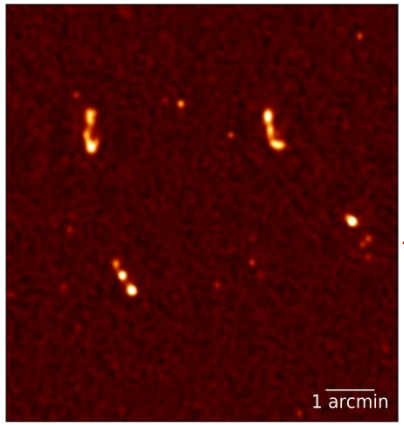
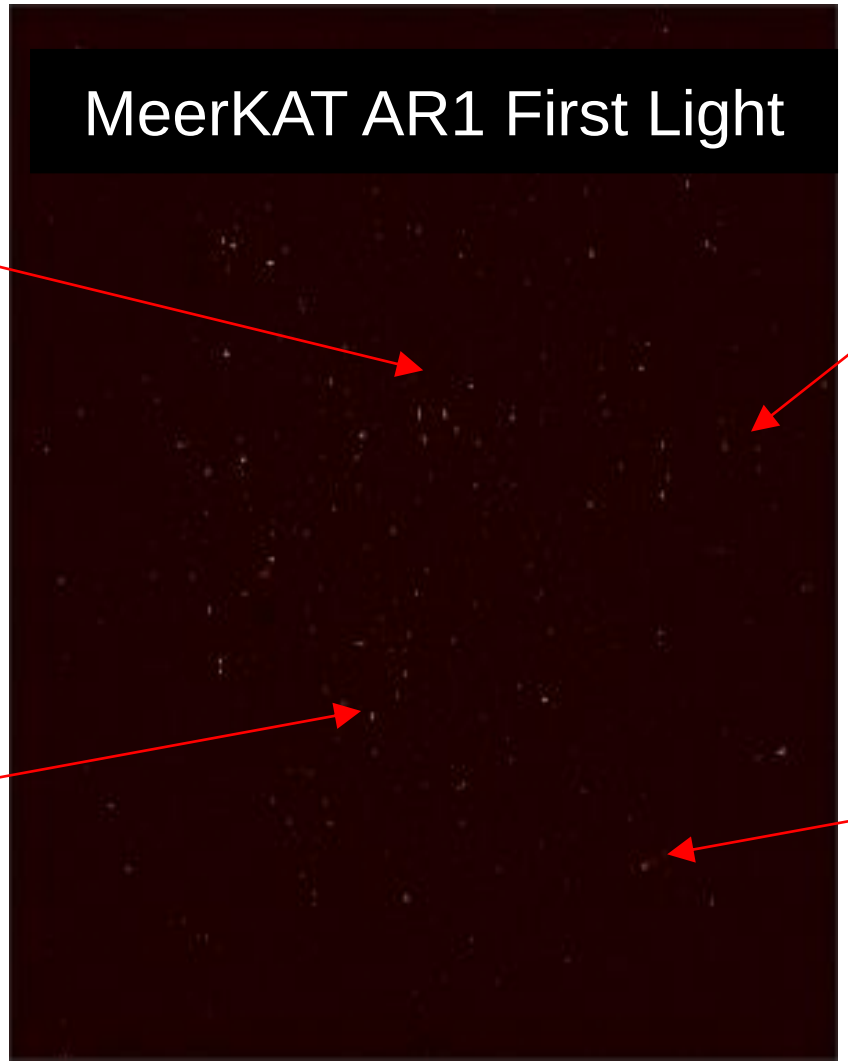
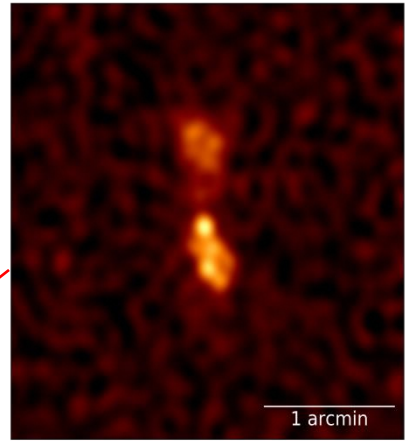
Monday 18 July 2016, Cape Town

