Welcome & Introduction

Aletha de Witt

DARA-AVN May 2019

Observational & Technical Training HartRAO

NRF
National Research Foundation

SARAO
South African Radio Astronomy Observatory

HartRAO

A Facility/site of the South African Radio Astronomy Observatory (SARAO)

operated by the

National Research Foundation (NRF)

who report to the

Department of Science and Technology (DST)

NRF National Research Foundation | SARAO South African Radio Astronomy Observatory

Department of Science and Technology

HartRAO location in South Africa

Latitude 25° 53' 27.1" South
Longitude 27° 41' 12.7" East

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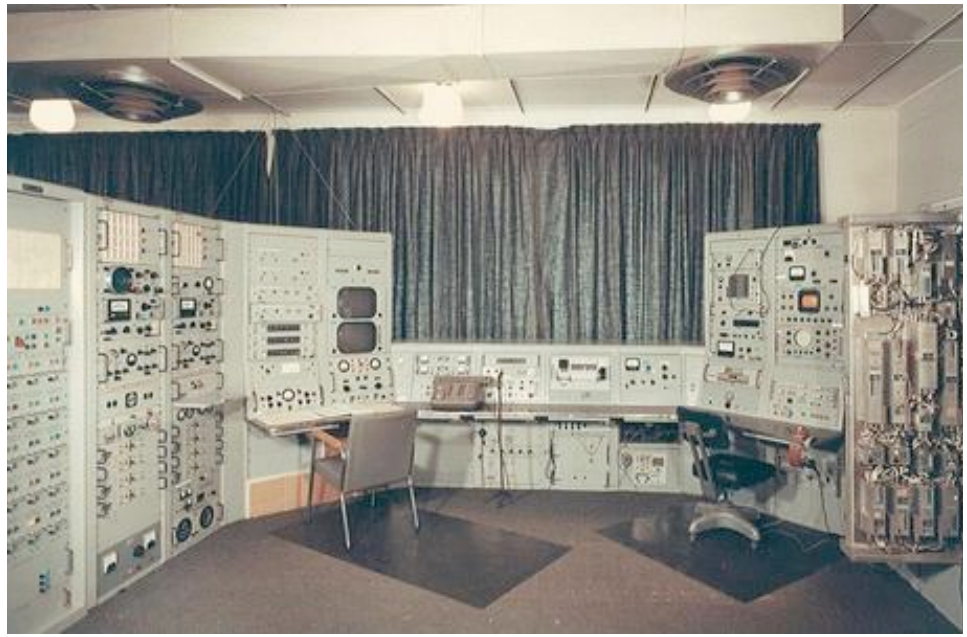
SARAO South African Radio Astronomy Observatory

