

IAU STRATEGIC PLAN ASTRONOMY FOR DEVELOPMENT

GEORGE MILEY
Leiden University

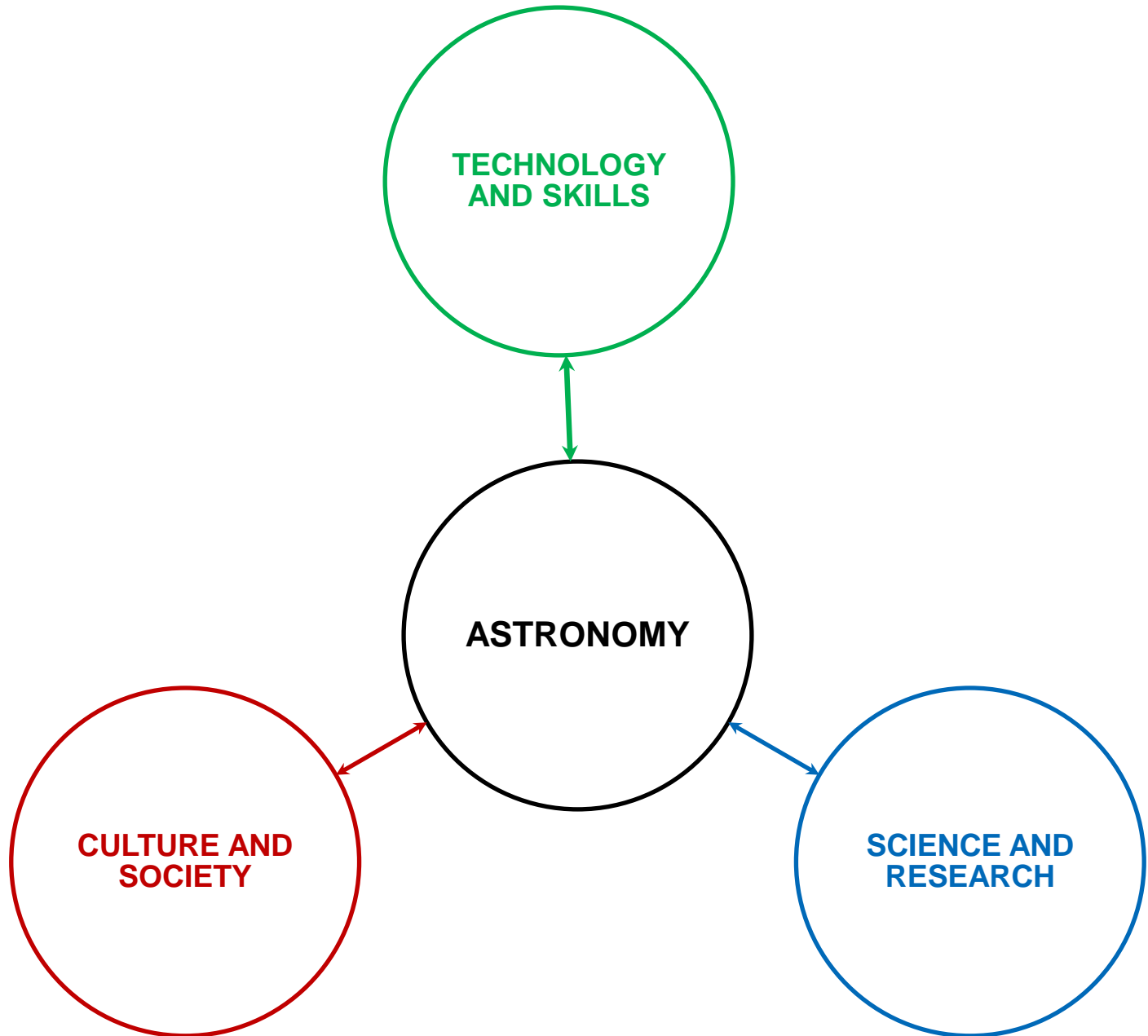
Emeritus IAU Vice President
(Portfolio: Development & Education)

- Rationale and motivation
- Strategy
- 3. Young children and astronomy for development
- Implementation
 - How far have we got?
 - Kevin Govender



ftp://ftp.saao.ac.za/outgoing/kg/astro4dev/stratplan_2012update.pdf

THREE PILLARS OF DEVELOPMENT



TECHNOLOGY DRIVEN BY ASTRONOMY

Charge coupled devices (cameras)