SKA AFRICA
SQUARE KILOMETRE ARRAY



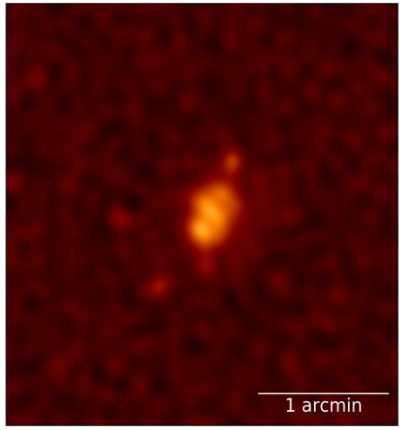
? Interesting quarted



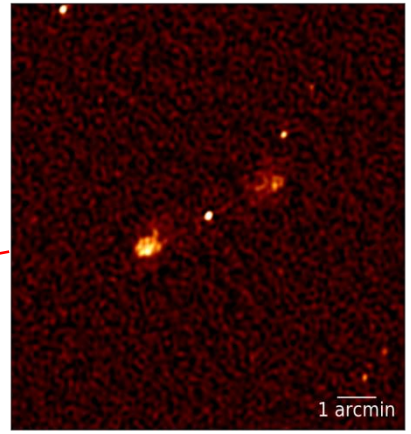


FR1 radio galaxy

Ex Africa Semper Novi



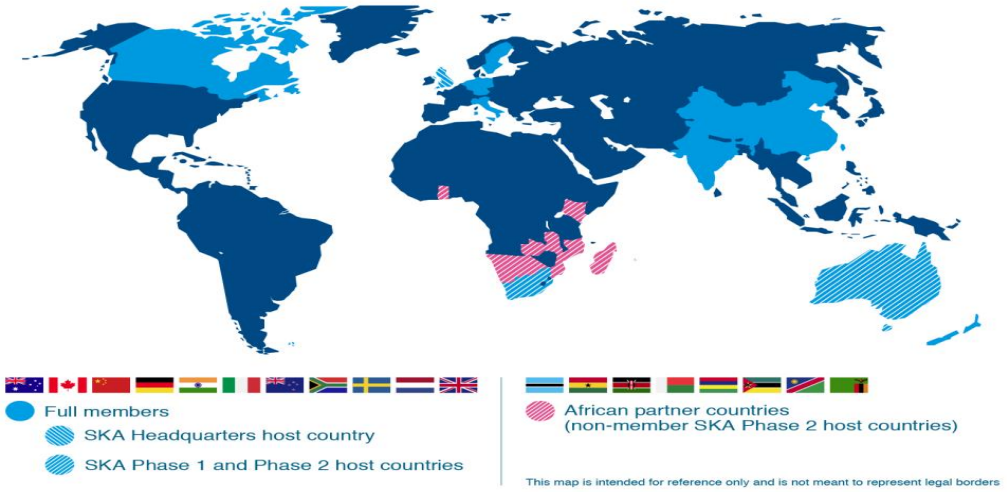
Star forming galaxy

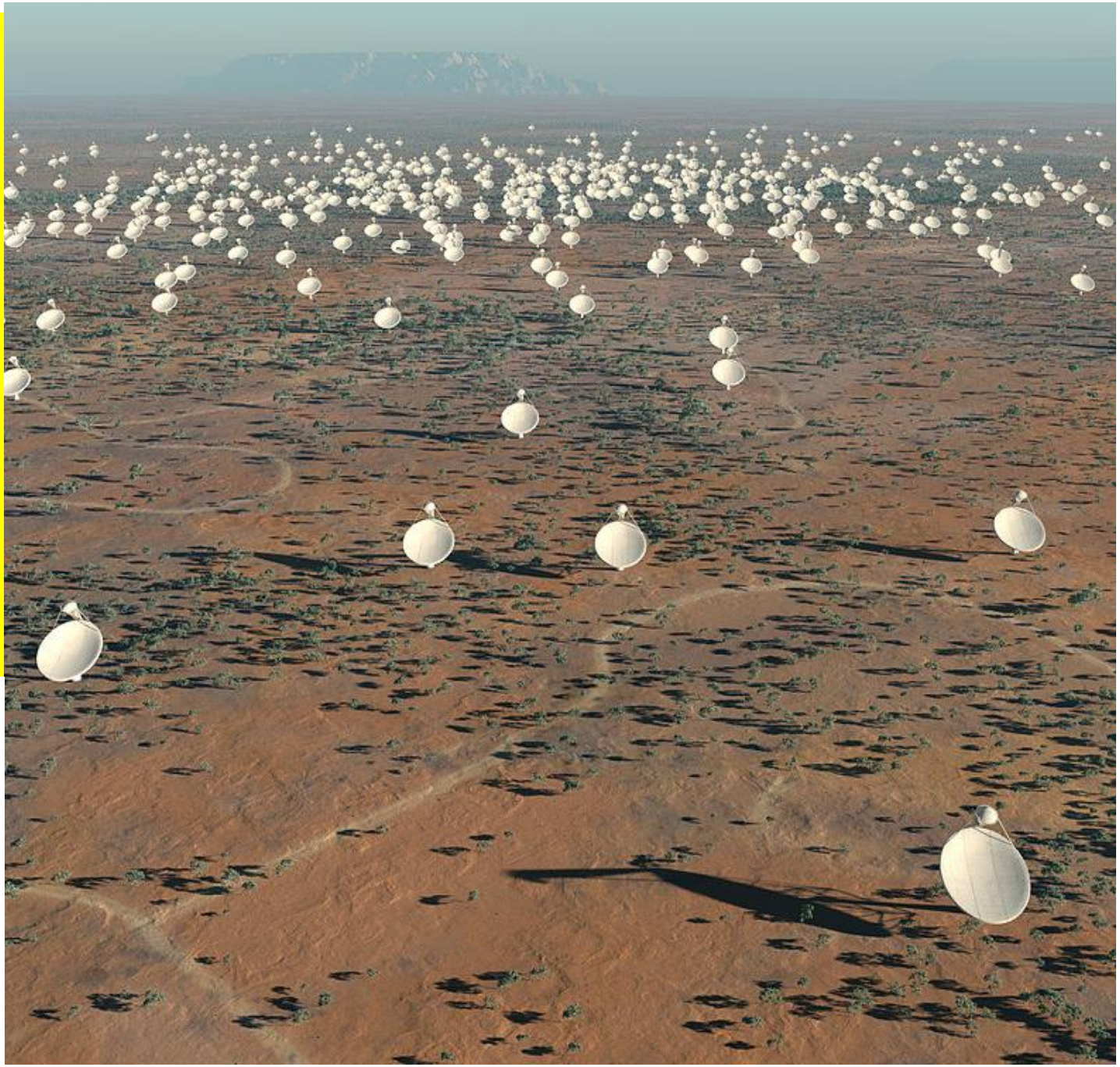


FR2 radio galaxy

More than 1300 individual objects – galaxies in the distant universe – are seen in this image.

