Astronomy Town Meeting
8-9 Sept 2022

Notes and community input

The purpose of the town meeting is to engage with the astronomy community in South Africa - this document serves to capture notes, comments, questions and any input, on each item of the programme, directly from that community.

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Welcome and Governance

Chair: Vanessa McBride

Imraan Patel, DDG: Research and Development Support (DSI)

- *Apologies from DDG - welcome by Takalani*

Motivation for and outcomes of the meeting Petri Vaisanen

- How should governance of astronomy in SA work e.g. AAC
- Should we have these meetings annually
- Share information on existing infrastructure

Update on Astronomy from DSI Takalani Nemaungani

- Long history of astronomy in South Africa
- Many returns on investment in astronomy (see slides) including growth of community; HCD programmes; research chairs; technological returns; big data; socio-economic returns; outreach programmes; pan-African development; international partnerships
- Number of policies in support of astronomy
- 2019 white paper and process to finalise decadal plan by end of the year - review study recommends retention of science missions like astronomy
- GTAC reviewing astronomy landscape (in line with 2017 Ministerial Budget vote and directive from Minister in 2016) - outcomes of this exercise will be communicated; process ongoing
- HESTIIL report also proposed SANSA and astronomy could come together (this option has been excluded for various reasons)
- Draft astro-tourism strategy developed together with Dept of Tourism (see Audrey presentation on Day 2); also plans for science centre in Carnarvon
- Multiwavelength Astronomy Strategy approved in 2015; meant as decadal plan so now is a good time to start reflecting and have a document by 2025; there was no new money for this - funded through reprioritisation and savings

The National Research Foundation and astronomy in SA Clifford Nxomani

- Choice of investing in astronomy based on advantages in South Africa
- Included “going out on a limb” on projects like SKA
- For both SALT and MeerKAT it was about positioning internationally
- National facilities falls under National Research Infrastructure Platforms under NRF - of the ~4bn budget of NRF, ~2bn goes to facilities (~55% for astronomy) i.e. quarter of NRF budget goes towards astronomy
- Process still underway in terms of the placement of astronomy within the science system/in relation to NRF (governance)
- As a country, can’t invest in everything in the same way
- Research funding will be informed by NRF research framework which will be tied to the DSI decadal plan; have mapped framework to key research areas and astronomy will easily find a home there
- Regarding AAC, it was relevant in the context of the sub-agency which no longer exists; should now think about community owned structure - something for community to think about
- New directions for national facilities (which affects astronomy facilities):
    - (i) demonstration of socio-economic benefit is very important; need to fine tune and formalise how we demonstrate benefits from astronomy;
    - (ii) how do we foster innovation - need to do this in a structured way - how do astronomy facilities become “innovation hubs” to demonstrate technology benefits;
    - (iii) how do we deal with HCD e.g. any national facility must have dedicated postgrad school; structure current HCD training like NASSP to have streams reflecting e.g. engineering, data science, etc; meaningful transformation and partnerships with HDIs
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Overview of the Multiwavelength Strategy Kevin Govender

- Quick run through of multiwavelength strategy

DISCUSSION: Astronomy governance

- If you are taking questions from the online community - could you please raise the question of funding levels for postgrads and postdocs and not just numbers of students funded. The levels have dropped in a highly inflationary environment which harms the HCD and the science. Is there a plan for the NRF to address this?
- Question: innovation; space science vs astronomy;
- Need to clarify mandates of facilities/institutions (e.g. SANSA vs SAAO/SARAO) in terms of Science, Innovation, and commercialisation
- Conversations should include neighbouring countries - invite people from African Union or other groups (Vanessa: have AfAS here; Petri: ideally these meetings can align with Africa-wide meetings)
- How will strategy be reviewed?
- Funding levels have dropped - is NRF aware of problems with new funding model? (CN: actually funding has increased but number of students has dropped - from 14000 to just over half of that; now also an inflationary component; need 1.5-2bn - currently just over 1bn; ongoing conversation with DSI)
- Timing around recruiting of students is challenging - scope for change? (CN: will pass on the info to the HCD directorate, including issue of timing - big contributor is the means test)
- Paul: number of bursaries very limited; need more to assist other African countries as well;
- Vanessa: what do people feel about a community run AAC? (Takalani: move away from the term astronomy advisory council e.g. think tank, coordination, convening, etc)
- David: what does AAC do? (Petri: haven't been meeting; idea was good but functionality could improve)
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Overview of current research facilities in SA

Chair: Petri Vaisanen

MeerKAT & SARAO Rob Adam

- Science on a construction site. 50% science time
- Italian funding for more frequency coverage (band 5)
- Third open call time allocation concluded (132 submissions from 19 countries; 13 led by SA based PIs recommended)
- Site also has number of guest instruments
- Number of community development programmes
- HCD - see Mthuthuzeli's talk
- Question (Catherine): 1500 bursaries but not a single south african applicant for commissioning scientist jobs at sarao. Surely this is a catastrophic failure of the HCD program? Response (Rob Adam): The point is taken. However, a problem is that there are not suitable/willing university supervisors in this area. Young people also

don't see commissioning as a way to build a quality CV. We will be introducing more incentives in these truly scarce skills areas. But I think a joint supervision (SARAO + a university based research leader) may be a way to address this. But please note that there are indeed commissioning scientists (at least two that I can think of) that came out of the SARAO HCD programme.
- see Tana's talk: many research chairs and leaders appear to have been chosen for the wrong reasons.. we need people who can make sure student projects are aligned with the Astronomy job market and goal of building south african participation (and South Africa more broadly)

