Meeting Zoom Link: https://cornell.zoom.us/j/96229214724?pwd=tlR895B8tqaVwA9GJJgyUjDRN0kcpH.1

2025 Spring Meeting of the Astronomical Society of New York

March 29, 2025 - Cornell University, Ithaca, NY

120 Physical Sciences Building

Campus Map: https://drive.google.com/file/d/1fs7r_YbO4GK84cqxKfV1B_1F5jGeYfl0/view?usp=share_link
Notes on parking: https://www.cornell.edu/visit/parking/

Full Program with Abstracts HERE:

8:00 - 8:30 Registration and Light Breakfast

8:30 - 8:45 Welcome to Cornell

8:30-8:45 **Opening Remarks**
Nikole Lewis, *Cornell University (Organizing Chair)*

8:45 - 10:00 Oral Session One

8:45-9:15 **CCAT/FYST: A Wide-field Trans mm-wave Survey Telescope - the Where, What and Why, and its Current Status**
Gordon Stacey, *Cornell University (Invited Talk)*

9:15-9:30 **Large-scale outflows in Active Galactic Nuclei (Narrow Line Region)**
Jayden Butler, *Rochester Institute of Technology*

9:30-9:45 **Disrupting the Baryon Cycle in the NGC5364 Galaxy Group**
Rose Finn, *Siena College*

9:45-10:00 **Constraining the Gas Temperature of MACSJ0717.5+3745 with Herschel SPIRE Fourier Spectrometry**
Benjamin Vaughan, *Cornell University*

10:00 - 11:00 Morning Poster Session

11:00 - 12:00 Oral Session Two

11:00-11:30 **Progenitors and Explosion Properties of Supernova Remnants Hosting Central Compact Objects**
Chelsea Braun, *SUNY Fredonia (Invited Talk)*

11:30-11:45 **Characterizing Magnetic Surface Features with Starspot Crossing Transits**
Leslie Hebb, *Hobart and William Smith Colleges*

11:45-12:00 **G515: E+A Galaxy with Previous Variability in the Context of Tidal Disruption Events**
Linnea Dahmen, *CUNY*

12:00 - 1:45 Lunch

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1:45 - 3:00 Oral Session Three

1:45-2:15 **The new frontier of low-frequency gravitational wave astronomy**
Shami Chatterjee, *Cornell University (Invited Talk)*

2:15-2:30 **Predicting Atmospheric Absorption Spectra using Gaussian Process Regression**
vasuda trehan, *University at Albany, SUNY*

2:30-2:45 **Hydrodynamic simulations of multiple low-mass migrating black holes in AGN disks**
John Meftah, *Queens College/AMNH*

2:45-3:00 **The Kozai Effect and extrasolar planetary transits**
Michael Richmond, *Rochester Institute of Technology*

3:00 - 4:00 Afternoon Poster Session

4:00 - 5:00 Oral Session Four

4:00-4:15 **A Trillion Pixels A Night - The Vera Rubin Observatory's First Look**
Charles Liu, *CUNY College of Staten Island*

4:15-4:30 **Dynamical Influence of the Time-Evolving Milky Way on a Population of Stellar Streams**
Hiroka Warren, *Rensselaer Polytechnic Institute*

4:30-4:45 **Machine Learning Characterization of AGN Broad-line Emission**
Liza Matrecito, *Rochester Institute of Technology*

4:45-5:00 **Analysis of bending waves in Saturn's rings.**
Phil Nicholson, *Cornell University*

5:00 Closing Remarks

Charles Liu, *CUNY College of Staten Island (ASNY Chair)*

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Poster Presentations

01. A Journey Across the Universe
Miguel Pacheco, Varun Pritmani, & Méabh Jack, *American Museum of Natural History (CUNY)*

02. Query Methods and Morphology for E+A Galaxies in the Sloan Digital Sky Survey
Jacob Yuzovitskiy, *College of Staten Island*

03. Identifying Early Massive Quiescent Galaxy Candidates with COSMOS-Web
Mimi Harrison, *Rochester Institute of Technology*

