Barbara Hof, University of Lausanne

Abstract: Based on archival sources and publications, this talk takes Tim Berners-Lee's 1989 web proposal (a combination of hypertext and the existing internet) as a starting point to look at the history of computing in physics from 1973,

when as part of the East-West collaboration between CERN/Geneva and IHEP/Serpukhov, two minicomputers were put into operation, named Adam and Eve. While there are many stories in the world and on the web about the vision and visionaries behind the idea of connecting people with digital devices, there is a lack of knowledge about why the World Wide Web (WWW) was set up and why this happened at the laboratory of the Conseil Européen pour la Recherche Nucléaire (CERN). By convention, CERN made its in-house invention a public good, while its Council decided to invest money in a bigger accelerator (it funded the LHC instead of the WWW). The talk argues that the WWW was the result of growing shared infrastructure and the need for international access to data, or a “technical fix” to problems of expanding international cooperation. It draws on insights from media history to make the development of the WWW a case of science diplomacy in action, thus broadening its repertoire and subjects.

A dialogue across different viewpoints. Some Cold War stories of Italian scientists concerned about nuclear threats

- Lodovica Clavarino, University of Roma Tre and LUISS

Abstract: The paper analyses the “social activation” in favour of arms control and détente of a group of Italian physicists during the last decade of the Cold War. In particular, it focuses on some founding fathers of the Italian USPID (*Unione scienziati per il disarmo*), established in 1983, to see how they tried to use their professional expertise and their prestige in order to claim a role as political experts in the security and disarmament field. I have already done research on this topic, starting with the personality of Edoardo Amaldi and the activities he fostered; I have also conducted interviews with some physicists of the following generations and now I am working on Roberto Fieschi’s papers, stored at the Istituto Gramsci in Turin. My goal is to deepen the knowledge of this network of scientists – well connected with similar groups abroad - and understand how a deep dialogue on nuclear arms control, détente and peace has been possible among individuals coming from different political allegiances (in fact we talk about communists, socialists, pro-Atlantic, Republicans, extra parliamentary leftists, etc...). During the “Second cold war”/Euromissile crisis, these scientists, several of them already grouped in the previous decades around the debate on the Non-Proliferation Treaty, gathered

around some charismatic persons and claimed their own role in international politics, with the aim at urging governments to make progress in arms control and to relaunch détente, at informing and educating citizens on issues related to nuclear weapons and at strengthening a transnational network.

3 Fading Empires and Conflicting Nation-Building. A Perspective on Science, Technology, Nation, and Statecraft from the European non-colonial peripheries (s. XIX-XX) (1/2)

Room: 40.105.

Chair: Antoni Roca-Rosell, Universitat Politècnica de Catalunya

Organisers: Francesco D'Amaro, Universidad Autónoma de Madrid; Daniel Pérez-Zapico, Universidad Autónoma de Madrid

Abstract: Scholars have interrogated the mutually constitutive legitimization practices of science, technology, and politics, considering the emergence of the nation-state as the most significant repository of political power. Recent times have seen the revival of the nation, including nationalistic approaches to economic, energy or security policies, even if current challenges such as environmental harm, pressure on resources, pandemics or terrorism require global and coordinated decisions. In this panel, we propose a historical, comparative, transnational perspective, to get a richer picture of how science and its technological applications relate to nation and nationalism.

To achieve this, the different papers address epistemic and material resources that less advanced, secondary nations or fading empires of the nineteenth and twentieth centuries used to propagate powerful sociotechnical imaginaries around the need to speed up development. We will focus on the European non-colonial peripheries, those territories that could experience the 'informal' techno-scientific imperialism by more developed industrial countries, but whose local elites retained considerable amounts of political power.

In particular, we will interrogate the feedback loops between industry, state and experts using science and technology, especially in medical areas, to perpetuate social orders structured around religion, race, gender, and global positions. We will focus on the role of national identities in selecting specific scientific or industrial

trajectories, the epistemic and authority conflicts within and between state institutions (including strategies for expert legitimation in weak state formations), and the role of social norms, communal aspirations and the multiple alternative imaginaries for national development.

In doing so, this panel wants to raise awareness of the diverse and uneven development of technoscientific cultures. As such, we suggest a thorough engagement with the political cultures of the respective cases under scrutiny while also avoiding classical divides “West/non-West” and “North/South” by examining the intricacies of intra-national and intra-regional trajectories within Europe.

‘We must impel Czech patients to seek out Czech doctors’: Language, Ethnicity and Professional Competition in the Czech Lands before World War I

- Barbora Rambousková. University of Pardubice – Universidad Autónoma de Madrid

Abstract: Medical community in the Czech Lands experienced growing divisions along the ethno-linguistic lines during the nineteenth century, which remained commonplace until the disintegration of Austria-Hungary after the Great War. In the context of rising nationalisms in the Empire and in Central Europe as a whole, the language used in professional practice and communication acquired political significance and the physicians practicing in the Czech lands became increasingly split into Czech-speaking and German-speaking professional communities. My paper analyses the effort of Czech-speaking nationalist physicians to institutionalize medical education in the Czech language and to strengthen their position at clinics and in the imperial medical establishment, particularly in the Czech lands. I focus on their strategies and argumentation and on their efforts to marginalise German-speaking physicians and the physicians whom they perceived as lacking commitment to the Czech national cause. I also assess the situation of and the pressures faced by Jewish physicians in an environment characterised by growing divisions. Besides analysing the discourse in medical press and memoirs, I focus on specific conflicts over the representation of the different ethnic communities at the posts of leadership in Czech medical institutions.

State Medicine and the (preventive) Care System in the Habsburg Monarchy in the First Half of the 19th Century

- Tereza Liepoldová, Institute of History of Czech Lands, Faculty of Arts, Charles University, Prague

Abstract: “In the absence of the physician's contribution, any administrative measure aimed at promoting the general physical well-being of the population would be frail,” wrote Professor of “state medicine” Josef Bernt in 1816. State medicine (Staatsarzneikunde) emerged as a new medical discipline in the medical faculties of the Habsburg Monarchy at the turn of the 18th and 19th centuries. One of its declared goals was to establish a system of legal measures that would contribute to the preservation and promotion of citizens’ health. In this regard, the physician is a servant of the state (Staatsdiener), utilizing the foundations of medicine to ensure the public’s overall well-being. In my contribution, I will focus on the part of “Staatsarzneikunde” that deals with public health care, the care of the sick, the dying, and the deceased. Its aim is to maintain and increase the population in accordance with the “culture of the country and the needs of the state” (*politia diaetetica*), the treatment of sick members of the state not only during epidemics (*politia therapeutica*), and last but not least, the prevention and investigation of violations of laws concerning the life and health of citizens (*medicina legalis*). Furthermore, I would like to demonstrate how this “new” discourse of state medicine facilitated the establishment of medicine, not as a scientific discipline but as an integral part of the state apparatus, as a specific institution of state power.

4 Intersecting Traditions: The Convergence of Digital Humanities and Historical Studies

Room: 40.047A.

Chair: Ignasi Medà Calvet

Textual Data and Conceptual Models: Reimagining Historical Scholarship through Digital Humanities

- Simone Ventura, Universitat Pompeu Fabra, Barcelona

Abstract: This proposal explores the intersection of ancient texts and new technologies within digital humanities (DH), focusing on digital scholarly editing,

especially of medieval texts and manuscripts. It exemplifies digital methods' broad applicability to historical and linguistic domains, aiming to investigate texts as data and conceptual models through a historical and conceptual lens. The central questions are: What does considering a text as data entail? What conceptual shifts occur when texts are viewed as models? What epistemological insights and methodological innovations emerge from integrating ancient texts with digital methods? The use of digital tools and computational methods offers new perspectives on ancient texts' historical and scientific value, challenging and enriching traditional historical research. Digital scholarly editing and conceptual framing of texts as data and models may be redefining our engagement with historical sources. This paper seeks to reveal the methodological and epistemological shifts DH is introducing in textual source examination. In discussing the broad implications of treating texts as data and models, the paper will provide a nuanced discussion that recognizes DH's transformative potential and examines its risks and limitations. By integrating digital scholarly editing and conceptual modelling, this paper seeks to not only unveil DH's methodological and epistemological shifts in examining textual sources but also critically assess its limitations, using concrete examples from digital editing projects to enrich our argumentation with practical insights. In reflecting upon our central inquiries, this proposal illuminates the transformative yet complex nature of DH. Our critical examination underscores DH's potential to redefine historical and scientific engagement with ancient texts and emphasizes the necessity of navigating its methodological challenges with caution. By grounding our theoretical discourse with practical examples, we underscore the critical importance of balance in evolving text studies within the digital realm.

Science, Society, Stemmatology: A Natural History

-María Morrás, Pompeu Fabra University

Intersections, parallels and interactions between 'scientific' and 'humanistic' sciences have been a neglected area of interest. The implementation of computing (digital) technologies, handling cultural artifacts as texts and images as data has made apparent the transference of methodologies between both sciences, leading to a massive use of numerical approaches to Humanities. This convergence confronts

certain reluctance of society and humanities scholars, fearful that Humanities will surrender to non critical methodologies, will be less 'humane' or will loss its traditional role in culture by imposing on its disciplines an episteme alien to them. But Humanities have long been nourished by models originating at the natural sciences.

As a case study I will focus on the use phylogenetic study on texts --stemmatology or stemmatics--, and how its origins are closely related to advances in the natural sciences. The dynamics of this interaction harks back to a common interest in genealogies and taxonomies (of vegetal and animal species, languages, texts), the development of structural similarities between the natural world and the human products (ie. the organic metaphor for power, the construction of social and emotional networks), and finally the application of scientific methods to texts, considered as a grained set of data and subject to empirical manipulation for the construction of hypothesis for modelling purposes. Under this light, importing 'scientific' methods into the humanities is a natural process with a long history.

Thus, rather than promoting a 'third culture' that would overcome a social divide (Snow 1959), I advocate for the existence of a common ground: that humanities and natural sciences coincide in having objects of study that can be investigated in their singularity, as tokens, and as patterns, types, subject for abstraction and modelling.

Social and Collaborative Scholarly Editing in the Landscape of Open Science

- David Merino Recalde, Universitat Autònoma de Barcelona

Abstract: The increasing emphasis on Open Science principles challenges us to reimagine established practices in scholarly editing of medieval and early modern texts. While open access publication of research results and the use of open standards, protocols, and software are crucial steps, true openness demands fostering collaborative practices - the essence of Citizen Science. This paper explores the integration of citizen participation in scholarly editing projects, tracing its historical roots back before the 'crowdsourcing' era of the early 2000s. Due to the current reliance on digital technologies for the advancement of such initiatives, the historical context of open participation in humanities projects is frequently presented in

isolation from prior efforts predating the emergence of crowdsourcing. Delving deeper, it will explore the impact of social media's rise on the text editing context, which around 2010 fostered a model of editing that fell short of realizing its intended influence. In contrast, we will talk about the success of projects involving transcription or correction of automatic transcriptions, demonstrating the potential of citizen engagement in specific tasks. Crucially, emphasis will be placed on the pivotal role of cultural institutions, with particular emphasis on libraries, in nurturing the fruitful development of collaborative text-based projects. Finally, this paper offers a preliminary preview of our collaborative project with the National Library of Spain (BNE) on the social editing and archiving of Lope de Vega's renowned play, 'Fuenteovejuna'. This project will serve as a concrete example of how open collaboration can enhance scholarly endeavors and engage new audiences with valuable cultural heritage.

Energy history as data: digital tools for investigating the history of energy production cycles

- Daniel Belteki, Science Museum, London

Abstract: Conceptualising the term energy requires historians to think about the complete energy production chain: from the initial gathering of raw materials, through the transformation of raw materials and the uses of energy, to the environmental impact. The distributed nature of this production chain often results in a reliance on different types of historical sources and datasets at the different stages of the production chain. While analogue and isolated digital humanities approaches can make sense of individual historical datasets, connecting a variety of numerical, textual, spatial, and audio-visual materials have been posing challenges to digital tools. The Congruence Engine Project (part of the Towards a National Collection initiative) explores potential solutions to this problem through experimental digital interventions into a variety of historical collections. As part of the Energy Strand of the Project, it has explored how historical datasets related to the histories of mining, engineering, power stations, and domestic appliances can be brought together with the aim to identify new connections as well as gaps across historical collections. The paper presents an overall examination of how digital tools can help with generating information for connecting together histories relating to the

various stages of the energy production chain while also retaining the contextual information necessary for the interpretation of historical datapoints. It introduces a variety of tools and case studies explored as part of the Energy Strand of the Project, and provides reflections on potential benefits and limitations of the tools for historical research.