SALT Lisa Crause
- Overview of SALT and instruments
- Gen I instruments: SALTICAM; RSS; HRS
- Near Infrared arrived - first light 7th July 2022
- Over 450 peer reviewed papers since the start of science operations
- Introduced new instruments, technologies & capabilities
- Big idea: SALT mini-trackers - feasibility study completed, idea is parked but may revisit in future
- Another big idea: replace prime-focus payload to be fit-for-purpose + future-proof, possibly relocate RSS to basement
- Will engage with community about a major Gen II instrument
- Question (VMcB): what fraction of the peer-reviewed papers are from SA? Response: Encarni Romero Colmenero: 19% of the papers have SA authors/co-authors and SA has the largest fraction of papers of the entire partnership. Next largest is 8% (UKSC and Poland).
- Question (VMcB): how can we provide input to SALT on our future instrument needs and priorities? Response (ERC) We are only now kick-starting these discussions, so this is the first engagement with the SA community. Coming up on 14-15 November we will have a SALT workshop in which we will again have a session to engage the broader SALT community on this. But this is not going to happen in a rush, so I'm sure there will be more opportunities to engage with the community and we will communicate those, but if anyone has ideas/suggestions already, please email me directly (erc@salt.ac.za) and we'll make sure they are included in further discussions

SAAO & hosted facilities Ramotholo Sefako
- Many hosted facilities in Sutherland - see https://www.saao.ac.za/explore/our-telescopes/
- SAAO telescopes open to anyone anywhere in the world
- Prime SAAO has 14% time and access to all survey data - will SAAO issue a call? Response (David Buckley): 14% of time outside of the winter "bulge season". Calls are TBD once commissioning out of the way.
- LCO - time available over the SA summer for south africans
- ATLAS - forced photometry available on the user portal: https://fallingstar-data.com/forcedphot/
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SAAO's transition to the Intelligent Observatory Steve Potter

- SAAO Intelligent Observatory Workshop two weeks from now
- Vision: to coordinate all telescopes
- Strategy: to upgrade existing telescope for Automation/4IR
- Users will interface through OCS
- Question (Ros Skelton) - how will time allocation be managed if users can apply at any time?

VLBI in South Africa Roger Deane

- Main talk takeaways:
    - 1. As we move toward the SKA era, VLBI increasingly merges with “normal” radio astronomy (in contrast to being a blackbelt niche).
    - 2. VLBI is undergoing a revolution and its future is bright. In hosting SKA1-mid, the SA community are all stakeholders.
    - 3. Comparatively moderate investments in VLBI-related hardware and human capacity can make large returns for multi-wavelength, multi-messenger, high-energy and time-domain SA communities.
- VLBI observations will enhance MeerKAT Large Survey Projects, especially if MeerKAT could participate as a VLBI station at the same time
- No significant high angular resolution community in SA at present
- If we don’t use our own strategic geographic advantage and leverage our technical and engineering expertise, others will.
- Small diameter, low-cost EHT station in South Africa could offer highest return on investment from a VLBI perspective
- Strong overlaps with time-domain, high-energy, multi-messenger, and theory communities etc.

SA-GAMMA programme David Buckley

- Research & funding for gamma-ray astronomy
- Primary activities: HESS and CTA
- Over 40 SA-Gamma members (ave 10 publications per year)
- HESS operating for 20 years; currently extended to 2024 and discussions underway about future
- Continuation of support of HESS during CTA will still be valuable
- CTA headquarters in Bologna and data centre in Germany - construction began 2022
- SA-Gamma has members in the Fermi Gamma-ray Space Telescope collaboration and KM3Net neutrino observatory

ilifu/IDIA Jeremy Smith

- Ilifu facility administered by IDIA
- Data intensive research in astronomy and bioinformatics
- 490+ users registered on ilifu cluster; astronomy users from 93 institutions
- Users interface remotely (SSH, Jupyterlab, etc)
- Provide data management services: storage (non-archival) (E.g. MeerKAT data) and transfer
- Workshops and hackathons in partnership with DARA Big Data and OAD
- Federated ID management + SSO in development

IDIA Vislab Lucia Marchetti

- Shift in how we handle data - astronomers need to be able to interrogate and visualise data - need both facility and software
- Developed CARTA, a software/tool to interrogate data
- Facilities: Vislab at UCT and Iziko planetarium
- Improvement of systems for procurement is needed (between Iziko and NRF) and is a cause of delays
- Interest from neuroscientists to use facility to study brain
- Developed IDaVIE-v software suite for VR and is available for download - https://idavie.readthedocs.io/
- Attach VR capability to CARTA, including VR streaming, etc.

DISCUSSION: Ideas for future research facilities in SA.