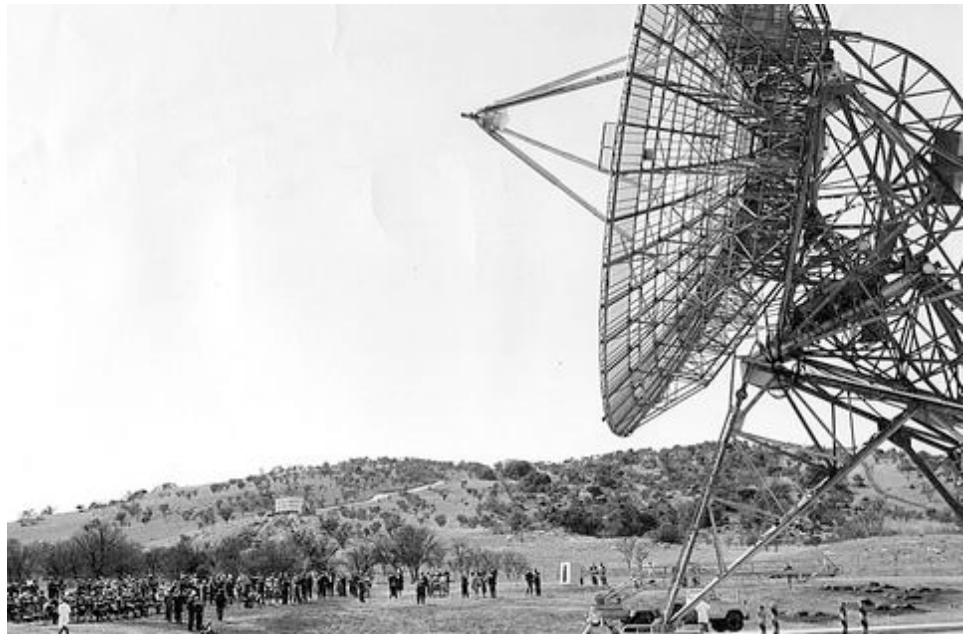
HartRAO Site Map

Latitude 25° 53' 27.1" South
Longitude 27° 41' 12.7" East

HartRAO Image

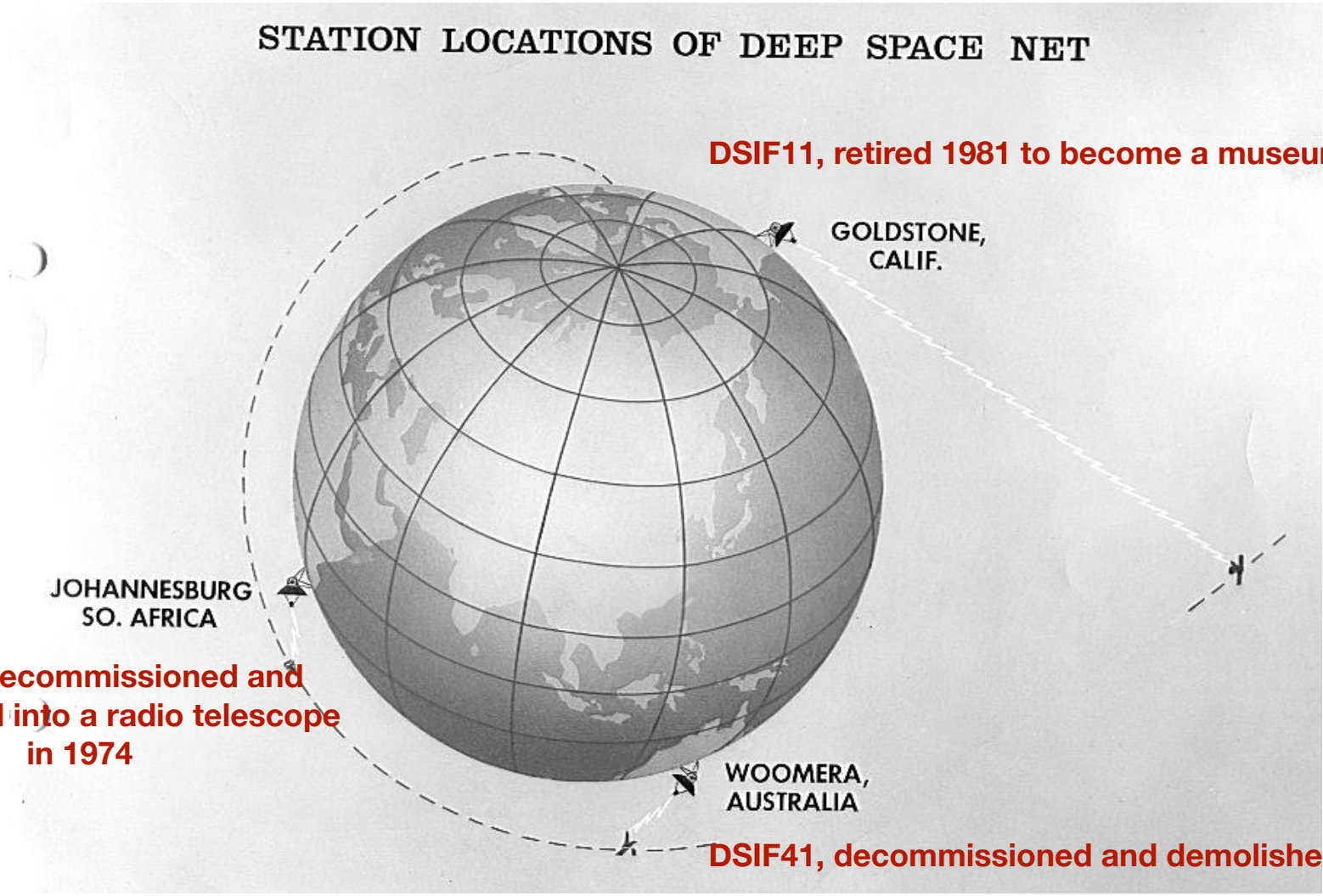
1961 - 1974 NASA Deep Space Station 51 operated by CSIR for NASA