Wireless Internet

Most accurate clocks

Sensitive antennas

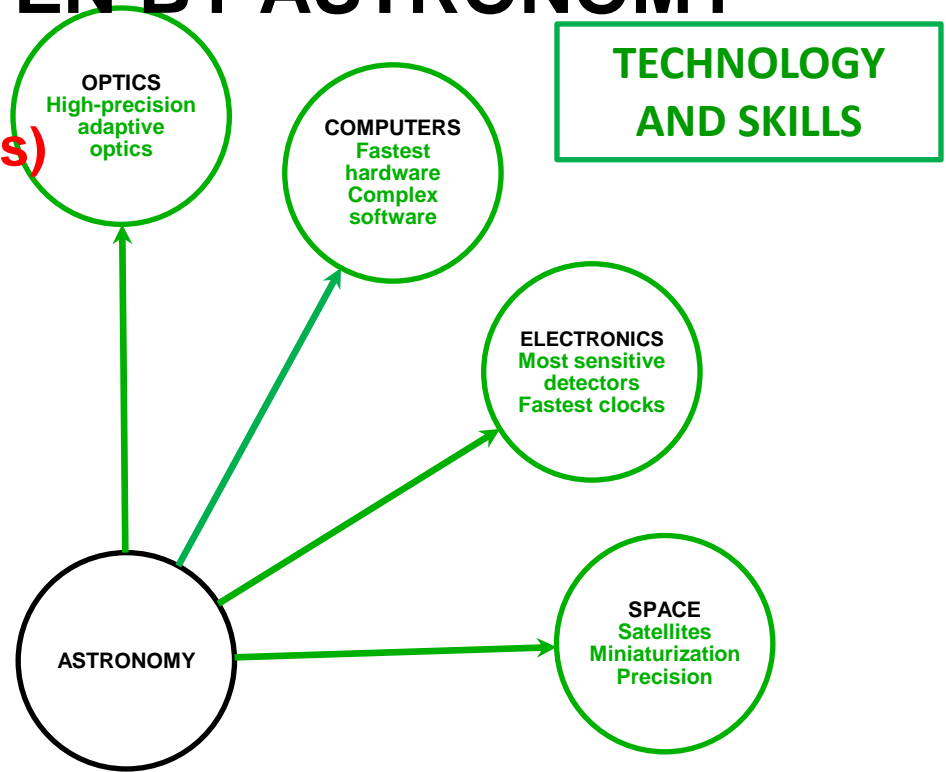
Low-noise amplifiers

Supercomputers

GPS navigation

Medical imaging

**NEED TO OBSERVE
FAINTEST OBJECTS**



**TECHNOLOGY
AND SKILLS**

ASTRONOMY

OPTICS
High-precision
adaptive
optics

COMPUTERS
Fastest
hardware
Complex
software

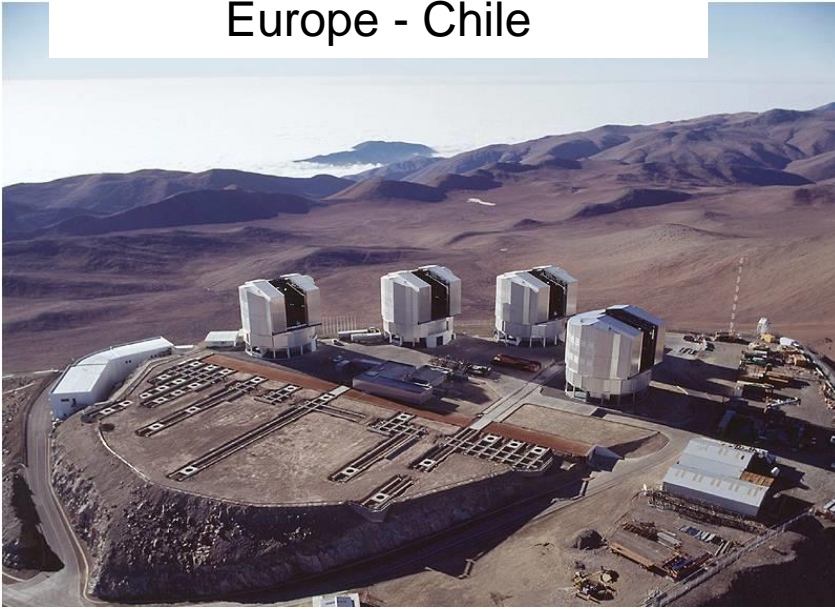
ELECTRONICS
Most sensitive
detectors
Fastest clocks