- Takalani: what about AVN, etc (Roger: talk was more about EHT part; long term can expand into Africa; in terms of science return right now, EHT)
- James: would prioritise getting another functional VLBI telescope
- Ongoing site testing on Kilimanjaro
- Petri: SA SALT time is open to anyone in Africa; perhaps earmark funding for African collaborations; in discussion with 3 countries (China, India, Mexico) about time swapping (we give them some time in exchange for time on their facilities);

Human capacity development

Chair: Zara Randriamanakoto

NASSP Ros Skelton

- NASSP funded mainly by DSI via NRF
- >430 Honours and 170 MSc over 20 years of NASSP
- Input welcome for alumni, curriculum, course content, lecturers, project supervisors, winter school and recruitment
- Discussion points: funding (e.g. students funding not received on time), future growth, African participation
- Question (VMcB): what are the major learnings in running NASSP that came through the pandemic. Did it bring the nodes closer together? Has there been more sharing of resources?
- Suggestion (CC) to add someone to the advisory board of NASSP to advise on preparing students for work life outside academia.

SARAO HCD programme Mthuthuzeli Zamxaka

- High graduation rates
- Good number of Undergraduates that move to honours
- Focus to be made to improve the number of honours and BEng students to Masters
- Good progress on transformation figures, however, still more effort is needed to reach required targets
- Gender parity is still a challenge, women are still lagging behind in STI

- Good work has been done to bring Engineers on board, however, more still needs to be done.
- SARAO' students employment rate is high

Undergraduate astronomy at UCT Sarah Blyth

- Tony Fairall Teaching Observatory - two optical telescopes, two radio dishes
- Field trips for second year class
- Numbers have increased a lot over the years - now more 3rd year undergrads than NASSP Honours!

Astronomy at UniZulu Cebo Ndlangamandla

- *Speaker sent apologies - unable to connect remotely*

Meaningful, measurable and sustainable change for transforming astronomy in SA Tana Joseph

- Late payment of students and postdocs is shameful and unacceptable
- Supervisors need training on managing diverse research groups
- Need road map to hand over reins of astronomy community to South Africans
- Integrating our graduates into industry

Instrumentation hub/training Lisa Crause

- For instrumentation HCD we have mechanical workshops, SAAO Labs, good track record, collaborators
- More recent additions: SAAO fibre lab; in-house optical engineer; optomechanical design engineer; instrument scientists and students; satellite development expertise; SARAO engineering collaborators
- Need: more people; instrumentation training plan; projects; support for collaborations; guidance from those with experience; funding

  Question: what is meant by 'significant impact' in this context? Is it training expert and transferable skills? And what would be the benefit for South African optical astronomy?

Growing a South African radio pulsar community Marisa Geyer

- Pulsars are extreme laboratories that allow us to do fundamental physics
- March 2023 MeerKAT open time call will include beamformer time
- Very few local pulsar astronomers, some students are now beginning their studies

Question (Catherine Cress): Once again - is this a catastrophic failure of the SKA HCD program (given the massive investment in pulsar projects on meerkat)?

NITHECS Francesco Petruccione

- NITHeCS supports 8 disciplines (essentially all the basic sciences without chemistry - may change) - Astro, Bio, Data, Climate, Maths, Fin, Stats, TheoP
- >200 Associates in 22 of 26 universities

- Lots of HCD related activities: colloquia; mini-schools; CHPC-NITHeCS summer school; Chris Engelbrecht Summer School

SKIES project Lucia Marchetti

- European project with transferable skills training for young researchers:
    - Innovation and entrepreneurship
    - Local trainers
    - Training modules
    - Mentorship programme
    - MOOC (will be released soon)
- Initial survey conducted e.g. which skills are needed, etc
- Speakers from industry - some ex-students

DISCUSSION: HCD in South Africa

- Takalani: need to look at way forward with issues that Marisa raised about lack of a pulsar community
- Patrick: UCT has connection with Venda - telescopes are remotely accessible
- Saalih: time for a curriculum review for NASSP; people suggest but not willing to teach - need to address this - need more people to contribute to teaching; next step is to look at NASSP curriculum and who is going to teach it so that it's sustainable
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- Petri: also have contacts with SALT partners who have programmes in instrumentation - we can draw from their experience
- Ros: want to have a regional NASSP discussion - look out for invitation and join
- Siva: NASSP resources available online - learning materials, project reports, etc; send email if you wish to contribute
- Student payments is a huge problem; those funded by NRF can't even pay rent etc
- Students are borrowing money to survive until NRF funding comes

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Discussion: Science Priorities in South Africa

Chair: Vanessa McBride

- Collaborations with northern hemisphere observatories?
- BRICS
- New science areas: how do they affect our current facilities, hcd programmes and broader community

- Pulsars
- VLBI
- Cosmic Baryon Cycle
- Should we start thinking about what comes after SKA? What other scale is possible?
- Don't think only about infrastructure - what science?