Origins of HartRAO - tracking station

Station locations of the Deep Space Network



DSIF11, retired 1981 to become a museum exhibit

DSIF51, decommissioned and transformed into a radio telescope in 1974

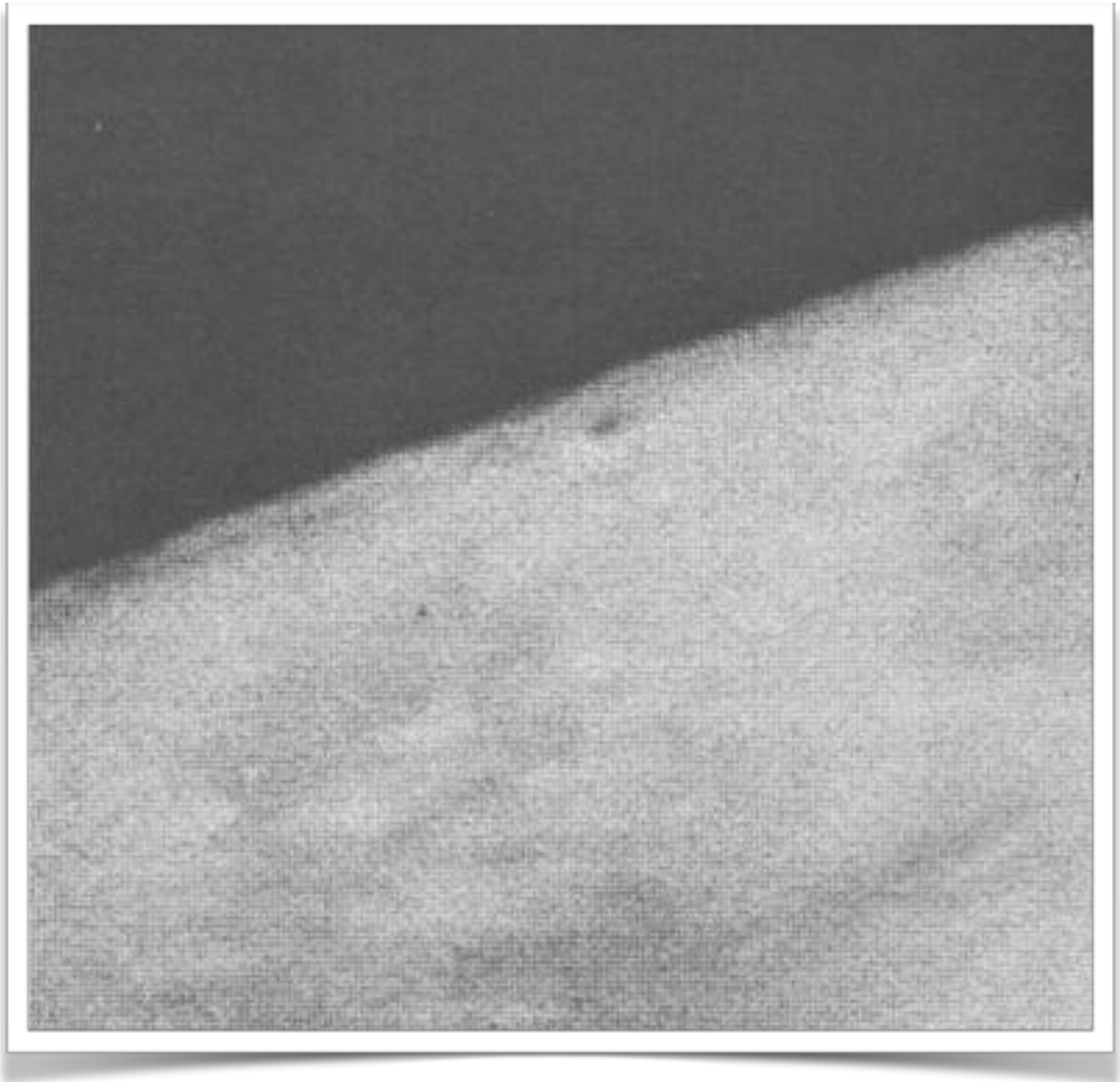
DSIF41, decommissioned and demolished in 1972

http://www.hartrao.ac.za/other/dss51/dss51.html

Origins of HartRAO - tracking station

1961 - 1974 NASA Deep Space Station 51 operated by CSIR for NASA

First pictures of another planet to be taken by a spacecraft !