The New Digital Platform of the Basel Edition of Bernoulli Letters (BEBB) – its Importance for the History of Science and its DH/AI-related Potentials for Development

- Martin H. Kurz, University of Zurich (UZH) / University of Basel

Abstract: The new digital Platform BEBB which has been published recently online as a first prototype will be presented here. The Basel Edition of Bernoulli Letters will encompass finally all the 5,000 letters of the Bernoullian network. This wide-ranging network spanning all over Europe includes world-renowned correspondents such as Leibniz, Newton, Voltaire, and others – in all 400 early modern and enlightenment period personalities. The eight Bernoullis chosen for the edition constitute a multigenerational dynasty of scientists active in the pivotal period from the scientific to the industrial revolution, and produced foundational findings in mathematics and physics – still relevant today – as well as in technology and law. The BEBB may be seen as a unique multipolar epistolary edition whereby the eight Bernoullis plus Jacob Hermann constitute several focal points of the letter exchanges in contrast to the usual mono-centred editions. It will be an unprecedented source for the history of science and technology and also for research using Digital and AI-Humanities approaches. After nearly a century of impressive editorial endeavours in Basel leading to 80 printed volumes of the Opera Omnia Series of Euler and Bernoulli works the publication process has been undergoing a digital transformation: three different technologies have been applied and the respective platforms developed, and now the BEBB uses the state-of-the-art TEI-XML based encoding language and the respective publishing technology (TEI Publisher). Albeit already offering attractive features the BEBB will be developed further in the most promising directions: new types of sources, automatic transcription, AI for Named Entity Recognition, and others. Thus transporting the edition into the digital future.

5 New Boundaries in Global Science

Room: 40.109.

Chair: Simone Turchetti, University of Manchester

Computational history of chemistry: the case of the chemical space, its expansion and interplay with socio-political effects

- Guillermo Restrepo, Max Planck Institute for the History of Science; Juergen Jost, Max Planck Institute for the History of Science

Abstract: Computational history of chemistry leverages the stable ontology of chemistry represented by its substances and reactions, which constitute the chemical space. Over history, chemists have annotated information on the space and it is today stored in electronic databases. Here we show results of our explorations of the chemical space between 1800 and the present day. We found that chemists have expanded the space at a stable exponential rate, where every 16 years the number of new chemicals is doubled. The expansion has not even been affected in the long term by social setbacks such as world wars, which, however, caused local declines in the discovery of new chemicals, but once the wars ended, chemical production reached the pre-war trends. By using time series analysis methods, we found that the expansion of the space has occurred through the sequence of three statistical regimes. Each regime is characterised by a stable variability in the number of new reported chemicals. Taken in chronological order, regime after regime the variability drops, indicating a regularisation of the discovery process in chemistry. These regimes are demarcated by two drastic transitions, one about 1860 and the other in 1980. The first transition is associated to the adoption of molecular structural theory and the second to technological shifts. By focusing on the recent space, we analysed the role of different countries and traced back the surge of China in the early 2000s as the hegemon of the space. We also explored the details of the rare-earth subspace, which is strongly associated to the required technologies to leave out the dangers of the Anthropocene. The results here presented not only allow for addressing the global history of chemistry from a *longue durée* perspective but also shed light on relevant microhistories worth exploring by more traditional historiographical methods.

Psychiatric Epidemiology and the Quest for Global Mental Health

- Alfred Freeborn, Max Planck Institute for the History of Science

Abstract: Despite impressive attempts to establish uniform methods for comparing patient populations across the globe, serious questions about the validity of psychiatric classifications and therapies across different cultural contexts remain. In what sense then can we talk about global mental health? By examining the World Health Organization studies of schizophrenia, important large-scale epidemiological studies which took place from the 1960s to the 1990s, I will explore the changing meanings of the global in the sciences of mental health.

In trying to rethink the history of science for the anthropocene, historians have highlighted the importance of understanding the evolution of knowledge as a global process (Renn, 2020). But there are challenges to linking the different scales at which knowledge production takes place into a single coherent narrative. This challenge of thinking across global and local scales has been well thematized by scholars in cultural anthropology, as well as more recently by intellectual historians of climate and empire, who rightly point to the multiple competing temporalities within the global history of knowledge production (Coen, 2016). I argue that the history of science and medicine should attend both to the global nature of knowledge evolution, as well as to how the global is articulated in specific technical practices. New technical methods in medicine create certain scales of coordination across time and space, which in turn shape notions of the local and global.

The standardization of psychiatric diagnostic methods has produced comparable data, but there has been a corresponding reduction of complexity in the type of data collected. The quest to identify mental disorders at a global scale often fails to link up with local clinical knowledge. In this talk I will examine the WHO studies of schizophrenia as a case study in what Anna Tsing has called the 'politics of scale making' (Tsing, 2000).

6 Science in political transitions. The role of the sciences in era changes (1/2)

Room: 40.004.

Organisers: Max Bautista Perpinyà, Université catholique de Louvain; Judit

Gil-Farrero, University of Zaragoza

Chair: Max Bautista Perpinyà, Université catholique de Louvain

'Transition' is a concept of the new millennium: we move 'towards' an era of socio-ecological transformations, a catchphrase that blends social, political, and technological items, turning a bleak catastrophic future into a bright solution. The role of science and technology in this imaginary is ambiguous, to be negotiated with other forms of change: activism, policy, and politics. However, the relationship between science and political transition is not a given, as historians of science can attest. For instance, the production of crops and animal products in fascist states, organised along the vertical structure of research-syndicates-producers started to disappear in the post-WWI scenario, but breeding programs awkwardly and silently squeezed through institutional changes. Project Paperclip helped further the US space program through the inclusion of Nazi scientist refugees. The Science for the People movement or the May '68 revolt, on the other hand, exemplifies the efforts of scientists in building bridges with anti-war and labour rights movements. More examples can be brought forward, putting the finger on the dual role of science as an emancipating and oppressing force, and the nuances we may find in between. This session aims to historize the role of science in political transitions, with particular attention to how scientists navigated in the political sphere.

The Americanization of English Science: Natural Philosophy and the Founding of the United States

- Paul Robinson, Bridgewater State University in Massachusetts (USA)

Abstract: Before the American revolution, British colonists in North America saw themselves as English, and the colonies' scientists (known at the time as "natural philosophers") saw themselves as members of the British scientific community. British natural philosophers, however, did not always feel the same, and they frequently dismissed their colonial peers as inferior outsiders. As the American revolution began and the colonists began to see themselves as distinctly different from the English, natural philosophers in the colonies similarly began to see their theory and practice of science as different from—and superior to—the English version. Amid the throes of revolution, English ideals of freedom and natural philosophy became American ideals of freedom and natural philosophy. As the

British had, American natural philosophers believed that freedom was an important component of science, but at the dawning of American independence they declared that science could only flourish in free lands like the new United States. They further predicted that science would literally remove itself from Europe and relocate to the United States, a prediction that seemingly came true when English natural philosophers, including the esteemed chemist Joseph Priestley in 1794, emigrated and became American natural philosophers. Now freed from Europe, science was seen as an American possession, one that would become a driving force in the development of the new nation and the furtherance of its national interests.

Science and the Communist Transition in the Soviet Union. The Case of Ivan Pavlov

- Eve Seguin, Université du Québec; Laurent-Olivier Lord, Cambridge University

Abstract: The role of science in the Communist transition in the USSR is usually associated with Lysenkoism. At the end of the 1920s, agronomist Trofim Lysenko published research results showing he had developed methods that could increase yields. Such results had everything to please the Bolshevik regime, which was struggling with famine, peasant resistance to the forced collectivisation of agriculture, and the growing need for food in the cities due to accelerated industrialisation. In his extensive work with plants, Lysenko rejected Mendelian genetics, which he regarded as reactionary. The ideological molding of scientific theories and results thus seems to be the main mechanism that explains the consolidating impact of science on the communist transition. However, the role of science in the establishment of the new communist regime was not one-sided, as shown by a less infamous case, that of physiologist Ivan Pavlov. Pavlov is known and praised for his relentless and daring criticism of Soviet rule, as well as his ability to negotiate with the new rulers. The proposed paper aims at showing that so far not enough attention has been paid to his action towards science as such. For one thing, the Bolsheviks never attempted ideological meddling in his work, despite the fact that several members of the Communist Party were researchers in his labs. More importantly, we want to stress that his political manoeuvring was also oriented to preserving in the country a science that met the criteria of the international scientific community, which ultimately smoothed the transition.

The commodification of blood in Francoist state (1939-1960): Science, Biocapital and resistances

- Cristina Sans-Ponseti, Institut d'Història de la Ciència (iHC) at Universitat Autònoma de Barcelona (UAB)

Abstract: The history of the study and manipulation of body fluids (e.g., sputum, breast milk or blood) cannot be understood without taking into account the political regimes and the historical transitions in which it took place. At the beginning of the 20th century, the bacteriological paradigm and the establishment of laboratory medicine led to these elements becoming central in the diagnosis of infectious diseases. With the Spanish Civil War, however blood was established as an important shared therapeutic element through blood transfusions. Finally, after the Second World War, blood banks emerged as new technoscientific institutions designed to manage, store and even market human fluids that gained an economic value. Here I study the Instituto Central de Análisis Clínicos, Bacteriológicos y Químicos, a blood analysis institute born in 1909 in Barcelona, which led to the creation of Laboratorios Grifols during the first Francoism, and the establishment of the first private blood bank in Spain in 1945. Studying the transition of blood can give us many clues about the role that Science played in the Franco dictatorship, and in turn, help us trace how some capitalistic views about the exploitation of nature and the human body were established. Through the dispute between public and private blood banks during the 1950s, we can see how blood was transformed from a biological element shared by all human beings to a relationship dictated by the logic of work and private property; biocapital that can be bought and sold without facing bioethical dilemmas.

On Psy Scientific Child Experts: Encounters and the (De)Construction of “the African” During Kenya and Uganda’s Transition from Colonial Rule to “Independence”

- Pokuaa Oduro-Bonsrah, The Geneva Graduate Institute

Abstract: Following World War II, scientists working across the “psy” disciplines travelled to lands far from their own to shape their disciplines and remain relevant by appealing to their contemporary social, political and economic situations. As places such as Kenya and Uganda transitioned from colonial rule to “independence,” these

psychologically inclined scientists sought to respond to growing demands for self-government and pressures facing the newly founded nation-states, seeking to assist in the formulation of national identity. They viewed the site of childhood as vital to the reproduction of societies. Children were seen through their ability to embody the future; therefore, scientists found it important to understand how they could be formed and reformed as future citizens of both the colonial and newly independent states. My research endeavours to understand how these “psy” scientists working across the continent shaped and utilised theories of the development of children in the African context in attempts to comprehend what the future “African” would look like. For this symposium on science and transitions, I want to explore how “psy” scientists observing child rearing practices navigated the social and political spheres in Uganda and Kenya during the late colonial period and beyond.

7 Styles of Thinking & Doing in the Ecological History of Scientific Knowledge and Practices (3/3)

Room: 40.008.

Chair: Roberto Lalli, Polytechnic University, Turin

Organisers: Matteo Vagelli, Ca' Foscari University of Venice; Joseba Pascual Alba, University of the Basque Country

Ian Hacking (1982) initiated the project of exploring 'styles of scientific reasoning' by drawing from Alistair C. Crombie's (1994) historical investigation on 'styles of scientific thinking in the European tradition.' Through this project, Hacking emphasized that 'reason has a history' and how standards of rationality emerge and evolve historically. Recognized as a valuable historical and philosophical tool for analysis (Hacking 1992), various historians and philosophers of science began incorporating this concept into their research (e.g., Davidson 1987; Gavroglu 1990; Schweber 1997; Radick 2000; Reck 2009; Elwick 2007; Winther 2012, 2013, 2015).