- For Radio, SKA is probably on long term timescale; From optical side, should be thinking of next big thing after SALT
- Have infrastructure; but do we have capacity to build own new infrastructure - if we had capacity then possibilities open up
- Think about SKA regional centres (SKA data will need a flexible system for data discovery, etc - premium interface between telescope and researchers) - will be home for science; with IDIA, ilifu etc we are frontrunners in being regional centre which would give us head start on science
- We need a consolidated policy and meaningful, actionable roadmap for SA's SRC development. Need to think about staging for the SRC to ensure that SA scientists are effectively enabled and supported to compete for leadership and involvement in SKA Key Science Projects.
- Multiple science working groups that SKA has set up - SA must be visible in these e.g. Patrick member of transients group
- Maybe community needs some kind of science working group - Takalani willing to be part of that group; to make sure nothing falls through the cracks; review and reflect on priorities in 2015 strategy; will be useful for NRF and DSI to know what interventions are needed to do the science
- **Action point: put together this working group to determine science priorities**
- But we should have critical mass
- In terms of science priorities: Time domain astronomy (has always been strong in SA); becoming hours or minutes; exoplanets; looking to next decade, how can communication between telescopes be done very quickly without humans; need data products ready in scale of minutes to hours;
- Proposed global network of telescopes (BRICS project) on transients
- SA GAMMA and CTA raises issue of how we connect to international collaborations which may not involve infrastructure; i.e. should we be part of other international efforts like ESO, EUCLID, etc. May be worth putting money into some of these international efforts
- Already have collaborations/activities which we can lead on in terms of data science training; outcome of recognising importance of data centres is socio-economic benefit
- Need to find ways to be part of big international projects; anyone who has collaborators/connections should raise these possibilities
- Great potential for IDIA to have socio economic impact but one course may be too little; deep flaws because doesn't have input from industry; should make sure we have socioeconomic benefit
- Everything seems to be observational; need to think broader
- How do we measure return on investment? If we know how to measure then we can work towards it;
- Don't only focus on benefit being in businesses etc but the actual science as well
- DSI invests in science so should also not lose focus - other things (benefits) must be built around it
- Careful not to spread ourselves too thinly; do what we do but more efficiently
- Maximise on what we have;
- Figure out what each science needs
- Look at how students are funded to complement the science

- What is the future of SARAO moving forward since this is where most of our investment goes
- Should we invest in smaller telescopes which may give more value for money in terms of science output; investment in SKA has opened many opportunities for HCD etc; also note that SKA released new money for astronomy
- Budget for SKA was new funding - was not taken from anywhere else; can probably still do more; still have the opportunity to maximise;
- Issues on HCD and transformation have been raised but shut down at past AAC meetings
- HI Astronomers are coming through the system
- In 2001 some didn't want a radio telescope - wanted to build community
- Capacity development takes a long time - decade or two; H1 community is big;

Encarni's notes

Pulsars - growing pulsar community to take advantage of MeerKAT

- Roger: VLBI - participate in EHT
- Ros: Galaxy evolution/ baryon cycle - was discussed as Gen 2 but still relevant
- Paul G.:
    - community in SA has grown, but is not optimally big to take advantage of investment
    - What's after SKA?
- Petri: legacy science survey? Something to put SA community in the map
    - What's the next big thing in the optical community? SALT will be there - new instrumentation? Something else?
- Lisa: A community that can build what it needs can be more agile and competitive, rather than having others build it for us.
- Brad: When SKA starts producing data, we'll have key science projects. Need to place the SA community to lead key science projects. Need:
    - Capable researchers with good/ expert track record
    - Have SKA regional centers (not budgeted for) as home for science, eg IDIA + ilifu + SARAO -> access to src, leadership, proximity to telescope. Needs to start planning now.
- Lucia: other places around the world are already prototyping for SRCs - we're not doing that in SA.
- Patrick:
    - IDIA lets students from Mauritius, Madagascar - look at thunderKAT data and lead their field. Supports SRC
    - We need for SA to be visible in science working groups for SKA/MeerKAT. Patrick involved in transients, but many other groups. SKA office needs to see SA participating. Multi-wavelength, not only radio
- Takalani: what are the key SKA science priorities, so we can build our community around those.
    - Maybe form a Science Working Group
    - There are instruments within NRF that we could tap into to make headway.

    - Realising now that there are things (science) that are falling through the cracks.
    - Reflection/review on progress on the MW areas? Useful to NRF/DSI
- Lucia: good to have a WG, but you also need critical mass of the community. A single person cannot drive this. Need more positions in MW or MeerKAT, in preparation for critical mass.
- Paul G. : time domain. Globally it is going to shorter timescales. What would we need to play a role in that arena? SA has been traditionally v strong, but it's changing. IO essential, not only for Suth but also MW - quick comms, no human intervention. Science data products need to be available v quickly - not good enough to take long to process data - needs to be ready similar timescales similar to the timescales you're studying. SA can play a big role, but machinery needs to roll faster.
- David: connection with international infrastructure too - SA-Gamma (maybe CTA), LSST. How do we connect to international projects in the future. Eg. Oz putting money into LIGO, ELTs... should we join ESO to access ELT? Gvt insist that money must be spent in the country and not go overseas.. but we may want to re-think that.
- Brad: we already have socio-economic benefits and innovation (eg IDIA) - it does not have to be something new, many already exist. Need to centralize our strategy, eg SRCs => socio-economic benefit
- Petri: already been asked whether we want to participate in next space missions or ELT - need to find ways to do this. Raise potential collabs. Eg. co-PI of Plato mission (exoplanets, asteroseismology)
- Roger: community present are very observationally-based, we're missing a theoretical.
- CAtherine: Country is desperate to see return for investment
- Charles: But how do we measure return on investment?
    - more students?
    - commercial products?
- Paul G: also basic science! Beautiful results. Must not forget science.
- Takalani: first point for our investment is scientific returns - should be number one priority, we are investing in science. But other categories are also important and should be built around that.
- Nic Erasmus: many exciting things happening out there, cannot get involved in too many things and not do things properly. Do what we do, more efficiently.
- Petri: yes, have all options on the table, but choose wisely.
- Takalani: 4m telescope could be somewhere else in the world, through collabs/time exchange. SA has already invested in infrastructure, need to focus on the science and maximize what we have. Some countries are leading in science without having a single telescope!
- Lucia: NRF funds are shrinking for students that want to work on non-radio projects. Can't grow community.
- Steve: SA investing a lot into SARAO - but what is the future of SARAO? What's its role moving forward?
    - Sharmila: starting those discussions in SARAO, but it's not her place to say.
- Catherine: - wonders if smaller radio telescopes like hirax, might provide more return of investment in terms of papers and exciting science.
- PAul G: smaller telescopes in Suth appearing there are due to investment made there initially, so similar investment can happen with SARAO.