SPACE
Satellites
Miniaturization
Precision

CUTTING-EDGE TECHNOLOGY

VERY LARGE TELESCOPE

Europe - Chile



HUBBLE SPACE TELESCOPE

US - Europe



SUBARU – Japan/ Hawaii



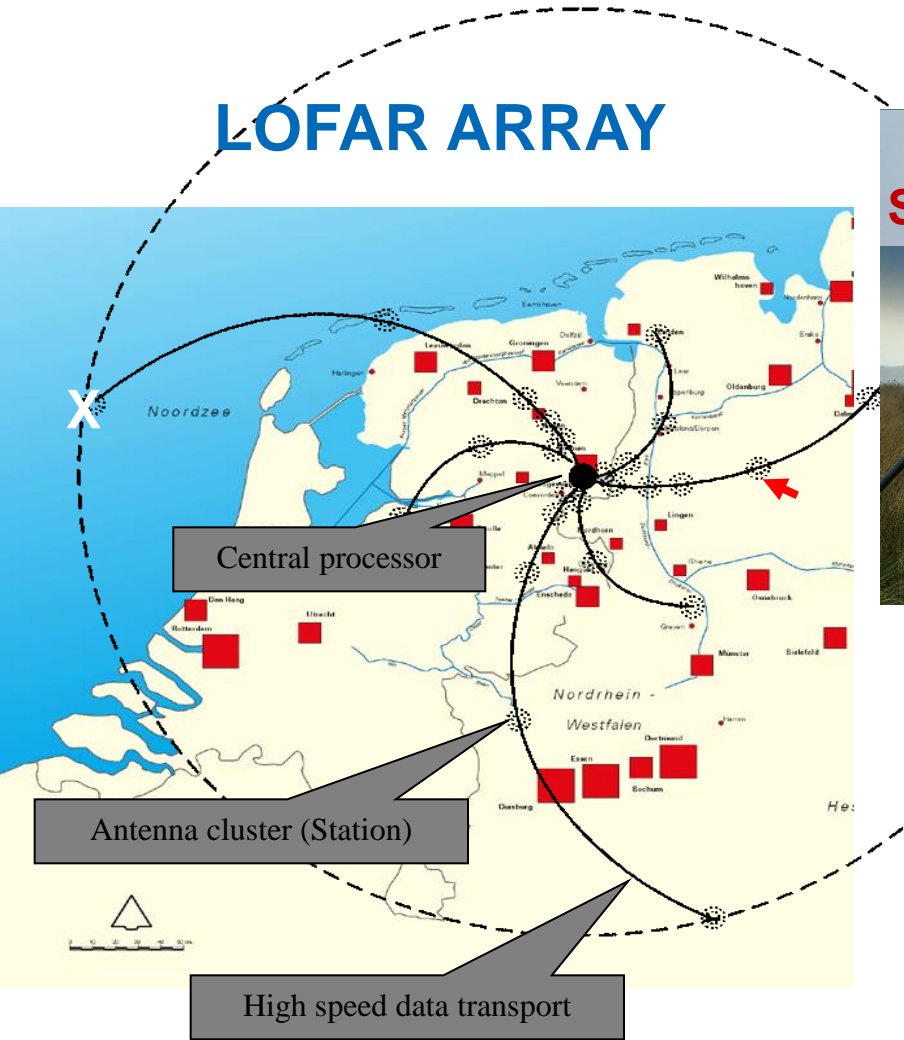
SALT – Southern Africa +



ASTRONOMY DRIVES OTHER APPLICATIONS – EXAMPLE 1

GEOPHYSICS PIGGYBACKS ON RADIO ASTRONOMY

LOFAR ARRAY

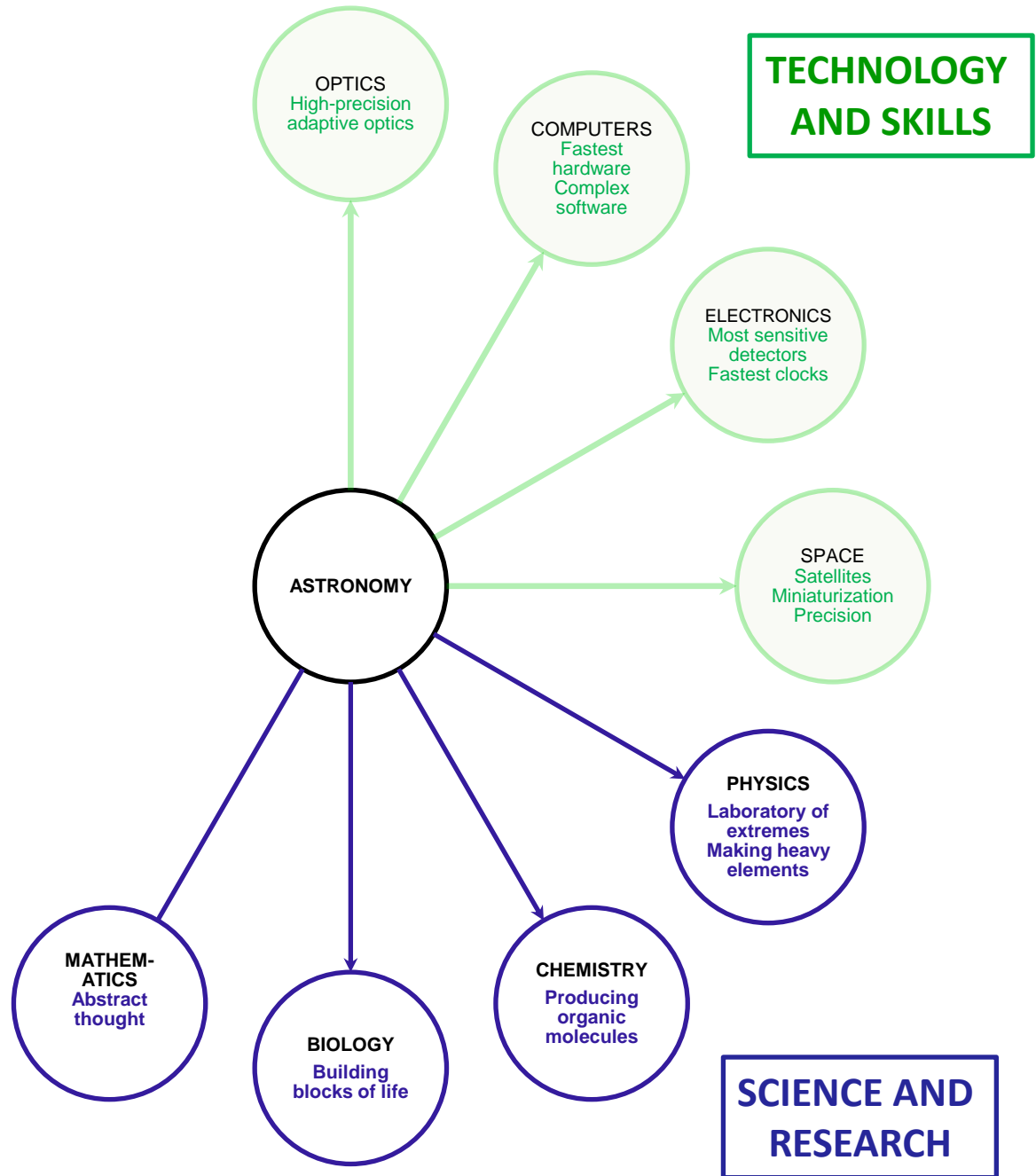


~5000 primitive radio dipoles
Steered by 30TFlop supercomputer



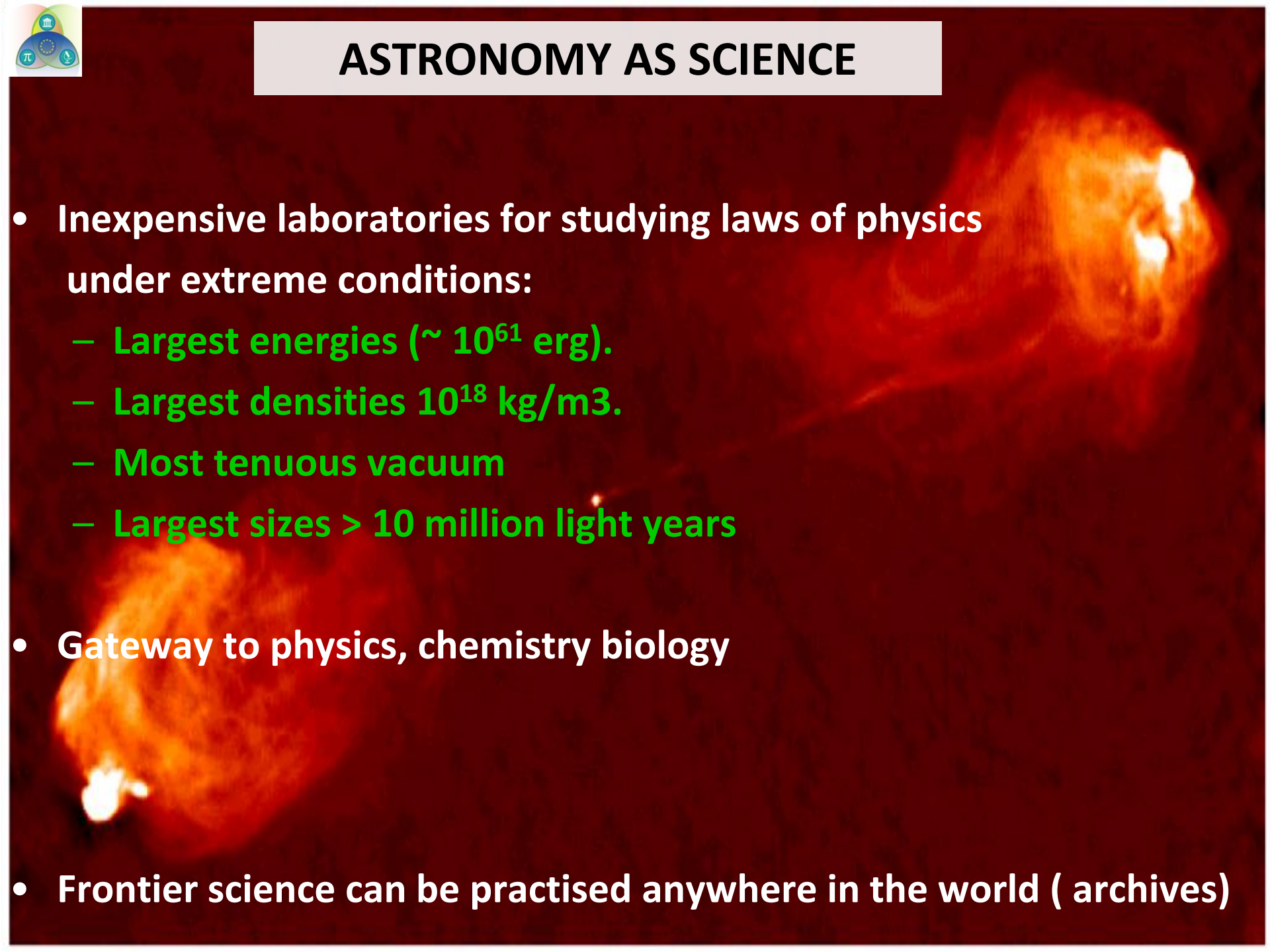
Array of geophones to measure earth subsidence due to gas mining