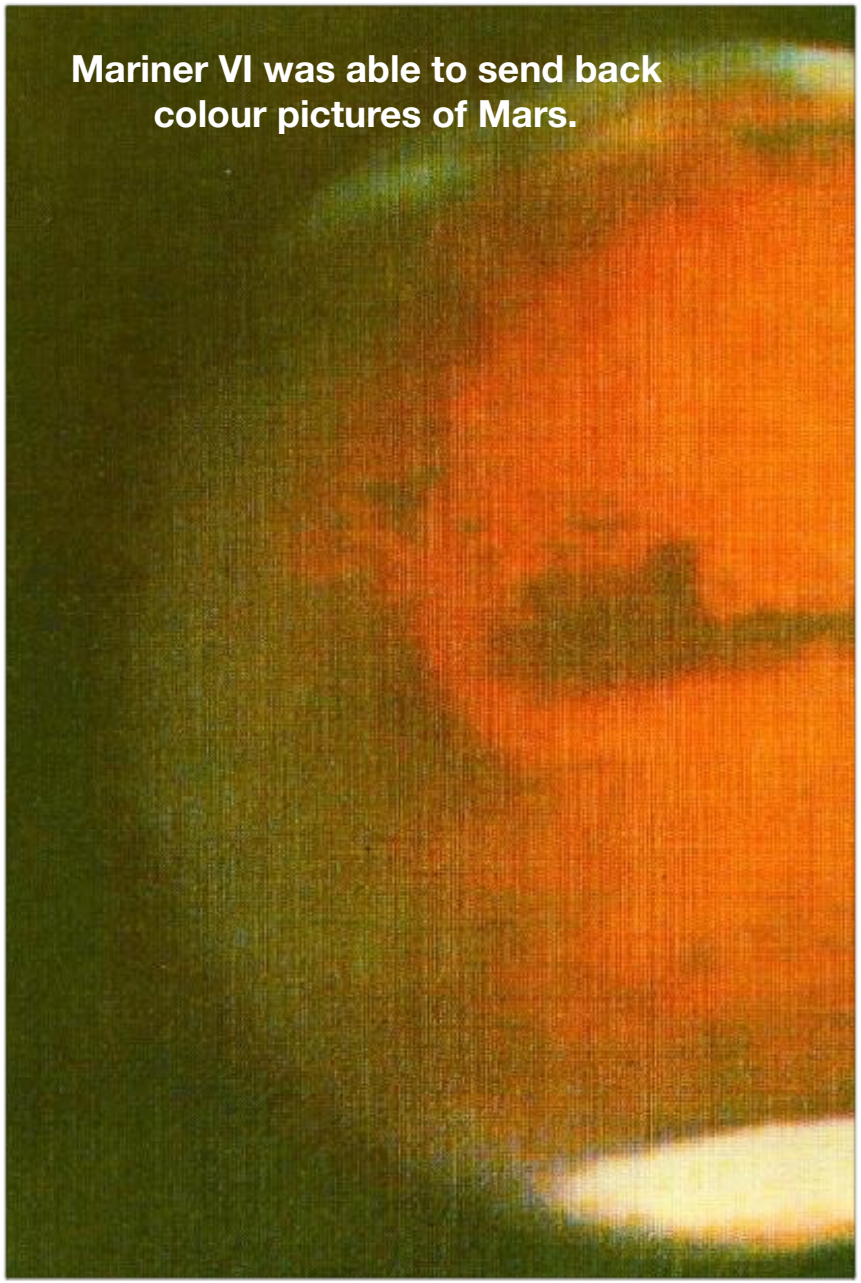


Mariner IV obtained the first closeup photographs of Mars in a fly-by during 1965

The very first picture was received here at Hartebeesthoek on July 15 1965, when Mars was nearly overhead at Johannesburg.