- Patrick: without investment in SKA the community would not have grown as much as it has.
- TK: Funding for SKA was not taken from any other science, it was a totally new science case from a totally different budget. We are prob not yet maximizing the opportunity, so we can prob do more. And opportunity is still there.
- Munira: HCD is working, though still young
- Patrick: takes 1-2 decades to grow. HI group is flourishing, have HI SARChI chair and it's internationally recognized, using MeerKAT data.

=> no new facilities, want to consolidate and grow community.

Reflections from Day 1

Chair: Vanessa McBride

- Was hoping to have more in terms of science goals more than instruments;
- Don't want future astronomers to be stuck with old infrastructure
- For next Town Meeting have more science focus discussions
- Need funding solutions - should not be ignored
- How do we get young women involved in astronomy
- Used to have purely astronomy meeting (rather than sessions at SAIP) - get feedback from community and plan for next time; there's always an astronomy session at SAIP but poorly attended because during time of year that clashes with others; people don't go because not critical mass; could insist all students go as training ground
- Should Town meeting be annual?
- Good that people not lining up for new instruments
- Patrick:would strongly encourage connections with SAIP

GA2024 and its legacy for South Africa

Chair: Kevin Govender

Current status of GA2024 Kevin Govender

Symposia & Focus meetings Brad Frank

Preparation of SA astro sites for IAU excursions Ian Glass

South Africa's interface with the African astronomy community Charles Takalana

- Gave information about AfAS and an update since the relaunch in March 2019 during the Astronomy in Africa Meeting.
- AfAS secretariat is hosted by Department of Science and Innovation (DSI) and based at the South African Astronomical Observatory (SAAO).
- AfAS has held two annual conferences since 2019 with the next meeting from 13 - 17 Marach 2023
- New AfAS ExCo was elected at the AfAS2022 GA
- AfAS collaborating with partner to roll out activities/projects (e.g. OAD, SAAO, ASSAF, etc.). These include special focus meetings and sessions.
- AfAS developed a Science Strategy
- Released calls for early career funding/support (Seed research grand and MSc. and Phd Prizes)
- Developing outreach and science flagship projects (inclding an African-wide optical telescope network, Map of Astronomy in Africa, and solar system project)
- AfNWA aims to connect women in astronomy on the continent
- African Science Stars Publication is released quarterly
- APA has been established to create and support a planetria network on the continent
- **Focus towards GA2024:**
    - Develop networks to share opportunities
    - Legacy of GA2024 for Africa
    - Pan-African and Regional Astronomy Schools
    - Coordinated human capacity building in science and technology
    - Encourage collaborations and synergies for the mutual benefit of infrastructure projects
    - Access to the new facilities and infrastructure
    - Site Testing for future astronomy projects
    - Promote the use of Astronomy for Development as a tool to deliver socioeconomic benefits and to achieve the Sustainable Development Goals
    - Encourage African leadership

DISCUSSION: Brainstorming/Call to action on GA2024

Outreach, Education and Broader Impact of astronomy

Chair: Charles Takalana

SALT Collateral Benefits Programme Sivuyile Manxoyi

- About the community benefits arising from SAAO/SALT
- Science Education: teacher training workshops and competitions; large number of misconceptions e.g. images from northern hemisphere; astronomy quiz; job shadow programme
- Science Engagement activities like festivals

- Socio-economic benefits like astrotourism
- Astronomers should be available to assist

Role of ASSA in astronomy community Daniel Cunnama

- ASSA sections: Comets and meteor; cosmology; observing; double and variable stars; imaging/astrophotography; instrumentation; photometry and spectroscopy; dark sky;
- Publication: Sky Guide; Monthly Notices of ASSA
- Symposium 2022 - celebrating a centenary
- Relationship between professional and amateur astronomers grown apart but this is a huge opportunity
- Question TK: what are the membership fees, and how can we work much closer with ASSA in future. DC: memberships works centre-by-centre. Memberships is ~R180 and you get a free sky guide.