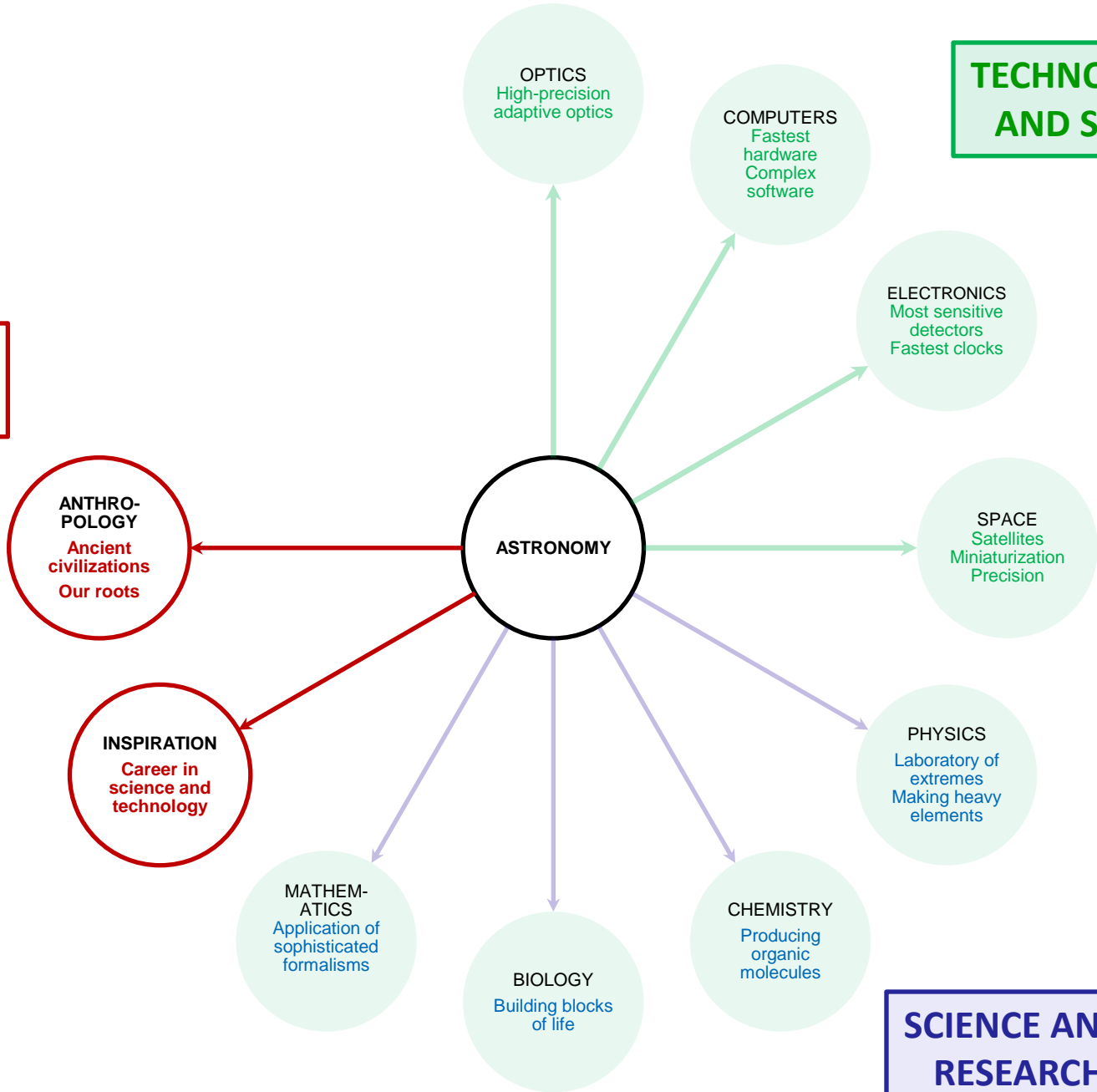
ASTRONOMY AS SCIENCE

- Inexpensive laboratories for studying laws of physics under extreme conditions:
 - Largest energies ($\sim 10^{61}$ erg).
 - Largest densities 10^{18} kg/m³.
 - Most tenuous vacuum
 - Largest sizes > 10 million light years
 - Gateway to physics, chemistry biology
 - Frontier science can be practised anywhere in the world (archives)
- 