“First Light is a significant achievement in the lifetime of a project and we congratulate our South African colleagues on this fantastic preliminary result” said **Prof. Philip Diamond, Director-General of the SKA Organisation** which oversees the delivery of the international SKA project. :“This bodes very well for the science SKA will deliver once the 64 MeerKAT dishes are integrated into the 197-dish SKA array in South Africa”





UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Diversity and Inclusion:

Global and Local Contexts

Zeblon Z Vilakazi, ICHEP 2016, 9th August, 2016

Can South Africa host the another Southern Hemisphere Underground Facility?

Status of underground labs

- **South Africa was active in this area of research in the 1960's through pioneering experiments done in a gold mine by F. Reines & JPF Sellschop**
  - **observed (in 1965) the first natural neutrinos** along with the Indian team led by Goku Menon and colleagues in Kolar Gold fields in India, **setting first astrophysical limits**!
- Some of the World's deepest mines are in SA:
  - Tau Tona 3,900 m (12,800 ft) – 50 C
  - Plans to extend Mponeng mine, a sister mine to TauTona, down to 4,500 m (14,800 ft) in the coming years

Underground Physics in SA

EVIDENCE FOR HIGH-ENERGY COSMIC-RAY NEUTRINO INTERACTIONS*

F. Reines, M. F. Crouch, T. L. Jenkins, W. R. Kropp, H. S. Gurr, and G. R. Smith

Case Institute of Technology, Cleveland, Ohio

and

J. P. F. Sellschop and B. Meyer

University of the Witwatersrand, Johannesburg, Republic of South Africa

(Received 26 July 1965)

*In reference 1 it states that the three-meson decays involving 3π, $\eta+2\pi$, $\rho+2\pi$, and $\omega+2\pi$ are comparable. Actually, it is found that the $\rho+2\pi$ and $\omega+2\pi$ modes are favored over the 3π and $\eta+2\pi$ modes, although it probably is still insufficient to account for the vast differences in decay rates between these two types of processes without introducing symmetry-breaking effects. The $\rho+2\pi$ and $\omega+2\pi$ modes are found to be comparable. For a detailed list of branching ratios, see reference 2.

[7]H. Harari, H. J. Lipkin, and S. Meshkov, Phys. [illegible] the same, and that the introduction of this term displaces the [illegible] amplitude one way, and that of the $\rho_{-}\pi_{+}(2\pi)$ amplitude the other way with equal amounts. Therefore, the statistical average of the $\rho+3\pi$ processes should not be greatly perturbed.

[9]See reference 1 for a summary of the experimental data.

[10]R. Armenteros et al., Phys. Letters 17, 170 (1465); N. Barash et. al., "Antiproton Annihilation in Hydrogen at Rest I, Reaction $\bar{p}+p\rightarrow K+\bar{K}+\pi$" (to be published).

EVIDENCE FOR HIGH-ENERGY COSMIC-RAY NEUTRINO INTERACTIONS*

F. Reines, M. F. Crouch, T. L. Jenkins, W. R. Kropp, H. S. Gurr, and G. R. Smith

Case Institute of Technology, Cleveland, Ohio

and

J. P. F. Sellschop and B. Meyer

University of the Witwatersrand, Johannesburg, Republic of South Africa

(Received 26 July 1965)

The flux of high-energy neutrinos from the decay of K, π, and μ mesons produced in the earth's atmosphere by the interaction of primary cosmic rays has been calculated by many authors.[1] In addition, there has been some conjecture[1] as to the much rarer primary flux of high-energy neutrinos originating outside the earth's atmosphere. We present here evidence[2] for the interactions of "natural" high-energy neutrinos obtained with a large area liquid scintillation detector (110 m^2) located at a depth of 3200 m (8800 meters of water equivalent, average $Z^2/A \simeq 5.0$) in a South African gold mine.

The essential idea of the present experiment[3] is to detect the energetic muons produced in neutrino interactions in a mass of rock by means of a large area detector array imbedded in it. Backgrounds are reduced by the large overburden and by utilizing the fact that the angular distribution of the residual muons from the earth's atmosphere is strongly peaked in the vertical direction at this depth. The angular distribution of the muons produced by neutrino interactions should show a slight peaking in the horizontal direction.[4]

The detector array, shown schematically in Fig. 1, consists of two parallel vertical walls made up of 36 detector elements. The array is grouped into 6 "bays" of 6 elements each. Each detector element, Fig. 2, is a rectangular box of Lucite of wall area 3.07 m^2 containing 380 liters of a mineral-oil based liquid scintillator,[4] and is viewed at each end by two 5-in. photomultiplier tubes. The array constitutes a hodoscope which gives a rough measurement of the zenith angle of a charged particle passing through it. In addition, the event is located along the detector axis by the ratio of the photomultiplier responses at the two ends. The sum of the responses then pro-

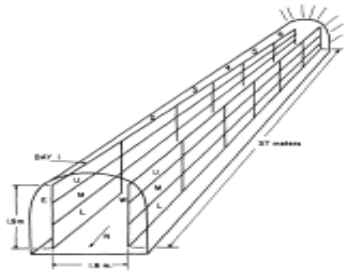


FIG. 1. Schematic of detector array.