Wits Digital Dome Roger Deane

- Celebrating centenary - largest in sub-saharan Africa
- Over million visitors to date
- Key concept is multidisciplinary visualisation laboratory
- Expansion of buildings and seats -will host university undergraduate lectures, public shows, corporate events
- Huge astrotourism opportunities - can highlight astronomical facilities in SA
- R75 million project (first two phases, which are funded)
- First two phases scheduled to be completed by 8 November 2023
- Should be ready to host public outreach events related to IAU GA2024

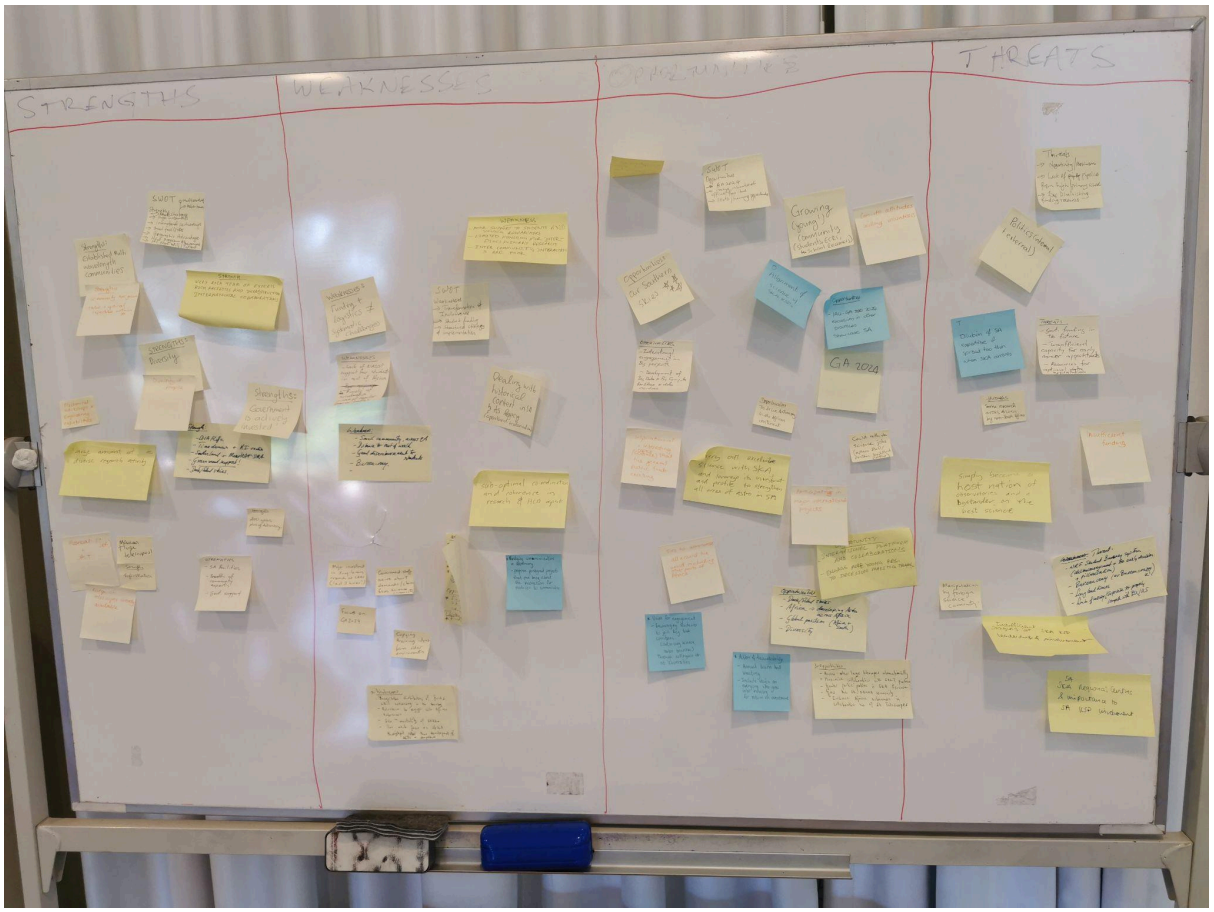
Astrotourism strategy Audrey Dikgale

- Numerous consultations and drafts over last year or so; currently compiling the implementation plan and refining the strategy with Dept of Tourism for approval by DGs from DSI & Tourism on 26th Oct 2022.
- Request people to fill form and submit info about programmes in astrotourism - this will inform implementation plan
- Status of Dark sky reserves? ASSA is giving some advice to various stakeholders. TK - also note northern cape is already declared an “astronomy reserve”. RRS: SAAO is thinking about applying for “dark sky” status.
- **Action:** CT to help DSI distribute the Astrotourism project form as a link for easy access and completion. Forms should be filled in by 21st of Sept for consolidation before presenting to the Working Group on the 3rd of Oct.

