

Astronomy for development

DARA Networking Event, March 2017

www.astro4dev.org

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science
& technology

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA



SAAO

South African
Astronomical Observatory

OAO - OAD - IAU (Divisions)



Knowledge

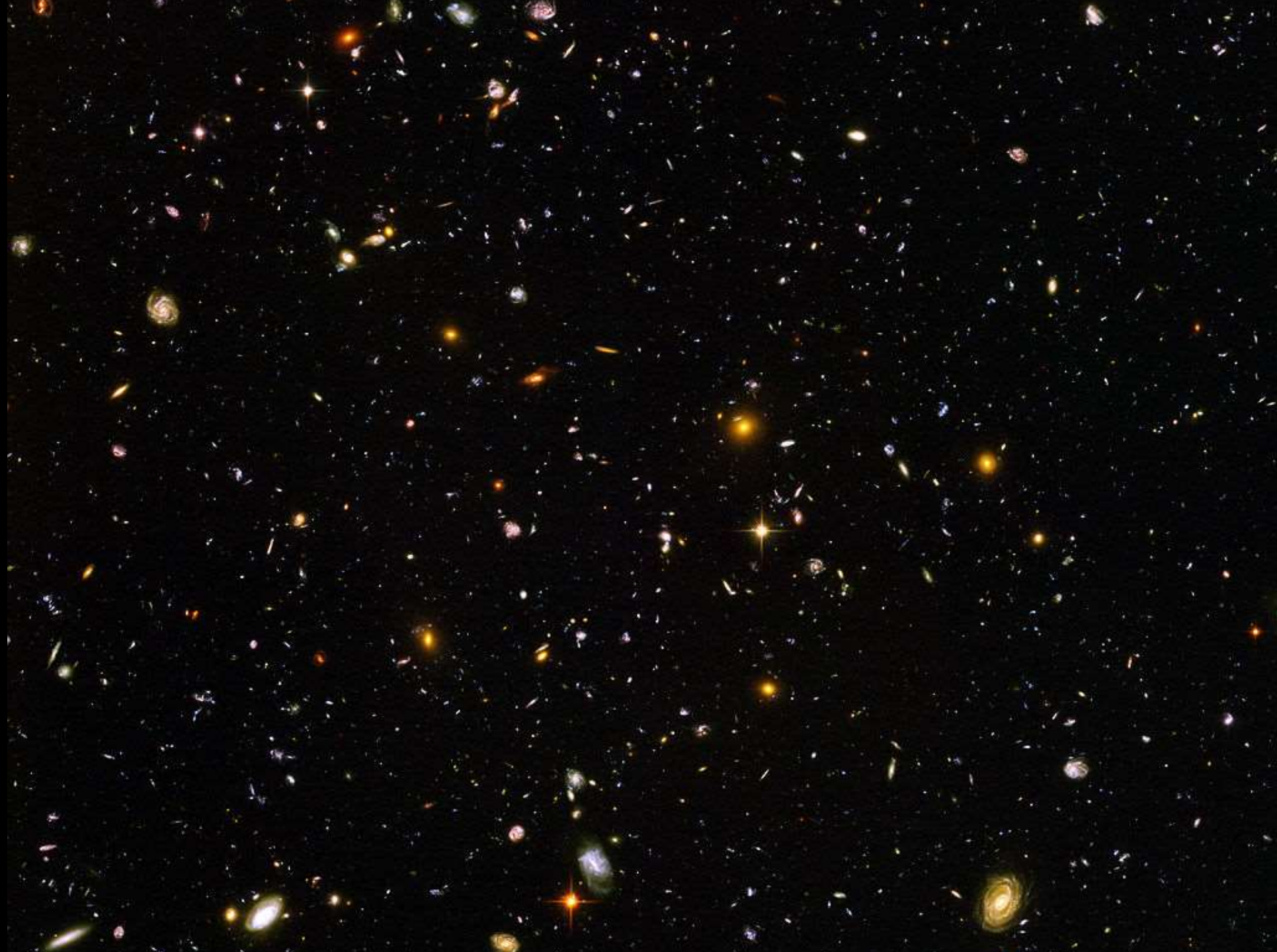


Engagement

Development



International | Office of
Astronomical | Astronomy
Union | for Development







SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS


SUSTAINABLE DEVELOPMENT GOALS

The IAU Strategic Plan 2010-2020:

**CULTURE
AND SOCIETY**

**TECHNOLOGY
AND SKILLS**



**SCIENCE AND
RESEARCH**





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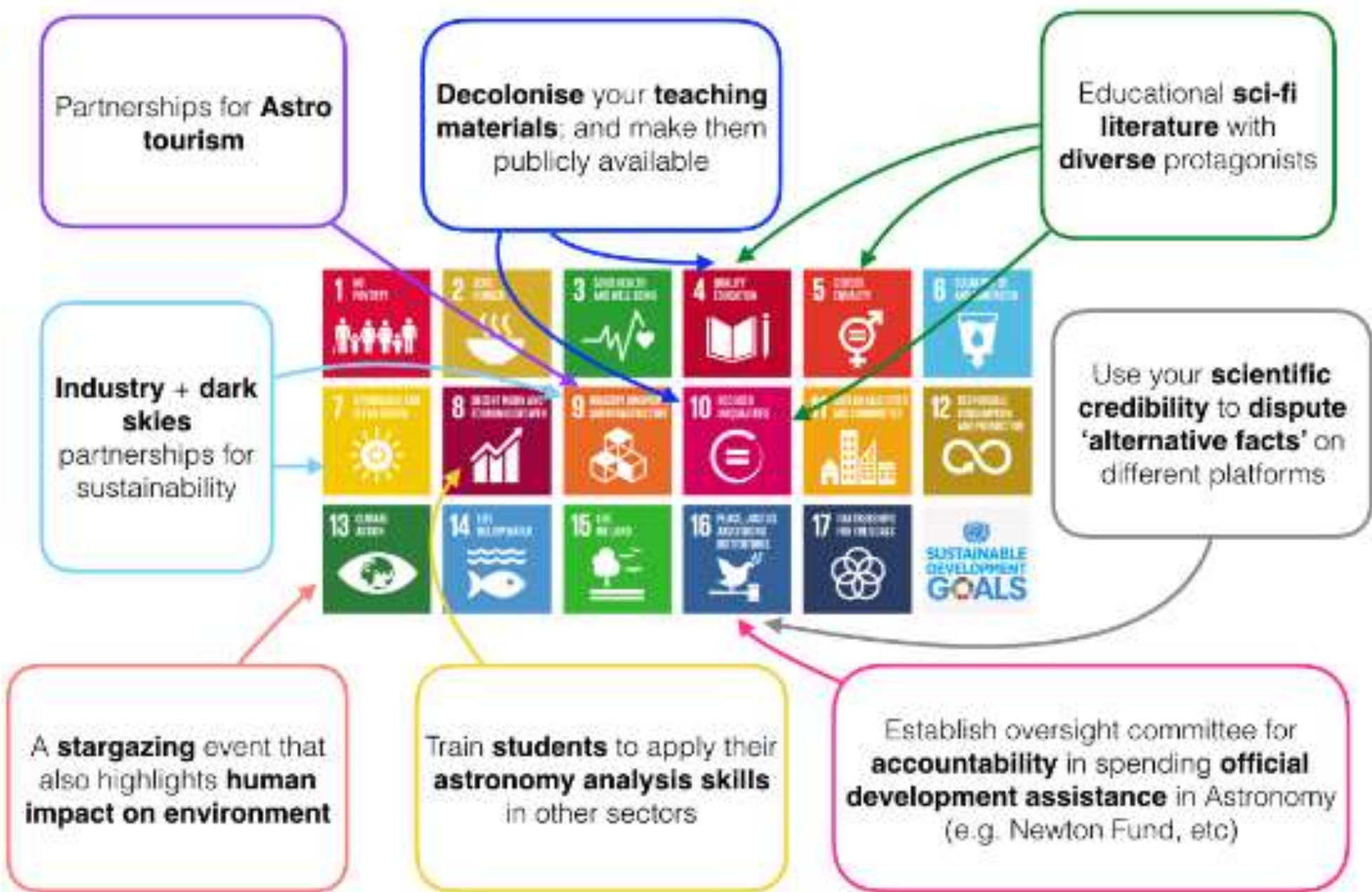
14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

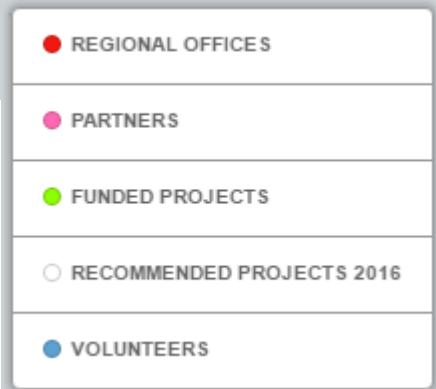
17 PARTNERSHIPS FOR THE GOALS


SUSTAINABLE DEVELOPMENT GOALS





Astronomy for Development
www.astro4dev.org







There has never
been a time of
greater
promise, or
greater peril

Professor Klaus Schwab
Founder and Executive Chairman
of the World Economic Forum