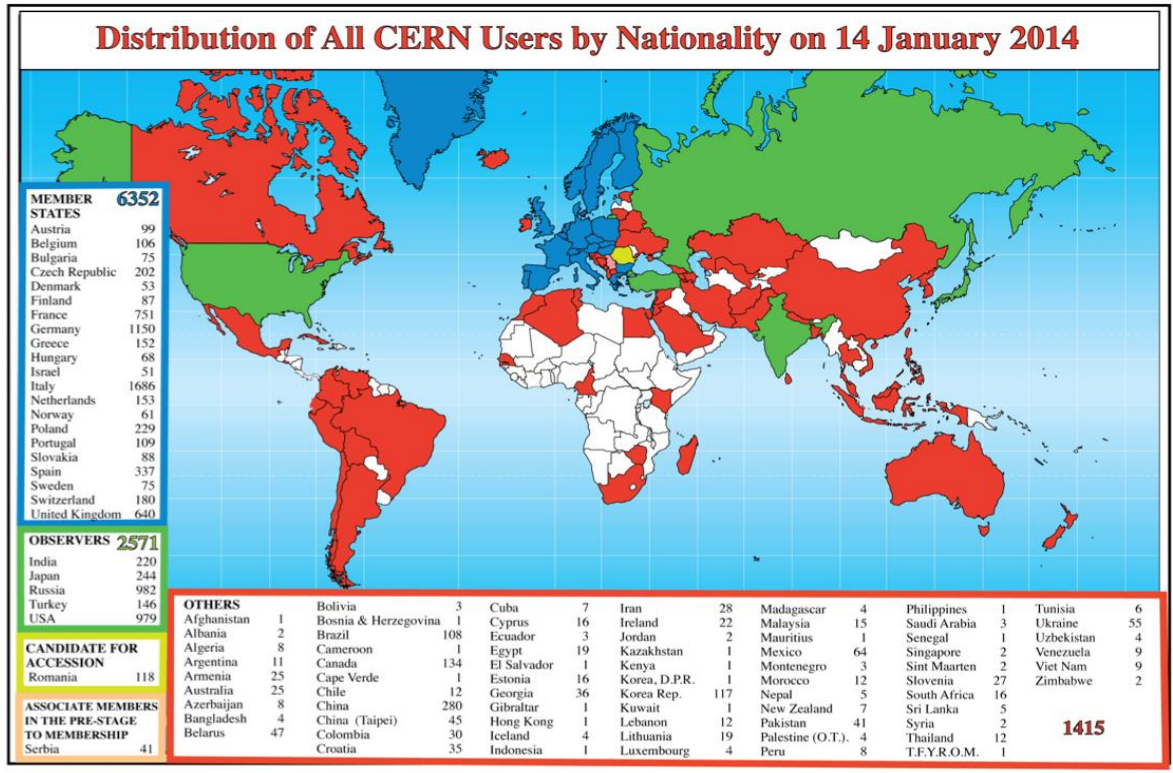
Frederick Reines

Friedel Shellschop

Phys Rev Lett, 15, 429 (1965)

Current issues and the African context

- Low participation of African scholars in major research labs around the world. Some examples:
  - CERN users
  - Users of LHC experiments
- Not limited to CERN. Broader issue



About 0.5% of CERN users are African Nationals

Opportunity: African Youth Bulge and fast growing economies similar to Asian economies of past decades.

African Participation in the ATLAS Experiment

In ATLAS, Morocco and South Africa. Several institutes, about 35 members total. Size of the collaboration: over 3,000

In CMS, only Egypt with 1 institute, 10 members.
Size of the collaboration: over 3,000

African Participation in the ALICE Experiment

Only South Africa: 2 institutes with 5 members. Collaboration over 1000 members

LHCb: 60 institutes, over 800 members. No African participation. There may be a few Africans through participating institutes.

THE BIENNIAL AFRICAN SCHOOL OF FUNDAMENTAL PHYSICS AND APPLICATIONS (ASP)

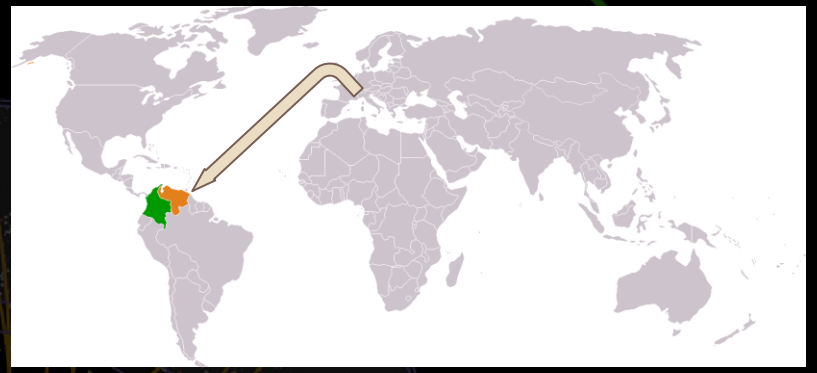
- **International Organizing Committee (IOC)**
  - The IOC is the main organizer of the school
  - The IOC Members:
    - B. Acharya (ICTP & King's College London)
    - K. A. Assamagan (BNL)
    - A. Dabrowski (CERN)
    - C. Darve (ESS)
    - J. Ellis (CERN & King's College London)
    - S. Muanza (CNRS-IN2P3)
    - R. Voss (CERN)
- **Local Organizing Committee (LOC)**
  - Local committee in the host country
- **International Advisory Committee (IAC)**
  - Advises on various aspects of the organization including fund raising

http://www.africanschoolofphysics.org/

ASP2012 Support from

Total Support received: €119730
In addition to transportation and accommodation coverage for most lecturers from their own institutes

cevale2ve.org



The CEVALE2VE is a HEP educational and outreach project for Latin America.