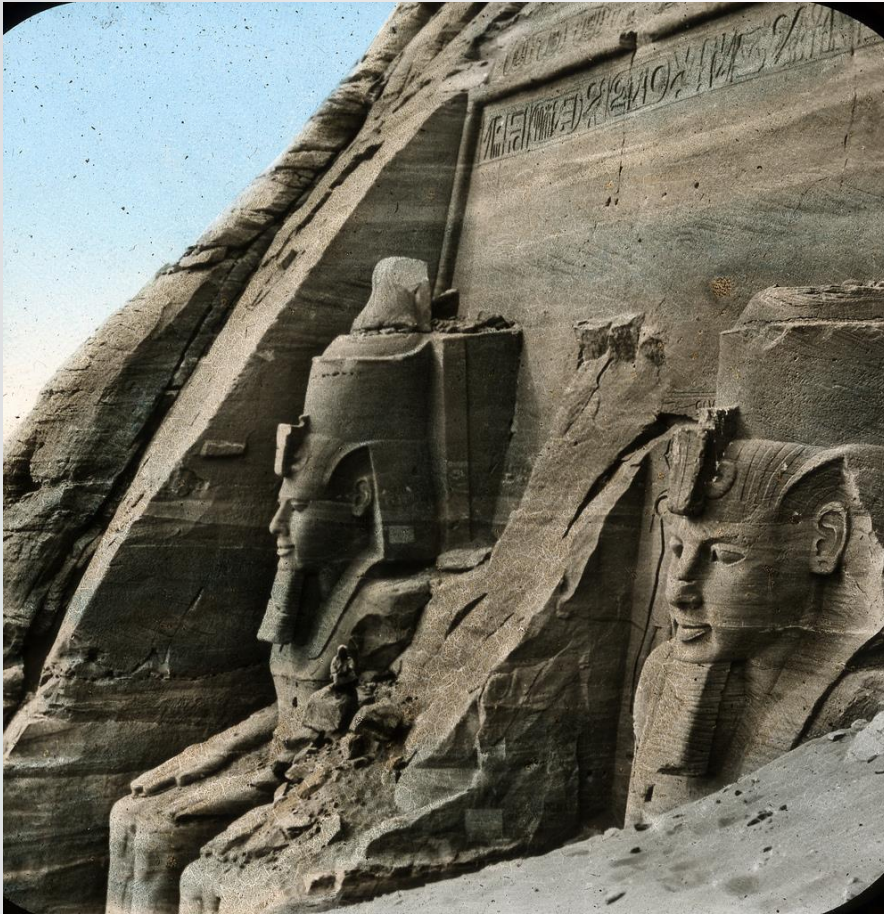
CULTURE AND SOCIETY

TECHNOLOGY AND SKILLS

SCIENCE AND RESEARCH



MIDDLE EAST AND NORTH AFRICA HAVE RICH ASTRONOMICAL HERITAGE



EGYPT - ABU SIMBEL

Sun illuminates sculpture on back wall



JORDAN - PETRA

At winter solstice

sun illuminates ancient deity
and mountain casts shadow of lion' head

CULTURE AND SOCIETY

HISTORY
Evolution of Universe
Our roots

ANTHROPOLOGY
Ancient civilizations
Our roots

INSPIRATION
Career in science and technology

ASTRONOMY

MATHEMATICS
Application of sophisticated formalisms

BIOLOGY
Building blocks of life

CHEMISTRY
Producing organic molecules

PHYSICS
Laboratory of extremes
Making heavy elements

SCIENCE AND RESEARCH

TECHNOLOGY AND SKILLS

OPTICS
High-precision
adaptive optics

COMPUTERS
Fastest hardware
Complex software

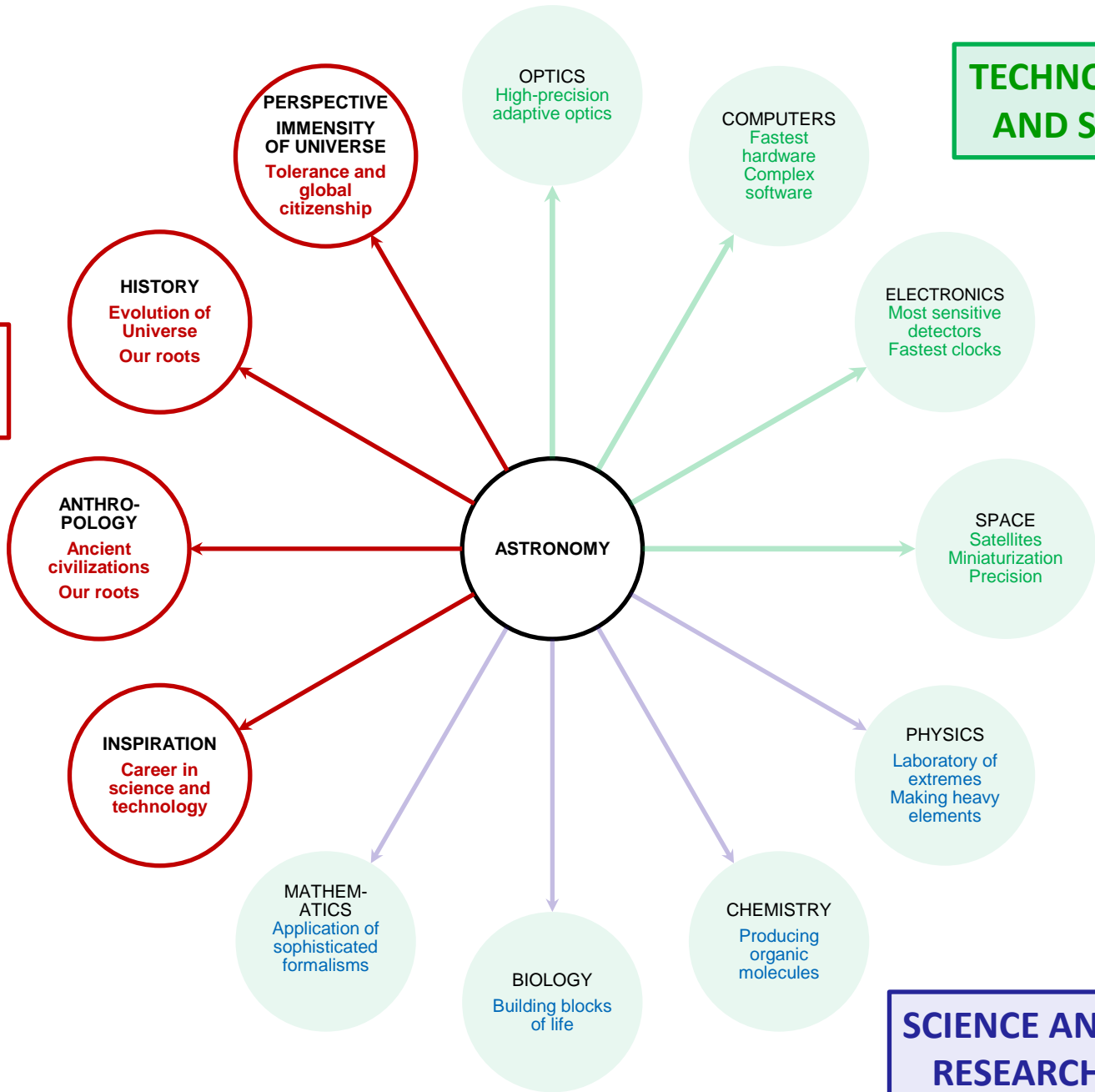
ELECTRONICS
Most sensitive detectors
Fastest clocks

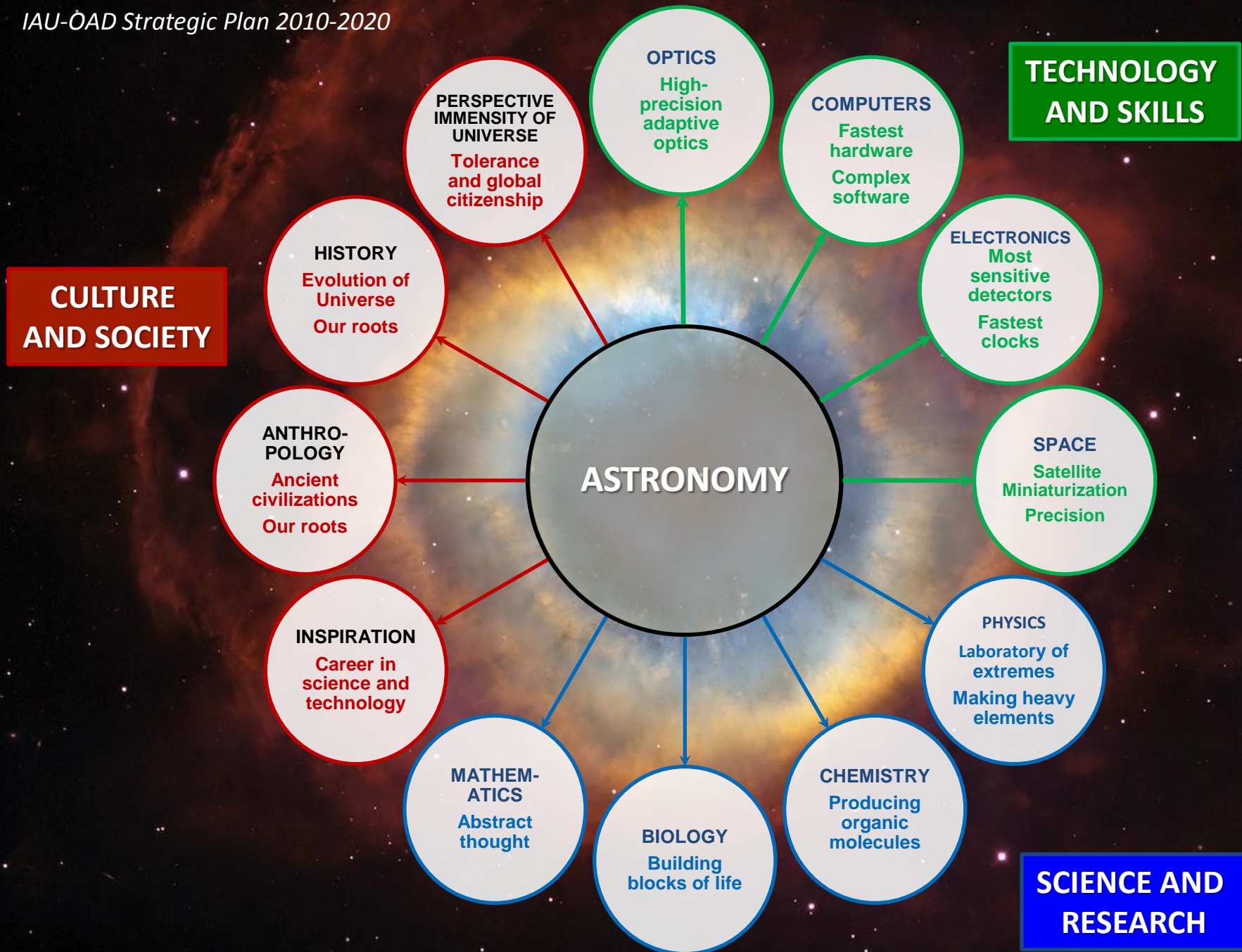
SPACE
Satellites
Miniaturization
Precision