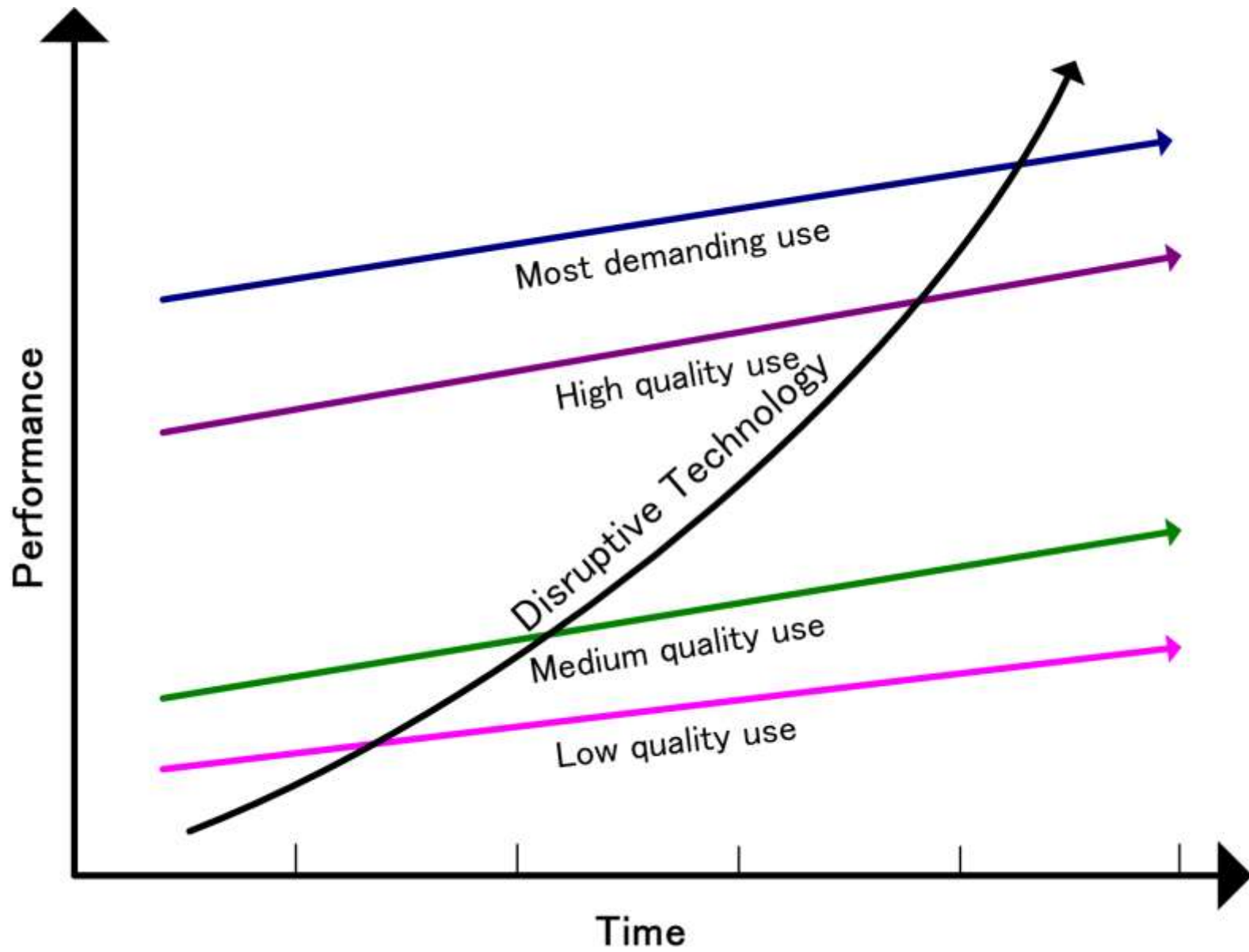


Navigating the next industrial revolution

Revolution	Year	Information	
	1	1784	Steam, water, mechanical production equipment
	2	1870	Division of labour, electricity, mass production
	3	1969	Electronics, IT, automated production
	4	?	Cyber-physical systems

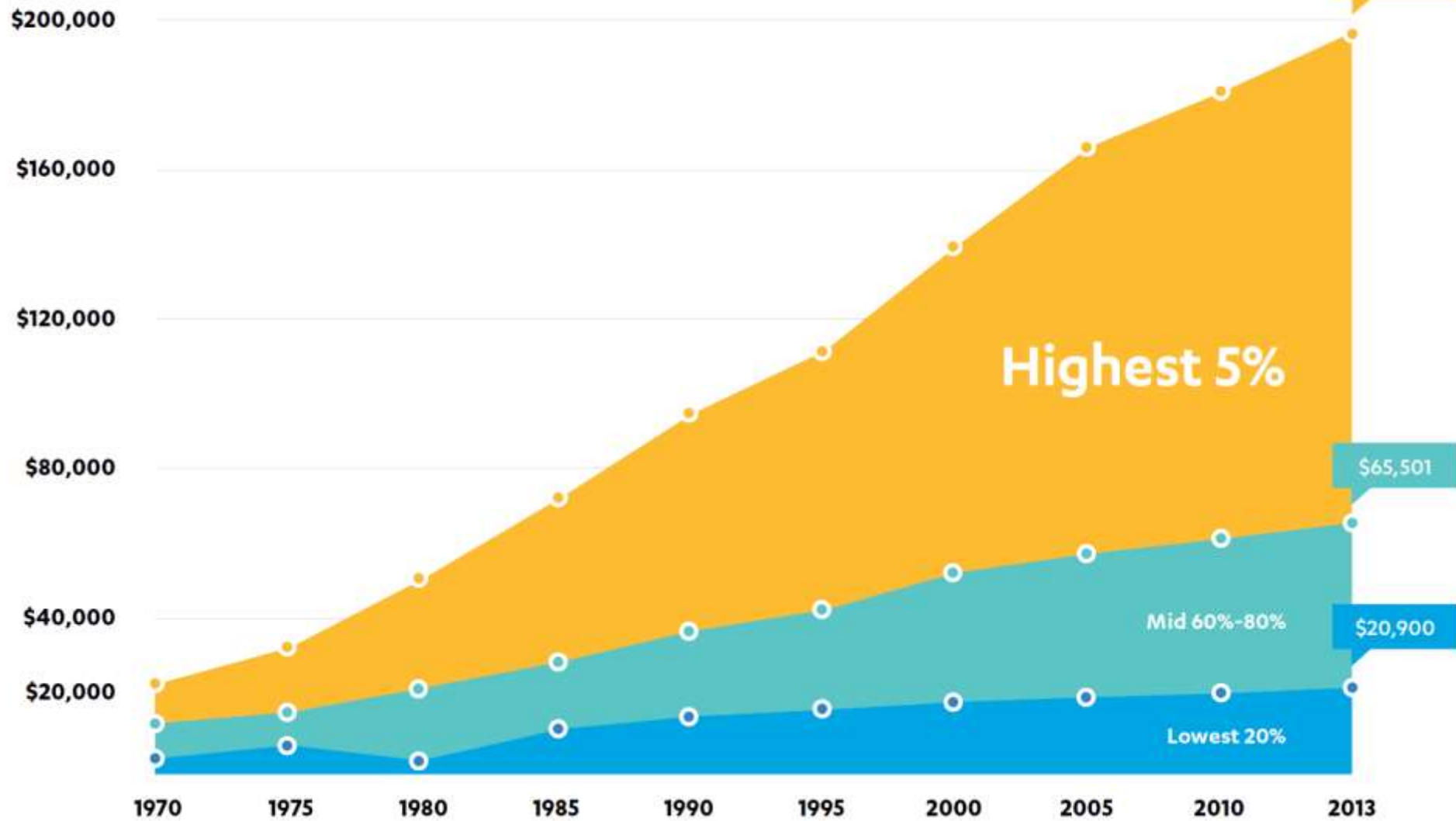
[The 4th Industrial Revolution] is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.

Klaus Schwab: Founder and Executive Chairman of the World Economic Forum



INEQUALITY IN THE UNITED STATES

Incomes for American households, 1970-2013.



Source: U.S. Census



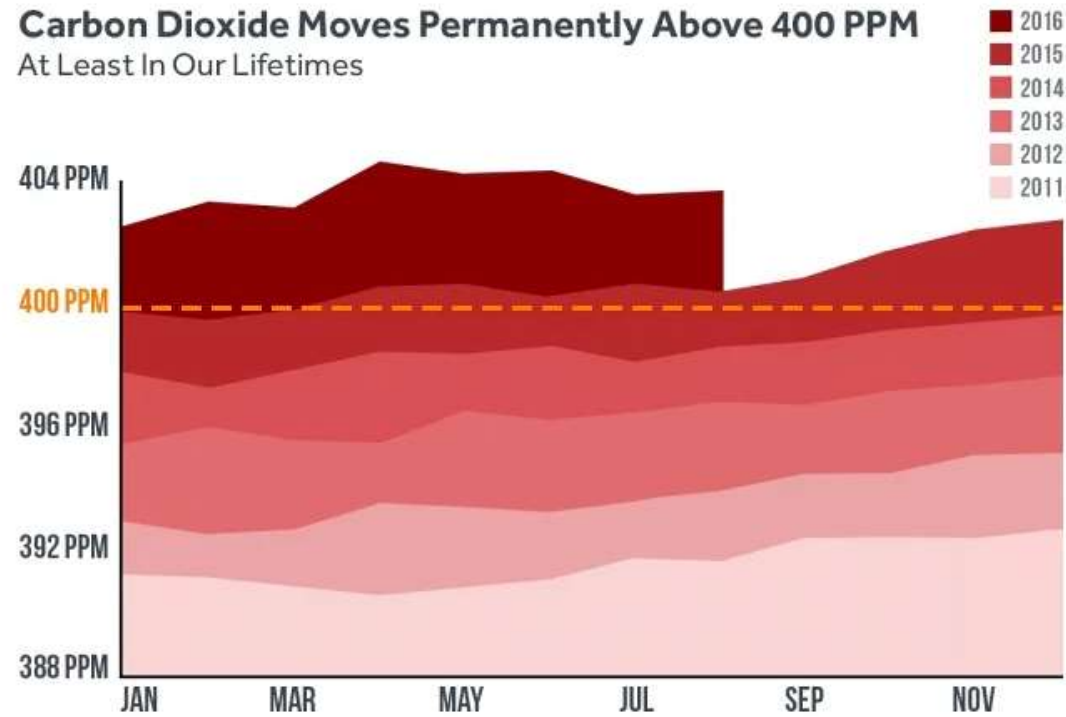
80 billionaires have
the same amount
of wealth as the
bottom half of the
planet.