In later installments of his style project, Hacking (2012) related what he came to call 'styles of thinking & doing' to a cognitive and an 'ecological' history of reason (Atran 1990; Netz 1999). The aim of this symposium is to provide a reassessment of Hacking's project, by engaging closely and critically with Hacking's arguments on scientific styles. In this respect, some of the questions that this symposium will

discuss are: What are the implications of Hacking's theory of scientific styles at the level of language, truth, and understanding? What roles have styles played throughout the history of the sciences? How effective are styles as a historical-philosophical tool for comprehending scientific knowledge and practices? In what philosophical and historical ways could this project be further developed, especially within the context of an ecological history?

Panel 3 of our symposium will discuss the methodological implications of styles from the perspectives of history and sociology as well as of computational and big data sciences.

The Intertwining of Laboratory and Computational Styles in Microbiome Sciences: What Impact on the Design of Experimental Models?

- Sylvain Lallier, University of Paris

Abstract: Microbiology began with the development of instruments unveiling the microbial world. Its inception, however, has consistently provoked debates about scientific evidence's nature and technology's role in drawing inferences. This paper shows how Hacking's 'styles of scientific reasoning' aid in comprehending scientific practices and knowledge in microbiome sciences. Since Koch's postulates, microorganism studies have been focused on isolation and cultivation. This approach has been integral to experimental exploration and measurement, embodying the laboratory style involving technical instruments and phenomenon creation. However, the advent of metagenomics and bioinformatics analyses via machine learning, relying on statistics and probabilistic logic, brought computational reasoning based on artificial intelligence. Based on a socio-ethnography of scientific practices within microbiology laboratories specialising in human and plant microbiomes, this paper questions the impact of computational style on the laboratory life, and it is founded on the idea that each style of reasoning introduces a new class of objects and establishes its own criteria for objectivity. Laboratory style, through experimental models, contributed to discovering the microbiome's role in host health, while computational style provided deeper insights into microbial diversity via metagenomics data. However, the integration of computational methods sparked debates about metagenomic DNA sequencing depth and database reliability. Moreover, these methods haven't fully elucidated host- microorganisms interaction

mechanisms, underscoring the need for ex-vivo models that connect computational data with microbiological reality. Subtly, this intertwining laboratory and computational styles not only digitises measurement data but also experimental models, altering the organisation of scientific work and its application in clinical or agroecological practices.

Contextualized word embeddings from large language models as a new tool for analyzing styles of thinking and doing?

- Arno Simons, Technische Universität Berlin; Adrian Wüthrich, Technische Universität Berlin; Michael Zichert, Technische Universität Berlin/Universität Leipzig

Abstract: More than 40 years on, Hacking’s “styles project” has lost none of its original appeal. The project continues to spark fruitful discussions and further developments (Sciortino 2023, 2017; Winther 2012; Hacking 2012). In essence, the styles project claims that our ways of thinking and doing, and of interacting with the world, are fundamentally situated in historical, social and ecological contexts. In this sense, the project is part of the larger program of historical epistemology, going back to at least Fleck (1935) and Kuhn (1962). An important question that is often overlooked in all of these approaches is how we can actually investigate the emergence and transformations of situated ways of thinking and doing empirically. Conventional methodologies rely on qualitative case studies and close reading analyses, which, while offering detailed insights and precise contextualization, are naturally limited in scope since a human researcher can only digest so many sources in a reasonable amount of time. However, the recent advent of neural language modeling has opened up new avenues for the empirical investigation of styles. As we argue in this paper, contextualized word embeddings from large language models have the potential of being used to identify and trace styles of reasoning in large text corpora pertaining to scientific fields. As a case in point, we investigate the meanings of three epistemic ordering concepts—“simulation”, “experimentation” and “observation”—within the adjacent fields of astrophysics and high-energy physics. We also explore how the nuances of these concepts have undergone shifts over a 30-year period, spanning from 1990 to 2020, in a corpus of more than one million

articles. Notwithstanding these promising explorations, we also critically discuss the applicability and usefulness of these new methods for the future of the styles project.

Hacking and the mathematization of physics

-Lucas Marcelo Cavalari Nardi, University of São Paulo

Abstract: Styles of reasoning—or “styles of scientific thinking & doing in the European tradition”, as Hacking (2012) later defended—are broad frameworks that focus on scientific methodologies and practices. They can also contribute to drawing contiguous historiographical interpretations while avoiding anachronisms since these styles were built through the course of history, which is the purpose of this work. In this presentation, I shall show how the mathematization of electrostatics in the 18th century pulls Hacking’s concept of styles of reasoning into historiography. In this case, I will discuss Johann Euler’s (1734-1800), Franz Aepinus’ (1724-1802), and Charles Coulomb’s (1736-1806) theories of electrostatics, especially how they used mathematics to build their hypotheses and results. With this, I will argue for the existence of different styles of mathematization in these works, which are specific cases of styles of reasoning. I shall also discuss the structure of these new styles. Finally, it will be possible to build a philosophically-minded and structured historiography of mathematization thanks to Hacking’s concept, which gives us a new take on Hacking’s idea of ecological history. For Hacking (2012), the aim is to encompass human biology and cognitive capacities. My argument is that ecological history should mean something different—i.e., centering on structures and the feedbacks that connect the different moving parts of what can be called historical context. Those are the things that define ecology the most—they make a forest a forest, not a randomly dispersed set of trees.

8 The gender of things and spaces in the sciences. Representing, Standardizing and Staging (3/3)

Room: 40.010.

Organisers: Brigitte Van Tiggelen, Science History Institute; Maria Rentetzi, , Friedrich-Alexander-Universität; Annette Lykknes, Norwegian University of Science and Technology

Chair: Annette Lykknes, Norwegian University of Science and Technology

Hands and Instruments: Gendered Images of Chromosomes

- María Jesús Santesmases, Instituto de Filosofía, CSIC, Madrid, Spain

Abstract: This contribution reflects on the trajectory of chromosome images, its forms and the meaning attributed to them within a gendered epistemology, a history of women in cytogenetics and particularly on the gendered origins of the chromosome banding technique. The participation of woman scientists in the origins of cytogenetics shows a trajectory of practices articulated around skills that are recognised as authority. In addition to authorship, recognition of experimental skills and the training of the eye in producing and identifying genetic technologies and shapes –instruments and handy crafts- contribute to a historiography on knowledge production as a collective and transnational activity. This endeavour includes both hands and minds, in the gendered hierarchies of both the laboratory and the clinic as spaces and practices of the late 20th century biomedicine.

The Standard Man: Gendering Instruments in Radiation Dosimetry Research

- Maria Rentetzi, Friedrich-Alexander-Universität, Erlangen

Abstract: Right after the Second World War, the International Commission on Radiation Protection (ICRP) recognized the need to formulate a set of standard biological parameters, describing the “average individual,” that could be used to calculate permissible radiation doses for those working with radionuclides. A construct of the atomic age, the “average individual” could then justify the level of radiation exposure that nuclear workers were made to accept. In 1949, during the Chalk River Conference on Permissible Dose convened in Ontario with the participation of the United States, Britain, and Canada, the ICRP formalized what was going to be considered the “Standard Man,” the first statistical baseline of the average human: a white, male, weighed 70 kilograms, and between twenty and thirty years old. This first standardized anthropomorphic phantom and the figures for the mass of his organs were based on the data collected by female radiologist Mary Jane Cook. Her sample was the group of reactor workers, the vast majority of whom were men. Based on their data, Cook’s 1948 “Survey Report of the Characteristics of the Standard Man” became one of the main sources for the ICRP’s first reference man for

future radiation studies. Indeed, the ‘Standard Man’ has dominated research on radiation dosimetry and still defines radioactive safety standards around the world till today. The paper questions the gendering of a key instrument in radiation dosimetry studies and discusses its results.

Gendered Robots on Display: A Case Study from the Smithsonian’s National Air and Space Museum

- Emily Margolis and Matt Shindell, Smithsonian’s National Air and Space Museum, Washington, DC, USA

Abstract: Space exploration is increasingly dependent on robotic labor, from Martian rovers to humanoid assistants on crewed spacecraft. As with other technologies, humans frequently anthropomorphize space robots—and assign gender, too. The Smithsonian’s National Air and Space Museum is developing exhibitions that prompt visitors to think critically about the widespread practice of gendering robots in space exploration.

This paper offers a case study of the presentation of gendered space robots in two exhibitions--Futures in Space (2025) and Exploring the Planets (2022). These exhibitions introduce visitors to robotic spacecraft that have been formally and informally gendered. They include robotic spacecraft named in honor of historic women, such as scientist Marie Curie and abolitionist Sojourner Truth, as well as humanoid robots with female forms. They also include robots like the Mars rover Opportunity, which engineers and scientists refer to by she/her pronouns.

The paper offers an overview of efforts to select objects and draft exhibit labels, and the resources that informed this process, including the history of naming and gendering military craft, the gendered language around labor, gendering of frontiers and exploration, and popular culture depictions of robots. The speakers will share insights and lessons learned from their attempts to challenge and contextualize this intersection of gender and technology in ways that make sense to the families and young adults who visit the museum. These visitors increasingly bring to the exhibitions their own experiences of gendered virtual and robotic personal assistants and smart devices.

9 Visual Practices of Ancient and Mediaeval Astral Sciences (2/3)

Room: 40.012.

Chair: Stefan Zieme, Humboldt-Universität zu Berlin

Organisers: Eleonora Andriani, Institut de recherche et d'histoire des textes, Paris;
Stefan Zieme, Humboldt-Universität zu Berlin

(Sponsored by the Commission for the History of Ancient and Medieval Astronomy.)

Different written artifacts in the domain of astral sciences, including tablets, papyri, manuscripts, up to early printed editions, can often be readily distinguished by their unique visual features, which encompass geometrical, instrument, and horoscopic diagrams, as well as numerical tables. A closer examination of even small sections of texts in this domain also reveals varying numerical notations, predominantly based on the sexagesimal system though shaped for different purposes. Therefore, spanning from the minute aspect of numerical notations to the grander framework of manuscript layout and organization, practitioners of the astral sciences have distinctive ways of visually structuring their documents. The study of these visual practices can provide fundamental clues to grasp source traditions and long-range circulation of knowledge and, as a result, enable a broader understanding of the development of astral knowledge across different geographical regions, historical eras, and cultural contexts. Finally, because diagrams and numerical tables, similar to prose texts, are also subject to the transformations induced by the mere 'copying/printing' processes, analyses of these variations and of the way they are potentially manipulated by historical actors can offer invaluable insights for historians as they engage with these source materials. The contributions of this symposium will touch upon the above variety of visual practices, spanning from the production to the transmission of astral knowledge. Some papers will therefore focus on astrological schemes and astronomical diagrams, their connection with diagrams and illustrations from neighbouring disciplines, their genetic relationships and their transformations as the interests or methods of astral science practitioners change. Other papers, however, will have as their subject matter numerical tables and/or the texts accompanying them with reference to their visual or diagrammatic properties, including general layout, use of colors, of different sizes and forms of characters.

Astronomical Diagrams and Illustrations of Instruments in the Greek Manuscripts of Proclus' *Hypotyposis Astronomicarum Positionum*

- Argyro Lithari, Humboldt-Universität zu Berlin / Berlin Graduate School of Ancient Studies (BerGSAS)

Abstract: In the *Hypotyposis Astronomicarum Positionum*, composed around 450 A.D., Proclus, one of the most authoritative late Neoplatonic philosophers, presents Ptolemy's geometric-kinematic models about the celestial bodies. The treatise addresses Platonic philosophers who are beginners in astronomy, though already acquainted with mathematics. The *Hypotyposis* is characterized by a high degree of technical discourse. As many textual elements show, astronomical diagrams and illustrations of astronomical instruments are an inseparable part of the astronomical propositions and descriptions of instruments recorded in the *Hypotyposis*. Their total number amounts to 24. Indeed, in all the 31 Greek Byzantine manuscripts of the *Hypotyposis* that I have examined, dated from the 13th to the 16th century, the text is accompanied by diagrams and illustrations. Nevertheless, many of these manuscripts contain diagrams and illustrations which are not strictly dictated by the text itself. I have identified 23 such "extra", as I call them, diagrams and illustrations. In the framework of the Symposium, I aim to present scribal practices regarding (i) the position of the diagrams/illustrations with respect both to the reference-text and the page of the codex, and (ii) the way of construction (i.e., the use of drawing materials, the co-existence of provisional, finalized and even incompatible variants). I will also correlate these practices with the aforementioned two categories of diagrams/illustrations. Furthermore, with the aid of specific examples, I will explain the main source of errors found in the diagrams in particular. Lastly, I will comment on the techniques adopted in the representation of the three-dimensional astronomical instruments.

