

Developing the next generation of African astronomers, engineers and technicians

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Why Astronomy in Africa? Scientific Reasons



- Niche science for Southern Hemisphere
- Pristine conditions = Astronomy geographical advantage
- Radio + optical + gamma = multi-wavelength capacity
- South Africa is emerging as an excellent place, not only to make observations, but also to do science

Why Astronomy in Africa? Political, Socio-Economic Reasons



- Astronomy is an effective instrument for development
 - For exciting young children into science
 - For developing a greater appreciation by the public about the wonders and importance of science
 - For developing technical innovations that have wider impact on society
 - For building bridges across cultural divides
 - For building a new generation of scientists, engineers and technicians, not only for astronomy, but also broadly for society

Outline



- I will present some of our HCD needs in Africa
 - Principles, rationale and notions rather than a shopping list

Where do we wish to be in 2025-2030?

What is realistically achievable?



- About half a dozen excellent astronomy research groups geographically distributed through sub-Saharan Africa (outside South Africa)
- From excellence in research, everything else flows
 - Collateral benefits
 - Delivers on the political, social and economic agenda in Africa in all its facets

Excellence in Astronomy Research in Africa



- Active African university groups utilizing African and world observatories for excellent scientific research
 - HESS, CTA, SALT, Sutherland small telescopes, SKA, AVN
- Publishing internationally
- Participating in international conferences
- Supervising masters and doctoral students
- Exchange of African students, postdocs and researchers with South Africa and Europe and elsewhere
- Teaching excellently
 - physics, astronomy, mathematics, engineering

How do we build excellent research groups in Africa?



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- South Africa and Europe have separate and complementary roles to play
 - No quick fixes
 - Be prepared for the long haul (next 15-20 years at least)
- Need coordinated programmes and interventions
 - Need great commitment to succeed
 - Help create a nurturing environment for success
- Multi-faceted approach, no one size fits-all
- Do not compromise on excellence

- Fellowships for honours, masters, doctoral and postdoctoral African students to study in South Africa and/or Europe
 - NASSP programme
 - NASSP North
 - SA University system
 - Stringent process of selection, focus on excellent potential
 - Earlier years in SA, later years in SA and/or Europe
 - Requirement that candidate returns to home country
- Increase capacity to teach and supervise in South Africa
 - Mobility of European academics and postdocs
 - Co-supervision of doctoral students
 - Joint research degrees

Infrastructure needs for HCD in Astronomy



- Infrastructural investments for teaching and research in South Africa over next 5-10 years
 - Small optical telescopes; Kit for building radio telescopes
 - Video conference facilities for remote teaching for NASSP
- Infrastructural investments for teaching and research in Africa over subsequent years
 - As African scientists return home to build their research groups
- Pairing of African universities with SA and European universities
 - Case of IIT's in India
 - Create critical mass
 - Counter isolation

- Need to locate some African students in high-end Engineering
 - Radio astronomy instrumentation development
 - Optical astronomy
 - Gamma ray detectors
 - Computer science and engineering
 - Electrical and electronic engineering
- For servicing astronomy needs and for broad society


- Need to develop more capacity in technical training
 - Lower level skills, artisan training
 - At universities of technology
- Service the needs for operating African research facilities
 - SKA, AVN, HESS, CTA
- Formal training rather than *ad hoc* training
 - Diplomas and formal degrees
- For servicing astronomy needs and for broad society

Final remarks

2013

2023

2033



Invest in SA in teaching and research infrastructure;
Award fellowships for African students to study in SA;
Mobility European researchers increase supervisory capacity in SA

African postdoctoral and visiting research fellowships in SA and Europe

Support African scientists as they build research groups in Africa;
Invest in Africa in teaching and research infrastructure;
Pair African groups with SA and European groups

- In building astronomy research facilities in Africa, we want to go beyond simply maintaining and operating the telescope, and making observations and collecting data ... we also want and need to be involved in doing the science