04. Identifying Post Starburst Galaxies in the Virgo Filament Survey Using the DESI EDR
Keith Pritchett Jr., *Siena College*

05. Identifying E+A Galaxies: Creating Photometric Criteria for E+A Candidates in the Siena Galaxy Atlas
Maddie Margulis-Ohnuma, *Edgemont High School*

06. Analysis of Gas Flows in the Large Magellanic Cloud
Megan Schlogl, *Rensselaer Polytechnic Institute*

07. Perfect Match? Testing the Co-Evality of IC2602 & Tucana-Horologium
Alyana Jusino, *City College of New York*

08. The Analysis Pipeline for the Tomographic Ionized-carbon Mapping Experiment
Shwetha Prakash & Selina Yang, *Cornell University*

09. Measuring Jupiter's Rotation Velocity Using LHIRES Spectrograph
Max Giordano, *Siena College*

10. Enhancing our ability to measure accretion rates
Jacob Taylor, *Alfred University*

11. StarGateVR: A Virtual Reality Tool for Exploring Gaia Data
Ryan Butler, *Rochester Institute of Technology*

12. Investigation of Wave Structures in Laser-Driven Ion-Scale Magnetospheres on the Large Plasma Device
Sophia D'Anna, *CUNY/New Jersey Institute of Technology*

13. CSI Rubin: Galaxy Evolution Studies with the Vera Rubin Observatory at an Urban Public University
Courtney Fleming, Patrick Blanco, Elliot Radov, Jesus Rolon, Christina Tobin, Jacob Yuzovitskiy, Kelly Zyko, and the CSI Rubin Collaboration, *CUNY College of Staten Island*

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Abstracts

Oral Session One: 8:45-10:00

CCAT/FYST: A Wide-field Trans mm-wave Survey Telescope - the Where, What and Why, and its Current Status

Gordon Stacey, *Cornell University (Invited Talk)*

Large-scale outflows in Active Galactic Nuclei (Narrow Line Region)

Jayden Butler, *Rochester Institute of Technology*

Understanding the evolution of galaxies requires studying the role of Active Galactic Nuclei (AGNs). This research investigates how AGN-driven outflows transfer energy to the interstellar medium (ISM) and whether this transfer can be traced through the Narrow Line Region (NLR). Specifically, we aim to study the kinematics of the wind and core components of the [O III] emission lines, which trace the ionized gas outflows in the NLR. Using the Python QSO fitting code (PyQSOFit) [Guo, H., Shen, Y., Wang, S. 2018], we fit the [O III] λ4959, λ5007, and Hβ emission lines (along with others) in Sloan Digital Sky Survey (SDSS) spectra, selected from the quasar dataset of [Liu et al., 2019], in order to measure spectral properties such as full width at half maximum (FWHM), flux, velocity shift, and amplitude. By fitting and isolating the wind and core components of the [O III] lines, we aim to trace the presence of blue wings and investigate their correlation with other AGN properties, such as BLR dynamics, X-ray luminosity, velocity shift, and the AGN's Eddington ratio. To ensure robust spectral fitting, we apply a signal-to-noise (S/N) threshold to both the Hβ and [O III] emission lines, selecting a subset of spectra with sufficient data quality for reliable measurements. Our next step is to perform a statistical analysis to assess whether these spectral properties exhibit significant correlations with BLR dynamics, X-ray luminosity, and the AGN's Eddington ratio, providing insight into the role of AGN outflows in feedback processes.