The Codex and the Instrument: describing the Construction and Uses of John of Lignères second Equatorium in Vatican, Biblioteca Apostolica Vaticana, Urb. lat. 1399

- Eleonora Andriani, Institut de recherche et d'histoire des textes, Paris and Matthieu Husson, CNRS, Paris

Abstract: The manuscript Vatican, Biblioteca Apostolica Vaticana, Urb. lat. 1399, produced either in Italy or France in the 2nd quarter of the 14th (before 1368) contains on folios 16r-21r a short work attributed to the French astronomer John of Lignéres (fl. 1st half of 14th c.). This work comprehends a description, an overview on the uses and composition of an *equatorium*, i.e. an astronomical instrument dedicated to the study and computation of planetary motions. The work contains one short numerical table and five large diagrams along with the text. In this presentation we will analyse how the graphical structuration of the text, diagrams and table function in coordination at different levels (characters, pages/manuscript openings, full work). This analyse will lead us to consider the extent to which the text itself, as materially manifested in the codex, can be considered an (astronomical) instrument and the kind of access it provides to an eventual concrete brass or wood *equatorium* that would exist as an independent object from the codex.

Imaginary Circles and Physical Orbs: New (?) Ways of Visualizing Planetary Models in Islamicate Astronomy

- Scott Trigg, Observatoire de Paris-PSL

Abstract: The tradition of Islamicate astronomy known as ‘ilm al-hay‘a, or “the science of the configuration [of the orbs],” aimed to set forth a cosmology based on uniformly-rotating physical orbs, while at the same time preserving the predictive accuracy of models inherited from Ptolemy’s *Almagest*. Indeed, many works in this tradition identified “doubts,” and unresolved “problems” that arose when interpreting the *Almagest* models in terms of physical bodies, and offered innovative solutions, yet the manuscript diagrams presenting these models remain little studied by modern historians. Alongside their discussion of models for planetary motion, authors frequently included two different diagrams for visualizing the same model: one diagram depicting physical orbs and another depicting “imaginary circles.” Using examples from authors such as al-Kharaqī (d. 1158), al-Ṭūsī (d. 1274), and al-Shīrāzī (d. 1311), I explore what types of knowledge could be gleaned from these two different types of diagrams, and analyze how the diagrams functioned on a material and mental level to help the reader visualize planetary motion. I highlight the historiographic challenges of situating these diagrams not only in the tradition of the *Almagest* itself but also Ptolemy’s *Planetary Hypotheses*, wherein he attempted to

translate the abstract circles of his *Almagest* into a unified physical system. Ultimately, I suggest that Islamicate authors adapted and transformed the “visual idioms” and diagramming practices from both works in order to support different ways of reasoning geometrically.

11 Women in Scientific Institutes and Universities in Crucial Years in the 20th Century in Central and Eastern Europe (2/2)

Room: 40.063.

Chair: Milada Sekyrková

Organisers: Adéla Jůnová Macková, Masaryk Institute and Archives of the Academy of Sciences, Prague; Milada Sekyrková, Institute of the History of Charles University and Archive of Charles University in Prague

The proposed symposium aims to uncover the changes in opportunities for female scientists during the crucial years of the 20th century in Central and Eastern Europe. Especially Central and Eastern European countries fundamentally changed their research policies and the newly established scientific institutions after the WWI, as well as after the WWII, and in the 1970s.

New state institutes, new universities and later on the Academies of Sciences were founded. State scientific politics thus broadened the possibilities for academic positions for women. The symposium aims to analyze the influence of changes during crucial years on the academic community, especially on the change of the role of female scientists at universities and other academic institutions. We would like to follow the changes, that presented more academic opportunities for a new generation of scientists, especially for women, as well as influence of the transformation of the science politics during political changes in different countries.

This Symposium presents continuity of the important research on the role of women in science and it is held on behalf of a Commission on Women and Gender in Science, Technology and Medicine.

Network and Women in the Institutes of Academy of Sciences. Women and Oriental studies in the crossroads of the 20th century

- Adéla Jůnová Macková, Masaryk Institute and Archives of the Academy of Sciences, Czech Republic

Abstract: The changes in the structure of scientific institutions after WWII as well as newly established scientific institutes, mainly the Czechoslovak Academy of Sciences in 1953, had a significant impact on careers of women in science. Academy broadened the possibilities for academic positions for women and in case of social sciences women even reached the leading positions in departments of the institutes. This paper will focus on the women scholars of the Oriental Institute in crucial years 1945, 1953 and 1969 to show the opportunities and challenges, that these political changes brought to women scholars in Czechoslovak oriental studies. Especially the geopolitical strategies and interest of the Soviet Bloc in the East brought a considerable boom mainly to Chinese studies and research. I would like to present case studies of women scholars hidden behind the statistics.

Women archaeologists in the crucial years of the 20th century

- Marcela Starcová, Institute of Archaeology of the Academy of Sciences, Czech Republic

Abstract: The paper is one of the partial outputs of the project *Forgotten or Unknown History? Research on Women's Identity in the Scientific Environment of Independent State Social Science Institutes and Subsequently in the Institutes of the Czechoslovak Academy of Sciences 1918-1968*. This paper is closely related to previous comparison of the problems of women's employment in archaeology in the interwar period, as well as after the integration of the State Institute of Archaeology into the newly created Czechoslovak Academy of Sciences. I will focus on the major problems and pitfalls that women archaeologists had to face in the crucial years of the 20th century. By crucial years, we refer to dates that were crucial especially for the existence of the state, namely 1918, 1938, 1948, 1968. Each of these years characterize an entire period of the state's existence and also influenced scholarly work and research in social science institutes. In each of the selected periods, women scientists faced different problems in their scientific careers and professional employment.

What if?

- Željko Oset, ASEF – Ljubljana, American Slovenian Education Foundation / ERC project SOVEREIGNTY

Abstract: Historians research history based on methodology, various types of sources, and different approaches, settings but in case of women in academia upon Sovietization in communist countries we should also pose the question (in terms of intellectual exercise): what would happen, if there had not been communist favoritism of scholars of workers and farmers background and concurrently dismissal of those with bourgeois background in the post 1945 period. In Slovenia, the majority of prewar women PhD originated from a well-to-do environment. In the post-war period academic opportunities for women have increased, though the glass ceiling remained due to selection procedures let alone reproduction practice. Therefore, I will discuss in my paper the impact of bourgeois background for women's aspirations for academic career in Slovenia.

16:00 - 16:30: coffee break

Pati Roger de Lluria

Saturday 7th 16:30 - 18:30 Sessions

1 Exploring novel perspectives in science diplomacy: conceptual, narrative, and historiographical innovation (2/2)

Room: 40.002.

Chair: Grigoris Panoutsopoulos, Universitat Autònoma de Barcelona, Institut d'Història de la Ciència

Organisers: Matthew Adamson, McDaniel College, Budapest; Barbara Kirsí Silva, Universidad Católica de Chile

The symposia aim for a new historical assessment of science diplomacy, probing received notions of knowledge transfer, alliance-building and disciplinary boundaries, via novel narratives and historiographical settings. The papers challenge traditional accounts of science diplomacy's advocates, who claim a predictable and equitable technoscientific diffusion. These symposia integrate presentations offering novel means of constructing technoscientific narratives, linking different disciplines

in unexpected examples of cause and effect and discovering new historical actors involved in science diplomacy. While falling into the post-World War II period most often associated with science diplomacy, the panellists diverge from traditional Cold War frameworks to consider various south-south relations as well as previously unexplored regional and global dynamics. In this sense, rather than a strict focus on a given time period, these panels illustrate how novelty and historiographical innovation can be embedded in narratives focused on new actors, elements, places, and global connections. These symposia are sponsored by STAND (DHST Commission for Science, Technology, and Diplomacy).

Regional approaches to the development of chemistry in Asia

-John Webb, Tom Spurling, Greg Simpson, and Bopha Roden, Swinburne University of Technology, Melbourne

Abstract: The United Nations science agency, UNESCO, was key to the development of chemistry in Asia. Inspired by the success of taking a regional approach for the Federation of European Chemical Societies (now the European Chemical Society) during the Cold War, UNESCO encouraged the development of regional networks for chemistry collaboration in Asia. The Federation of Asian Chemical Societies (FACS) emerged from a meeting called by UNESCO in Bangkok Thailand. The meeting was attended by representatives from the chemical societies of Australia, Hong Kong, Indonesia, India, Iraq, Korea, Malaysia, the Philippines, Singapore, Sri Lanka and Thailand. Japan and New Zealand joined in 1981. Both the Chinese Chemical Society, Beijing and the Chinese Chemical Society located in Taipei joined in 1984. Over the following 40 years, the FACS has grown to include 30 member countries. In that time, Asia has grown in chemistry capability, as measured by bibliometric analysis of research papers, to now be the epicentre of world chemistry, contributing nearly 60% of world chemistry papers. The Asian Chemistry Congress hosted by the Chinese Chemical Society located in Taipei, Taiwan in late 2019, just prior to Covid pandemic, saw two and a half thousand chemists gather from around the globe, to celebrate the 40th anniversary of the FACS. Regional associations can provide a science diplomacy platform for developing cross-cultural professional relationships, new research and technical collaborations and a platform for considering controversial issues.

Diplomacy for Science and the scientization of the Water, Energy, and Food Nexus framework

-Julian Prieto and David Baker, Penn State University

Abstract: The German government, in partnership with the World Economic Forum, the World Wildlife Fund, and the International Food Policy Research Institute hosted the Bonn2011 Nexus Conference with the aim to present the outcomes of a year-long series of consultations to understand the intricate interdependencies among Water, Energy, and Food systems. Attended by over 550 participants, including influential figures from politics, academia, the United Nations, civil society, and the private sector, the conference sought to establish the Water, Energy, and Food Nexus framework (WEF Nexus) as a crucial facet of green economy and growth paradigms. The WEF Nexus has counted with the support of diverse Diplomacy for Science agreements that promoted and fostered international scientific and research collaborations. To gauge the impact of these efforts, one approach is to evaluate scientific output using peer-reviewed papers. In the SCOPUS database by Elsevier, as of April 2023, there are 1,587 publications on WEF Nexus across 483 journals. By using bibliometric analysis, this paper develops a taxonomy of science diplomacy programs that have supported the WEF Nexus. In addition, this paper looks to understand how this diplomacy for science mechanisms influences the development of scientific communities by building and comparing co-authorship networks according to the source of funding and analyzing their respective scientific contributions to the field. The importance of this research relies on the capacity that the WEF Nexus framework has to broaden disciplinary boundaries towards environmental and societal challenges.

Australia and Indonesia: the role of science diplomacy in building new industries and alliances.

- Tom Spurling, Greg Simpson, Bopha Roden and John Webb.

Abstract: The Centre for Animal Research and Production (Pusat Penelitian dan Pengembangan Peternakan), Bogor Indonesia, was opened in 1978 by Indonesian President Suharto. The Centre was the culmination of Australia's largest scientific overseas aid program to that time. The project was the result of a direct request some 10 years earlier from Indonesia to Australia for help in building a science- based

animal husbandry industry in Indonesia. The intergovernmental agreement between Indonesia and Australia stated that the major undertaking of the project was to establish a new animal research laboratory and associated buildings conducive to problem-solving research of the highest standard, with the long-term view of staffing it fully with Indonesian scientists trained to carry out first class research. The scientific expertise came from CSIRO, Australia's pre-eminent government research organisation. CSIRO had been initially established to support Australian industry, that is, within Australia, through scientific research. This project marked the significant realisation by the Australian government that successful Australian industries needed successful regional engagement and thus the assignment of this large project to the CSIRO. We discuss how this large-scale international collaboration has contributed to the concept of science diplomacy between Australia and Indonesia. In addition, we look at how this collaboration has helped the Indonesian agri-industries and influenced the future research programs and international strategy of CSIRO.