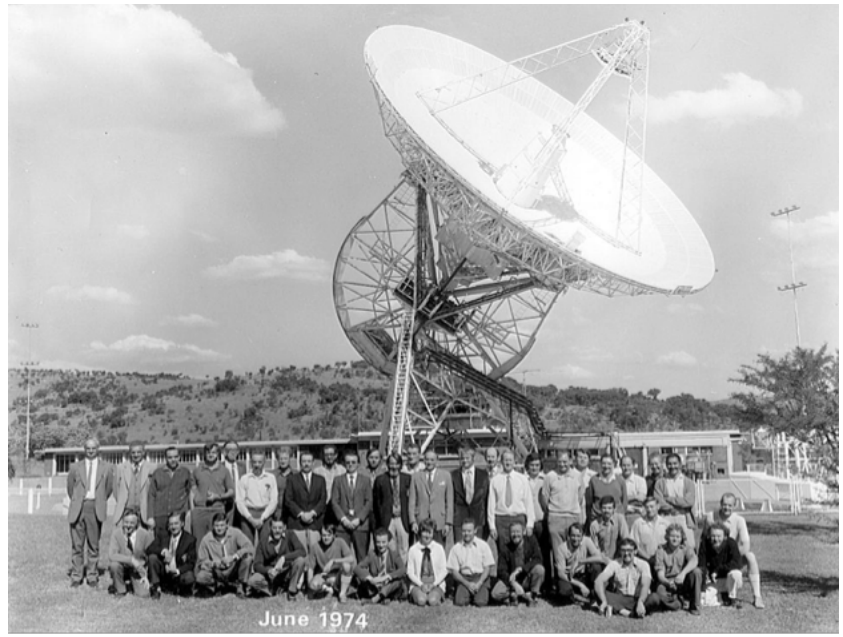
Origins of HartRAO - tracking station

1961 - 1974 NASA Deep Space Station 51 operated by CSIR for NASA



Origins of HartRAO - tracking station

National Facility for Radio Astronomy and Space Geodesy



HartRAO since 1974

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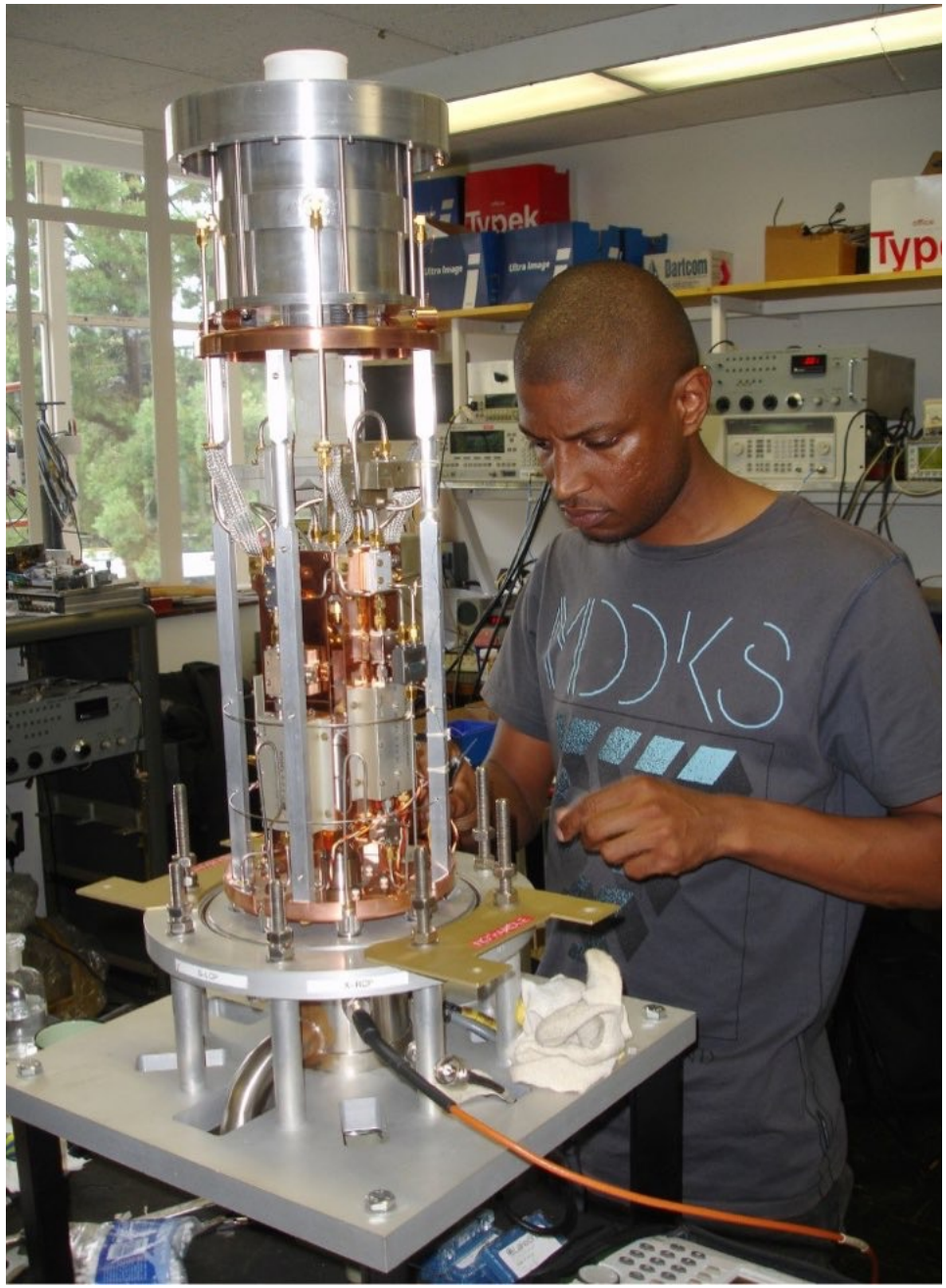
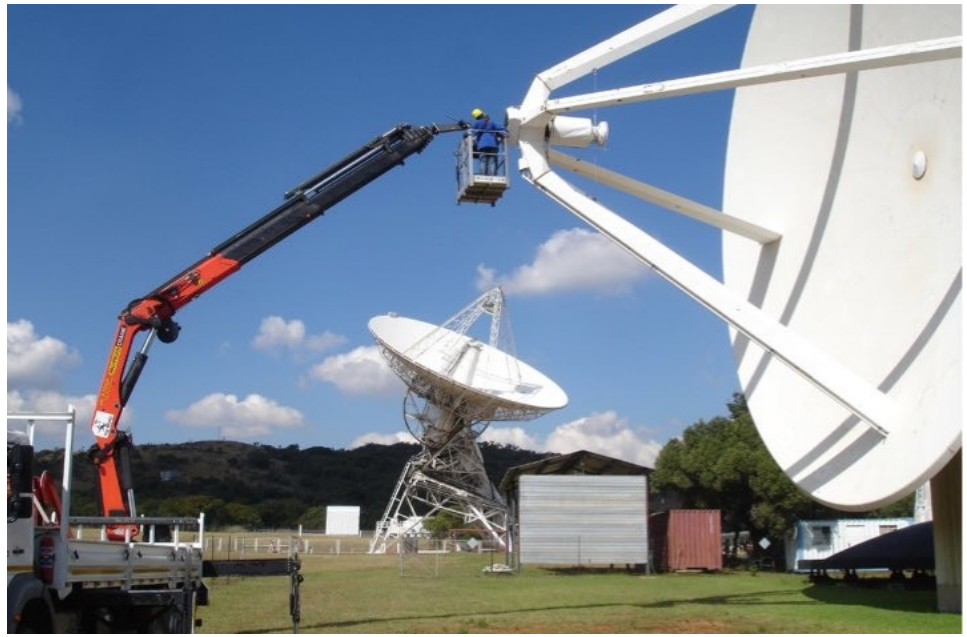
http://deepspace.jpl.nasa.gov/about/history/#

HartRAO since 1974

Continuous upgrading to increase science capability





HartRAO since 1974

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HartRAO today

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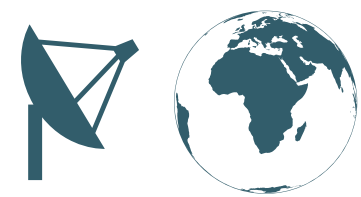
SARAO
South African Radio Astronomy Observatory

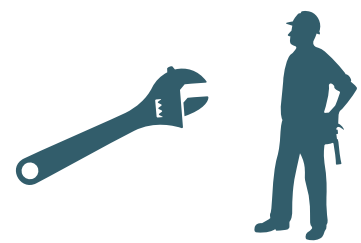
What HartRAO does

- Radio Astronomy Research -
  Studying objects in the Universe that produce radio waves (VLBI)