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Disrupting the Baryon Cycle in the NGC5364 Galaxy Group

Rose Finn, *Siena College*

The Virgo Filament Survey (VFS) is a comprehensive study of galaxies that reside in the extended filamentary structures surrounding the Virgo Cluster, out to 12 virial radii. The primary goal is to characterize all of the dominant baryonic components within galaxies and to understand whether and how they are affected by the filament environment. A key constituent of VFS is a narrow-band H-alpha imaging survey of over 600 galaxies, VFS-Ha. The H-alpha images reveal detailed, resolved maps of the ionized gas and massive star-formation. This imaging is particularly powerful as a probe of environmentally-induced quenching because different physical processes affect the spatial distribution of star formation in different ways. In this paper, we present the first results from the VFS-Ha for the NGC 5364 group, a low-mass (log(M_dyn/M*) < 13) system located at the western edge of the Virgo III filament. We combine H-alpha imaging with resolved HI observations from MeerKAT for eight group members. These galaxies exhibit peculiar morphologies, including strong distortions in the stars and the gas, truncated HI and H-alpha disks, HI tails, extraplanar H-alpha emission, and off-center H-alpha emission. These signatures are suggestive of environmental processing such as tidal interactions, ram-pressure stripping, and starvation. We quantify the role of ram-pressure stripping expected in this group, and find that it can explain the cases of HI tails and truncated H-alpha in the disk-dominated galaxies. Our observations indicate that multiple physical mechanisms are disrupting the baryon cycle in these group galaxies.

Constraining the Gas Temperature of MACSJ0717.5+3745 with Herschel SPIRE Fourier Spectrometry

Benjamin Vaughan, *Cornell University*

Galaxy clusters are permeated throughout with a diffuse atmosphere that consists of hot gas and ions, known as the intracluster medium (ICM). Measurements of its electron temperature gives us critical information about the thermodynamics of these systems, an important piece of cluster evolution. These environments can produce temperatures of > 30 keV that are well outside of the bandpasses for both Chandra and XMM-Newton. To better understand this difference we need other methodologies to measure cluster temperatures. The Sunyaev-Zeldovich effect (SZe) is a spectral distortion of the cosmic microwave background blackbody radiation as it inverse-Compton scatters off of hot electrons in the ICM. With relativistic and doppler corrections it can be parameterized by the electron temperature, optical depth of electron scattering, and the cluster peculiar velocity. Since it is a spectral distortion, fluctuation in electron temperature only increases or decreases the distortion rather than pushing it out of band. We use the Herschel Spectral and Photometric Imaging REceiver Fourier Transform Spectrometer (SPIRE-FTS) and the 140 and 270 GHz photometric bands from Bolocam to fit for the SZe in MACSJ0717.5+3745. We estimate a preliminary temperature of 18.5 +4.2 -4.5 keV demonstrating that the SZe can effectively be used to estimate temperature independent of X-ray measurements.

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Oral Session Two: 11:00-12:00

Progenitors and Explosion Properties of Supernova Remnants Hosting Central Compact Objects

Chelsea Braun, *SUNY Fredonia (Invited Talk)*

Characterizing Magnetic Surface Features with Starspot Crossing Transits

Leslie Hebb, *Hobart and William Smith Colleges*

An apparent increase in brightness that appears as a bump in the light curve during a planetary transit is the signature of the planet crossing in front of a starspot that cooler and darker than the surrounding photosphere. Knowledge of the planet's orbital properties provides precise positional information about the starspots in the path of the planet. We present detailed analyses of several transiting planet host stars that show starspot crossing features to derive the sizes and positions of individual starspots on these system. We compare the spot distributions to sunspot distributions.

G515: E+A Galaxy with Previous Variability in the Context of Tidal Disruption Events

Linnea Dahmen, *CUNY*

The luminous E+A galaxy G515 has decades of multi-wavelength observational data that calls for new analysis in the context of more recent discoveries. While G515 was a topic of detailed investigation in the late 1990s and 2000s, studies in the past ten years have shown that a large fraction of the observed tidal disruption events (TDEs) occur in E+A galaxies. In this talk, we present a discussion of previous analyses of G515 through the lens of TDE detection, the strengths and shortcomings of the survey data available, and a more complete timeline of G515's evolution and patterns of variability as seen across wavelengths.