Winnie Byanyima
Executive Director
Oxfam International

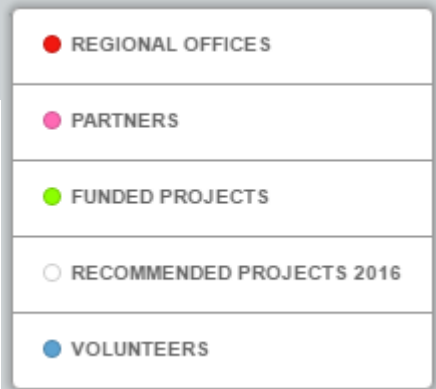
The world passes 400ppm carbon dioxide threshold. Permanently

Wednesday 28 September 2016

We are now living in a 400ppm world with levels unlikely to drop below the symbolic milestone in our lifetimes, say scientists. [Climate Central reports](#)



Source: Scripps Institute of Oceanography, Mauna Loa Observatory



When change is inevitable, our hope will reside with people.



Experimentos espaciales (espacio)





Which is more important? Expanding human knowledge or bringing humanity along when new knowledge is generated.



As access to information increases we cannot afford an uncritical society.



What is our culpability in “post factual” politics and pseudo-science propaganda?



**JUST SAY NO TO
VACCINES** 
Defend Your Health Freedom
www.YouAreTruth.com www.naturalnews.com Peace Resource Project 888 822 7075 www.peaceproject.com (@MS148)



BBC news (just today!)



Trump scraps Obama climate policies

Environmentalists warn Mr Trump's order will have serious consequences at home and abroad.



Any sufficiently advanced ~~technology~~ *knowledge* is
indistinguishable from ~~magic~~ *myth*.

(Arthur C. Clarke)

izquotes.com

**We are producing the next generation disruptors...
Will they (you) be ready for the role?**





Taking a “tick box” approach to education and public engagement is like being the vegan environmentalist – it appeases one’s own conscience but fails to influence meaningfully and at a necessary pace, the global change necessary.

OAO - OAD - IAU (Divisions)



Knowledge



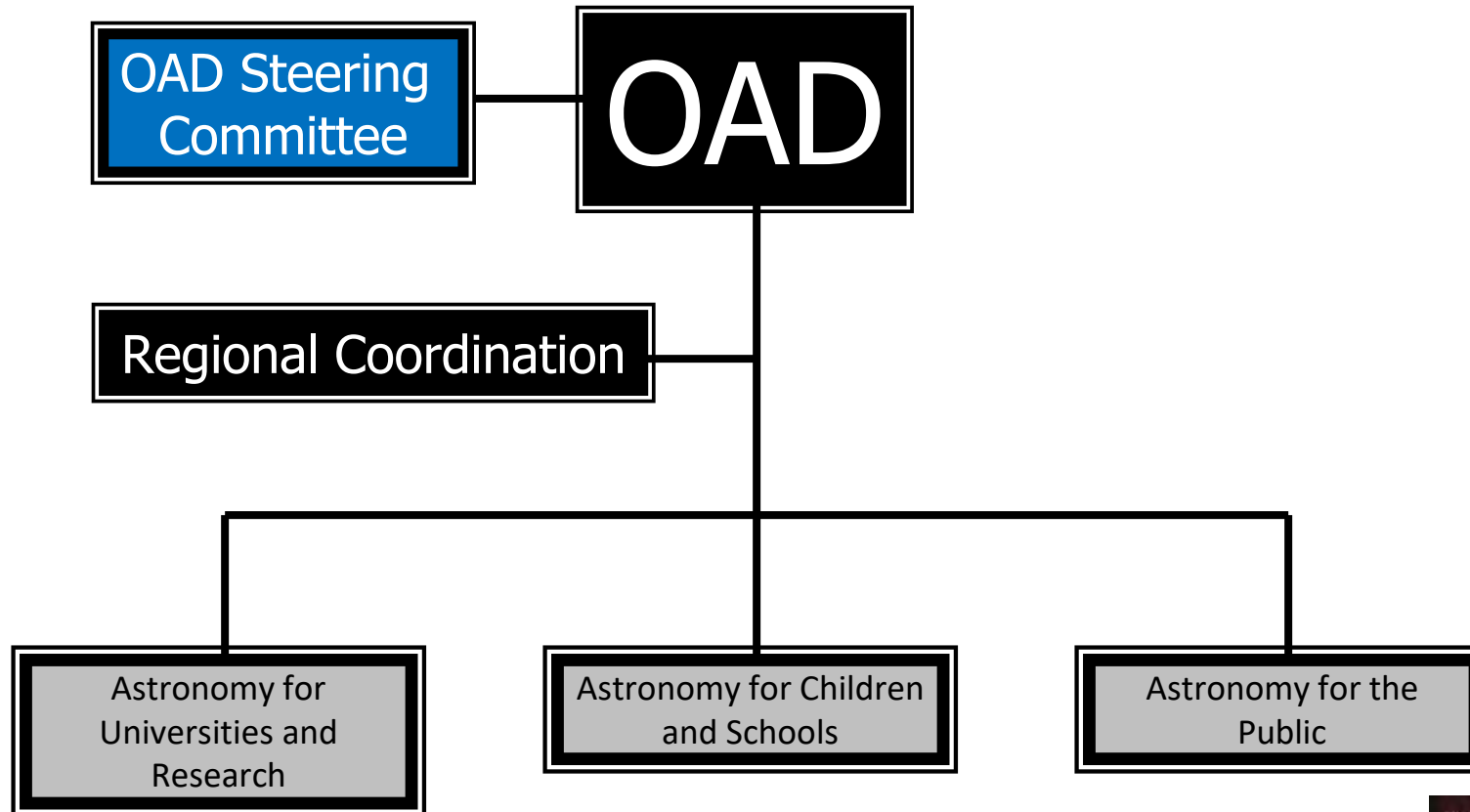
Engagement

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International | Office of
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OAD Structure

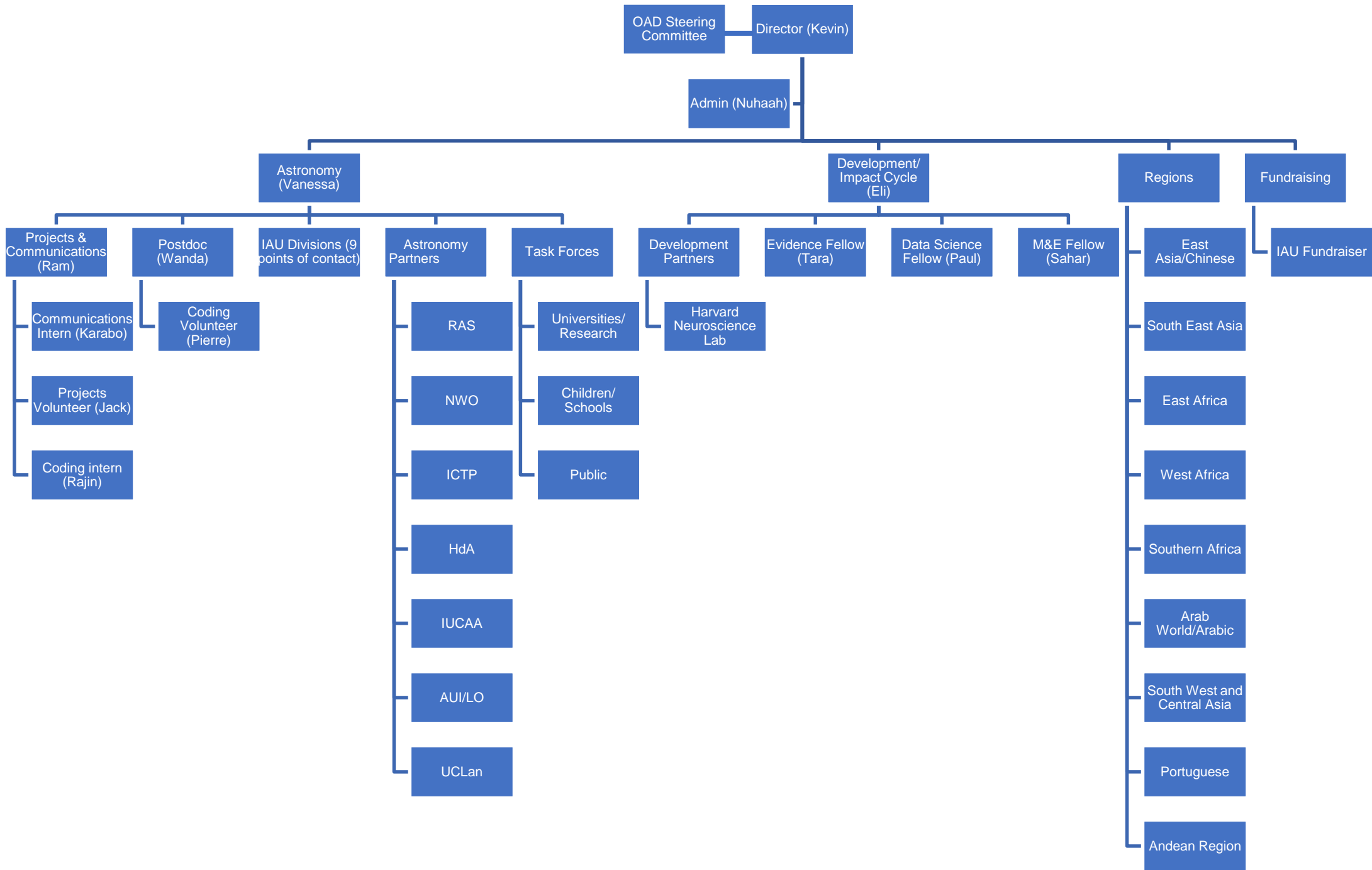


“Astronomy for a better world!”



