
SOCIO-ECONOMIC BENEFITS FROM ASTRONOMY

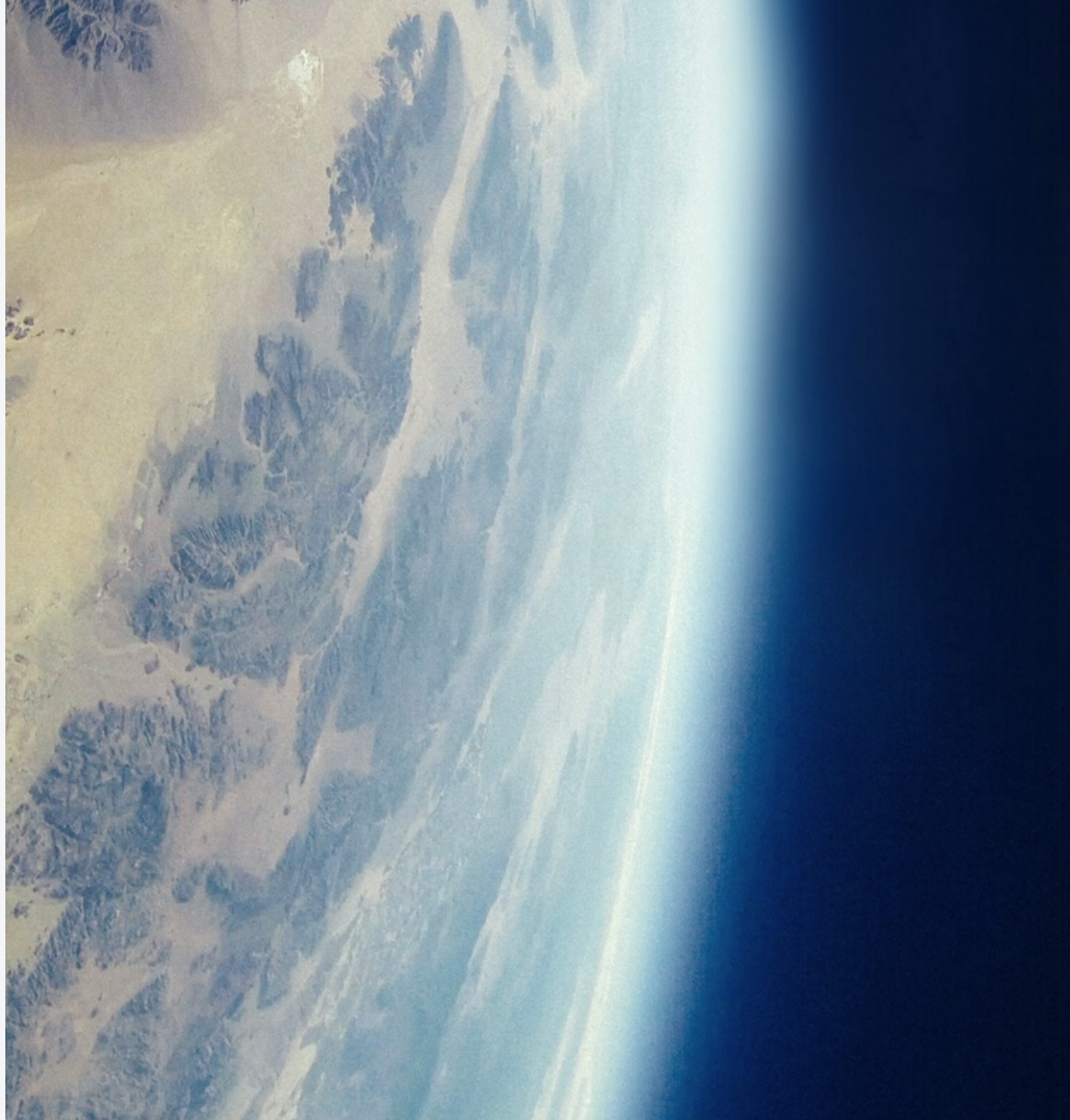
Perspectives from South Africa

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University of the Western Cape