With the help of a lot of people in both side of the ocean, we developed a course in particle physics as an “excuse” to create and strengthen ties between members of the scientific community.

Several students have got a good start in their advance studies thanks to this collaboration and their incredible energies: some of our students have participated in the HEP CERN-LA school, CERN/DESY summer student programs

Next project? With the ICTP Physics Without Frontiers program, sponsored by ATLAS, in October 2016, we go to Venezuela and Colombia for personal contact with the students, professors and general public in several outreach activities for two weeks!

1.1 Vision and Objectives

Education and interest in research: positively influence and stimulate physics student's interest in HEP research

Awareness of opportunities: educate and invigorate the students with further study opportunities in physics and possible career paths in research

Create networks: in both directions!

Virtual research and learning community

Created with the goal of promoting the scientific dissemination, education and research in the field of high energy physics (HEP) in the venezuelan and latin american scientific community.

Modernization of the education and training: through the use of e-learning tools

Policy making: working towards formalizing the involvement of Venezuela institutions in HEP experiments

European Particle physics Latin American Network
EPLANET

The program started on Feb 1, 2011 and ended 31 January 2016.

- **Coordinators Prof. Luciano Maiani and Dr. Veronica Riquer,**
- **Financial support from EU**

Argentina	Italy (Coordinator)
Brazil	France (CERN)
Chile	Portugal
Mexico	Spain

The project is structured through a set of 9 work packages addressing the mobility of **Early Stage Researches (ESR)** and **Experienced Researchers (ER)** to those installations where most of the research works in High Energy Physics.

Objectives for CMS were : Data taking at CERN, Detector hardware, Computing, Physics Analysis

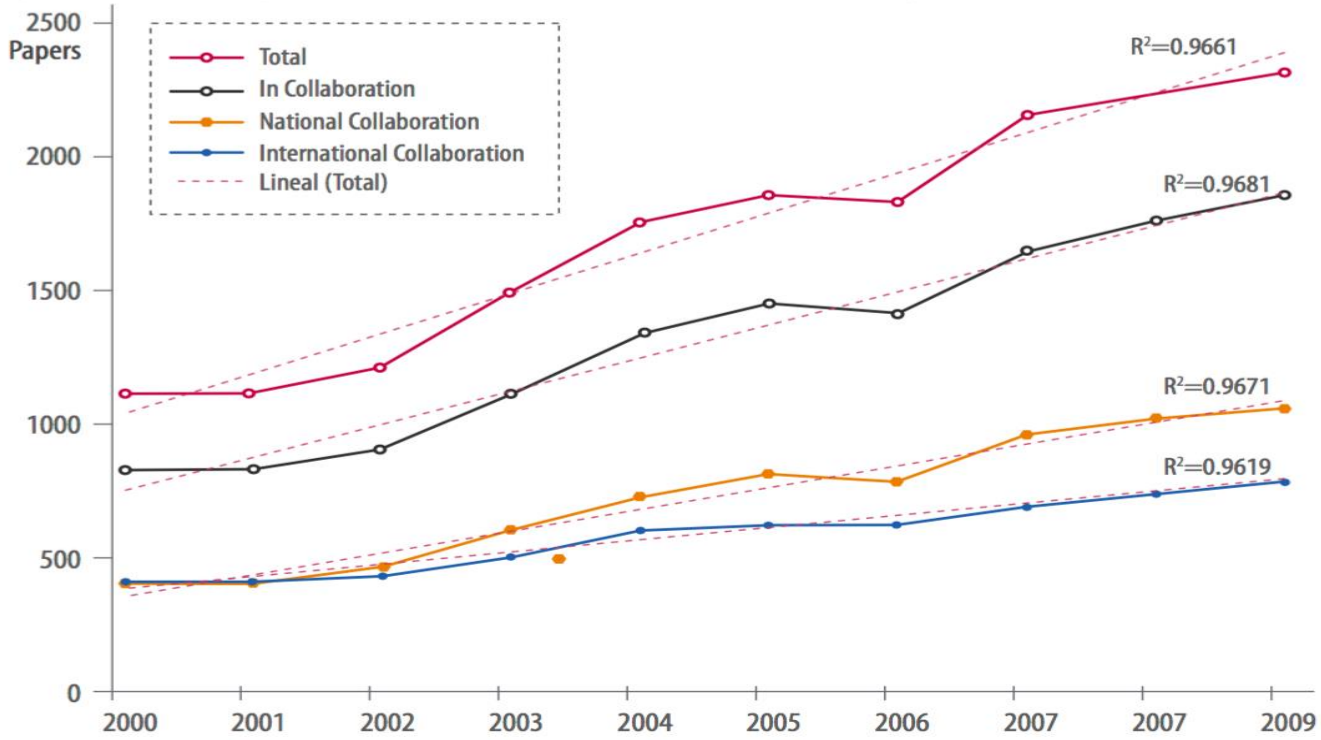
Kirsti Apostola, CMS Coordinator, EPLANET report, June 2014