CULTURE AND SOCIETY

TECHNOLOGY AND SKILLS

SCIENCE AND RESEARCH





IAU STRATEGIC PLAN

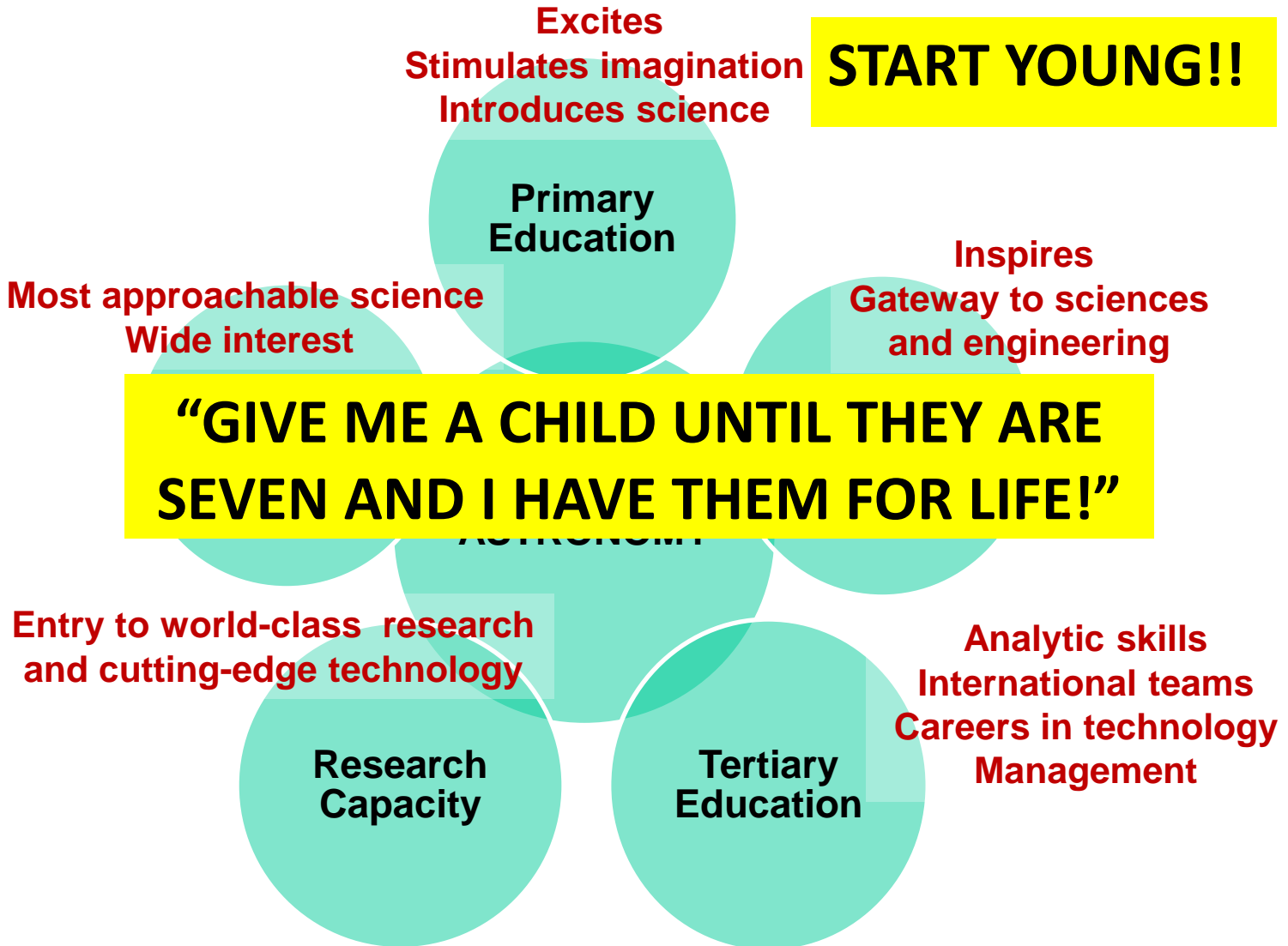
“ASTRONOMY FOR DEVELOPMENT”

http://iau.org/static/education/strategicplan_091001.pdf

- Long term vision and goals for decade
- Strategy
 - Integrated phased approach
 - Increased regional involvement (bottom-up)
 - Demand driven from the regions
 - Enlarge no, of volunteers
 - Multidisciplinary, Use expatriates
 - Build on IYA2009
- Implementation roadmap includes
 - Set up and operate global coordinating office
 - OAD
 - Regional coordinating offices
 - ROADS



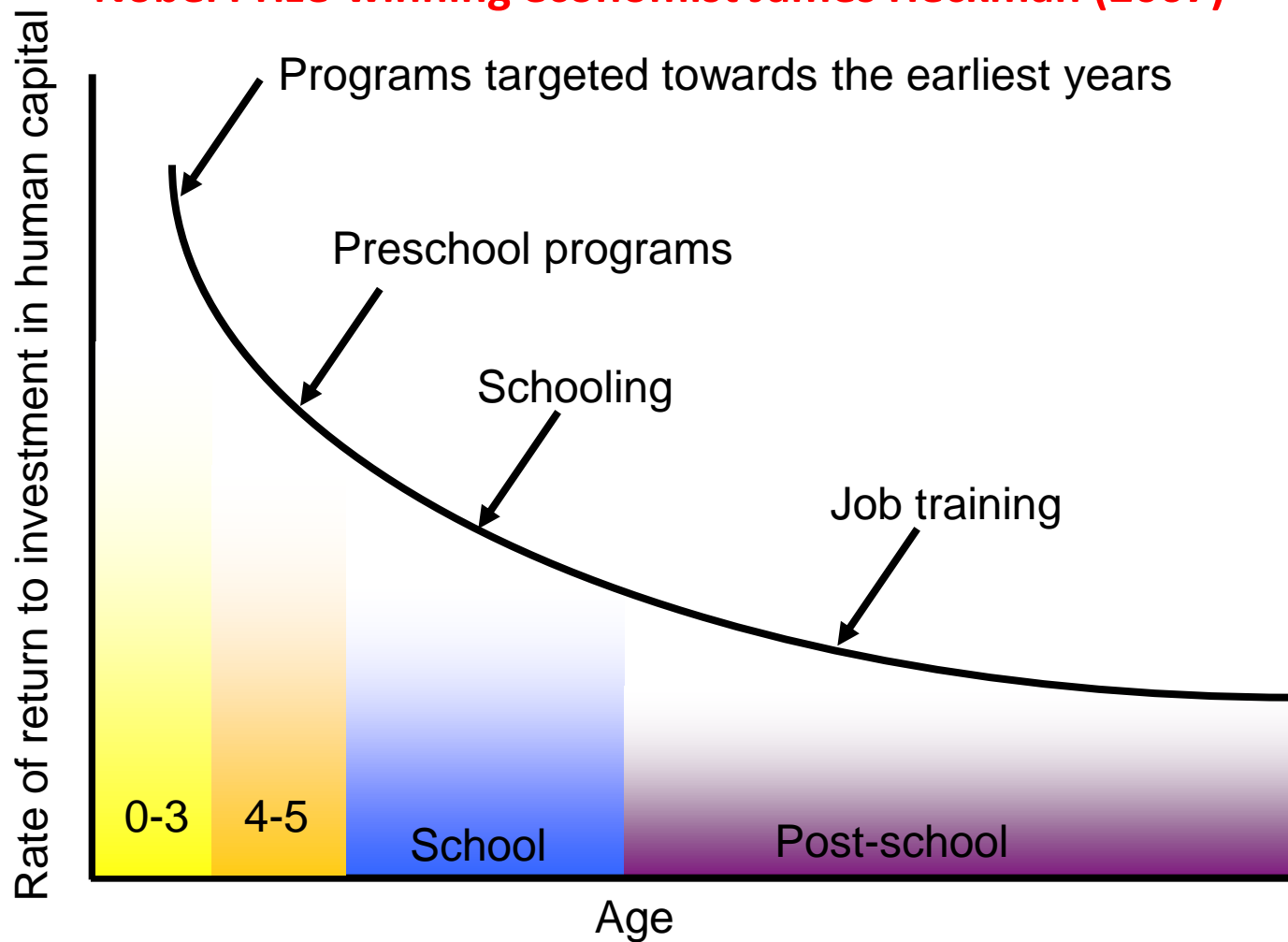
TOOLS OF ASTRONOMY FOR DEVELOPMENT



CAPACITY BUILDING – START YOUNG

Rates of Return for Human Capital Investment at Different Ages

Nobel Prize-winning economist James Heckman (2007)