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Oral Session Three: 1:45 - 3:00

The new frontier of low-frequency gravitational wave astronomy

Shami Chatterjee, Cornell *University (Invited Talk)*

The NANOGrav collaboration, with our international partners, recently presented evidence for a low frequency (nanohertz) gravitational wave background, opening a new window on the universe with gravitational waves. I briefly review how our Galaxy-scale gravitational wave detector is constructed, and what it reveals about the history of mass assembly in the universe as galaxies formed through mergers. In the near term, we will have a detailed characterization of the gravitational wave spectrum, which constrains the abundance and merger rates of supermassive black hole binaries in the centers of galaxies. Longer term detection goals include anisotropy in the gravitational wave background, continuous waves from individual supermassive black hole binaries, and the memory signal from the aftermath of their mergers.

Predicting Atmospheric Absorption Spectra using Gaussian Process Regression

Vasuda Trehan, *University at Albany, SUNY*

We are developing a Bayesian machine-learning system that acts as a forward model to predict exoplanetary atmospheric spectra using observed and simulated data from NASA's ROCKE-3D General Circulation Model (GCM). Efficiently and accurately modeling exoplanetary atmospheric absorption spectra is essential for determining planetary atmospheres and assessing planetary habitability. This framework is expected to improve our understanding of exoplanetary properties, climates, and habitability and provide a robust tool for future exoplanetary research.

Previous approaches, such as spline interpolation techniques, are impractical in high-dimensional parameter spaces because the number of model parameters required to describe the spline functions scales poorly with dimension. This work explores the use of Gaussian Process Regression (GPR) to model the atmospheric spectra in the multi-dimensional planetary parameter space. GPR is a non-parametric probabilistic method with built-in uncertainty quantification as an integral aspect of spectral modeling. By optimizing the kernel functions, we improve GPR's ability to capture high-order spectral variation.

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Hydrodynamic simulations of multiple low-mass migrating black holes in AGN disks

John Meftah, *Queens College/AMNH*

The Laser Interferometer Gravitational-Wave Observatory (LIGO) infers a high merger rate density of stellar-mass binary black holes (BBHs). Active galactic nucleus (AGN) disks are likely locations for binary formation that could lead to BBH mergers.

Our aim is to study how BBH formation can be enhanced by migration of black holes through the gas disk. Migration in disks is a well-studied problem, particularly in the context of planetary disks, that has been described with analytic expressions for migration rates of single objects. However, no study has previously examined the interference and interactions of the gas structures that cause migration of embedded objects in a gas disk due to the interactions of multiple migrators (including in the planetary context). In the case of multiple embedded objects, this interference could speed up or slow down migration, compared to the rate expected for a single object. Depending on the outcome, binary formation between migrating compact objects may be enhanced or suppressed. We use the high-order, hydrodynamic Pencil code (Pencil Code Collaboration, Brandenburg et al. 2021) to simulate the migration of stellar-mass BHs in model AGN disks. For our work here, we model the migration of two BHs, and compare the migration rates and gas torques to those found for comparable single migrator runs.

We present results from our simulations including gas density maps, the time evolution of migration torques, and the time evolution of orbital radii. We present initial findings comparing torques between single and paired migrators in these disks. We also discuss the implications of our results on the expected rate of BBH mergers from AGN disks, detectable by LIGO in GW.

The Kozai Effect and extrasolar planetary transits

Michael Richmond, *Rochester Institute of Technology*

The Kozai Effect describes the influence of a massive outer planet on the orbital parameters of a trifling inner planet. Under the right circumstances, changes to the inner planet's orbit could give rise to observable consequences in that planet's transits across its host star over relatively short timescales. We explore the range of system parameters in which Kozai perturbations might allow astronomers to deduce the presence of unseen outer planets.