- Space Geodesy Research -
  Using radio astronomy and space techniques to study the Earth (VLBI)

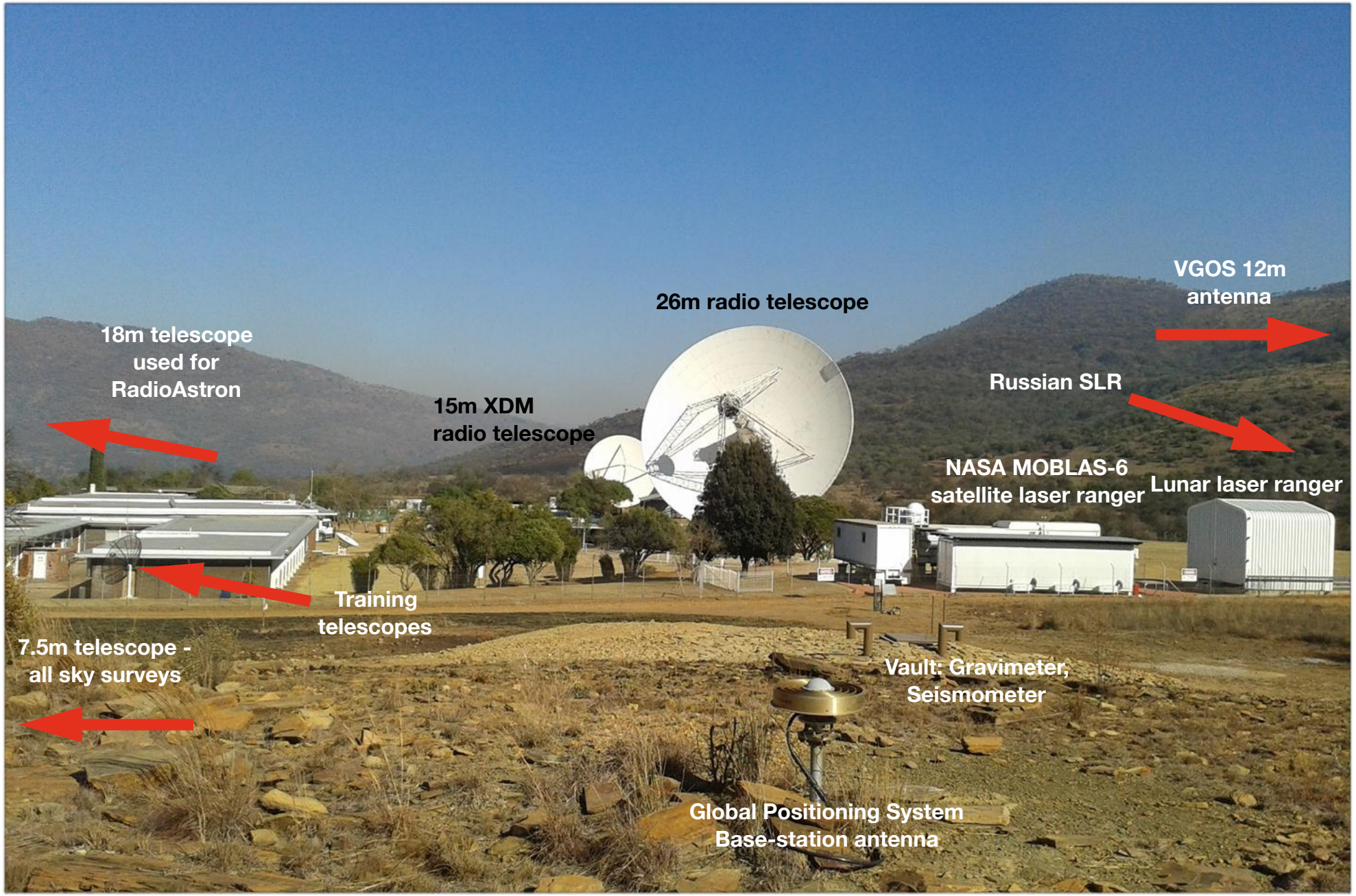


- Engineering and Technical -
  Maintenance, upgrading, testing and development



- Radio Astronomy Development -
  e.g. SKA, AVN, C-bass, VGOS, ICRF-3

- Tertiary Education and Training & Science Awareness and Outreach
  In association with Universities e.g. NASSP, WITS, AVN-Newton Fund/DARA
  public and school visits and workshops for educators