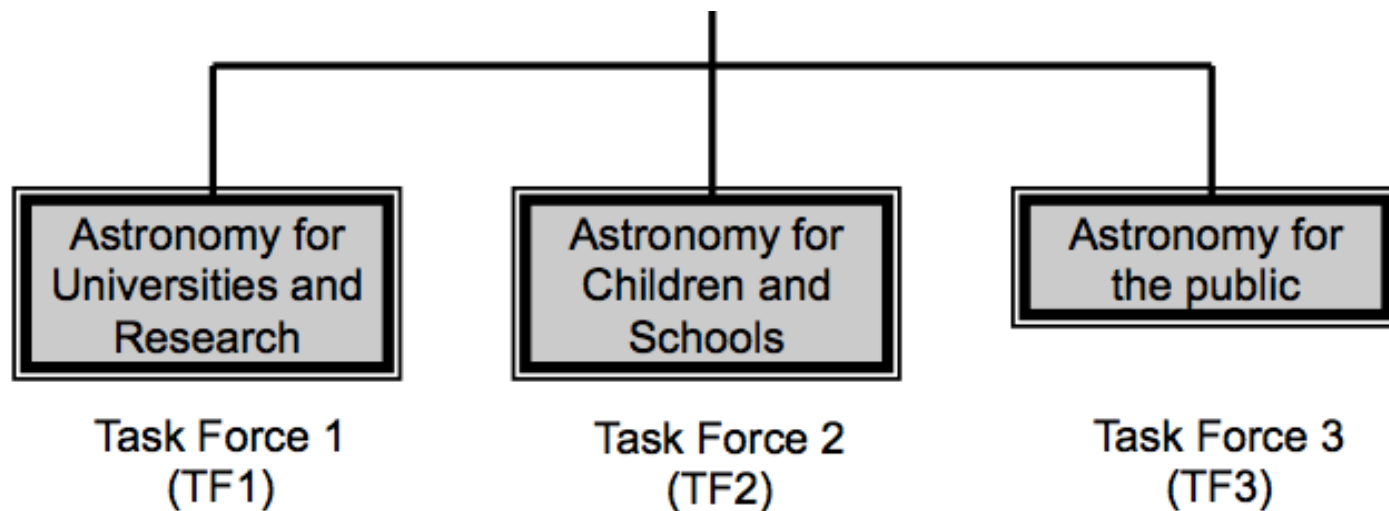
The OAD Team







OAD Task Force membership



Nicole van der Bliet
(Chile/Netherlands)
Jean-Pierre de Greve (Belgium)
Michele Gerbaldi (France) – Co-Chair
Edward Guinan (Chair – USA) – Co-Chair
Roger Hajjar (Lebanon)
Edward Jurua (Uganda)
Stella Kafka (US)
Hakim Malasan (Indonesia)
Shengbang Qian (China)
Ravi Sheth (ICTP/Italy)

Edward Gomez (Co-chair – UK) – Co-Chair
Jen Gupta (UK)
Robert Hollow (Australia)
Ofodum Chukwujekwu Nworah (Nigeria)
Linda Strubbe (Canada/USA)
Akihiko Tomita (Japan)
Amelia Ortiz-Gil (Spain) – Co-Chair
Tsolmon Renchin (Mongolia)
Lina Canas (OAO/Japan)

Megan Argo
(Australia/Commission C2
Nomination)
Kimberly Arcand (US)
Sze-leung Cheung
(OAO/Japan)
Thilina Heenatigala (Sri Lanka)
Carolina Odman (South Africa) – Co-Chair
German Puerta (Colombia)
Kumiko S. Usuda (Japan/USA) – Co-Chair
Brooke Simmons (UK)

OAD Volunteers



- IAU members, amateurs, professionals, teachers, students, public
- Over 600 worldwide (on this map they are grouped by location)

www.astro4dev.org/volunteers



OAD Regional Offices



OAD Regions: Towards a common plan

- All offices subscribe to a combined implementation plan in addition to the IAU Strategic Plan
- Document developed together with all regions and distributed for signature
- Example topics:
 - Oversight structures
 - Guiding principles
 - Operational Objectives and Indicators
 - Challenges