Astronomy for Development Kevin Govender

- Impact on sustainable development goals, astronomy-for-development built into the IAU’s strategic plan
- 11 regional or language offices
- Partnerships with organisations that have expertise in development
- > 200 project, >100 countries, > 1 million euro through an open call for proposals
- Three flagship projects: local socioeconomic development around observatories, astronomy for mental health, knowledge and skills for development

WORKING SESSION: **SWOT analysis of Astronomy in South Africa**



Strengths:

- Infrastructure (SAAO/SALT, SARAO/MeerKAT, IDIA, ilifu, etc)
- Large and growing community
- Excellent governmental support
- location/geographical advantage; dark and quiet skies
- Quality of astronomy skies protected by legislation
- SAAO Workshops and labs (incl fibre lab)
- Strong and growing international connections
- SARAO engineering division
- Established multiwavelength communities
- Range of telescopes already available
- Radio and optical expertise within SA
- Government is actively invested; government support
- Large amount of diverse research activity
- Diversity of people
- Time domain and H1 radio
- 200+ years of astronomy

- Expertise in data visualisation and computing infrastructures
- 20 years experience with inter-institute postgrad training through NASSP

Weaknesses:

- Poor timing in terms of payments to graduate students. It was thought the new funding system would solve this, but it clearly has not. Possible workarounds using research grants? AW suggestions: universities should step up and put students on the payroll and be paid monthly.
- lack of clear career pathways post-PhD in South Africa
- Lack of sufficient transformation in the community
- Lack of fundings for project with an international impact but not strictly connected with MeerKAT/Radio science.
- Funding, logistics and systematic challenges
- Transformation and inclusiveness; dealing with legacy of apartheid
- Student funding
- Lack of critical mass in several key areas, lack of staff for teaching and training students
-

Opportunities:

- IAU General Assembly 2024
- African Astronomical Society - leveraging astronomy in SA can help grow the field on the continent.
- BRICS Astronomy projects
- SKA key science WGs
- New SALT Strategy starting now
- SKA Regional Science centers
- Exploit the international nature of the community (e.g. exploit existing collaboration with major astro projects - Rubin, JWST, Euclid, eELT)
- Use instrumentation to train people at various levels, not just ‘PhD’ astronomers, i.e. a great channel for HCD in the country
- We can be agile in terms of instrumentation collaborations & provide a “test bed” type service for the international community (e.g. test new technologies on actual telescopes)
- International collaborators/partners that we can send our students to as part of their training
- Leverage dark skies (etc) for Astrotourism even more
- Great attitudes
- Southern skies
- Involve young researchers in research teams
- Africa
- Large telescopes internationally
- Growing SA GAMMA
- Engage African astronomers

Threats:

- Losing students from the pipeline due to poor experiences with their funding

- Losing early career researchers, i.e. post PhD
- Inadequate number of faculty and postdoctoral positions to absorb trained students. While it's been hard to create new position since 2015, perhaps through new programmes, such as astro-instrumention, universities can unlock additional teaching staff.
- Potential inability to demonstrate "Innovation" (which is asked for from gov) if understood narrowly as commercialisation only
- Not capitalising on IDIA developments (universities) in the process towards establishing an SKA Science Regional Centre (this needs broad community involvement)
- Negativity/pessimism
- Lack of pipeline
- Internal/external politics
- Dilution of SA expertise
- Govt funding in future
- Research areas driven by non-SA

Way forward for astronomy in South Africa (potential steps towards new strategy, any specific actions/responsibilities, etc):

- Officially declare the end of the Astronomy Advisory Council
- Establish national astronomy working group
- Task the working group to coordinate a review (and rewrite?) of the multiwavelength strategy through a community engagement process (target for new strategy: 2025)
- Establish a task team of heads of groups (of universities **and** institutes) to tackle the serious issue of funding and timely payment of scholarships across the NRF/Universities divide, and create best practices across the institutes
- To avoid a "business-as-usual" scenario, it may be worth constituting a very small committee representing all major science themes and/or wavelength regimes, and theory, that are important in SA. The committee should meet (just a zoom now and then) to see if some progress is being made - and help with setting up the next Town Meeting, possibly with a short science meeting attached AND foremost to ensure that action is being taken on the important points raised at this meeting.
- Provide and curate online learning astronomy courses which include foundational astronomy courses and astronomy data analysis to support training more astronomers across the continent and different research groups in poor-funded institutions.

Notes from discussion:

- will we have a report or something?
- need task team/WG who can follow up on these things
- report back at next town meeting
- SA doesn't have a prof society (apart from ASSA), e.g. in spain there's a national society - town meeting is serving this
- think of informal structure going forward, something driven by community, this will be interface between govt and community, team to write up and also do the studies needed, someone coordinate with SALT, SKA regional centres, etc; also coordinate with heads of universities etc

- dedicated subgroups
- no coordination with community - SAIP/SARAO bursary not working
- need to encompass whole community - they can organise community under one umbrella

- aren't we describing national astronomy agency
- but don't want it to be an agency

- Community has grown a lot
- don't want to lose connection with SAIP - that's what SAIP does
- Coordination role that rallies
- intermediate step - task group for a year - they figure out e.g. SAIP, national agency,

- sub-agency was formed within NRF - they developed strategy; both SAAO and SARAO should drive this
- disagree - should be wider community than SAAO/SARAO
- Universities should have clear role
- shouldn't be SAAO/SARAO - whole community

- community is busy
- task people who make recommendations that speak to system of accountability - perhaps annual town meeting used to report back
- good to see so much buy-in - good that we can argue - people care; glad meeting was productive - good to know people taking forward - good sign

- David: dejavu; 2014 decadal review involved whole community; ended in national strategy that just sunk;

- make MWS available
- all have NRF in common - where are they?