http://www.roma1.infn.it/exp/eplanet

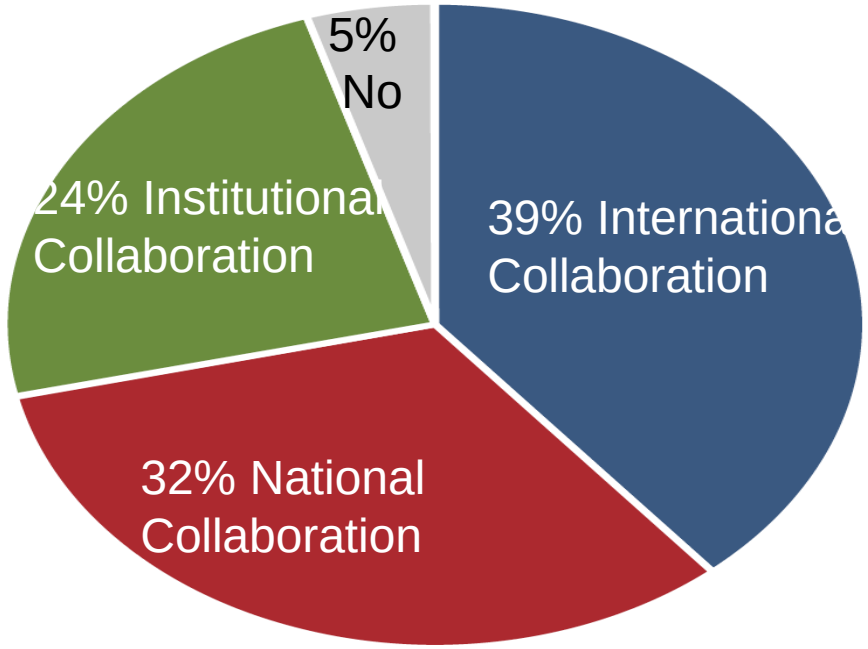
Increasing diversity through collaborations

- Collaborative programs is a gate to increase diversity
- Clearly increase the scientific production

National Papers in Chemistry with Mexican Authors



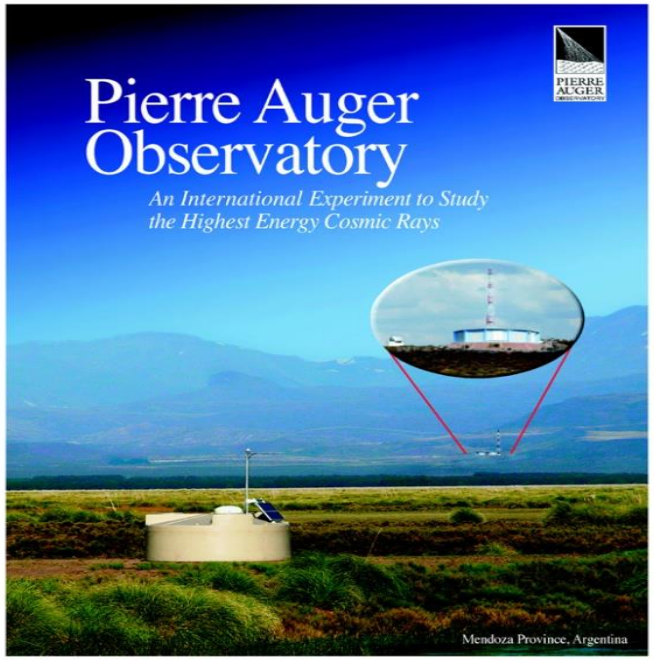
Published papers at Autonomous University of Puebla



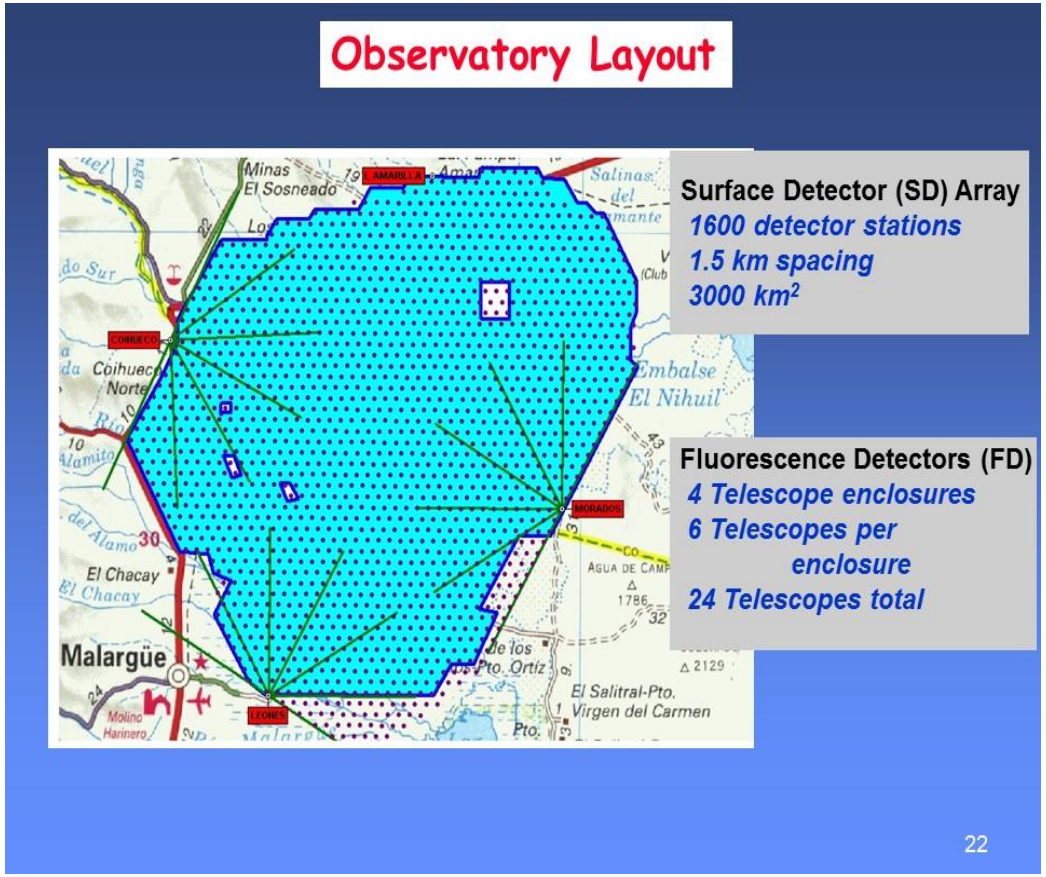
Foro consultativo científico y tecnológico, Taller sobre indicadores en Ciencia y Tecnología en latinoamérica, 2014, ISBN: 978-607-9217-46-4