**International
Astronomical Union**
*Office of Astronomy
for Development*

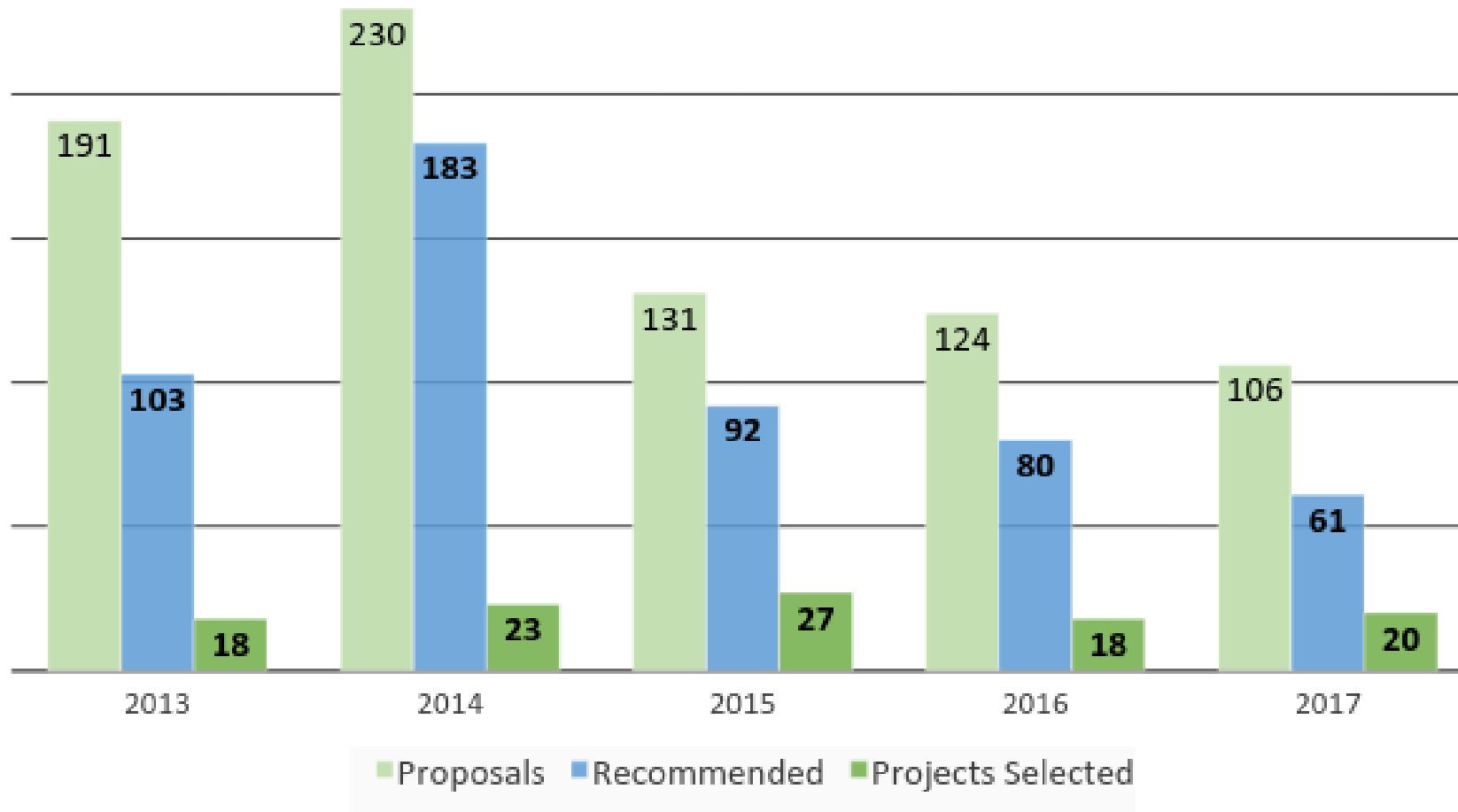


www.astro4dev.org
info@astro4dev.org



**OAD Projects Summary:
2013-2017**

OAD Funded Projects

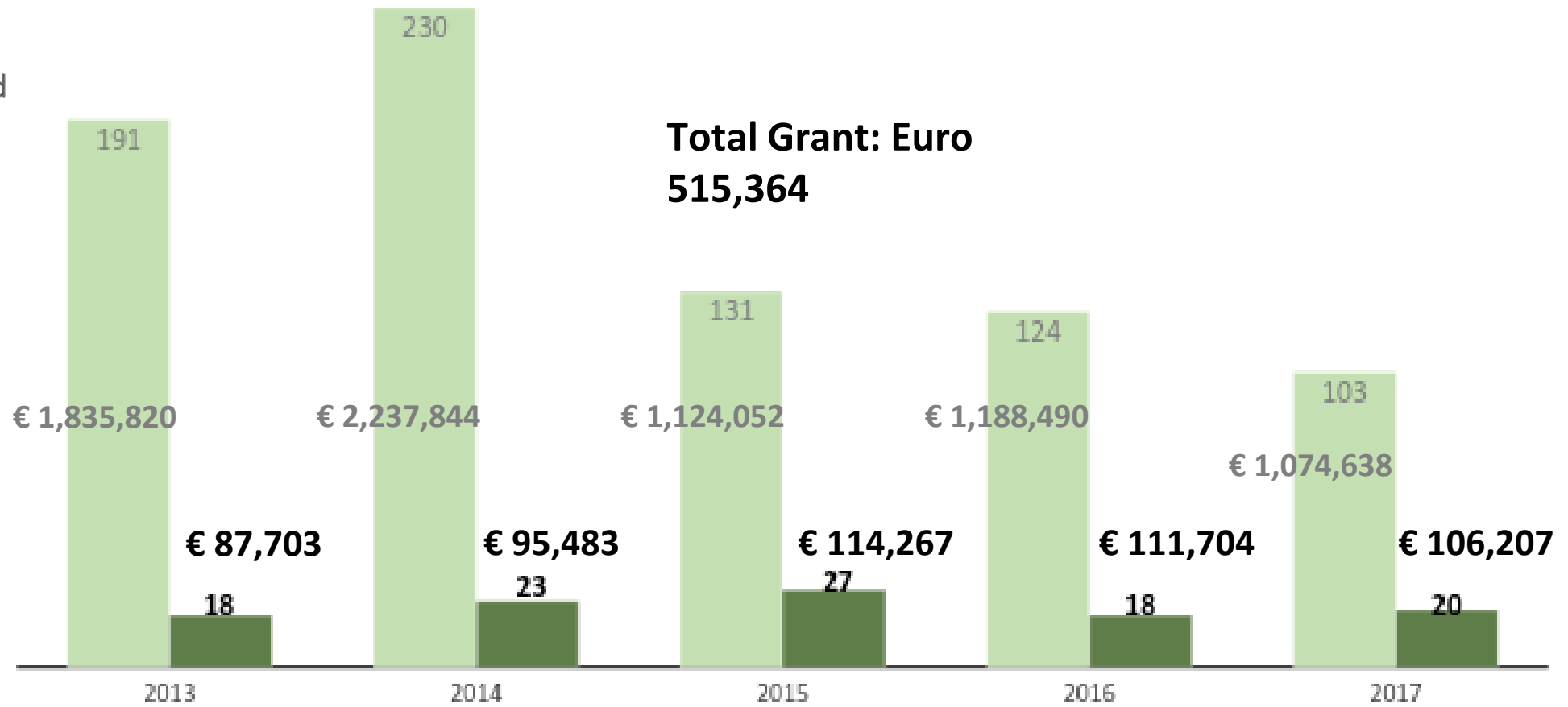
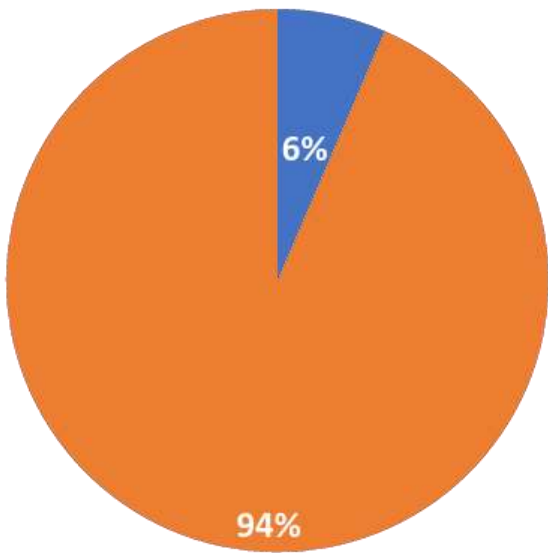


OAD Projects by Region

Region	Proposals	Selected	Success Rate
Australasia + Oceania	12	0	0%
North America	29	6	21%
Latin America and Caribbean	99	23	23%
North Africa and Middle East	27	6	22%
Sub-Saharan Africa	155	33	21%
Europe	88	8	9%
Central Asia	68	16	24%
Far East	38	8	21%