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Oral Session Four: 4:00-5:00

A Trillion Pixels A Night - The Vera Rubin Observatory's First Look

Charles Liu, *CUNY College of Staten Island*

Dynamical Influence of the Time-Evolving Milky Way on a Population of Stellar Streams

Hiroka Warren, *Rensselaer Polytechnic Institute*

When globular clusters (GCs) or dwarf galaxies (DGs) come too close to the Milky Way (MW), they get ripped apart by tidal forces from the gravitational pull of our galaxy and form stellar streams. Nearly a hundred stellar streams have been discovered in the MW halo, and new streams are continuously being found. Because streams are long-lived, they contain information about their entire history from their formation to their current path through the MW as well as information about the MW potential through which they passed, which has its own history of gradual mass increase and bar rotation. It is becoming more evident that incorporating the complex MW mass distribution is crucial to understanding the dynamical history of stellar streams. Here, we investigate the influence on a population of stellar streams of encountering more realistic components of the time-evolving MW using the existing basis function expansion (BFE) based model of the Feedback In Realistic Environments (FIRE-2) simulations. In this study, we used the potential extracted from m12i from the Latte suite as the MW, which is a MW-like galaxy but has a weak bar. We ran 1,000 GC-like stellar stream simulations by using the particle-spray method. We found that the time-evolving MW potential affects morphology of stellar streams in length, width, and complexity.

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Machine Learning Characterization of AGN Broad-Line Emission

Liza Matrecito, *Rochester Institute of Technology*

It is believed that at the center of all large galaxies resides a supermassive black hole (SMBH). During growth phases, as the SMBH accretes gas, it emits large amounts of radiation spanning the electromagnetic spectrum and is visible as an Active Galactic Nucleus (AGN). A key probe of AGN structure and kinematics is the broad emission line (BEL) profile, which provides critical insights into the gas surrounding SMBHs. However, the vast volume of spectroscopic data from large surveys poses a challenge for traditional analysis methods. To address this, we apply machine learning (ML) techniques to large databases to characterize BEL profiles and correlate them with key SMBH and AGN properties, such as SMBH mass, Eddington ratio, and multi-wavelength luminosities.

As an initial investigation, we applied dimensionality reduction and clustering techniques to the hard X-ray selected AGN within the SWIFT/BAT AGN Spectroscopic Survey to understand how the individual spectral components are related to the properties of the source. Non-negative matrix factorization revealed several spectral components, which we identify with the narrow emission lines (NELs), the core and wings of the BELs, and the AGN and host galaxy continua. Clustering analysis revealed groupings based on the relative strengths of these components, particularly the ratio of the NELs to the BELs. Additionally, our ML algorithm identified AGN with unusual spectral features, potentially revealing candidates for SMBH binaries (SMBHBs) or recoiling SMBHs (rSMBHs). Building on this, we will refine our ML techniques and apply them to larger datasets, such as the Sloan Digital Sky Survey Data Release 16 Quasar Catalogue containing ~750,000 quasars.

Analysis of bending waves in Saturn's rings.

Phil Nicholson, *Cornell University*

Bending waves (henceforth BWs) in a planetary ring are tightly-wrapped spiral waveforms that involve periodic vertical displacements of the ring material as the waves propagate radially. The most prominent BWs in Saturn's rings are driven by the satellites Mimas and Titan, whose orbits are inclined relative to the planet's equatorial plane. We have begun a systematic study of these waves, using a simple analytical model to convert the apparent optical depth profile in a wave, as observed in stellar and radio occultation profiles, into estimates of the local surface slope. This can then be integrated to determine the wave's radial profile of vertical displacement z(r) [Koh et al. (2022) BAAS 54:301.07]. Our model is based on previous studies of Voyager occultation data [Gresh et al. (1986) Icarus 68:481] and Cassini imaging observations of vertical corrugations in the D ring [Hedman et al. (2015) Icarus 248:137]. Our work to date has concentrated on the two strongest BWs: the Mimas 5:3 wave in the A ring and the Titan nodal wave in the C ring. We have analyzed data for the former from over 80 Cassini stellar (VIMS) occultations, covering a wide range of effective ring opening angles down to Beff = 13.4o. As expected, the wave is more prominent at lower values of Beff , but remains visible up to ~60o. However, its maximum vertical amplitude appears to decrease from ~450m to ~250m at values of Beff < 25o, which is unexpected. Data from ~50 Cassini radio science (RSS) occultations allow us to extend our opening angle coverage down to Beff = 4.5o and again we see an apparent decrease in amplitude of the wave at low effective opening angles, and especially for Beff < 7.5o.