Data central clearing house for the world? The IAEA, data, and global nuclear history

-Matthew Adamson, McDaniel College/Corvinus University, Budapest

Abstract: Scholars of nuclear history have taken several approaches to exploring that history at a global scale: analyzing nuclear weapons proliferation, documenting the nuclear fuel cycle from mining to the building of power plants to waste disposal, and surveying radioisotope techniques have served as means for considering the politics, costs, and the illuminated and hidden historical actors involved in the worldwide spread of nuclear technology. This paper considers the circulation of nuclear data as another means of investigating nuclear history at a global level. Shortly after its creation in 1957, the International Atomic Energy Agency (IAEA) became largely responsible for data curation and management, in harmony with its statute. Especially if considered in the light of the present advocates (Boyd et al, "Data Diplomacy," 2019) of science diplomacy, this suggests a universal potential for worldwide scientific action and adjudication of relations. However, nuclear data circulation in the 1960s with the IAEA at its hub—one IAEA administrator declaring the Agency "the central clearing house" for the management of such data—facilitated

certain diplomatic and scientific processes while failing to address others, in patterns of marked asymmetry. As for global nuclear history, this paper suggests that by the end of the 1960s there was underway at the IAEA a process of the coproduction of data-management capacity and diplomatic influence (e.g. management of East-West relations in the Agency; raising the IAEA's international profile), a process that lent itself to claims if not realizations of globality.

2 Fading Empires and Conflicting Nation-Building. A Perspective on Science, Technology, Nation, and Statecraft from the European non-colonial peripheries (s. XIX-XX) (2/2)

Room: 40.105.

Chair: Antoni Roca-Rosell, Universitat Politècnica de Catalunya

Organisers: Francesco D'Amaro, Universidad Autónoma de Madrid; Daniel Pérez-Zapico, Universidad Autónoma de Madrid

Scholars have interrogated the mutually constitutive legitimation practices of science, technology, and politics, considering the emergence of the nation-state as the most significant repository of political power. Recent times have seen the revival of the nation, including nationalistic approaches to economic, energy or security policies, even if current challenges such as environmental harm, pressure on resources, pandemics or terrorism require global and coordinated decisions. In this panel, we propose a historical, comparative, transnational perspective, to get a richer picture of how science and its technological applications relate to nation and nationalism.

To achieve this, the different papers address epistemic and material resources that less advanced, secondary nations or fading empires of the nineteenth and twentieth centuries used to propagate powerful sociotechnical imaginaries around the need to speed up development. We will focus on the European non-colonial peripheries, those territories that could experience the 'informal' techno-scientific imperialism by more developed industrial countries, but whose local elites retained considerable amounts of political power.

In particular, we will interrogate the feedback loops between industry, state and experts using science and technology, especially in medical areas, to perpetuate social orders structured around religion, race, gender, and global positions. We will focus

on the role of national identities in selecting specific scientific or industrial trajectories, the epistemic and authority conflicts within and between state institutions (including strategies for expert legitimation in weak state formations), and the role of social norms, communal aspirations and the multiple alternative imaginaries for national development.

In doing so, this panel wants to raise awareness of the diverse and uneven development of technoscientific cultures. As such, we suggest a thorough engagement with the political cultures of the respective cases under scrutiny while also avoiding classical divides “West/non-West” and “North/South” by examining the intricacies of intra-national and intra-regional trajectories within Europe.

The Battle for the Spas: National and Class Conflict in Spa Treatment and Tourism in the 19th and 20th Centuries in the Czech Lands

-Vladan Hanulík, University of Pardubice

Abstract: The paper reflects on the nationalization of the spa sector in the context of the development of the Czech Lands in the 19th and 20th centuries. The lack of effective therapeutic means of professional medicine turned the spas of Central and Eastern Europe into locations interconnecting the development of modern science and the traditional use of mineral and thermal springs. Over the 19th century, we can trace the gradual transformation of these localities from places of the social representation of the highest aristocracy into centers of the leisure, tourism and healthcare industry. Important spa sites in the Bohemian lands were located in areas inhabited by the population claiming the nationality of Austrian Germans. Representatives of the Czech ethnic group, therefore, tried to penetrate the area and fought for the positions of spa doctors. Moreover, in the second half of the century, growing anti-Semitism, became part of the national disputes. The struggle for dominance in the spa industry was subsequently capped by the establishment of Czech spas, associated with integrating national semiotic signs and attempting to distinguish the spa infrastructure not only visually but also in the structure of the medical treatments. During the socialist regime, all spa sites were subsequently nationalized and integrated into the socialist healthcare system. Transformation of the once prestigious spa pavilions for the needs of the working-class was associated

with a strong emphasis on the therapeutic function of the spa and the establishment of scientific institutes elaborating the effectiveness of physical therapies.

Professionalism in Medicine and Political Engagement during the Late Ottoman Era

-Ceren Gülser İlikan Rasimoglu, Acibadem Mehmet Ali Aydinlar University, Istanbul

Abstract: This presentation delves into the development of medicine as a vocation within the Ottoman Empire during a period of global emergence of modern medicine and a noteworthy political change. It particularly emphasizes the interconnectedness between medical education and political engagement during the late Ottoman era. Specifically, the study examines how modern medicine in the 19th century impacted the mindset of the Military School of Medicine in Istanbul. Within this environment, two generations of physicians—spanning the periods of Tanzimat (1839-1876) and Abdulhamid II (1876-1909)—viewed the advent of modern medicine as a means of social advancement and service to the Ottoman state during a period of crisis. The concept of modernization and progress, originally perceived as a solution to the empire's challenges, evolved into a call for a constitutional monarchy among certain medical professionals during the Hamidian era. The presentation also sheds light on the formation of a secret organization by medical students, whose liberal and nationalist aspirations intertwining with their professional identities, aiming to address the issues of reuniting the empire amidst the Eastern Question and various micro-nationalistic movements. This organization eventually transformed into the Committee of Union and Progress, later known as the Party of Union and Progress. The committee advocated for the sultan to restore the Constitution and Parliament, leading to the pivotal 1908 Revolution—an instrumental turning point in Ottoman political history.

The Telegraphic Connections of the ‘Model Kingdom of the East’: European Identity and Infrastructures in Greek Political Discourse in the Nineteenth Century

-Elati Pontikopoulou-Venieri, European University Institute

Abstract: This contribution will focus on the first years of development of the Greek state's telegraph network and its connection, drawn by the Greek political elites, to

the propagation of alternative narratives about Greek national and European identities. The construction of the Greek telegraphs set off in the late 1850s with the laying and purchase of a submarine cable providing for Greece's telegraphic connection to the European telegraph network and constituted, upon its expansion, the first, quite successful, investment of the Greek state in infrastructure. In an era of national aspirations for further territorial expansion –what was called the Greek 'Great Idea'– profoundly related to the backing and support of the European great powers, the development of the telegraph network acquired an additional layer of meaning, more important than its function as a tool for the nation-state's consolidation: it represented the proof that the Greek state was capable of participating, in terms of progress and national development, in the 'family of civilized European nations', rising to the occasion of being considered as 'the model Kingdom' of the East. Based on archival research of the Parliament and the Senate Proceedings, I aim to present the political debates of the time around the proposed alternative trajectories for the expansion of the network and the multiplication of its foreign, mainly, telegraphic connections, as well as the organization of the institutional framework of its operation, in which the 'anxiety' of the Greek political elite for achieving the Greek state's 'telegraphic connection to Europe' was depicted.

Public Works, Regeneration and the Struggle for Authority within Spanish Engineering Communities

-Francesco D'Amaro, Universidad Autóno

Abstract: In 1899 an engineer stated that the civilian "soldiers" of the Spanish administration, the Corps of Civil Engineers, had to take charge of public works to regenerate the nation. Amid the profound identity crisis that follow the loss of overseas territories in 1898, managing Spain's natural resources (in particular, water through hydroelectric dams) became one of the baselines for national resurgence. While increasing the country's hydropower output, Spanish civil engineers also pondered over their role in society as members of the State's technical elite. However, civil engineers were not the only ones addressing the vital question of how to regenerate a decaying nation. One of the leading institutions focusing on electrical engineering was the Catholic Institute of Arts and Industries (ICAI), established in 1908. While aiming at training the next generation of engineers, this private

institution also attempted at defining the contours of the “dreamed engineer”, one that should combine up-to-date technical knowledge with a strict adherence to Catholic traditions and Christian ethics. This paper will reflect on the Spanish engineers’ rhetoric and professional strategies as reflected in their journals and conference proceedings in the first half of the twentieth century. In these platforms, engineers tried to reflect on their influence in the management of the nation’s natural heritage, including ideas on hydropower as the solution to the country’s backwardness. Also, the paper will spotlight the ensuing competition between the different engineering communities. This will show the disagreements over who would promote electrical and infrastructural endeavours to regenerate the nation. ma de Madrid; Daniel Pérez-Zapico, Universidad Autónoma de Madrid

3 Gender and sexuality

Room: 40.006.

Chair: Demián Missael Muñoz Jiménez, Universidad Nacional Autónoma de México

Hidden Figures? Women's Knowledge and Work in Early Modern Mining

- Gabriele Marcon, University of Vienna

Abstract. Early modern mines ranked among the most populated workplaces of preindustrial Europe. Both men and women engaged in mining activities. Yet women’s work, which historians have either scarcely documented or considered irremediably lost, was part of a paradox. On the one hand, early modern mines were segregated workplaces for women. In sixteenth- and seventeenth-century Europe, women were deemed unfit for mining labour, and perceived to lack the necessary strength and skills to carry out risky, unhealthy, and physically demanding activities. As a result, employers and subcontractors organized work and allocated tasks to women by following traditional gender differences in male and female labour outputs. On the other hand, while continuities of gender inequality persisted at various stages of their work, female agency challenged this gendered working environment. Women contributed to various economic, scientific, and labour activities of preindustrial mining. For instance, they participated in the industry as heads of money lending institutions in the mines, and worked in high-skilled positions such as surveyors, metalworkers, and labour supervisors.

The presentation aims to shed new light on this paradox by examining women's scientific contribution to early modern mining through the lens of the labour history of science. First, it surveys how humanist writers associated women with Nature, and how this connection underpinned technical discourses that excluded women's bodies from mining activities. Second, it analyses how sixteenth-century texts on mining and metallurgy supported this scholarly tradition while also recognizing women's participation in the mines as discoverers of new metal deposits. Finally, the presentation draws some preliminary conclusions by presenting new archival material on the scientific knowledge of German and Italian female labourers in the working community of the Medici mines in sixteenth-century Tuscany.

‘My body, my choice. Their science’: Female Technologists and Oral Contraceptives in Australia, 1961 to 1991

-Natasha Szuhan, Australian National University

Abstract: It has been 63 years since the Pill was released onto the global market as a (mostly) female-controlled contraceptive technology. This product was unlike any of the messy, fiddly, inconsistent, fallible, and sometimes mood-killing mechanical and chemical contraceptive methods and products that preceded it. Oral contraceptives basically sold themselves through the promise of spontaneous and guaranteed safe (from pregnancy, at least) marital sex through the regimented daily ingestion of a pill that ‘c[ould] be eaten like candy’. The rapid uptake in the Pill in Australia (and most of the western world) in its first decade of sale demonstrates that there was a broad enthusiasm across ecumenical, economic, and ethnic cohorts for an efficient female-managed technology that didn't require constant maintenance, extensive pre-sex preparation, or the use of fine motor skills.

But how did this shift in contraceptive practice – and its resultant socio-cultural and gender ruptures – relate to scientific communication? Was it a product of an incremental increase in public appreciation and application of medico-scientific knowledge built up over several decades by contraceptive scientists and activists? Or a by-product of the apparent scientific breakthrough that had rendered the reproductive female body wholly manageable? No one has yet asked these questions – but they are central to my oral history of oral contraceptives in Australia.

