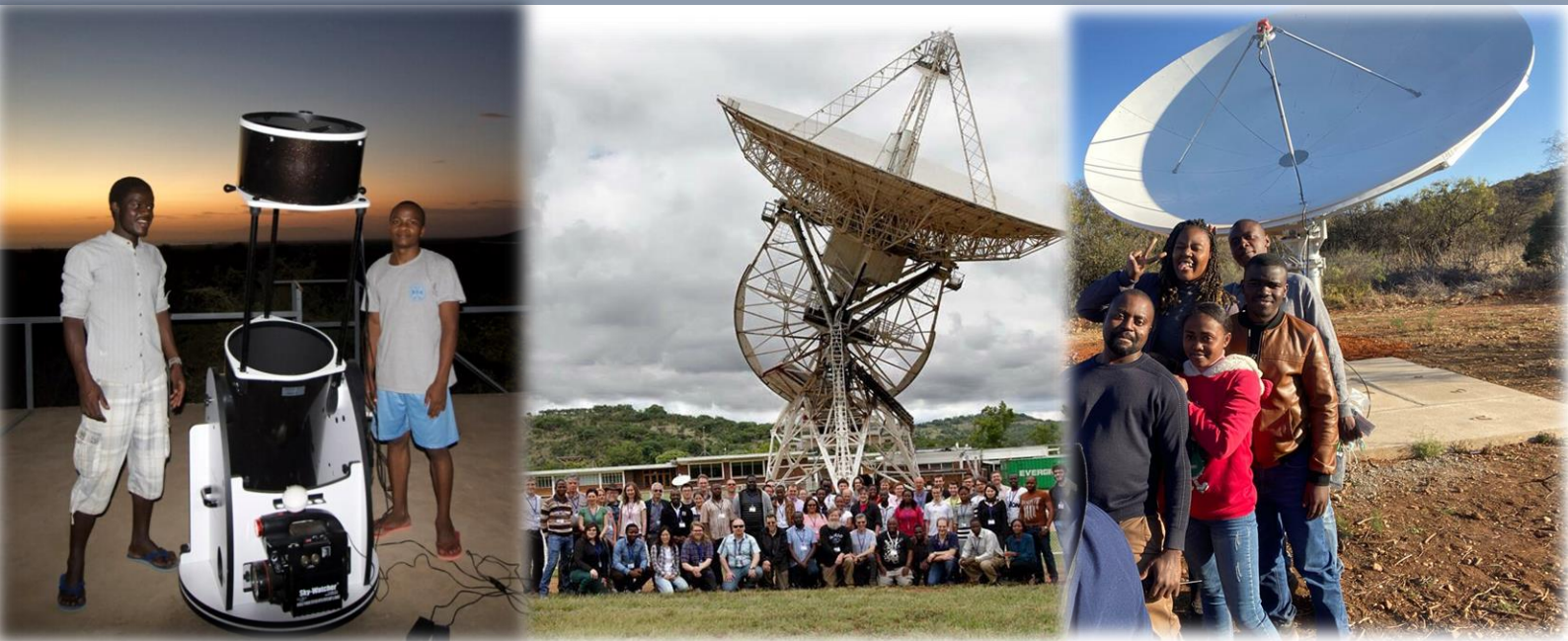




DARA Astronomy Basic Training Programme

South Africa



THE UNIVERSITY
of EDINBURGH





Introduction

Africa is becoming the focus for the world of astronomy. Construction is underway of the mid-frequency dishes of the Square Kilometre Array (SKA) – the next generation global radio astronomy facility in South Africa. There is an ambition to deploy further dishes in the eight SKA African Partner Countries (Ghana, Kenya, Zambia, Namibia, Botswana, Madagascar, Mozambique and Mauritius). South Africa also hosts the South African Large Telescope (SALT), which with its 10 m diameter mirror is one of the largest optical telescopes in the world.

To support the development of astronomy in Africa and ensure that opportunities in this area are open to African citizens, the Development in Africa with Radio Astronomy project (DARA: www.dara-project.org) runs a basic training programme with the aim of offering any suitably qualified person the opportunity to become familiar with the basics of astrophysics and radio astronomy and gain hands-on experience.

The training will take place in Kenya and South Africa delivered by experts from the UK, South Africa and Kenya. Hands-on training in optical astronomy will take place at the Turkana Basin Institute in northern Kenya. Practical training in radio astronomy will take place at the Hartebeesthoek Radio Astronomy Observatory in South Africa. Training in computer skills in Linux and python will also be provided. Advice on the industrial opportunities afforded by knowledge of skills in astronomy techniques will be provided by experienced entrepreneurs from our industrial partners in the commercial space sector. The basic training programme will consist of:

- 8 weeks of lectures, workshops and hands-on sessions spread out over a year;
- on completion, trainees will receive a certificate of completion and can request a reference letter from their trainers;
- trainees will then be in a position to apply for advanced training places in astronomy at Masters or PhD level, or use their new skills to aid the development of related high tech industries.