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Posters:

A Journey Across the Universe

Miguel Pacheco, Varun Pritmani, & Méabh Jack, *American Museum of Natural History (CUNY)*

Our research is to confirm exoplanets' existence by conducting transit observations using a remotely operated telescope. As members of NASA's Exoplanet Watch we have been connected to resources like Photon Ranch, a new education project of Las Cumbres Observatory which allows remote and scheduled use of a telescope network. Photon ranch is currently what we use for collecting data measuring changes in a stars light to confirm planets existence as it orbits around its host star.

Query Methods and Morphology for E+A Galaxies in the Sloan Digital Sky Survey

Jacob Yuzovitskiy, *College of Staten Island*

We attempt to query for poststarburst galaxies in the Sloan Digital Sky Survey. We use a representative sample of E+A Galaxies from SDSS Data Release 7 (DR7) to assemble Legendre polynomials, which we use to compare E+A galaxies to random SDSS galaxies with spectra. Volunteers assess the spectra of random galaxies to identify possible E+A candidates, which have been ordered by their similarity to the representative sample. We analyze the resulting E+A candidates for indicators of poststarburst behavior that may aid us in more concrete classification of this sample. Future work will involve closer inspection of both samples, and the use of the Vera C. Rubin Observatory dataset, expected to become available in the summer of 2025, to perform more refined observations and classify more E+A Galaxies.

Identifying Early Massive Quiescent Galaxy Candidates with COSMOS-Web

Mimi Harrison, *Rochester Institute of Technology*

Massive galaxies exhibit a bimodal distribution in the Universe, consisting of active star-forming and quiescent populations persisting through high redshifts. Theoretical models of galaxy evolution and hierarchical structure formation models cannot explain how galaxies in a cosmologically young Universe could become quenched of star formation in significant numbers so quickly. With access to revolutionary observational equipment with sample sizes larger than previously possible, we present a sample of 250 high redshift quiescent galaxy candidates selected from the COSMOS-Web catalogs using color-color diagrams to identify and distinguish candidate quiescent galaxies from active star-forming ones. Spectral energy distribution (SED) models of photometric COSMOS-Web data test whether these candidates fit a typical quiescent galaxies' SED profile, and images from JWST's NIRCam instrument reveal the morphologies of these candidate galaxies. Finally, utilizing archival spectroscopic data matches can aid in confirming quiescence, photometric redshifts, and the efficacy of color-color techniques at higher redshifts.

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Identifying Post Starburst Galaxies in the Virgo Filament Survey Using the DESI EDR

Keith Pritchett Jr., *Siena College*

Filaments are the largest structures in the universe and can impact the structure and gas content of galaxies within them. The Virgo Filament Survey (VFS) was established to investigate the gas and star-formation properties of filament galaxies surrounding the nearest galaxy cluster, Virgo. The Dark Energy Spectroscopic Instrument (DESI) Early Data Release (EDR) contains 1.7 million spectra, and the full sample will include 50 million by 2026. The purpose of this study is to (1) increase the census of galaxies within the region surveyed by VFS using the new DESI redshifts, and (2) use the spectral data from the DESI EDR to search for post-starburst galaxies within the Virgo filaments. Post-starburst galaxies have undergone rapid star-formation quenching, and we investigate the frequency of these galaxies as a function of environment.

R.A.F. gratefully acknowledges support from NSF grants AST-1716657 and AST-2308127 and the NASA ADAP grant 80NSSC21K0640. J.M. gratefully acknowledges funding support from the U.S. Department of Energy, Office of Science, Office of High Energy Physics under Award Number DE-SC0020086.