UNIVERSITY of the
WESTERN CAPE

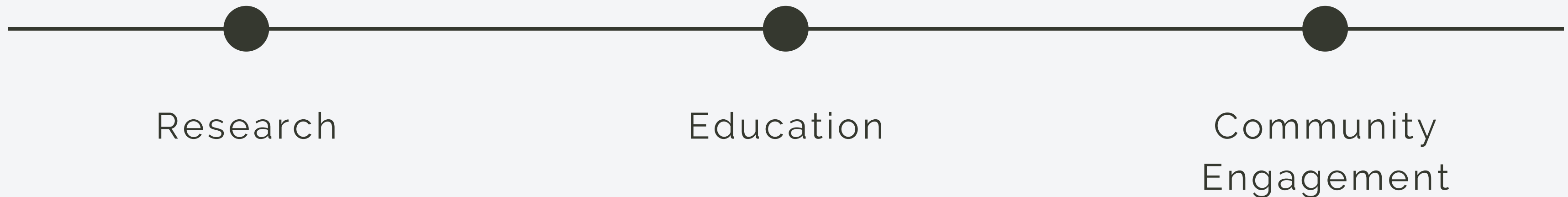




"The Scientific Excellence Working Group takes a broad approach towards scientific excellence as excellence in all aspects of the scientific endeavor. "Scientific excellence" in this sense not only includes excellence in scientific research, but also excellence in connecting science to society, in teaching and mentoring scientists, in science management, and in science advice to policy makers, to name only a few".