https://www.elsevier.com/solutions/scival

PIERRE AUGER OBSERVATORY



Education and Outreach



Gregory Snow / University of Nebraska-Lincoln
For the Pierre Auger Colllaboration

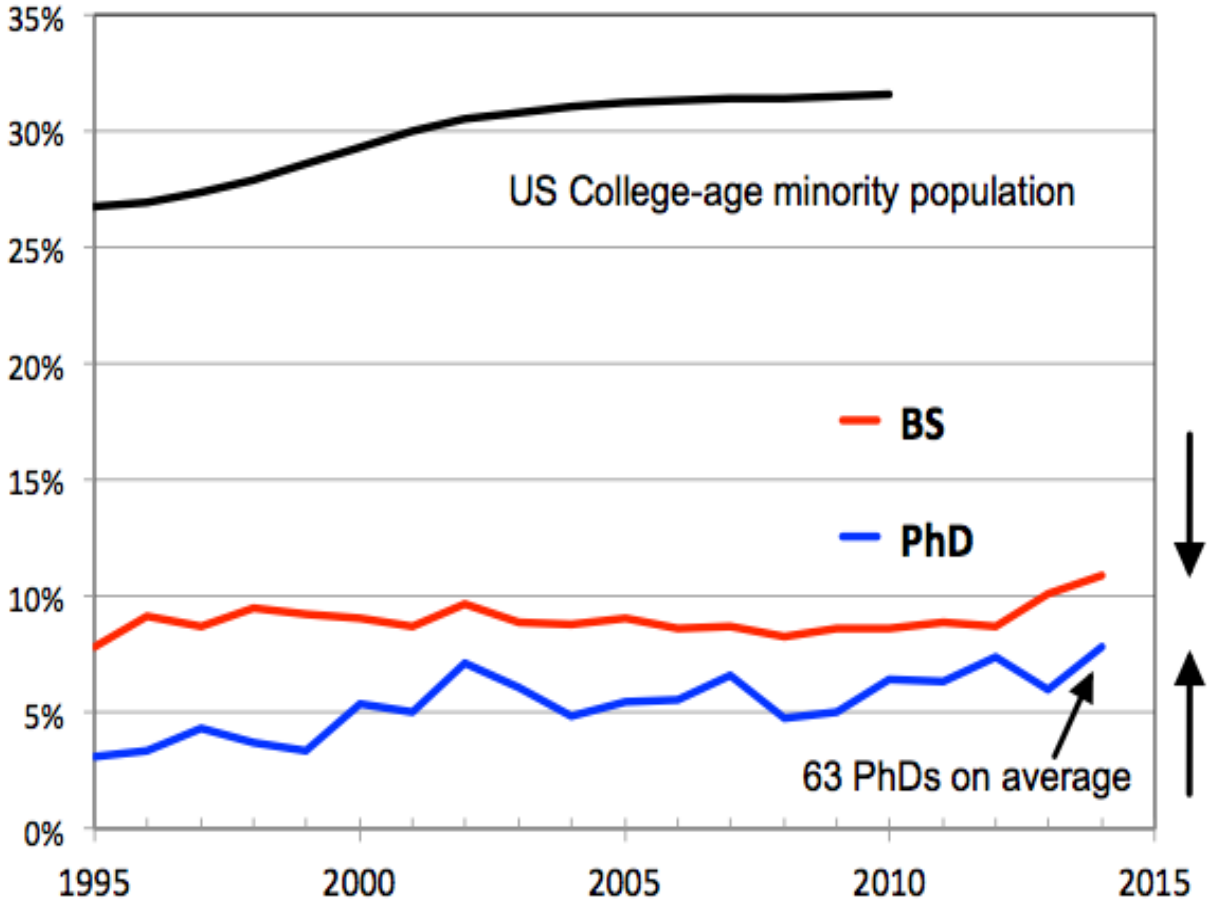
- **Use the Auger Observatory and international collaboration to enhance science literacy and technology skills in the region of the Auger site and internationally**
- **Increase public awareness and support for basic research in physics, astrophysics, and all areas of science**
- **Encourage and support a wide range of education/outreach projects which link schools, community groups, and the public with the science and scientists of the Auger Observatory**
- **Provide technical and non-technical information on Auger to a wide-range of audiences: students, public, government officials, scientific colleagues**
- **Recruit and encourage the participation of groups underrepresented in science in Auger education/outreach activities**