Identifying E+A Galaxies: Creating Photometric Criteria for E+A Candidates in the Siena Galaxy Atlas

Maddie Margulis-Ohnuma, *Edgemont High School*

E+A galaxies are post-starburst systems with no ongoing star formation that form as the result of mergers. These unique galaxies are key tools for understanding star formation and galaxy evolution. Previous researchers have created criteria for identifying E+A galaxies by their spectral characteristics, but these methods can only be applied to spectral surveys. To identify E+A galaxies in larger, non-spectroscopic surveys, I attempt to create a method of photometric analysis that can be applied to any survey that records redshift and g, r, and z magnitudes, utilizing the Siena Galaxy Atlas (SGA) specifically for this research. Using 9 E+A galaxies from the Sloan Digital Sky Survey (SDSS) as a reference sample, a parent sample taken from the HyperLEDA database was repeatedly refined based on characteristics shown by the reference E+A galaxies. This research was confined to nearby, low-redshift galaxies, and utilized multiband photometry and g-r and r-z color values to identify E+A galaxy candidates and their photometric patterns. Through color-magnitude diagrams and other graphs, it was clearly shown that E+A galaxies exhibit strong and consistent trends in their photometry that can be used to set ranges for identifying E+A candidates within the parent sample. However, these ranges alone cannot obtain an exclusive sample of E+A galaxies and result in a heterogeneous sample containing E+A galaxies mixed with various other types. This work must be supplemented with other characteristics to create a usable method of identifying E+A galaxies without spectra.

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Analysis of Gas Flows in the Large Magellanic Cloud

Megan Schlogl, *Rensselaer Polytechnic Institute*

Star formation is one of the driving forces behind kinematic and ionization structures in the interstellar medium (ISM) and the circumgalactic medium (CGM) of galaxies. In this project, we study the connection between star formation and ionization structures of inflows and outflows in the Large Magellanic Cloud (LMC). For seven HII regions in the LMC, we investigate the intensities and line ratios of H-alpha, [OIII], and [SII] emission lines with narrowband imaging data from the Magellanic Cloud Emission-Line Survey. Furthermore, we find that shocked nebulae show a preference to outflows in CIV and SII, and weakly ionized outflows probed by SII are less likely to be detected in optically thin areas. We also begin a Voigt Fit analysis of the region N79 to further understand gas flows in the LMC.

Perfect Match? Testing the Co-Evality of IC2602 & Tucana-Horologium

Alyana Jusino, *City College of New York*

Tucana-Horologium Association (THA) and the IC2602 cluster are young stellar groups with ages estimated to be similar, however, their relationship remains uncertain. By analyzing their rotation period distributions using TESS data, we can measure and assess if their rotation periods are consistent with their estimated age. Using stellar light curves' rotation periods through Lomb-Scargle periodograms and phase folding techniques, we can compare these distributions to see their evolutionary similarities and develop a deep understanding of gyrochronology, and use these techniques to improve estimates for potential new planetary systems, and see which exoplanetary systems are potentially habitable.

The Analysis Pipeline for the Tomographic Ionized-carbon Mapping Experiment

Shwetha Prakash and Selina Yang, *Cornell University*

The Tomographic Ionized-carbon Mapping Experiment (TIME) is a millimeter-wavelength spectrometer, installed on the Arizona Radio Observatory 12-meter radio telescope and is designed to perform line intensity mapping (LIM) of the [CII] 158 μm fine structure line and low - to mid-J CO rotational transitions. [CII] is used as a tracer of cosmic star formation, large-scale structure, and the epoch of reionization ($z \sim 5 - 9$), and CO transitions are used to probe molecular gas density during the cosmic noon ($z \sim 0.5 - 2$). Additionally, TIME can probe science cases such as the kinetic Sunyaev-Zeldovich effect (KSZe) in galaxy clusters, planetary nebulae, and dust properties in prestellar cores. TIME operates over a frequency range of 183-326 GHz with Transition Edge Sensors and a grating spectrometer at cryogenic temperatures and is sensitive to faint signals from diffuse objects owing to its low-noise properties. The spectrometer consists of 32 feedhorns, each with 60 spectral channels. We will present the data analysis pipeline, which has been developed to take these measurements as raw data, calibrate and scale it to flux densities, and generate filtered 2D rasterized images of the sky. We present a summary of the observations done in 2022, which included 251 observations, and describe how the data is processed through the pipeline and the resulting 2D observations.