This talk will present initial findings from this project's pilot trial and seek to draw some useful conclusions about the intersection of science and technology communication and gender and reproductive autonomy in recent Australian history.

4 (Global) knowledge networks

Room: 40.010.

Chair: Oliver Hochadel, Institució Milà i Fontanals, CSIC, Barcelona

Excavation Networks 1800 / 1900

-Felix Lüttge, University of Basel - German Historical Institute London

Abstract: Metaphors of readability have been central to scientific descriptions of the world: the book of nature, the archives of earth history, the genetic code, the archaeological record. But there is no book of nature without writing tools, no archaeological record without recording devices. Looking at excavation and notation in British archaeology in the late nineteenth and early twentieth centuries, this talk will shift the focus from the concept of the archaeological record to the practice of archaeological recording. It will investigate the ways in which notation systems helped produce the sites, objects, and subjects of archaeological knowledge.

Taking a media historical perspective, I will argue that the archaeological excavation can be described as a paper technology. The talk will focus on the writing routines centred around archaeological excavations – planning, note-taking, excavation reports – and visual representation in anthropological theory based on archaeological finds at two highlighted moments in the history of British archaeology, the 1860s and the 1930s. It will show that the production of the archaeological record relied on the same notation techniques as theories of material and cultural evolution. The talk will deal especially with the table as a medium central to excavations reports as well as to the administration, planning, and digging of an excavation.

KNOW.AFRICA - KNOWledge networks in 19th-century AFRICA

-Sara Albuquerque, IHC - University of Évora - IN2PAST

Abstract: Nineteenth-century Africa is characterized by a historiography of a dispute between European colonial powers, being presented as a uniform, wild continent open to territorial and scientific incursion. The Eurocentric perspective

reaffirmed by the History of Sciences associates African scientific expeditions with ideals of patriotic courage, adventure and pioneering, led by individuals transformed into heroes of the country. Recently, new research agendas reevaluated the narratives written by travellers, realizing that the science practised was necessarily collaborative: naturalists depended on networks of individuals who knew the region, communication with the local population and support in the collection, identification and preparation of specimens. The KNOW.AFRICA project aims to analyse four Portuguese expeditions to Africa, unveiling the sociability of fieldwork to reveal local groups that collaborated with travelling naturalists. When investigating the way in which local agents contributed to the success of travellers, it is revealed that, despite social asymmetries in the colonial space, they actively participated in the European process of building knowledge of African nature. Using computational tools to create georeferenced maps, maps will be created that recreate expedition itineraries, mapping interactions between travellers and local agents. A platform is proposed with a virtual exhibition, a display of original illustrations from travel books, and an interactive chronology of expeditions in Portugal and Angola. KNOW.AFRICA will promote digital sharing, scientific debate, research and dissemination, critically contributing to the historical narrative/construction of historical-scientific heritage, working with young audiences within the framework of Public History: workshops, production of support materials for decolonising science aimed at secondary education, involving teachers and students. Funding: KNOW.AFRICA - KNOWledge networks in 19th-century AFRICA (ref. FCT - 2022.01599.PTDC; <https://doi.org/10.54499/2022.01599.PTDC>).

Networking Environmental Research. Unesco's Man and the Biosphere Programme Between the Local and the Global

-Philipp Kuster, Rachel Carson Center, Munchen

Abstract: The Man and the Biosphere Programme (MAB) was launched in 1971 by Unesco in order to bring the human dimension into ecological research. In spite of the global ambitions embodied in its name, the programme mainly operated locally in small scale research projects. This “small science” approach was presented as a strength of the MAB in comparison to previous environmental research programmes such as the International Biological Programme, as it enabled the research to be

tailored to the local context. However, the goal of regional and global synthesis remained with the MAB, leading to various efforts to bring the projects into exchange. This was done through the formation of cooperative networks, especially in the area of tropical and arid zone research. These networks crossed the division between the Global North and South, as they entailed partnerships between research institutions in tropical or arid regions with others in Europe and the United States.

Apart from research projects, the other major focus of activity for the MAB programme was a new form of protected area which allowed for some human use, including scientific research. These “biosphere reserves” were also meant to form a global network, with the hope that they could serve as “laboratories” for long-term research on human-environment relations. This paper follows these attempts at bridging the local and the global through research networks in the 1970s and 1980s. It is centred around the question of synthesis, which was a major problem for the MAB throughout this period. In addition, it takes into account how those networks were shaped by global inequalities.

5 Invisible knowledge – invisible labour

Room: 40.109.

Chair: Mariana Sánchez, KU Leuven

Maya Kitchen gardens: an archival bastion of domestic knowledge

-Olin Moctezuma Burns, University of Cambridge

Abstract: Centuries of memocide, including the destruction and displacement of documents, have resulted in a scarcity of written sources in Yucatan, Mexico. This is particularly true when studying the household as a site for the production, preservation, and circulation of natural knowledge. However, the peninsula is richly populated by solares, Maya kitchen gardens of household plots. These spaces have been central to assimilating and preserving species, knowledges, and practices since prehispanic times, patterning history upon the land. And so, this paper presents solares as archives. Drawing on the newly established community archive in Sotuta, Yucatan and my fieldwork in the town, I will call attention to the vital role of solares in the various forms of record-keeping of the household. I explore this through the Yucatec Maya concepts, tsikbal, intimate, everyday dialogue, and ts'iib, an expansive

conception of writing defined by the cyclical creation of patterns beyond words. This paper will thus show how the spaces and activities of the household have been crucial for the preservation and renovation of knowledge, especially in the face of colonial threats to written records. Moreover, it considers the challenges and opportunities in defining and thinking about archives based on the territories they inhabit.

The ‘boys’ of Buitenzorg: Indigenous botanical experts and scientific expeditions in the Dutch East Indies (1890-1940)

-Sjoerd Kompier, Leiden University

Abstract: Around 1900, the Botanical Gardens in Buitenzorg had over 300 indigenous employees, working as plant collectors, laboratory assistants and gardeners. At the time, Buitenzorg was an international hub for research into tropical botany, and attracted scientists from all over the world. Recent historiography shows the importance of scientific exchange between European universities and institutions in the colonies, like Buitenzorg. A precondition for this exchange was the work of indigenous people employed by these institutions, yet their impact on scientific knowledge production remains elusive. In our paper, we uncover the contributions of Buitenzorg’s indigenous plant collectors and botanical experts, called mantri’s, to both colonial science and biodiversity heritage today by focusing on expeditions connected to Buitenzorg.

European scientists working at Buitenzorg only relayed snippets of information about the work of mantri’s and downplayed their significance, describing them as ‘boys’. For our research project “Who did all the Work? the hidden labour of colonial science” (Leiden University), we systematically surveyed publications related to scientific expeditions in the Dutch East Indies and formed a relational database. From that research, an image emerged of mantri’s who were indispensable for their botanical knowledge and practical skills to European expeditions. As the authoritative boundaries between Europeans and non-European scientific personnel blurred during these expeditions, these sources offer a unique view of the mantri’s work.

In our paper, we present an overview of the role of mantri’s during Dutch scientific expeditions between 1890 and 1940. Then, we present a case study of the scientific achievements and personal story of mantri Iboet. We show the lasting legacy of

mantri's and the afterlife of the specimens they collected by connecting their stories to the collections of Naturalis Biodiversity Centre. Here, these specimens, which were collected by indigenous experts, form a historical base for biodiversity research of present day Indonesia.

Invisible narrative tweakers? On the hidden role of Austrian and Romanian academic institutions in shaping artificial radioactivity histories

-Daniela Dandes, Centre for the History of Science, Technology and Medicine, University of Manchester

Abstract: The infancy of radioactivity research has yet to provide definitive historical answers, as past narratives often focus on early discoverers rather than the representations of their work's importance by the institutions that took over their historical portrayal. This paper analyses such an instance as reflected in the case of two early contenders of the discovery of artificial radioactivity and their respective institutional sponsors: Carl Auer von Welsbach (1858-1929) at the Technical University of Vienna; and Stefania Măărăcineanu (1882-1944) at the University of Bucharest. In this scenario (hidden) institutional actors played a part in shaping reputation-building narratives emphasizing the discoverers' role at the local, national and global levels. Hence, through a comparative analysis, the paper shows that early discoveries in artificial radioactivity often resulted from the input of invisible agents' "tweaking" given narratives. In turn, the paper also draws on recent literature to explore the diplomatic ambitions behind these narrative-tweaking operations, hence revealing as one of their covert goals to be the promotion of national enterprises connected with the further development of these discoverers' work.

6 Limit and definition issues in miscellaneous perspective

Room: 40.113.

Chair: Sara Bassanelli, Northwestern Italian Philosophy Consortium/University of Pavia

Merging Science with Religion. The "Lezioni elementari di Fisica Terrestre" by Angelo Secchi (1879)

-Francesco Vezzani, Università degli Studi di Trieste - Università degli Studi di Udine-EHESS

Abstract: In 1879, one year after the death of their author – the renowned Italian Jesuit and Astronomer Angelo Secchi – the *Lezioni elementari di Fisica Terrestre* were published in Turin and Rome. The book was a collection of lessons in Geology, Palaeontology and Archaeology that the cleric taught inside an “istituto di nobile gioventù” (educational institution) in Rome and included as well two lectures on “la grandezza del creato” (the greatness of creation), given in front of a wide audience at the Accademia Tiberina in March 1876 and May 1877.

What was important to Secchi was to dispute the contemporary evolutionary theories in a so-called scientific way, fighting every possible form of atheism and proposing a dialogue between the world of Christian religion and the one constantly reshaped by scientific progress.

While emphasizing the value of Geological knowledge, the Jesuit accepted Charles Lyell’s modern approach, describing a long process of transfiguration that operated steadily over time in shaping the Earth. However, when dealing with organisms, fossils and living species were represented as a magnificent celebration of the power of the Creator, who had organised them in space and time within a chain that could only lead back to Himself.

Secchi celebrated not only the Divine Providence but also the presence of man, understanding his role among other species. In doing so, an anthropocentric construction of the environment was depicted in front of the eyes of the Roman audience: the concept of “Era Antropozoica” (Anthropozoic Era), forged some years before by Antonio Stoppani, was used to show how far human greatness could go.

The Naturalism-Antiquarianism in the Kingdom of Naples. Archaeological and Geological Discourses and Anxieties in the Travel Writings of Lazzaro Spallanzani (1729-1799)

-Gennaro Ambrosino, University of Warwick

Abstract: From the eighteenth century onwards, with the discovery of the buried cities of Herculaneum (1738) and Pompeii (1748), and the continued volcanic activity of Vesuvius (reactivated in 1631 after five centuries), the area of Naples became a laboratory for archaeological and geological research, attracting scientists,

enthusiasts, artists and travellers from all over Europe. Moreover, the discovery of the Temple of Serapis (1750) in Pozzuoli, a town near Naples, and, in particular, the debates surrounding the three columns corroded by marine molluscs, contributed to irreversibly link the study of natural history with that of human history. As Maria Toscano (2009) has shown, the close combination of archaeology and geology in this area gave rise to a new type of scholar, the “antiquarian-naturalist”, who was interested in both aspects and studied human history as part of a broader history of the Earth.

By analysing the travel writings of Lazzaro Spallanzani (1729-1799), an Italian biologist and geologist famous for refuting the theory of spontaneous generation, this intervention aims to study how antiquarian and naturalistic methods integrated and informed each other in a phase preceding the studies of Charles Lyell and the establishment of the figure of the professional archaeologist. In particular, focusing on *Travels to the two Sicilies and in certain parts of the Apennines* (1792-97), I will analyse Spallanzani’s method of studying Vesuvius and the Temple of Serapis, showing the emergence of the awareness of the so-called “deep time” and the theory of the stratification of the volcanic terrain of the Neapolitan territory. I will also show how the constant presence of objects and human remains excavated from the buried cities, combined with the present volcanic activity and the awareness of an extended temporal scope of the universe, contributed to a sense of anxiety within geological research.

7 Mechanisms and Forms of Women’s Invisibility in Astronomy

Room: 40.152.