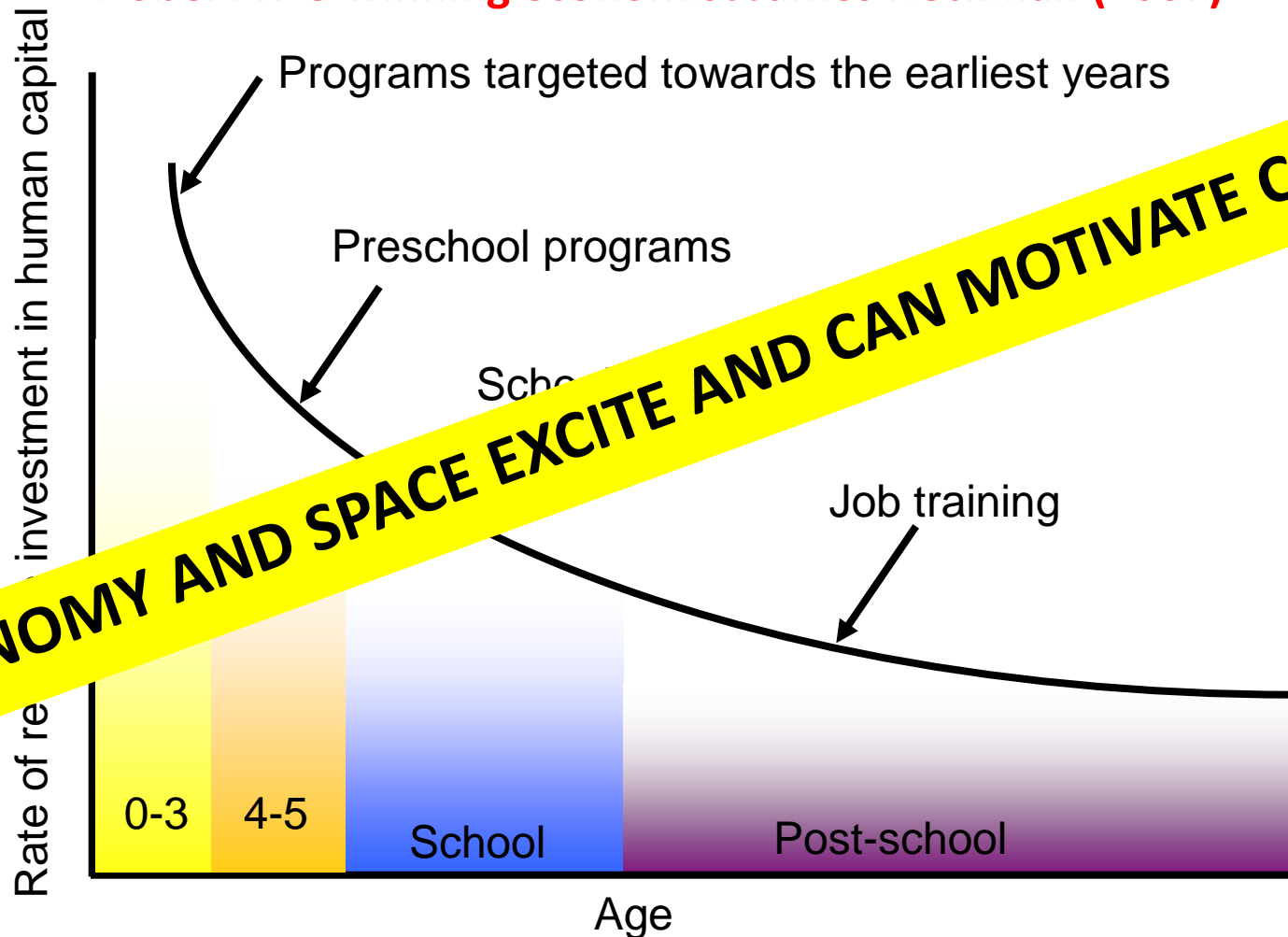


**“Strong case for funding interventions
in early childhood for disadvantaged children”**

CAPACITY BUILDING – START YOUNG

Rates of Return for Human Capital Investment at Different Ages

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“Strong case for funding interventions in early childhood for disadvantaged children”

MUCH MORE THAN JUST ECONOMIC EFFECTIVENESS AWARENESS OF UNIVERSE GIVES PERSPECTIVE CAN HELP COMBAT FANATICISM

"Fanatic ethnic, religious or national identifications are difficult to support when we see our planet as a fragile, blue crescent fading to become an inconspicuous point of light against the bastion and citadel of the stars."
CARL SAGAN

UNIVERSE AWARENESS
www.unawe.org

EARTH FROM SATURN (CASSINI)



UNIVERSE AWARENESS (UNAWE)

Astronomy-based program with social goals



Exposes **DISADVANTAGED** young children (4 – 10) to **INSPIRATIONAL** aspects of astronomy

- Use **INSPIRATION** and **FUN** of astronomy to
 - **Introduce excitement of science**
 - Demonstrate power of rational thought
 - Motivate development of language and numeric skills
- Use **PERSPECTIVE** of astronomy to
 - **Broaden children's minds**
 - Stimulate sense of internationalism, tolerance, respect at formative age
- **Global reach**
 - **Activities in 63 countries**
 - 5th UNAWE International Workshop Leiden, 5 – 9 October 2015

UNAWE IN MORE THAN 60 COUNTRIES



UNAWE Zimbabwe

UNAWE Zimbabwe
16 photos



Aruba workshop
111 photos



Deadly Moons drawing
workshop
13 photos



UvA stargazing
27 photos



Open Day Old
Observatory...
24 photos



Duostage The Hague
2010
75 photos



Duostage Utrecht 2010
59 photos



Weekend van de
Wetenschap -...
17 photos



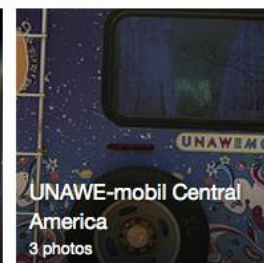
Mongolia
23 photos



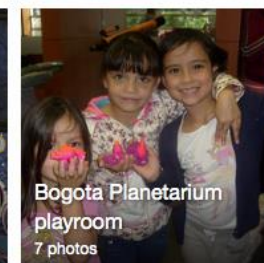
Duostage closing event
47 photos



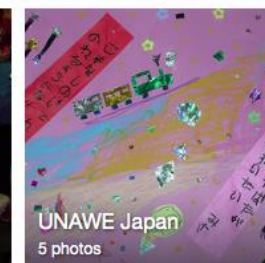
Coder Dojo
8 photos



UNAWE-mobil Central
America
3 photos



Bogota Planetarium
playroom
7 photos



UNAWE Japan
5 photos



UNAWE Indonesia
52 photos



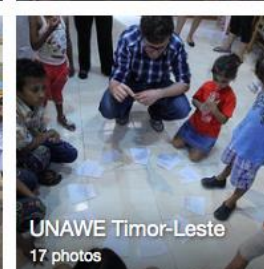
UNAWE Philippines
4 photos



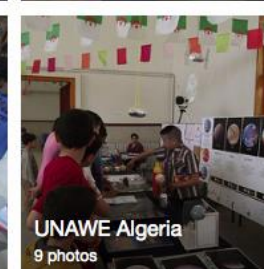
UNAWE Bulgaria
5 photos



UNAWE Nigeria
25 photos



UNAWE Timor-Leste
17 photos



UNAWE Algeria
9 photos



UNAWE Resources
13 photos



Dies Natalis 2014
14 photos



Dutch Mission X 2014
32 photos



Deadly Moons
Workshop -...
5 photos



1 June 2013 -
Mozambique
14 photos



UNAWE Chile 2013
4 photos



Deadly Moons
Workshop in...
8 photos



Space Scoop Story -
British...
30 photos



UNAWE RESOURCES: e.g. EARTH BALL WITHOUT BORDERS



- > 10 000 distributed to schools in > 60 countries

UNAWE RESOURCES: UNIVERSE IN A BOX



- ~ 1000 distributed to schools over whole world

ISLAMIC ASTRONOMY HERITAGE TOOLBOX

EU Space Awareness deliverable : Prototype ~ June 2016

- **Development**
 - Dr. Cecilia Scorza, Max Planck Heidelberg/ Heidelberg University
 - Prof. Hassane Darhmaoui, Al Akhawayn University, Ifrane, Morocco
- **Audience**
 - Migrant and ethnic European children and their teachers
- **Content**
 - Stories, hands-on activities, teacher manual etc.
- **Philosophy – “Explore the journey of ideas that grow and influence each other”**
 - Shared history – of collaboration, coexistence and tolerance
 - Shared night sky - Arabic names of stars
 - Need for calendars
 - Demonstrate influence of Islamic civilisation on modern space science
 - Combat stereotypes

ISLAMIC ASTRONOMY HERITAGE TOOLBOX

Based on 4 Moslim scientists – 2 women en 2 men



Fatima Al Fihri

9th century,
Fez Morocco

Founder of
Qarawiyyin
University, Fez



Al-Biruni

10th century,
Aleppo, Syria.