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Measuring Jupiter's Rotation Velocity Using LHIRES Spectrograph

Max Giordano, *Siena College*

The rapid rotation of Jupiter causes measurable Doppler shifts in its spectral lines, providing an opportunity to determine its equatorial rotation velocity. In this study, we obtained high-resolution spectra of Jupiter using the LHIRES spectrograph mounted on our telescope at Breyo Observatory at Siena College. We focused on the Hα (656.28 nm) absorption line, a prominent feature in Jupiter's reflected solar spectrum, and analyzed its shift across different points of the planet's disk. To measure the rotational velocity, we compared the Hα line position from the approaching (blueshifted) and receding (redshifted) areas of Jupiter. Using the Doppler formula, we calculated Jupiter's equatorial rotational speed. By combining these measurements with Jupiter's known inclination, we estimated its true rotation velocity.

Enhancing our ability to measure accretion rates

Jacob Taylor, *Alfred University*

Measurements of the rate at which young stars and planets accrete matter from their surrounding disk provide information about their formation mechanisms. However, measuring accretion rates relies on accurately characterizing the emission arising from the accretion process. Since the UV continuum is the most sensitive to accretion processes, it can be used to robustly and accurately measure accretion rates. During the summer, I worked on two projects to this end. For the first, we attempted to obtain an accretion rate measurement for Delorme 1 AB(b), a planetary-mass companion (PMO), using optical spectra from SOAR. By combining UV measurements with these optical spectra, we can develop new scaling relationships for the substellar regime, allowing us to obtain accurate measurements using ground-based observatories in the future. However, poor seeing caused significant contamination from the host binary system which prevented us from constraining the accretion rate. The second project involved producing tools to measure spectral types of UV-bright stars needed for an upcoming HST proposal to measure UV extinction laws toward star-forming regions targeted by the Hubble UV Legacy Library of Young Stars as Essential Standards (ULLYSES). It is believed that current extinction laws may be inaccurate after seeing discrepancies between UV and optical accretion rate measurements of young accreting stars in ULLYSES datasets. To correctly measure new extinction laws, accurate spectral types are required in order to compare observations with unreddened stellar models. In preparation, we adapted the PyHammer spectral typing suite to seamlessly accept data from our observatory. This resulted in a pipeline that is ready for use during this upcoming project. Both projects will ultimately contribute to more accurate and useful methods for measuring both stellar and planetary accretion rates.

Meeting Zoom Link: https://cornell.zoom.us/j/96229214724?pwd=tlR895B8tqaVwA9GJJgyUjDRN0kcpH.1

StarGateVR: A Virtual Reality Tool for Exploring Gaia Data

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Virtual Reality (VR) is an emergent technology which has seen increasing application to astrophysical problems in the last decade. The European Space Agency's Gaia Mission has produced a wealth of positional, kinematic, and photometric data for approximately 2 billion stars in and around the Milky Way. We demonstrate a VR motivated tool, developed by Immersive Science LLC, that leverages the inherently multi-dimensional capabilities of VR to explore and manipulate Gaia data in a 3-dimensional interface. StarGateVR allows the user not only to view and explore Gaia data in this natural 3-dimensional space but also includes tools that allow one to easily filter and select out targets of interest for further analysis. Additionally, StarGateVR includes collaborative features that allow multiple scientists to simultaneously experience the same data and work on it together. We display the capabilities of StarGateVR through various example science cases involving Gaia data selection and "on the fly" analysis with the tool.

Investigation of Wave Structures in Laser-Driven Ion-Scale Magnetospheres on the Large Plasma Device

Sophia D'Anna, CUNY/New Jersey Institute of Technology

CSI Rubin: Galaxy Evolution Studies with the Vera Rubin Observatory at an Urban Public University

Courtney Fleming, Patrick Blanco, Elliot Radov, Jesus Rolon, Christina Tobin, Jacob Yuzovitskiy, Kelly Zyko, and the CSI Rubin Collaboration, *CUNY College of Staten Island*