OAD Grants 2013-17

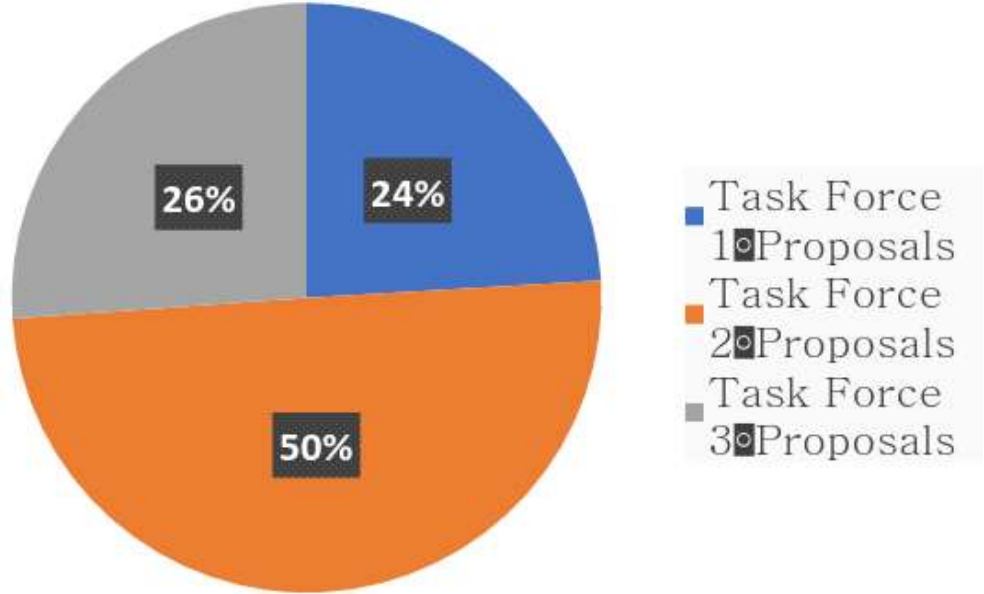
■ Total Grant ■ Total Requested



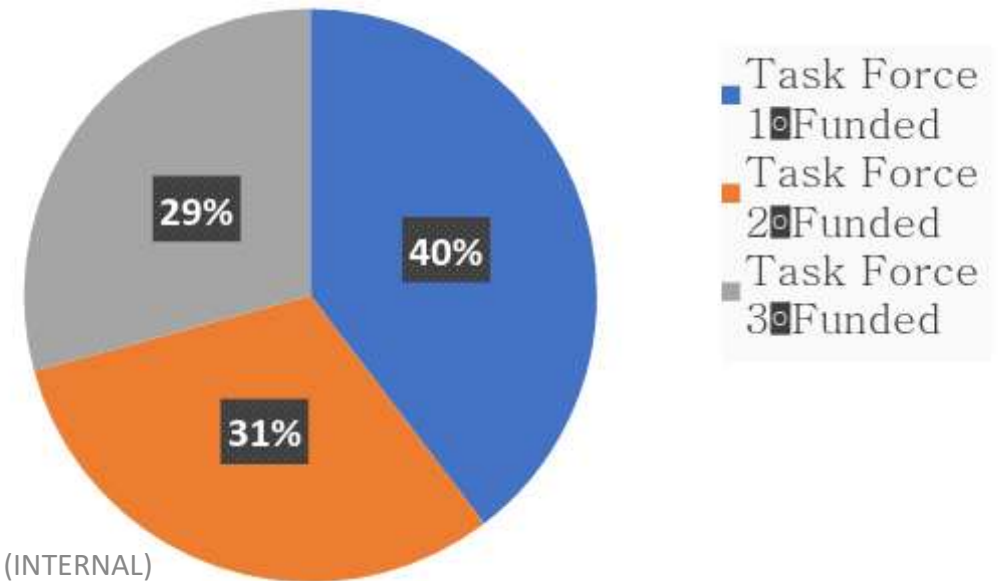
**Total Grant: Euro
515,364**

■ Proposals ■ Funded

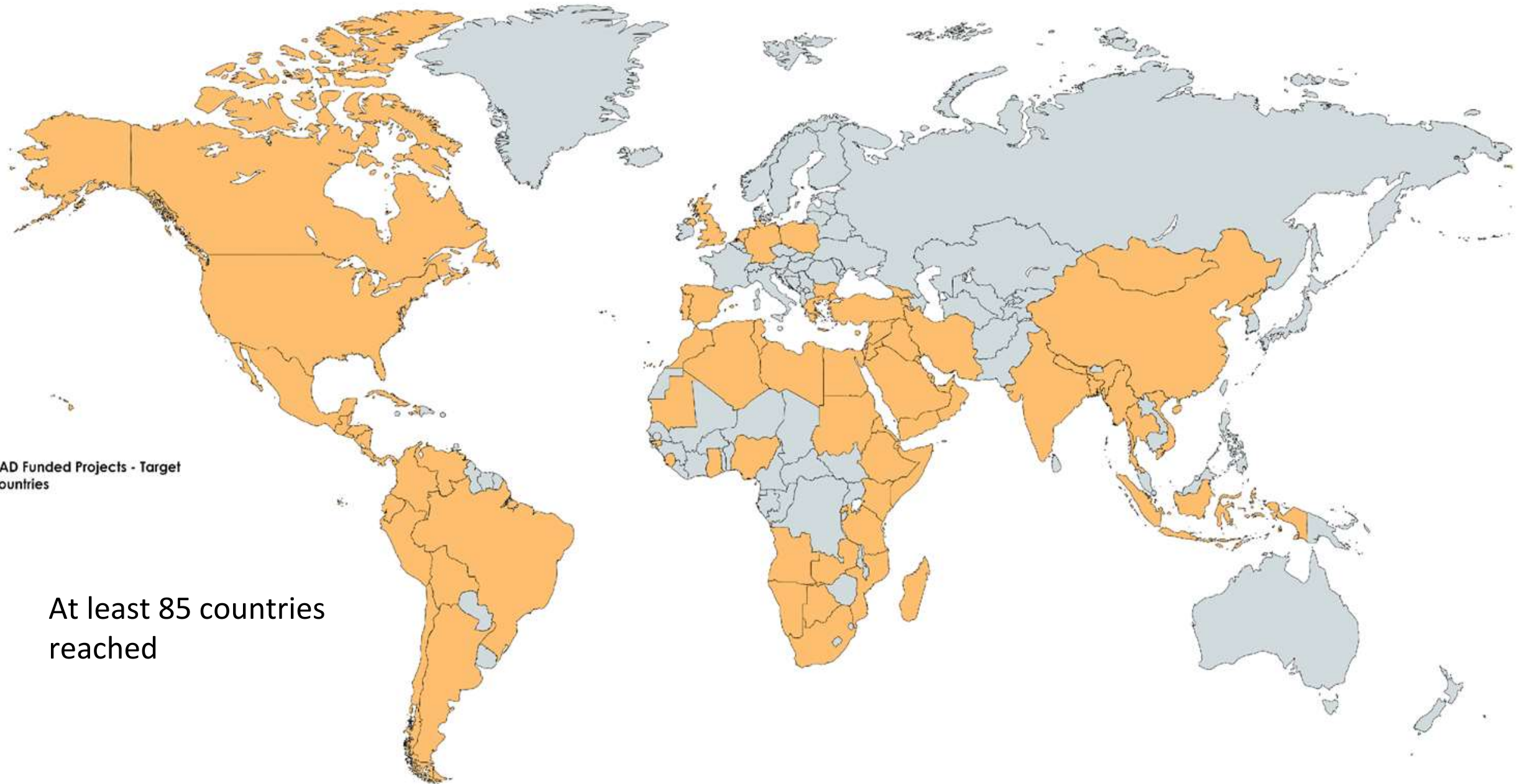
OAD Proposals by Task Force 2013-17



OAD Selected Projects by Task Force 2013-17



Countries reached by OAD Projects



OAD Funded Projects - Target Countries

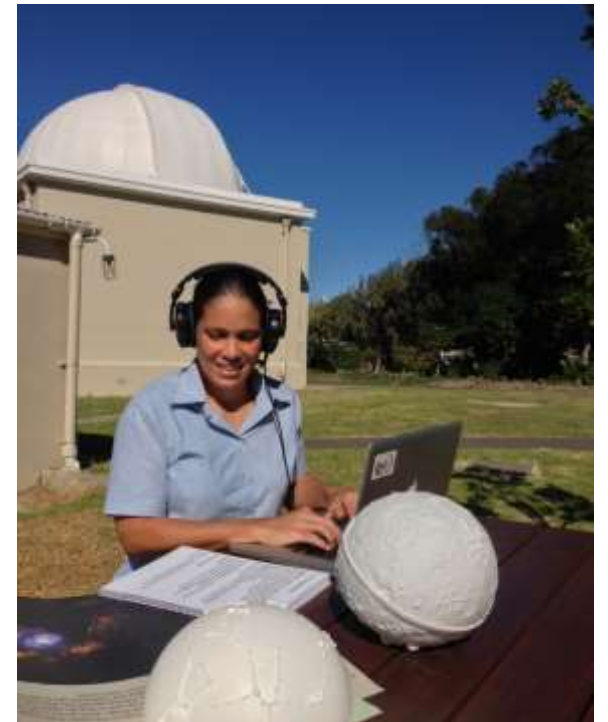


At least 85 countries reached

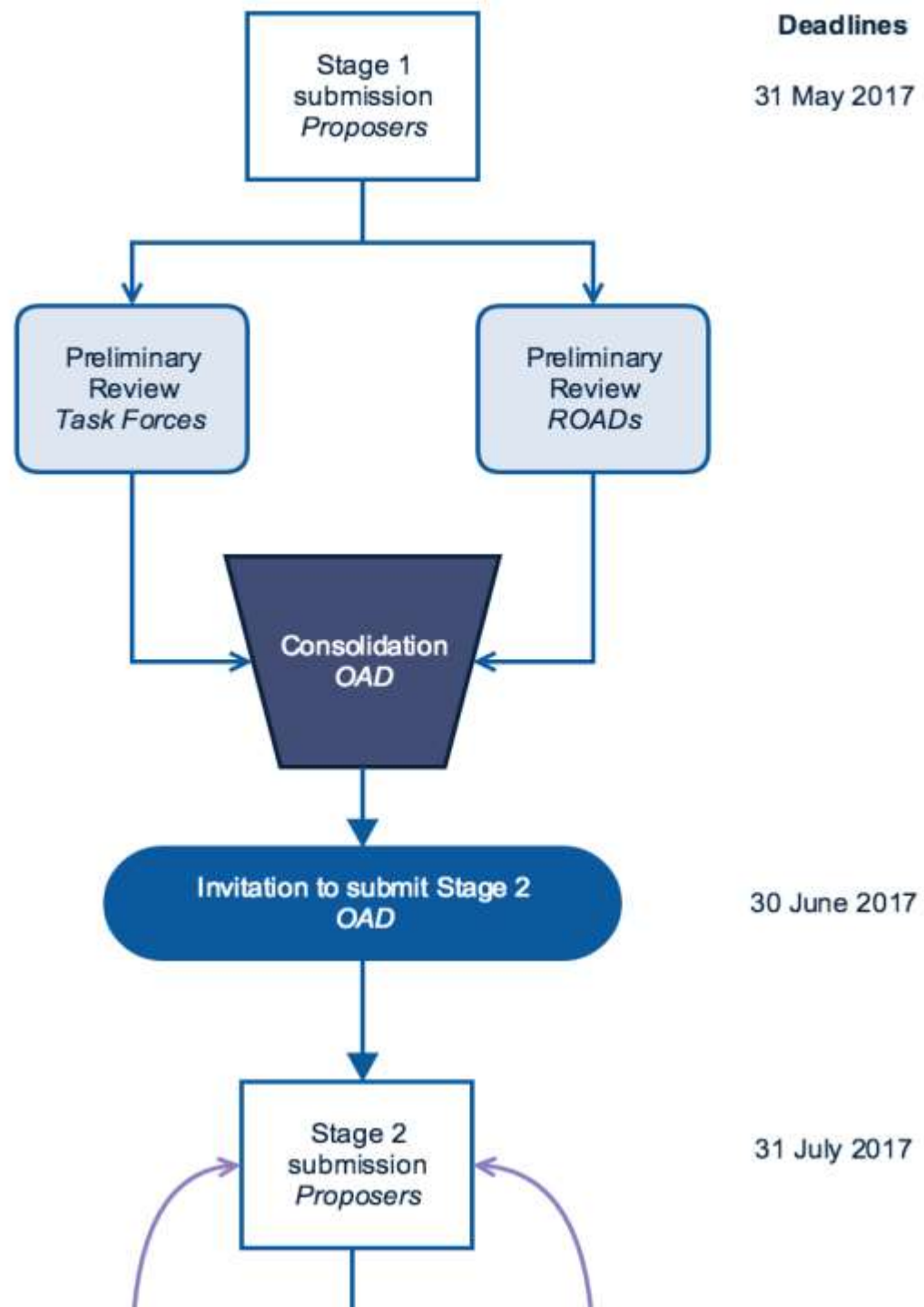
Ad-hoc Projects

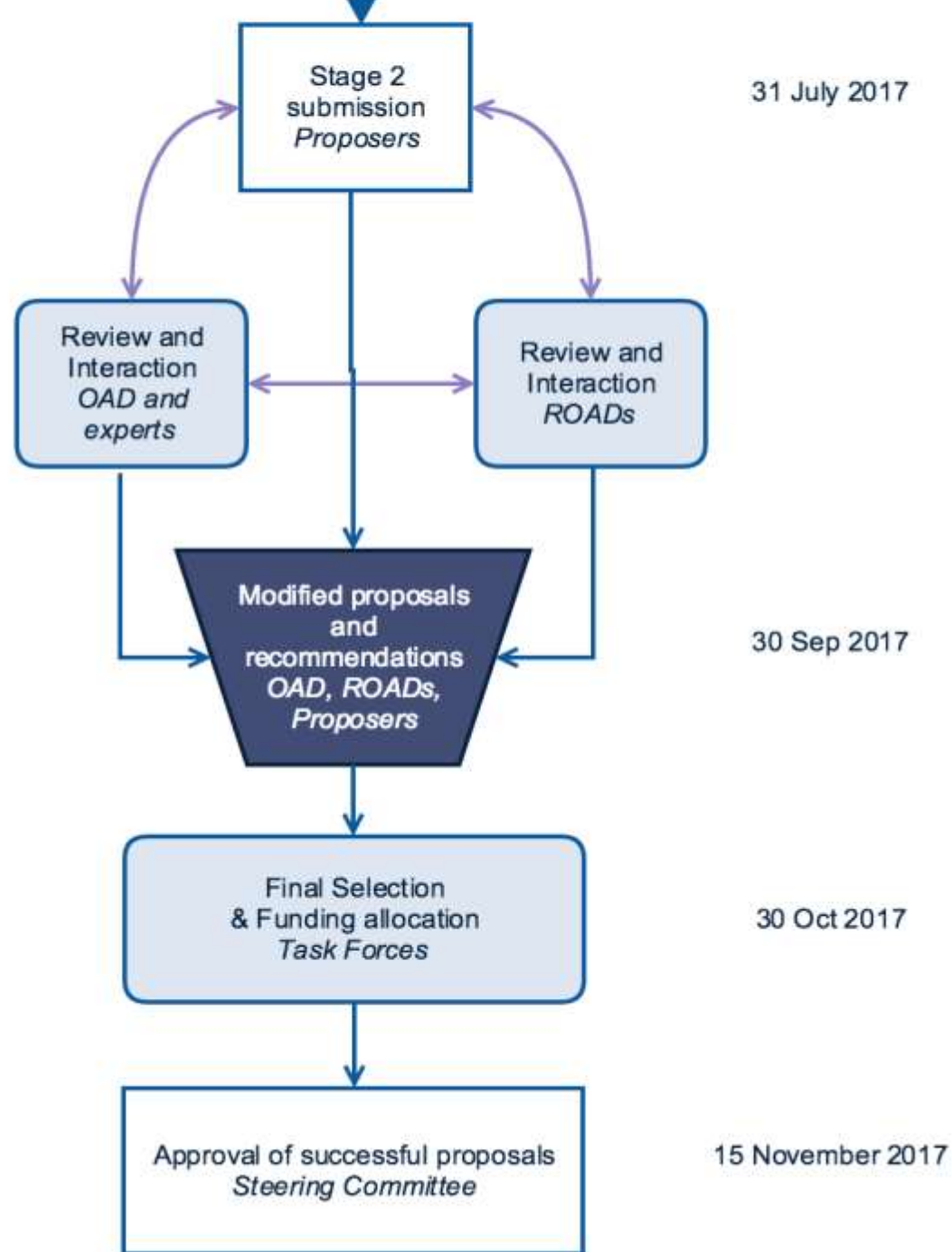
- AstroVarsity
 - provide course and tutorial resources for Maths & Physics lecturers at undergraduate level
- AstroSense
 - Accessibility and Inclusion
- Ultrascope and 3D printing
 - NASA Asteroid Grand Challenge
- Randomized Control Trial

Previous – AstroTruck, AstroPack, AstroComputing



New call for proposals: 2017 and beyond...