She was famous
scientist who
designed and
constructed
astrolabes.



Abd al-Rahman al-Sufi

(902-960), Rey, Iran.

Identified Large
Magellanic Cloud and
made earliest recorded
observation of
Andromeda galaxy.



Ibn Al Haytham

(Alhazen, 965-1040),
Basra, Iraq.

Among most influential
scientists of all time.
Referred to as father of
experimental physics,
modern optics and
scientific methodology.

INPUT AND FEEDBACK WOULD BE APPRECIATED

TUNISIAN ASTRO-BUS



- Pioneering activity of La Cité des Sciences, Tunis.
- Transports small telescope + mini-planetarium + exhibition.
- Inspiring children throughout Tunisia, even in remotest villages.
- During 2008 > reached 150,000 children!

**Idea could be exported to many countries
Also implemented by Galileo –Mobile**

POLITICAL IMPORTANCE - ASTRONOMY FOR DEVELOPMENT

- **EUROPEAN PARLIAMENT; Written Declaration 45/2011 March 2012 signed by 394 MEPs**
 - SUPPORTS ***THE DEVELOPMENT OF SCIENCE CAPACITY in Africa through greater investment in research infrastructures, WITH PARTICULAR FOCUS ON RADIO ASTRONOMY***
- **AFRICAN UNION; Declaration AU Assembly 18th ordinary session 29 -30 Jan 2012**
 - PROPOSES the inclusion of ***RADIO ASTRONOMY AS A PRIORITY FOCUS AREA FOR AFRICA'S INTERNATIONAL SCIENCE AND TECHNOLOGY PARTNERSHIPS***
- **PR CHINA; President Xi, 21 August 2012 at IAU GA**
 - ***ASTRONOMY IS A CRUCIAL FIELD OF BASIC RESEARCH. We will make larger and larger investments in such a field.... that will benefit humankind.***
 - ***PUBLIC OUTREACH SHOULD BE GIVEN EQUAL EMPHASIS AS SCIENTIFIC RESEARCH..... to inspire the creativity for science and technological innovation among the public.***

FINAL REMARKS

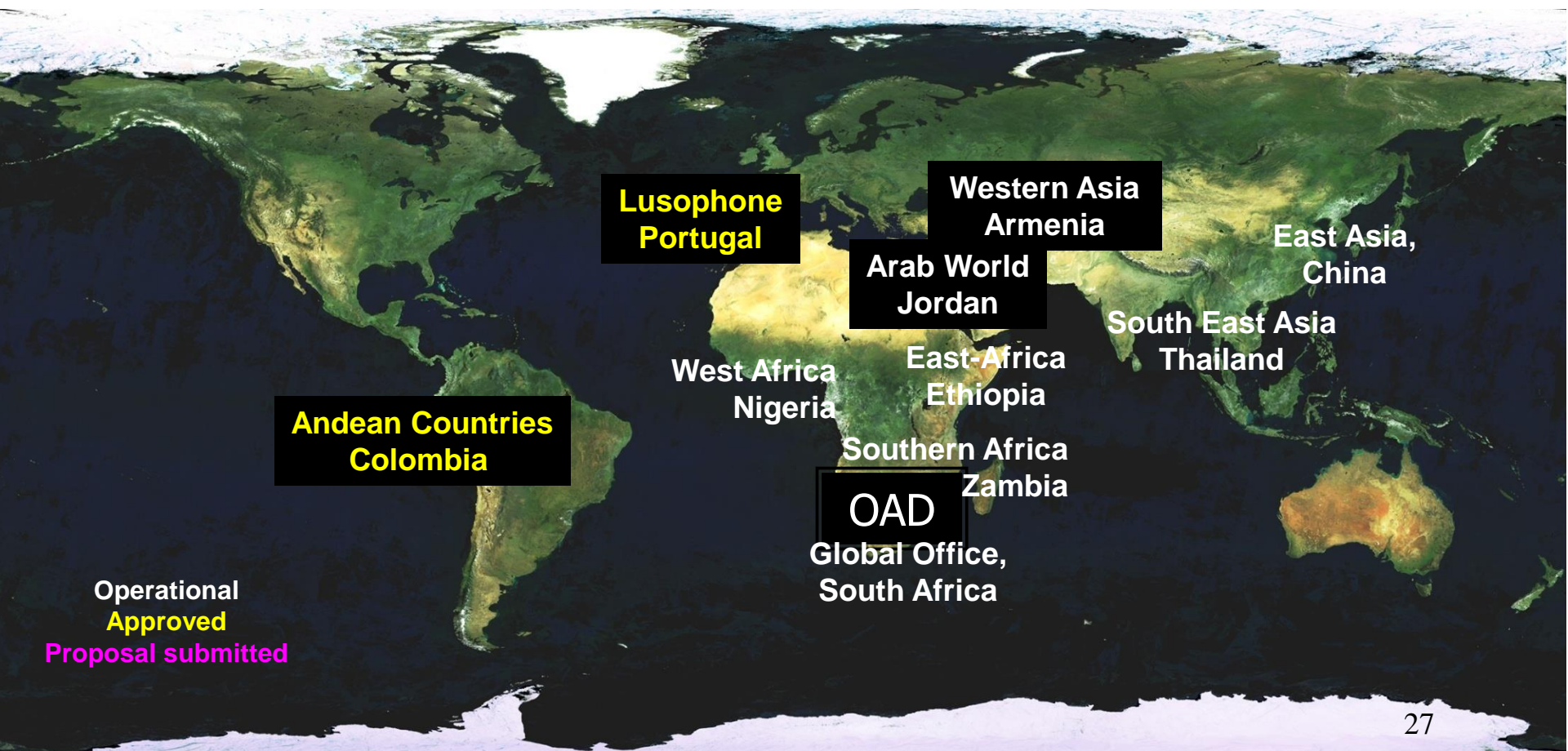
- **Astronomy FOR Development**
 - **Mutually beneficial for society AND astronomy**
 - **Unique for an international scientific organisation**
 - **Sets example for other curiosity-driven sciences**
- **Needs joint effort by professional and amateur astronomers, educators/teachers, outreach experts**
- **Equal partnership**





INAUGURATION IAU ARAB REGIONAL OFFICE OF ASTRONOMY FOR DEVELOPMENT

CONGRATULATIONS DR. IR. AWNI KHASAWNEH



Operational
Approved
Proposal submitted

NALEDI PANDOR

**SOUTH AFRICAN MINISTER OF SCIENCE AND TECHNOLOGY
ADDRESSING SA BUSINESS LEADERS**