- In AfAS experience something going on even if people busy
- focus on things to deliver on along the way

- have to cross hurdle of NRF blaming univ and vice versa regarding student funding

- we mix strategic and operational stuff; if we are getting a task team, separate strategic discussion from operational; interface with NRF needs to be faster
- maybe two committees (operational and strategic)

- draft composition and send out (univ, young researchers, student rep, etc)
- task group should have university high level people

- suggest have pre-team - few people who will set up task team and coordinate everything

- Marisa, Patrick, Munira, Lucia, Sunil, Itu, etc

- make proper statement - be inclusive beyond western cape - make clear not yet official team

- would like to have astronomy town meeting annually
- beyond that, a meeting on science
- have to decide if that's SAIP or separately
- in order to move forward will ask community to nominate people to a planning community

- use this committee also for strategic input
- this is kick start but will need other people to be involved to update MWS etc
- operational and science committees

- NASSP curriculum review
- foreign students
- Acknowledgement to DSI for support
- PV: this is invaluable; thanks to Nuhaah, Nazli, Vanessa; SAAO, SARAO, SALT

Outcomes & Recommendations

A. Operational outcomes

1. There is an appetite for an annual astronomy town meeting in conjunction with an astronomy science meeting in South Africa. There is, as yet, no consensus on the best vehicle for such a meeting, e.g. through the SAIP conference, the SARAO bursary conference, alongside the AfAS annual meeting, in association with ASSA, or entirely independent.
2. The Astronomy Advisory Council has been discontinued.
3. An HCD task team should be constituted, comprising Heads of University Departments, NASSP, NRF facilities and DSI representatives, to take immediate action on late payment of student bursaries. Key issues are summarised in §C below. The interim committee (see point #A.5, and afterwards the Astronomy Community Task Team) will follow up on the progress of the task team.
4. There is a need for a community-led team, the Astronomy Community Task Team (ACTT), that can a) organize town and science meetings, b) coordinate operational aspects of Astronomy in South Africa, and c) establish committees or teams that can address the variety of strategic issues listed in 2 below.

5. An interim committee[1] has been established to a) refine these outcomes, b) draft terms of reference for the ACTT and c) set up the ACTT through an open call to the South African astronomy community.

B. Strategic outcomes

1. While the South African community currently has access to state-of-the-art research equipment, planning is required for renewal or new investments on a 10 year horizon. The current multiwavelength strategy was developed for the period 2015 to 2025. The ACT should coordinate the process for renewal of the strategy for the 2025-2035 period.

2. In the short term, the optical community will focus on building capacity and expertise for home grown instrumentation and astronomy research infrastructure development.

3. The community needs a consolidated policy and meaningful, actionable roadmap for South Africa's development of an SKA Regional Centre (SRC). An SRC is essential to ensure that South African scientists are effectively enabled and supported to compete for leadership and involvement in SKA Key Science Projects.

4. There is a gap in the South African radio research community with very few local pulsar astronomers. A well coordinated human capacity development strategy is required if South Africans want to participate in and lead pulsar science in both the MeerKAT and SKAO eras.

5. The state-of-the-art observational facilities in South Africa may be leveraged to participate in large international projects (e.g. Euclid, JWST) or to 'timeshare' with observational facilities in the northern hemisphere.

6. The 20-year experience in the National Astrophysics and Space Science Programme (NASSP) should be leveraged to ensure fit-for-purpose postgraduate training in a very dynamic and different South African astronomy landscape. This process will begin through regional discussions and a curriculum review.

7. A small diameter, low-cost EHT station in South Africa could offer a high return on investment for developing VLBI capabilities, and using this as a driver of multiwavelength and multi-messenger astronomy.

8. Future and current strategies for astronomy in South Africa should build in the value of computational and theoretical support for the observational facilities. These are essential for producing the science and informing the next generation of observational facilities.

C. Key issues around student funding: to be taken up by the HCD task team

1. Funding levels have dropped in a highly inflationary environment, and new funding rules have capped top-ups from supervisors' grants.

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[1] Membership of this committee: Sunil Chandra, Daniel Cunnama, Kelebogile Gasealahwe, Marisa Geyer, Munira Hoosain, Lucia Marchetti, Lia Labuschagne, Vanessa McBride, Itumeleng Monageng, Jack Radcliffe, Patrick Woudt.

2. Timing around student recruitment is challenging, coming too early in the academic year.
3. Can we broaden the scope to make bursaries available to students from other African countries?
4. Tying student funding to individuals has the unintended consequence of delaying science projects. Good scientific ideas for student projects may take years to get funded as a PhD project.
5. Student payments are late in the year. Students are borrowing money to survive until NRF funding comes. The recent revamp of the system was intended to prioritise those who are most needy, but these very students are left without means.

Appendix: Previous reviews and strategy documents

https://www.dst.gov.za/images/pdfs/Decadal%20PlanHCDin%20Astro_AWG.pdf
https://www.dst.gov.za/images/pdfs/Astronomy_Desk_Report.pdf
https://www.dst.gov.za/images/Final_MultiWavelength_Astronomy_Strategy_July_2015.pdf