Chair: Brigitte Van Tiggelen, Science History Institute, Philadelphia, U.S.A.

Organiser: Eva Kaufholz-Soldat, University of Koblenz

This symposium addresses the ways in which women’s invisibility in astronomy has historically been enacted and maintained, focussing on three main themes:

- Firstly, we propose a layered interpretation of what it means to describe women and their astronomical work as ‘invisible’. In numerous contexts women have been involved in national and international ventures through which they became respected experts. Mechanisms of invisibility therefore need to be located geographically and

temporally, with awareness of whether women were invisible at the time they worked or whether their current invisibility is a result of historical or community ‘amnesia’.

- Secondly, we will examine power structures and data, i.e. how gender hierarchies determined who carried out observations, who had the authority to interpret data, or under whose name results were published. These hierarchies prevented women from being named and rewarded for the work they did, or even characterised their work as unworthy of reward or attribution at all, also contributing to a lack of archival materials testifying their astronomical work, thus reinforcing their invisibility.

- The third theme concerns the power of narratives to exclude women from the history of astronomy. On the one hand, we would like to discuss historically established narratives that have favoured the invisibility of women, such as that of nature which, through the allocation of gender roles in society for example, delineated and still delineates who can and cannot be recognised for intellectual work. The long-held idea that women are naturally disposed to caring or that they lack of objectivity has often led historians to characterised them as assistants, subordinates to men. On the other hand, we would also like to address the role of modern historiography and criticize the ways in which some recent portrayals of women in astronomy have resulted as a mechanism for fortifying invisibility.

‘The Favor not to be Named’: Gender Stereotypes in the Practice of Astronomy (1753-1814)

-Isabelle Lémonon-Waxin, Cermes3, Centre François Viète

Abstract: During the second half of the 18th century, four women successively collaborated with French astronomer Jérôme Lalande, as did several men. While his name is remembered by astronomical historians, those of his female collaborators are little known. If some of them like Duchess Marie Charlotte of Saxe-Gotha-Altenburg deliberately chose anonymity, others such as Nicole Reine Lepaute enjoyed a certain notoriety in the 18th century. Marie Louise Dupiéry gave public astronomy courses in Paris. Marie Jeanne Lefrançois made astronomical observations at the Ecole Militaire observatory in Paris, and took part, along with the Duchess of Gotha, to the first European astronomical conference organized in Gotha in 1798. Many famous men (savants, court members, kings or princes, ministers, writers, etc.) knew them, collaborated with them, and were their friends. How then

can we understand the construction of their invisibility? This presentation will first examine their degree of (in)visibility and the arenas of this (in)visibility during the 18th century in relation to gender norms. Then it will question some of the mechanisms that led to their current invisibility in the historical narrative.

Letters, Stars, and Photography: The Visual Languages of British Popularization of Astronomy (1834-1910)

-Madelyn Hernández, University of Valencia

Abstract: This work aims to study the making of astrophotography, book culture, and science popularization through three exemplary cases: *On the Connexion of the Physical Sciences* (1834) by Mary Somerville, *A Popular History of Astronomy during the Nineteenth Century* (1885) by Agnes Clerke and *The Heavens and their Story* (1908) by Annie Maunder and Walter Maunder (mainly written by Annie). These books allowed the establishment of astronomical photography in the public imagination, legitimizing its use in science and thus having an active role in the genesis of disciplines such as astrophysics. Attempting to reevaluate various biases present in the biographical accounts of these authors, who have been extensively examined, it is evident that despite the considerable attention they have received from previous scholars, much of their work is still frequently depicted in hierarchical association with the male scientists they collaborated with.

1919, the French Bureau des longitudes requests better salaries for women calculators

-Colette Le Lay, Centre François Viète

Abstract: At the end of the First World War, the French Bureau des longitudes knew how much it owed to women calculators. Without their efficiency, the astronomical ephemeris *Connaissance des temps* could not have been annually published. But their salaries remained far beyond those of men. In a letter that we will present, the Bureau asks the Ministry of Public Instruction for a better financial recognition. Two of them, Louise Lemaire and Marie-Louise de Bauller, had been made available to the Bureau by the Paris Observatory in 1915, when the male calculators left for the front. Another one, Zoé-Louise Schmit, had been hired by the Bureau as a temporary calculator in 1884. Although 66 years old in 1919, being a widow, she had to keep

working because she was not eligible for a retirement pension. We will emphasize in this talk that this astronomical institution was aware of the essential role played by women during this tragic period and aimed at giving them a form of acknowledgment. In this respect, the involvement of men was necessary to make those women visible, even if they were not able to succeed for all of them.

Men as enablers of women's careers in astronomy from the 19th century onwards

-Eva Kaufholz-Soldat, University of Koblenz

Abstract: There can be no doubt that men who aspired to a scientific career in astronomy and wanted their research to be visible in the scientific community had to overcome hurdles. Nor can there be any doubt that women faced additional, gender-specific obstacles, be they legislative or based on social conventions. In this lecture, I will first present criteria that were relevant from the beginning of the 19th century onwards, each of which had to be fulfilled by a woman who wanted to contribute to astronomical research. Highlighting how individual female representatives managed to overcome these obstacles, I will emphasize that women usually were not able to manage this feat through their own efforts alone but that favourable circumstances were required, such as personnel shortages in times of war, financial shortages or the benevolence of men in influential positions. In this context, I will also discuss the role of men in relation to gender-specific visibility in astronomical research. They not only assigned women tasks supposedly corresponding to their nature, but they also organized these tasks hierarchically according to potential recognition. In summary, this synoptic presentation is intended to encourage a discussion about the complexity of female participation and visibility in astronomical research, which in each case was based on the determination and talent of the respective woman, but whose realisation ultimately depended on the decisions of the people who had power in the scientific community: men.

8 Science in political transitions. The role of the sciences in era changes (2/2)

Room: 40.004.

Chair: Judit Gil-Farrero, University of Zaragoza

Organiser: Max Bautista Perpinyà, Université catholique de Louvain; Judit Gil-Farrero, University of Zaragoza

‘Transition’ is a concept of the new millennium: we move ‘towards’ an era of socio-ecological transformations, a catchphrase that blends social, political, and technological items, turning a bleak catastrophic future into a bright solution. The role of science and technology in this imaginary is ambiguous, to be negotiated with other forms of change: activism, policy, and politics. However, the relationship between science and political transition is not a given, as historians of science can attest. For instance, the production of crops and animal products in fascist states, organised along the vertical structure of research-syndicates-producers started to disappear in the post-WWI scenario, but breeding programs awkwardly and silently squeezed through institutional changes. Project Paperclip helped further the US space program through the inclusion of Nazi scientist refugees. The Science for the People movement or the May ’68 revolt, on the other hand, exemplifies the efforts of scientists in building bridges with anti-war and labour rights movements. More examples can be brought forward, putting the finger on the dual role of science as an emancipating and oppressing force, and the nuances we may find in between. This session aims to historize the role of science in political transitions, with particular attention to how scientists navigated in the political sphere. Despite being familiar with ‘revolutions’ and ‘innovations’, the concept of transition remains undertheorised in the History of Science.

Protected natures and expertise in transition. Spain, 1970-1985

- Judit Gil-Farrero, Universidad de Zaragoza.

Abstract: In Spain, forestry engineers had been in charge of protected natural areas since the creation of the first national parks in 1918. However, in the last years of Franco's dictatorship (1939-1975), various groups publicly rejected what they considered a disastrous management of nature. This was the beginning of a citizen mobilisation that became more widespread and more evident after the death of the dictator Francisco Franco in 1975, with the appearance of multiple campaigns to halt development policies and to “save” natural spaces. These campaigns involved

environmental movements, students and university professors, and scientific associations, among others. This communication presents the process of institutionalisation of nature conservation in Catalonia, in which a triple transition was taking place at the same time. Firstly, we will look at the process (not without conflict) of legitimisation of new experts in the field of nature conservation (biologists and geologists, but also geographers and architects). To this process of transition of expertise must be added the development of a new conception of nature conservation, which is configured as a land-use planning instrument. All this, in a context of political transition towards a state in which new autonomous administrations were being created, including conservationist administrations, which were partly nourished by some people who played a leading role in the aforementioned citizen mobilisation. We will see how a situation of nature in conflict and transition such as this offers a series of opportunities that would not have been available in a more stable situation.

Forest, and its understanding, in Transition. Spain, 1970-2000

- Iñaki Iriarte-Goñi, Universidad de Zaragoza.

Abstract: After more than 30 years of forest policy guided by authoritarianism, in 1971, the dictatorship of General Franco changed its strategy, dismantled the organizations that had managed the country's public forests until then, and created the Institute for the Conservation of Nature (ICONA). The new body was entrusted, among others, with all functions relating to the public forests (commercial exploitation, management and reforestation plans), fire policy, creation and management of natural parks, and hunting and inland fishing policies. The ICONA survived until its dissolution in 1995. The scant literature that has analysed the ICONA's role suggests that its creation was a mere formal change of the Franco regime and that, in fact, the same policies were maintained. Nevertheless, in its 24 years of existence, the ICONA survived a transition from dictatorship to democracy, an effervescence of the ecological movement, a political decentralization that transferred a large part of forest management to the Autonomous Regions, and a deployment of European policies after the integration of Spain into the EU in 1986. The aim of this communication is to discover how all these changes were influenced by and affected the scientific understanding about the forests and its social, economic

and environmental functions. This paper explores professional journals and books from the period (mainly the papers of the journal “Montes” and the books included in their annual bibliographic reviews) trying to discover to what extent the vision of the forest engineers about forests and its functions changed in the Spanish political transition years.

Databases, draught, Catalan nationalism and European scientific environmentalism in the Spanish democracy (1988-2004).

- Max Bautista Perpinyà, Université catholique de Louvain

Abstract: The Ecological and Forestry Inventory of Catalonia (IEFC) was the flagship project of the newly founded Ecological and Forestry Applications Research Centre (CREAF) in Barcelona. The IEFC was Catalunya’s first ecological forest inventory, led by ecologists who saw themselves as critically responding to the centralist and productivist forest engineering that characterised forest policy during Franco’s dictatorship. The Spanish political transition created new regional funding structures and opened the possibilities for new sciences to emerge. The CREAM as an institution and the new map of Catalunya’s forests as a technology were founded upon the values of a socially responsible, democratic science of ecology, and was entangled with a new wave of Catalan nationalism. Based on archival documentation and a nascent oral history collection, this paper tells the story of the institutional rise of terrestrial ecology and the technical and political difficulties of making the IEFC database: putting it together, making it useful, and integrating it with other databases. The IEFC fed from “new ecologic data” of forests beyond timber and was consciously designed to track the effect of climate change on European forests. The aim was to provide a “radiography of the Catalan forest’s health” by giving a probability of forest fires in the face of drought. Here, technical terms like root biomass and bush species count (deprecated by the Spanish state foresters for being not directly related to timber production) became tools to integrate Catalonia’s ecology into the construction of an environmentally conscious Europe.

Climate science for or in socio-ecological transition? Mapping the scientific and political trajectories of French climate scientists (1990-2023)

- Hannah Gautrais, École Normale Supérieure de Lyon.

Abstract: Since the nineties and the conception of the first climate models, climate sciences have played a significant role in informing global political actions against climate change. Undeniably, the Intergovernmental Panel on Climate Change (IPCC), especially since the Paris agreement of 2015, has become the leading scientific voice to set political objectives in terms of socio-ecological transition. However, since a few years, more and more researchers in climate sciences are publicly calling for (and sometimes engaging in) direct action. While most climate scientists are still using expertise to weigh on governmental policies, it seems that their repertoire of collective action is being restructured. More precisely, the idea of transition has reached scientific practices themselves: some climatologists have called into question the way their methods and research agendas comply with ecological goals or not. Based on the notion of boundary work and the work of Thomas Gieryn (Cultural Boundaries of Science: Credibility on the Line, 1999) on designating the researchers' discursive and material strategies to enforce or to blur the distinction between science and politics, I will probe into the reconfigurations of the means by which climate scientist have sought to push for socio-ecological transition in the face of climate change since the nineties. In order to do so, I will compare the scientific and political trajectories of twenty French climate scientists, paying special attention to the professional turning points and the local institutional contexts that allow them to engage in climate advocacy, whether publicly within the scientific field.