Do projects work?



- Engagement/Outreach \neq Development
- Humans are complex and embedded in complex social systems
- OAD needs to
 - Identify best practices, allocate resources efficiently
 - Manage risks of unintended consequences



Win an iPhone 6

Every day for 90 days an iPhone 6 is being given away with Whackhead Simpson and LottoStar!

R160
MILLION
YOU GET! YOU WIN!

Top student commits suicide over failed exams

December 23 2003 at 08:50am

By Yogas Nair

A brilliant final year actuarial science student ended his life by hanging himself after learning on the Internet that he had failed two examination subjects.

University of Witwatersrand student, Evar Mohan, 21, of Gust Manor Place, Trenance Manor, had apparently gone to a Phoenix Internet cafe to obtain his results on Friday.

According to his devastated mother Roma, 50, her son returned home about midday on Friday and was "upset" at his results.

She said: "Evar was a brilliant student and this was his first academic failure.

"When he told me he had failed two subjects (stats and actuarial science three) I comforted him and told him not to worry."

Evar passed his matric examination in 1998 with six distinctions. The former Trenance Manor Secondary pupil achieved a 92 percent pass in maths and physical science and was presented with a merit award from the university. He also secured a partial bursary from the university to study actuarial science.

Find it on
Property24.com

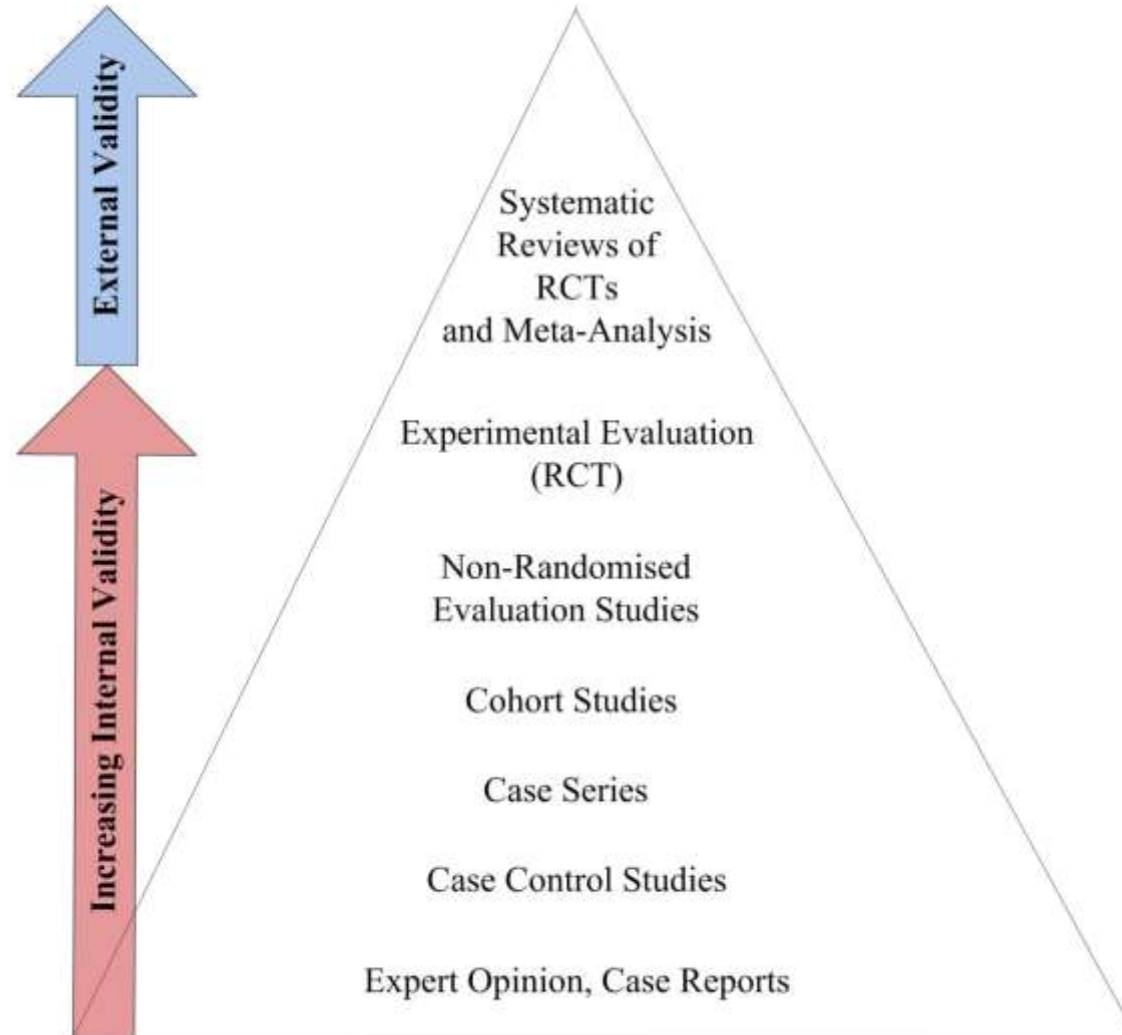
property24

- Most Viewed** Most Commented
- Panty thief rapist guilty on 30 counts
 - I have not refused to go to Parly - Z ...
 - Sunette Bridges faces hate speech case

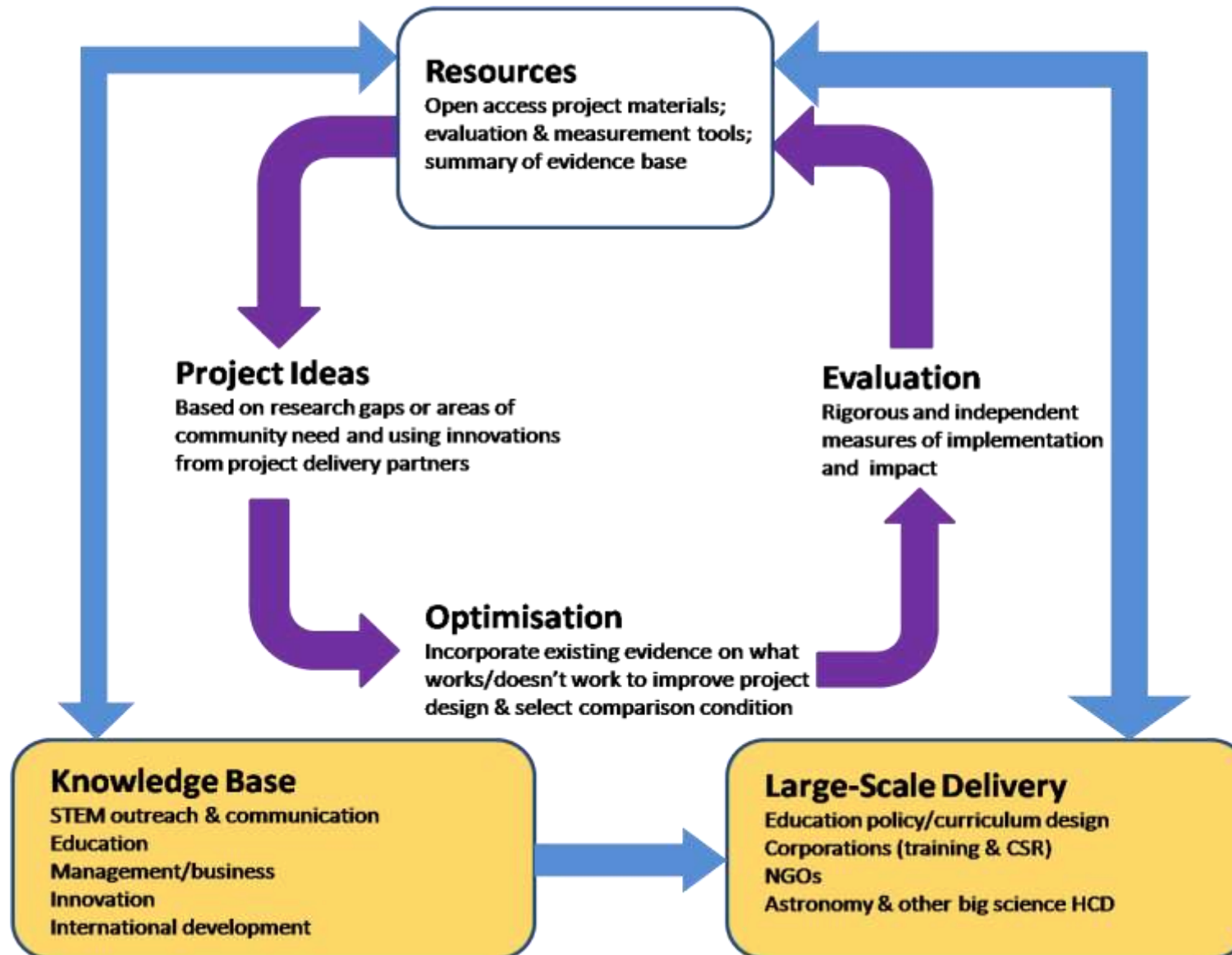
Unintended positive consequences?...



Not All Evidence is Created Equal



OAD Impact Cycle: Positive Feedback Loop



Resources

- **Project materials:** Past project reports*, past project resources/manuals*, outcome data*, ROAD data on needs
- **Instruction toolkits**:** data science**, behavioural science*, gender*, accessibility**, “Blue Dot”*, links to existing resources*
- **Partnership support**:** Co-funding, co-operation frameworks**, astronomer requests, data*, volunteer co-ordination**
- **Interviews & blogs & SDG intro****
- **Community training toolkits**:** project design, inclusion & accessibility**, project planning, incorporating evidence*, outcome assessment*
- **Evidence summaries***

* >80% complete **In progress

Resources for Astronomy

Our resources are derived from

- OAD funded projects
- IAU projects
- Partner projects
- Special projects



- Broad range of resources – telescopes, activity kits, online resources, best practices, books.