Global Young Academy

3 PILLARS OF UNIVERSITIES

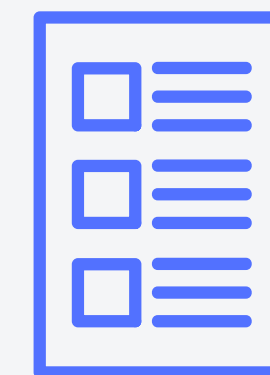




17 GOALS



169 TARGETS



232 INDICATORS

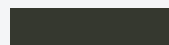
Development

MILLENNIUM DEVELOPMENT GOALS

2000 - 2015

SUSTAINABLE DEVELOPMENT GOALS

2015 - 2030



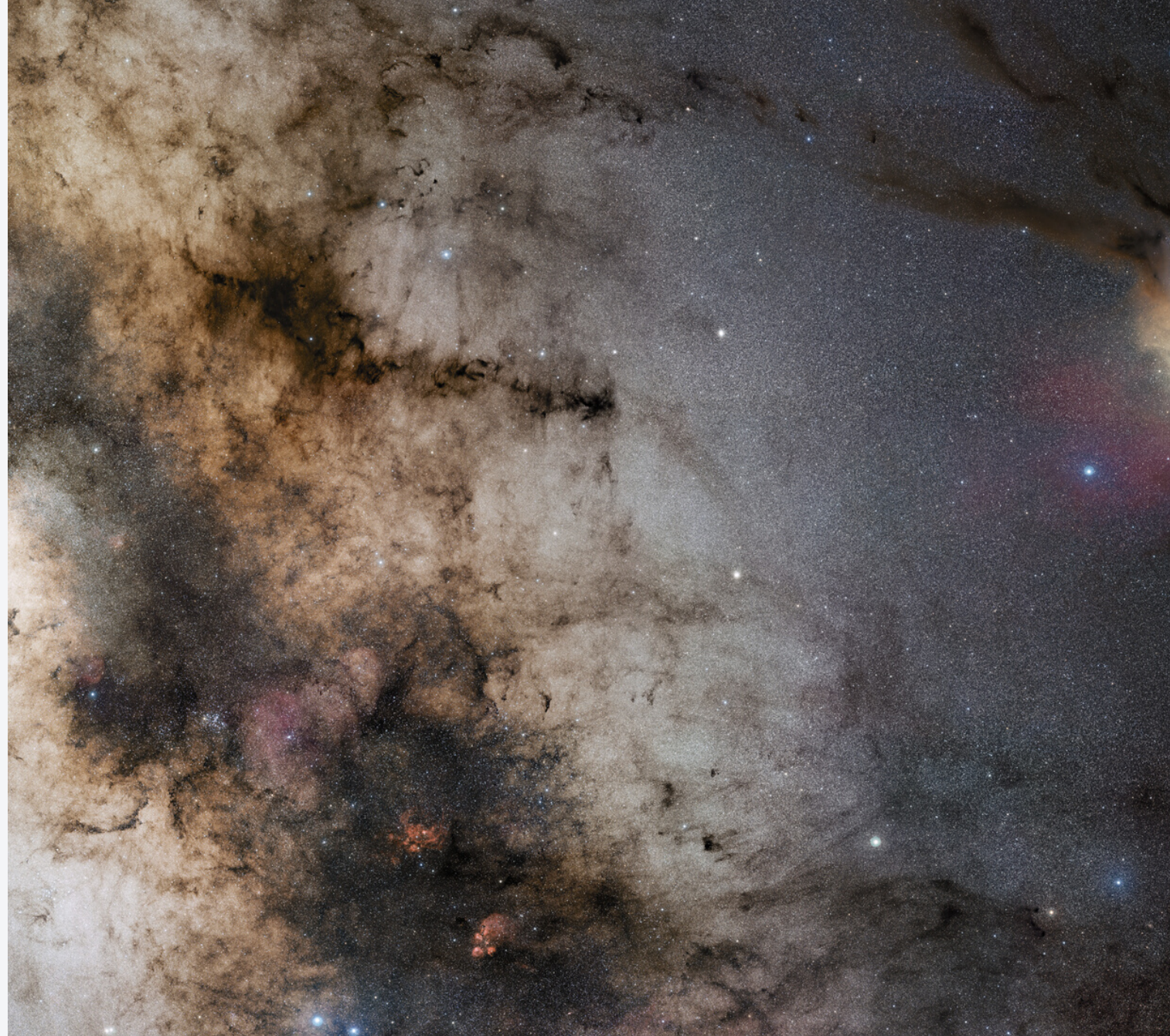


Science in Development

Concerns development directly
Public Health, Energy, Water management,
Agricultural sciences, etc.

Has a voice in policy
Ensuring scientific outputs lead to policy
changes

Followed by implementation
Leads to impact



Fundamental research?

Science not related to
development topics

Astronomy, Quantum computing,
Mathematics, Philosophy, etc.

Skills development

Education leads to development in
principle, but is that process passive or
active?

Inspiration

Dreaming big should not be a privilege

Brief history of Astronomy in South Africa

Colonial Origins

Royal Observatory in Cape
Town (1820)
and Johannesburg Observatory
merged in 1972

HartRAO

NASA Satellite monitoring dish
1960 - 1975

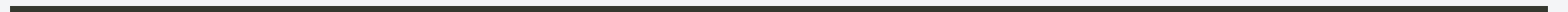
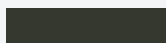


SALT

- 100% South African built
- Biggest single-dish optical telescope in the Southern Hemisphere
- 5x cheaper than similarly powerful telescope
- Part of world-changing discoveries
- Collateral Benefits programme



**SOUTHERN AFRICAN LARGE
TELESCOPE**

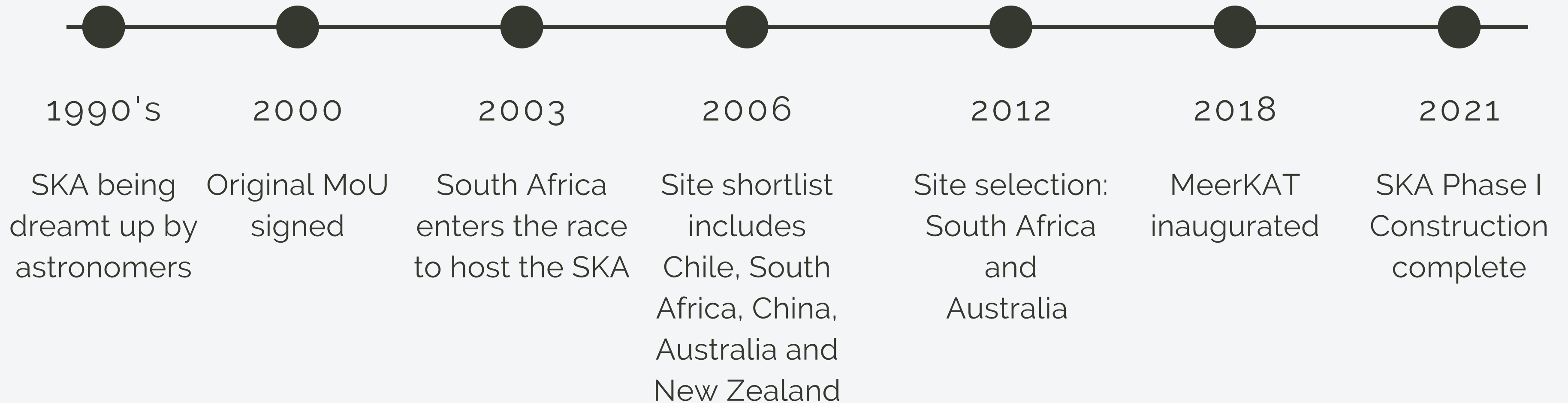




THE SQUARE KILOMETRE ARRAY

How did we get there?