HartRAO Facilities

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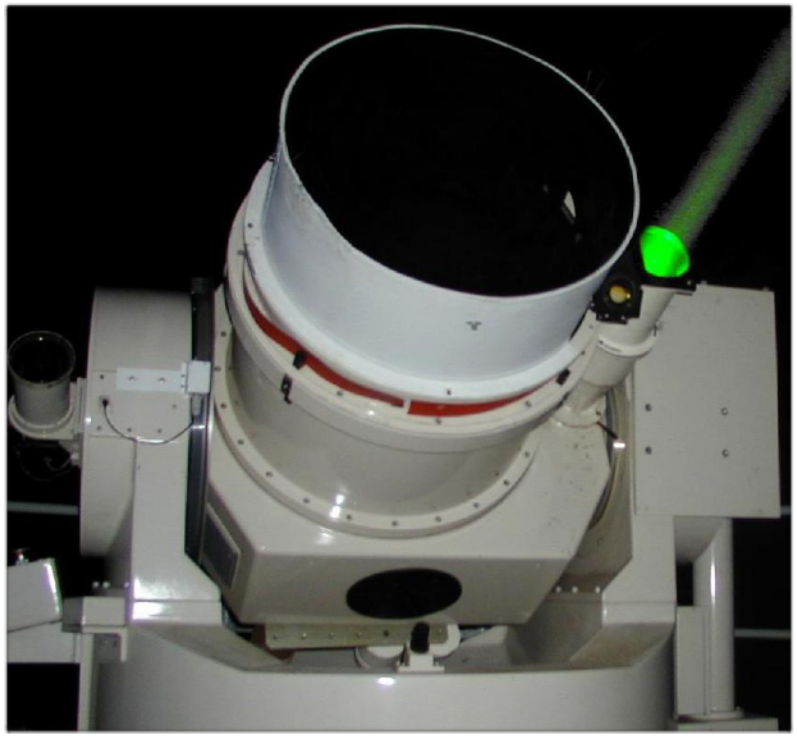
HartRAO Facilities



HartRAO/NASA **Satellite Laser Ranger**

HartRAO **Lunar Laser Ranger**

Global Navigation Satellite System (GNSS) receivers for GPS, GLONASS and Galileo, at HartRAO and at other locations, for geodesy

Gravimeter, Seismometer
Seismic network across SA, Gough and Marion island: 10 additional seismic stations.

Gough Island **Tide Gauge** installed.

AVN-Newton Fund: Project overview

- **Funding for the SA/UK Newton Fund African VLBI Network (AVN) project was approved in January 2015**

- The aim of this project is to develop researchers in Radio Astronomy fields and related instrumentation, who can become part of the international science community and ensure optimum use of the new observatories deployed through the AVN project.

- **This project is a collaboration involving the following partners in the UK:**
  - Universities of Leeds,
  - Manchester,
  - Oxford and
  - Hertfordshire
  - as well as the Goonhilly Earth Station Ltd.

https://www.dara-project.org

- **And the following partners in South Africa:**
  - the Hartebeesthoek Radio Astronomy Observatory (HartRAO),
  - Square Kilometre Array (SKA)-SA,
  - the Office of Astronomy for Development (OAD),
  - the South African National Space Agency (SANSA),
  - Universities of Cape Town, Rhodes, Western Cape, North West and South Africa.

SARAO

AVN-Newton Fund: Project overview

- **Newton Fund (UK) and DST (SA) matching Funds:**
  - Principal SA Investigator: Aletha de Witt (SARAO)
  - Principal UK investigator: Prof Melvin Hoare (University of Leeds)

- **Close collaboration with joint delivery and one Steering Committee from SA & UK:**
  - UK/SA 5 year collaboration
  - SA activities funded by DST
  - UK activities funded by Newton Fund

3 x sessions/yr

- **Training in 2015/16, 2016/17, 2017/18 and 2018/19 in progress**

- **Participants using the available telescopes at HartRAO and Ghana:**
  Botswana, Ghana, Kenya, Madagascar, Mozambique, Namibia, Zambia,

Thank You

Contact Details

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Image credit: Lynne Arnold, 2019