<http://astroedu.iau.org/>

PEER-REVIEWED ASTRONOMY EDUCATION ACTIVITIES



- Open-access platform for peer-reviewed astronomy education activities.
- educators can discover, review, distribute, improve, and remix educational astronomy activities.
- **Resources:** *List of peer reviewed activities to learn Astronomy*

ACTIVITY COLLECTIONS

Sun



The Sun or Sol, is the star at the centre of our solar system and is the largest object - about 109 times the diameter of Earth. It contains more than 99.8% of the total mass of the Solar System. Through this collection you can explore and observe the behaviour and characteristics of the Sun.



Stars



Stars are cosmic energy engines that produce heat, light, ultraviolet rays, x-rays, and other forms of radiation. They are composed largely of gas and plasma, a superheated state of matter composed of subatomic particles. Discover various types of stars through this collection.



Drawing



Science keeps unraveling the Universe every day while playing a big part of the process of designing aliens to glimmer. This collection touches both knowledge to explore through hands on activities from

Galaxies



A galaxy is a massive, gravitationally bound system consisting of stars, stellar remnants, an interstellar medium of gas and dust, and dark matter. Roughly one hundred billion galaxies are scattered throughout our

Moon



The Moon is the Earth's only natural satellite and the fifth largest moon in the Solar System. It was formed 4.6 billion years ago. The Moon is in synchronous rotation with Earth meaning the same side is always

Earth



Earth is the only planet known to harbor life. It is the third planet from the Sun and the fifth largest in the Solar System. 71 percent of Earth's surface

Measure the Solar Diameter

Hands-on activity to measure the Sun by using household materials.

Edward Gómez, LCOGT



Brief Description

The Sun moves across the sky at an approximately constant rate because of the rotation of the Earth. By measuring how fast the Sun moves, you can work out how big the Sun appears in the sky. All you need are some household items and about 30 minutes on a sunny day.



Goals

- Students will have an appreciation of the relative and actual size of the Sun.
- Students will have an appreciation of how fast the Sun moves across the sky.



Learning Objectives

- Students will be able to describe perspective which makes the Sun appear smaller in the sky than it is in reality.
- Students will be able to describe why the Sun appears to move across the sky when in fact its apparent motion is produced by Earth's rotation.
- Students will be able to convert between different time units, angles and calculate an accurate diameter for the Sun.



KEYWORDS

Sun, Observing, Measurement



AGE

12+



LEVEL

Middle School, Secondary School



TIME

30min



GROUP

Group



SUPERVISED

Supervised



COST

Low (<= 5 EUR)



LOCATION

Outdoors



CORE SKILLS

Using mathematics and computational thinking, Constructing explanations, Communicating information



TYPE OF LEARNING ACTIVITY

Partial enquiry

DOWNLOADS





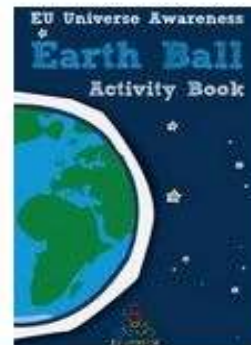
Inspiring every child with our wonderful cosmos

UNAWAWE

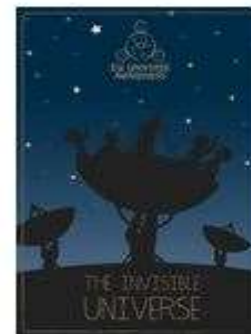
<http://unawe.org/>

•To use astronomy as a tool for inspiring and educating young children, aged 4 to 10 years, especially those from underprivileged communities.

•**Resources:** *Activities, Educational materials, Images, Videos, Posters, Presentations, Books, Universe in a Box*



Earth Ball Activity Book



The Invisible Universe

Activity Book



Universe in a Box Activity Book



Model of a Black Hole



Design your Alien Activity



How to make heat visible?



Which way is North?



Earth Ball Activity Book: Answer Guide



Space Scoop Storytelling



<http://sac.csic.es/astrosecundaria/en/Presentacion.php>

- To train future teachers and we cooperate with the departments of education in order to train experienced primary and secondary school teachers.
- To set up in each country a local group of NASE members who carry on teaching “the basic NASE course” every year and create new courses by using NASE materials.

Courses

- 1) teaching astronomy to teachers
- 2) teaching teachers how to teach astronomy

Resources: *Books, Lectures, Workshops, Network*



Galileo Teacher Training Program

A LEGACY OF THE INTERNATIONAL YEAR OF ASTRONOMY 2009

<http://galileoteachers.org/>

- IYA2009 program to train teachers in the effective use and transfer of astronomy education tools and resources into classroom science curricula.
- The *Galileo Teachers* are equipped to train other teachers in these methodologies
- **Resources:** *package available online ~1GB of software and educational materials*



<http://galileoscope.org/>

- IYA 2009 program
- low-cost telescope kit, easy-to-assemble

Specifications:

50-mm (2-inch) diameter, 25- to 50-power achromatic refractor

You can see - lunar craters and mountains, Jupiter & 4 moons, the phases of Venus, Saturn's rings, and countless stars

- Order online - \$25 per piece, cheaper in bulk
- Galileoscope kits to teachers and schools worldwide through the [Telescopes4Teachers](#) program

Other Open Resources

- NASA Wavelength <http://nasawavelength.org/data-and-images>
 - Peer reviewed digital collection of Earth and space science resources for educators of all levels
- Astroweb consortium database - <http://cdsweb.u-strasbg.fr/astroWeb/astroweb.html>
- Starry night software – Targeted at Astronomy content for schools
<http://astronomy.starrynight.com/content/free-astronomy-teaching-resources>
- OAD Funded Projects – Data, Best practices

OAD's position in this context

- Interface between
 - global organizations and communities in education & outreach
 - Local players
- To bring in best practices, tools and resources into Africa
- Present the best of Africa to the world

Future...



IAU GA 2015 Resolution

(following positive OAD review)

...

Resolves

1. That the pursuit of the goals of the Strategic Plan: Astronomy for the Developing World should **continue until the XXXI General Assembly to be held August 2021,**
2. That the Executive Committee should present for approval at the XXX General Assembly to be held in Vienna, Austria in August 2018 **an extended Strategic Plan** which addresses the future of the OAD and its activities beyond 2021,
3. That the Executive Committee should **consult existing and potential stakeholders** in the preparation of this Strategic Plan.



Roadmap to 2018

- **Strategic Plan:** Input obtained globally and adequately inform the next IAU Strategic Plan. Allow for the adoption within other ICSU unions.
- **Regional Offices:** Synergised regional leadership participating in annual call for proposals. Regions coordinate pilot projects and scaling up of projects.
- **Impact Cycle:** A user friendly and practical “impact cycle” for projects, containing a library of best practice resources on what works and what doesn’t work, including partnerships from development field.
- **Focus projects:** Some projects selected for focussed evaluation and expansion. Illustrate the principle of testing and expanding projects. External funding should be sought for additional resources and staff per project.
- **Volunteers:** User friendly platform to allow for the flow of skills from the astronomy community to other regions and fields.

Physics for development movement 'needs a strategy'

213

[BRUSSELS] The emerging global 'physics for development' movement needs a common strategy to define the field, a conference has heard. This

IOP Institute of Physics

Join the IOP | Events | Publications | Education | Activities | Career

You are here > About us > International > Physics for Development

International

Grants and programmes

Physics for Development

IOP for Africa

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C13: PHYSICS FOR DEVELOPMENT

The Commission on Physics for Development (C13) was established by the International Union of Pure and Applied Physics in 1981 to promote the exchange of information and views among the members of the international scientific community in the general field of Physics for Development.

In this section

All IUPAP Commissions

C13: Physics for Development

C13: Mandate

C13: Members



EPS Physics for Development Group

Solidarity in Science by Sharing Knowledge

WHO ARE WE?

PROJECTS

Physics for Development

The IOP aims to support physicists and physics teachers in low- and middle-income countries around the world primarily through

Edinburgh Medal – 2016



2016 Edinburgh Medal celebrates astronomy



- 1989 Professor Abdus Salam
- 1990 Professor Stephen J Gould
- 1991 Professor Jane Goodall
- 1992 Professor Heinz Wolff
- 1993 Professor Wangari Maathai
- 1994 Professor Manuel Patarroyo
- 1995 Sir John Crofton
- 1996 Professor Richard Levins
- 1997 Professor Amartya Sen
- 1998 Sir David Attenborough
- 1999 Professor Jocelyn Bell Burnell
- 2000 Professor Lynn Margulis
- 2001 Sir John Sulston
- 2002 Lise Kingo
- 2003 Professor Wang Sung
- 2004 Professor Steven Rose
- 2005 Professor Colin Blakemore
- 2006 Professor James Lovelock
- 2007 Dr. Richard Horton
- 2008 Professor Chris Rapley CBE
- 2009 Professor John Beckwith
- 2010 Professor Sir Alec Jeffreys
- 2011 Professor Carl Djerassi
- 2012 Dr. James Hansen
- 2013 Professor Peter Higgs/Cern
- 2014 Prof. Mary Abukutsa-Onyango
- 2015 Mary Midgley

Enhancing African benefits...

- ROAD coordination capacity for HCD
- Expanding the AVN beyond partner countries
- Communicating the benefits of astronomy for development
- Call for proposals – seed funding
- OAD volunteers – global network
- OAD partners
- IAU endorsement for fundraising/support
- Special projects
- etc ...

To make Africa great...

- Innovate the **development of astronomy** in the context of *astronomy for development*



Astronomy for a Better World!



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