SKA HOST BIDDING PROCESS





The other story

Astronomy Geographic Advantage Act of 2007

Preserves the scientific research environment.
Restricts what development can take place.

"Mayhew-Ridgers and van Jaarsveld looked at a range of options, but settled on developing their own antenna technology to solve the problem."

"The solution was an antenna based on phased-array principles, providing omnidirectional coverage but also blocking the RF transmissions along a single direction (that would correspond with the bearing of the SKA core site)."

"The antenna has since been tested in the Karoo and performs extremely well. Trialling measurements have shown that the RF signal levels at the proposed SKA core site can be reduced significantly, while at the same time, much of the original GSM coverage can be retained," Vodacom said."

MyBroadband 2011

In terms of private sector investment in SKA, Cisco has invested over R66 million including equipment and engineering support for PhD students at Nelson Mandela Metropolitan University (NMMU) to explore how broadband technology can be further scaled in rural areas. In partnership with NMMU, Cisco has supplied a state-of-the-art Optical Transport Research laboratory as well as direct access to key expert resources in the company's Optical Engineering Business Unit based in San Jose,

cisco





Telescope building

Engineering, Cooling, Computer infrastructure, Information transport (optic fibre), radio interference insulation, etc.

Cloud Computing

The overarching goal of IDIA is to build within the South African university research community the capacity and expertise in data intensive research to enable global leadership on MeerKAT large survey science projects and large projects on other SKA pathfinder telescopes.



Technology development



HCD programme

1168 bursaries distributed in total (2019)

Annual postgraduate bursary holder conference

SKA Research Chairs

Impact on HDIs

For the 2016 Nature Index, covering the period 1 June 2015 to 31 May 2016, UWC is ranked number 1 in Physical Science - not just in South Africa, but for Africa as a whole.



SOL PLAATJE
UNIVERSITY

Human Capital Development

Hackathons

Big Data skills

Madagascar 2018

Botswana 2018

South Africa 2018

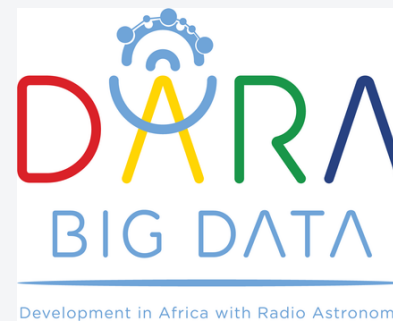
South Africa 2019

Namibia 2019

South Africa 2020

Zambia 2020

Pan-Africa 2020



Entrepreneurship skills

South Africa 2019

Research project as a start-up simulation

Fundraising Role Play

CV Labs



Inter-University Institute
for Data Intensive Astronomy





Tankiso
Moso
Instrumentation



Mokhine
Motsoaledi
Binary stars



Wanga
Mulaudzi
Radio astronomy



Denisha
Pillay
Radio astronomy



Sambatra
Rajohnson
Radio astronomy



Mpati
Ramatsoku
Galaxy Evolution



Tanita
Ramburuth-Hurt
Gas in galaxies



Shilpa
Ranchod
Galaxy clusters



Katlego
Sejake
Radio astronomy



Jessymol
Thomas
X-ray binaries



Nicole
Thomas
Black holes and AGN



Sarah
White
Multi-wavelength AGN

Science in South Africa is changing
Young scientists are taking the lead
Astronomy in Colour initiative