9 Testing the Limits of the Gendered Body: Extreme Corporeal Experiences in Modernity

Room: 40.047C.

Chair: Mònica Balltondre Pla, iHC-UAB)

Commentator: Agustí Nieto-Galán, iHC-UAB

Organiser: Mònica Balltondre Pla and Elena Serrano Jerez, iHC-UAB

Nuns that survived only on breathing air, mesmerised people that underwent surgery without feeling pain, “hunger artists,” fakirs, Houdinian escapists and other freaks of the spectacle; explorers, divers, climbers; spiritists, self-experimenters, and testers of drugs: a motley crew that put their bodies to the limit in the name of religion, science, honours, self-esteem or business. Indeed, the list can be sundry and lengthy. However, all these people have at least two things in common. First, the idea, the hope perhaps, that their will, their sang-froid, their exhausting training, their knowledge, or their faith will help them. Second, a close sense of being observed, of having their public, as the fascination that these cases arose was discussed in convents, plazas, journals, and scientific venues alike. It is precisely the tension between these two poles, the intimate struggles in their tormented bodies and the public gaze of the spectacle that interests us, as the boundaries between the normal and the extraordinary, life and death, human and non-human, science and fraud, future and past and the subconscious and the rational, how are tested and questioned, embedded in a gendered body. We present papers that examine how the body and its limits become matters for empirical experimentation with a gender approach. How did these people perceive the working of their senses, mind, emotions, will, etc. in these extreme conditions? Which was and how did they negotiate the public reception of their experiences in scientific and public spaces? What were the rhetorical devices that they used and how did they deploy their witnesses? Which technologies and objects were involved? How different were these experiences in male and female bodies and their public displays?

‘Martyrs’ in Life and Death: Extreme Corporeal Experiences and Hagiographic Propaganda in the Mariana Islands during the Late 17th Century

-Enrique Moral de Eusebio. Institut d’Història de la Ciència, UAB/UPF

Abstract: The hagiographies of the Jesuit missionaries who died in the Mariana Islands (Western Pacific) are full of the (alleged) extreme corporeal experiences they underwent in life. These texts show the missionaries resignedly exposing their bodies to mosquito bites, mortifying themselves daily with cilices and diligences, and surviving for days on a single spoonful of rice. Building on our research on sexuality and food in the archipelago, this paper will question the limits to which these Jesuits

subjected their bodies according to their hagiographies. By exploring the documents written by the same subjects during their lifetimes, we will suggest that hagiographies served as propaganda to create and disseminate an ideal of ‘Jesuit masculinity,’ in terms of Ulrike Strasser. We will further argue that this ideal was intended for an audience of young priests who, through *imitatio* or emulation of these male models, would be encouraged to enlist as missionaries to evangelize the most ‘remote’ areas of the world, according to European perceptions.

Debating Women’s Sanctity through the Use of the Body: Devout Waxes vs Miraculous Relics in 18th century Bologna

-Laura Guinot Ferri, Universitat de València (UV)

Abstract: In 1743, the hagiography of Anna Maria Calegari Zucchini, a weaver from Bologna who had died in 1741 in the odour of sanctity, was published. In her honour, the wax sculptor Filippo Scandellari had produced a bust depicting her as a devout old woman, a wax body intended to stimulate veneration that symbolised the new model of female sainthood sought by the Church. The faithful, however, were particularly attentive to her physical body, which they accessed through the relics that had once touched it. Indeed, in the hagiographic text, numerous healing miracles describe how devotees ingested or touched pieces of her habit or parts of her body, which circulated among the families of the city thanks to the mediation of the Oratory of Saint Philip Neri, the institution that promoted a canonization that never arrived. Zucchini's case, therefore, without being exceptional, represents very well the contrasts in the construction of a new model for female sanctity, and helps to understand how the authorities and believers gave new meanings to the use of the real, the symbolic and the “miraculous” body during the 18th century.

On the Gendered Ape: The Case of Madame Chimpanzee, Representative of the Bourgeois Female Ideal of the 18th Century

-Rubén Gómez-Soriano (UNED/UAB)

Abstract: From the 17th and 18th centuries onwards, and in the context of the great transoceanic voyages that began at the end of the 15th century, modern knowledge of the great apes developed in Europe with the arrival of the first specimens in the continent. In this paper, I will focus on analysing the case of Madame Chimpanzee, a

young specimen who arrived in London in 1738 and became a celebrity (Sebastiani, 2017). Her story was traversed by colonial and enlightened thought, embodying in a singular way the humanisation and feminisation of the ape, through a civilising process, as opposed to the degeneration and animalisation of the savage (Haraway, 1989; Schiebinger, 1993). As I will set out, the knowledge contributed by slavers, illustrators and chroniclers coexisted and exchanged with a natural history in transit, which had as one of its main cores the study of comparative anatomy in a framework where naturalism coexisted with the beginning of the society of the spectacle (Secord, 2004).

10 Visual Practices of Ancient and Mediaeval Astral Sciences (3/3)

Room: 40.012.

Chair: Stefan Zieme, Humboldt-Universität zu Berlin

Organisers: Eleonora Andriani, Institut de recherche et d'histoire des textes, Paris;
Stefan Zieme, Humboldt-Universität zu Berlin

Different written artifacts in the domain of astral sciences, including tablets, papyri, manuscripts, up to early printed editions, can often be readily distinguished by their unique visual features, which encompass geometrical, instrument, and horoscopic diagrams, as well as numerical tables. A closer examination of even small sections of texts in this domain also reveals varying numerical notations, predominantly based on the sexagesimal system though shaped for different purposes. Therefore, spanning from the minute aspect of numerical notations to the grander framework of manuscript layout and organization, practitioners of the astral sciences have distinctive ways of visually structuring their documents. The study of these visual practices can provide fundamental clues to grasp source traditions and long-range circulation of knowledge and, as a result, enable a broader understanding of the development of astral knowledge across different geographical regions, historical eras, and cultural contexts. Finally, because diagrams and numerical tables, similar to prose texts, are also subject to the transformations induced by the mere 'copying/printing' processes, analyses of these variations and of the way they are potentially manipulated by historical actors can offer invaluable insights for

historians as they engage with these source materials. The contributions of this symposium will touch upon the above variety of visual practices, spanning from the production to the transmission of astral knowledge. Some papers will therefore focus on astrological schemes and astronomical diagrams, their connection with diagrams and illustrations from neighbouring disciplines, their genetic relationships and their transformations as the interests or methods of astral science practitioners change. Other papers, however, will have as their subject matter numerical tables and/or the texts accompanying them with reference to their visual or diagrammatic properties, including general layout, use of colors, of different sizes and forms of characters. (Sponsored by the Commission for the History of Ancient and Medieval Astronomy.)

The Places of the Sun, Mercury, and Venus: Diagrammatic Innovation in Ancient, Medieval, and Renaissance Planetary Order

- James Brannon, Independent Scholar (Phoenixville, PA, USA)

Abstract: Pre-modern celestial observers had difficulty understanding the positions of the sun, Mercury, and Venus in a geocentric planetary order. Prominent ancients – Plato, Aristotle, Archimedes, Cicero, and Ptolemy – were uncertain in their statements regarding the placement of these three bodies. The same uncertainty carried over into a plethora of medieval and Renaissance Latin manuscripts. The modern scholar faces the question of how these later astronomy authors of the ninth through the seventeenth centuries diagrammatically responded to the planetary uncertainty? The answer, in many instances, was with innovation. By discussing several of these celestial diagrams, this paper demonstrates that attempts to adjudicate planetary locations resulted in a variety of novel planetary configurations: circumsolar epicycles, double and triple intersecting orbits, and implied epicycle-on-deferent schemes. Of particular focus for this presentation are unusual epicycle-on-epicycle arrangements for Mercury and Venus, which permitted a large variety of planetary orders to ensue. These planetary arrangements largely evolved from the fifth-century writings of Martianus Capella and Macrobius. The former sought to reconcile the ancient misgivings by suggesting that Mercury and Venus traveled in circumsolar epicycles, while the latter was widely (but perhaps incorrectly) interpreted to suggest intersecting planetary circles. These diagrams greatly impacted medieval and Renaissance ideas on planetary arrangements,

including those of Copernicus. He explicitly acknowledged the role of Capella – and unnamed “other” Latin writers – in developing a sun-centered system that relegated the earth to planetary status. This paper concludes by considering who the “other” Latin writers may have been, along with their relevant circumsolar diagrams.

Outer Space meets Heavens Above: Representations of the Empyrean Heaven from Medieval to Early Modern Times

- Antonia Karaisl, Waseda Institute for Advanced Study, Waseda University, Tokyo

Abstract: Imagined to be the immobile realm of the Blessed, the Empyrean Heaven is a theological concept by provenance which found its way into astronomical treatises in the course of the Middle Ages. In schematic depictions of the universe, the Empyrean occupies the space outside the mobile orbs containing planets and fixed stars – and a middling ground between two discourses laying claim to the celestial sphere: astronomy and theology. Gregor Maurach traces the conceptual origin of the Empyrean Heaven back to the Chaldeans and credits its theoretical formalization to the Neoplatonists in the 5th. Thanks to its canonical approval in the 12th century and consolidation in the subsequent Aristotelian overhaul of science and theology, the Empyrean Heaven routinely featured in schematic depictions of the universe until the scientific revolution spelled its demise – at least within the realm of science. Scientific depictions of the cosmos combining the Empyrean heaven with the mobile orbs of the universe tacitly span a logical chasm: the mobile orbs correspond to different movements observed amongst celestial bodies and conceptually represent the visible world; the Empyrean Heaven, however, is the realm of afterlife, by definition beyond human experience, and its shape and substance is derived from Biblical exegesis. Proposed talk will consider visual representations of the Empyrean Heaven from the Middle Ages to Early Modern Times to understand how these two worlds apart were made to fit within one system.

From Schema to Art: Technical Diagrams & Symbolic Iconography in Late Medieval and Early Modern Astrological Texts

- Luís Campos Ribeiro, Centro Interuniversitário de História das Ciências e da Tecnologia (CIUHCT)

Abstract: As a facet of the mathematical and astronomical arts, astrology shared many of its technical apparatus, and many astronomical schemes were common to both theoretical astronomy and practical astrology. Yet, astrological doctrine includes a layer of symbolic correlations which is unique. This is observed in many of the diagrams specific to astrological texts, which are often embellished with an iconographic corpus which preserves and transmits the astrological significations of the various celestial bodies and entities. This paper offers an overview of this diverse corpus and presents some of the main medieval and early modern lineages of this iconographic and schematic vocabulary.

The Dissemination and Influence of Western Astronomical Diagrams during the Late Ming and Early Qing China

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Abstract: In contrast to the widespread use of diagrams in Western astronomy, traditional Chinese calendars almost had no utilisation of such visual representations. At the beginning of the Ming Dynasty(明, 1368-1644), a part of Ptolemaic astronomy was introduced to China through the Huihui lifa (The Chinese-Islamic system of calendrical astronomy, 回回历法). Following the traditional Chinese calendar, however, the book did not incorporate diagrams. Until the late Ming Dynasty, with the large-scale introduction of Western astronomy by the Jesuits who came to China, astronomical diagrams were adopted in Chinese astronomical works. In this presentation, I will first introduce the utilisation of Western astronomical diagrams in the Chongzhen lishu (Chongzhen reign treatises on calendrical astronomy, 崇祯历书), which was compiled with the assistance of the Jesuits in the late Ming Dynasty and later officially adopted in the early Qing Dynasty (清, 1644-1911). I will discuss the form, layout, and other aspects of these diagrams and then compare them to diagrams in subsequent official calendars. Furthermore, as Western astronomy gained official acceptance, an increasing number of unofficial scholars began studying Western methods. Therefore, I will also explore the different perspectives of these unofficial scholars regarding Western astronomical diagrams and their usage and modifications of such diagrams. By examining these aspects, I

will outline the picture of the dissemination and influence of Western astronomical diagrams during the late Ming and early Qing China.

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