Eligibility

In South Africa the programme is open to current or recently graduated Honours students from Historically Disadvantaged Institutions who want to undertake the training in astronomy. No prior experience of astrophysics is required. Applicants would normally be expected to be studying physics or other relevant subjects such as mathematics, computing or engineering. Students who are currently studying or employed need to obtain a letter of permission from their Head of Department or line manager stating that they will be giving the time off to attend all the basic training programme elements.

Training Package

The basic training programme is fully funded by the University of Leeds, and therefore students will not have to pay a fee or any costs. The training package includes accommodation, meals and travel to the training venues in South Africa and Kenya. An out-of-pocket allowance will also be included.

How to Apply

Applicants should complete the application form and send it together with a CV, passport copy (if in possession) and transcripts to the following contact from the South African Radio Astronomy Observatory (SARAO):

Mr Mkhululi Jodwana, Email: mjodwana@sarao.ac.za and

Dr Mthuthuzeli Zamxaka, E-mail: mzamxaka@sarao.ac.za

The application must also be copied by e-mail e.c.smith1@leeds.ac.uk

Deadline for applications: 20 August 2024

Applications received after this date will not be considered.

The Training Programme

The training programme will consist of four or five 2-week elements spread over a year.

Foundation Astrophysics Online Training

Prior to the commencement of the training, you will be required to undertake online courses in astronomy and/or radio astronomy depending on your previous experience. Those with no prior experience of astrophysics should take the DARA Foundation Astrophysics course. This consists of 20 online lectures by Prof Melvin Hoare from the University of Leeds covering the basis of astrophysics. Those with some prior experience of astrophysics should take the DARA Radio Astrophysics online course, which also consists of 20 online lectures by experts focussing on radio astronomy as well as workshop exercises.



For those taking the Foundation course it would be advisable to also complete the Radio Astrophysics prior to the practical radio astronomy training. Each online course will take about two weeks to complete in your own time.

Practical Optical Astronomy Training

This two-week course will take place from 13-24 January 2025 and will be delivered by trainers from the DARA team and Technical University of Kenya. It will be hosted at the Turkana Basin Institute in northern Kenya.

- Introduction to observational astronomy – coordinate systems, planning an observation
- Introduction to optical astronomy – telescopes and detectors, photometry, spectroscopy, time domain
- Practical sessions using the University of Edinburgh’s 40 cm optical telescope and the DARA 20 cm telescope
- Introduction to radio astronomy and practical sessions using a small radio telescope and RFI monitoring device
- Reduction and analysis of the data taken



Computer Training

This one-week course will take place on 27 -31 January 2025 (to be confirmed) at North-West University (NWU), Potchefstroom, South Africa.

- This will introduce students to the Linux operating system and python scripting language that is widely used in astronomy as well as in industry and commerce. The course will be delivered remotely by experts from the Centre for High Performance Computing in South Africa together with local tutors. It will take place at NWU.





Practical Radio Astronomy Training

To take place over two-weeks during February 2025 (exact dates to be confirmed) at Hartebeesthoek Radio Astronomy Observatory (HartRAO), South Africa. This training will be taught using a mixture of lectures, workshops and hands-on training.

- Radio Telescopes – antenna systems, Radio Frequency Interference and mitigation procedures.
- Receiver Systems - feedhorn, amplifiers, cryogenics, downconverter, local oscillator, digital backend
- Single dish observations
- Interferometric observations
- VLBI Techniques - recording systems, e-VLBI, timing systems, hydrogen masers
- Geodesy



Annual Network Meeting

In February 2025, (exact dates to be confirmed) trainees from all 60 partner countries will attend a three-day annual network meeting in South Africa. Representatives from the DARA industrial partners will provide training on opportunities in related areas such as space science, satellite communications, remote sensing and space AI applications. There will also be a workshop on the use of astronomy for development from our partners at the IAU Office of Astronomy for Development (OAD). Your country cohort will be encouraged to submit a development proposal to the OAD's annual call. A CV workshop will allow you to discuss your potential future career opportunities with a panel of academics and industrial partners.

Radio Astronomy Data Reduction Training

This two-week course will take place in March/April 2025 (exact dates to be confirmed) at the University of Pretoria. It will be delivered virtually by DARA team members together with local tutors. This course will be taught using a mixture of lectures and hands-on workshops with real data. Using the DARA computer suite, each student will use the python-based CASA software.

- Interferometric Data Reduction - flagging, fringe finding, flux calibration, phase calibration, polarization calibration, self-calibration and imaging.
- Data Analysis - flux densities, source sizes, image fidelity.