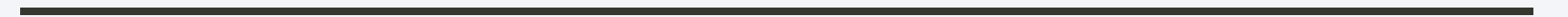
Outreach is key

Nearly all the young astronomers are
involved in Outreach

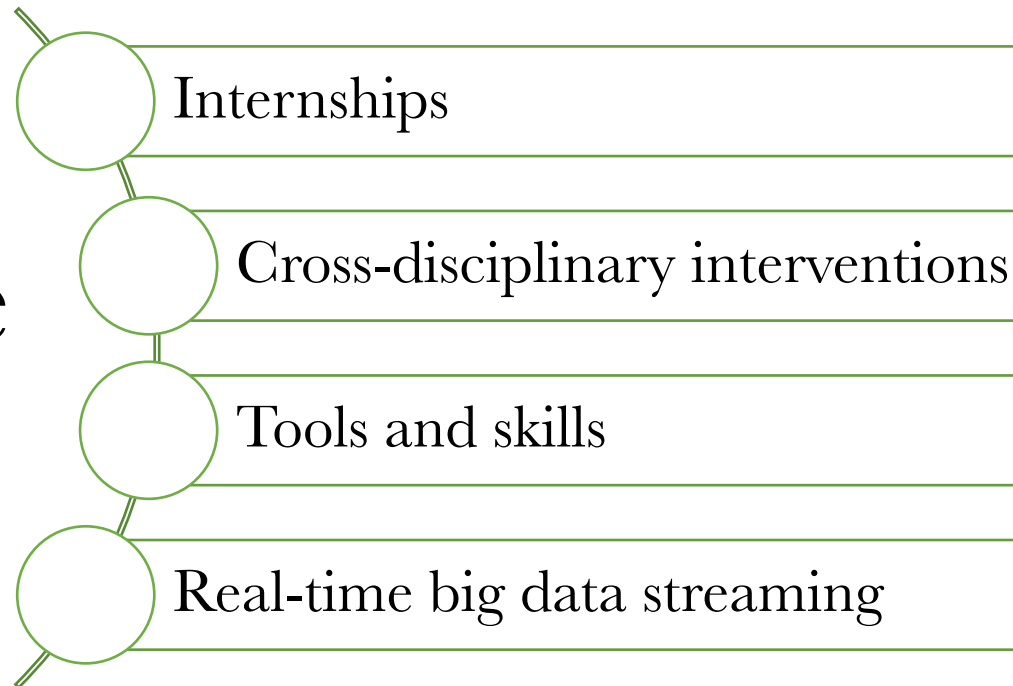
Inspiration

Children who see these astronomers and
scientists have role models they didn't
have before.

Owning their space



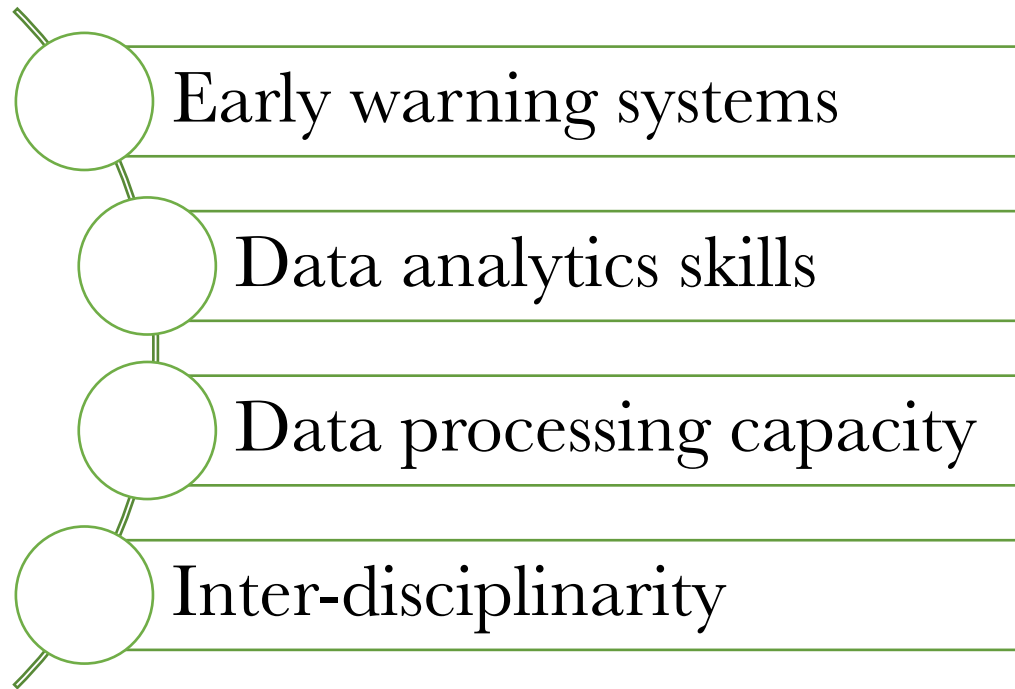
big data
big compute



Industry



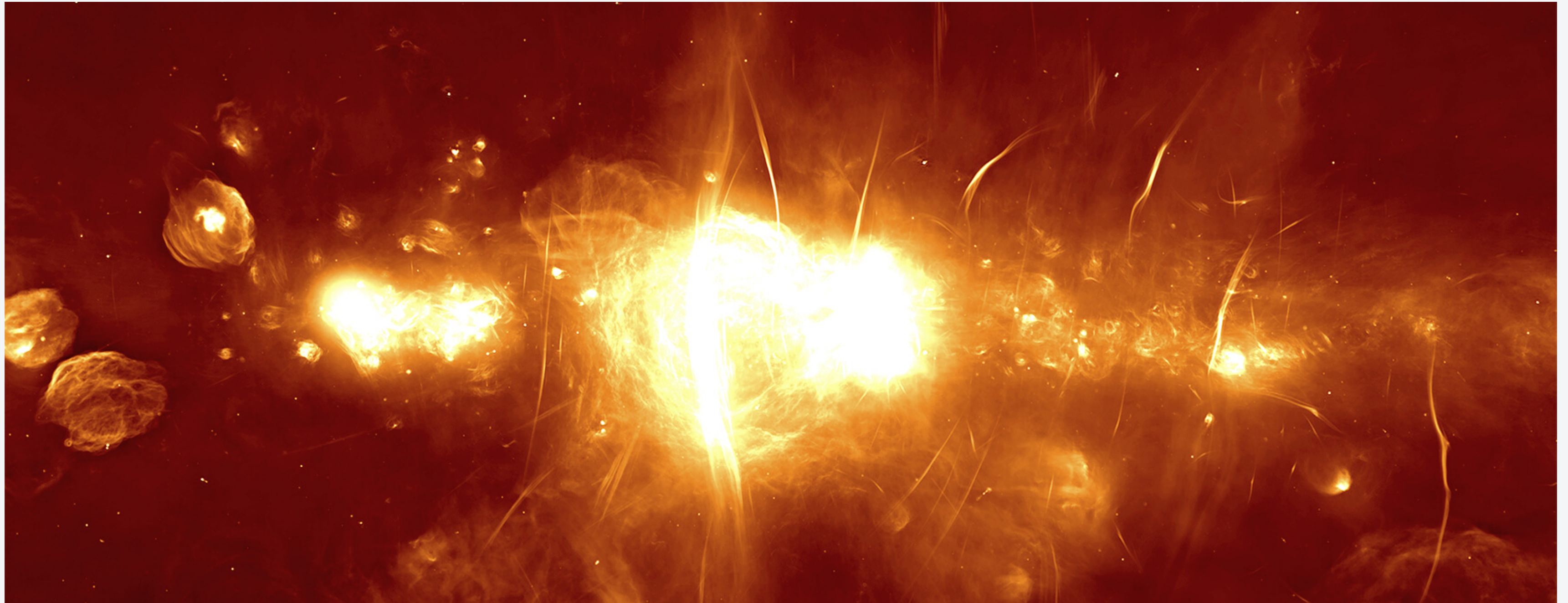
Life on Earth



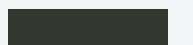
Near Earth objects

COVID-19 and
other pandemics

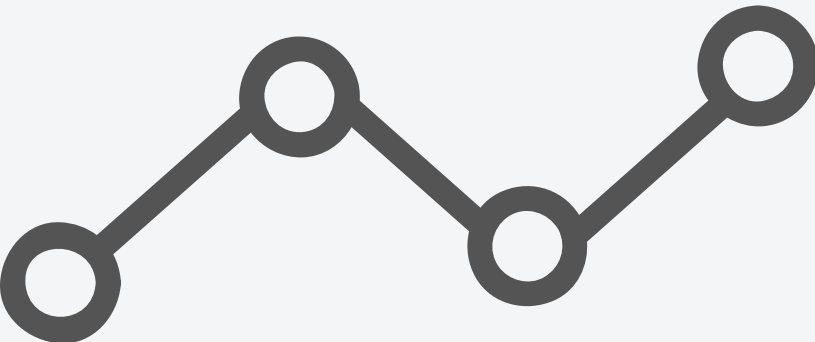
Disaster management



Clearest image of the centre of the Milky Way



Scientific excellence stimulates development - if an active process



Development is fundamentally interdisciplinary



Transformation is key and needs real efforts



Concerted investment in scientific excellence has placed South Africa firmly on the world map of science