James Cronin School Inauguration

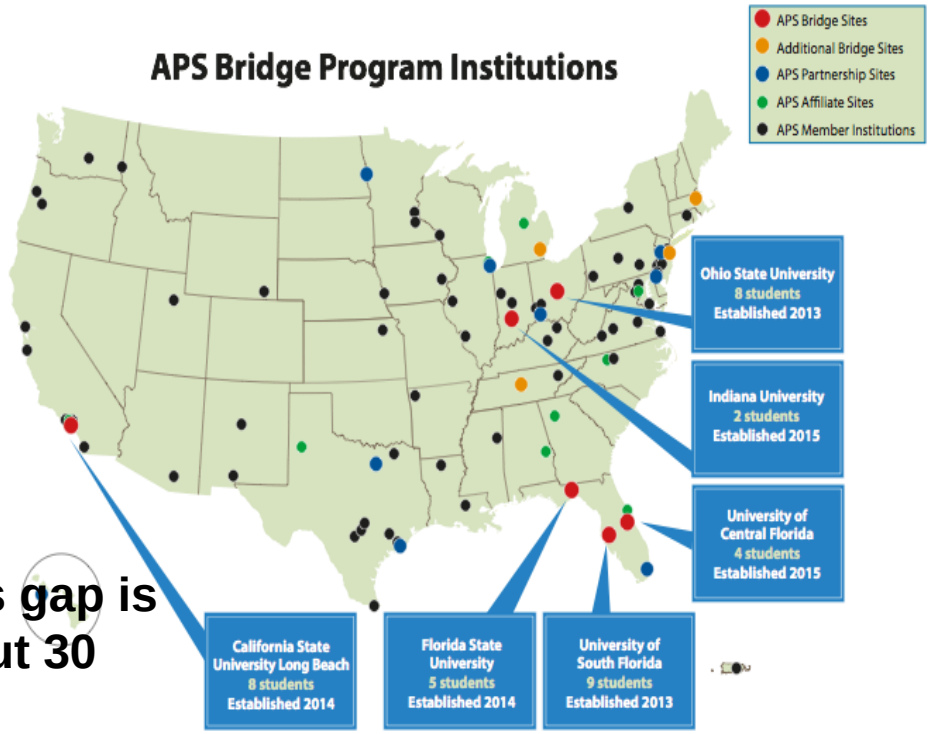
Funding from Malargüe, Mendoza Province, U.S. Grainger Foundation (via Cronin contact)

We have found that establishing and maintaining good relationships with the local community in Malargüe is important to the success of the Observatory.

The US Bridge Programs as an approach to increasing diversity in physics



Bridging this gap is roughly about 30 PhDs



Bridge Programs in Physics

Bridge Program -

- An approach to addressing the underrepresentation of some groups in physics
- Aim to provide opportunities for students to be successful that may not have had such chances by traditional means

APS Bridge Program - National effort to increase the number of PhD earned by underrepresented students in physics.

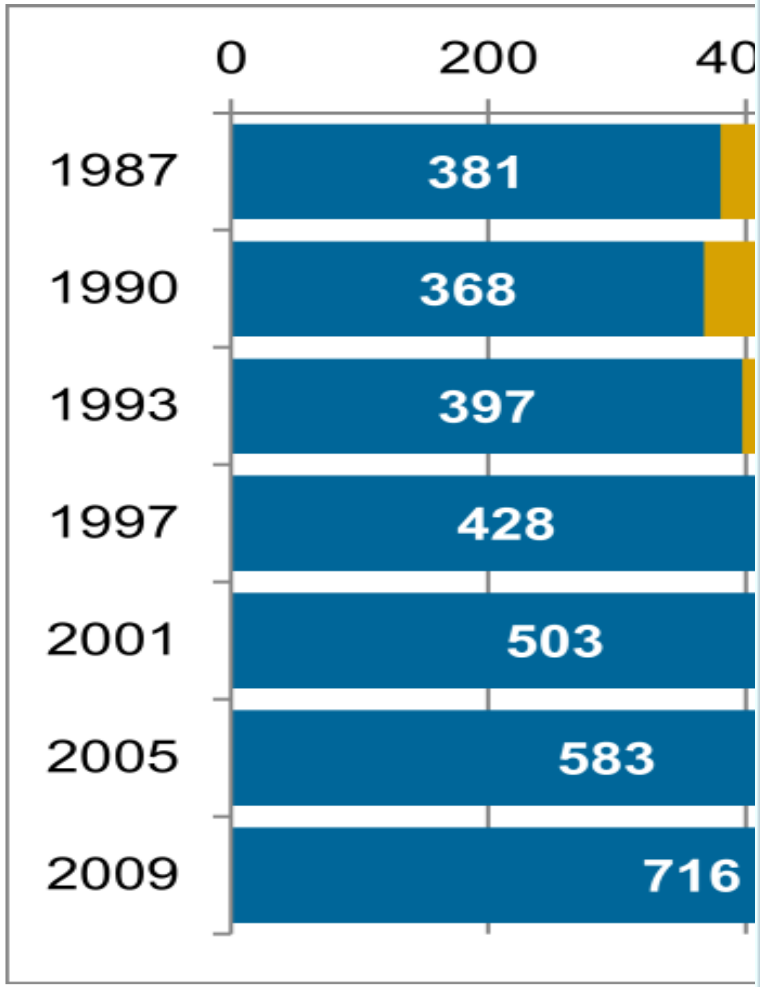
APS Funded Sites:

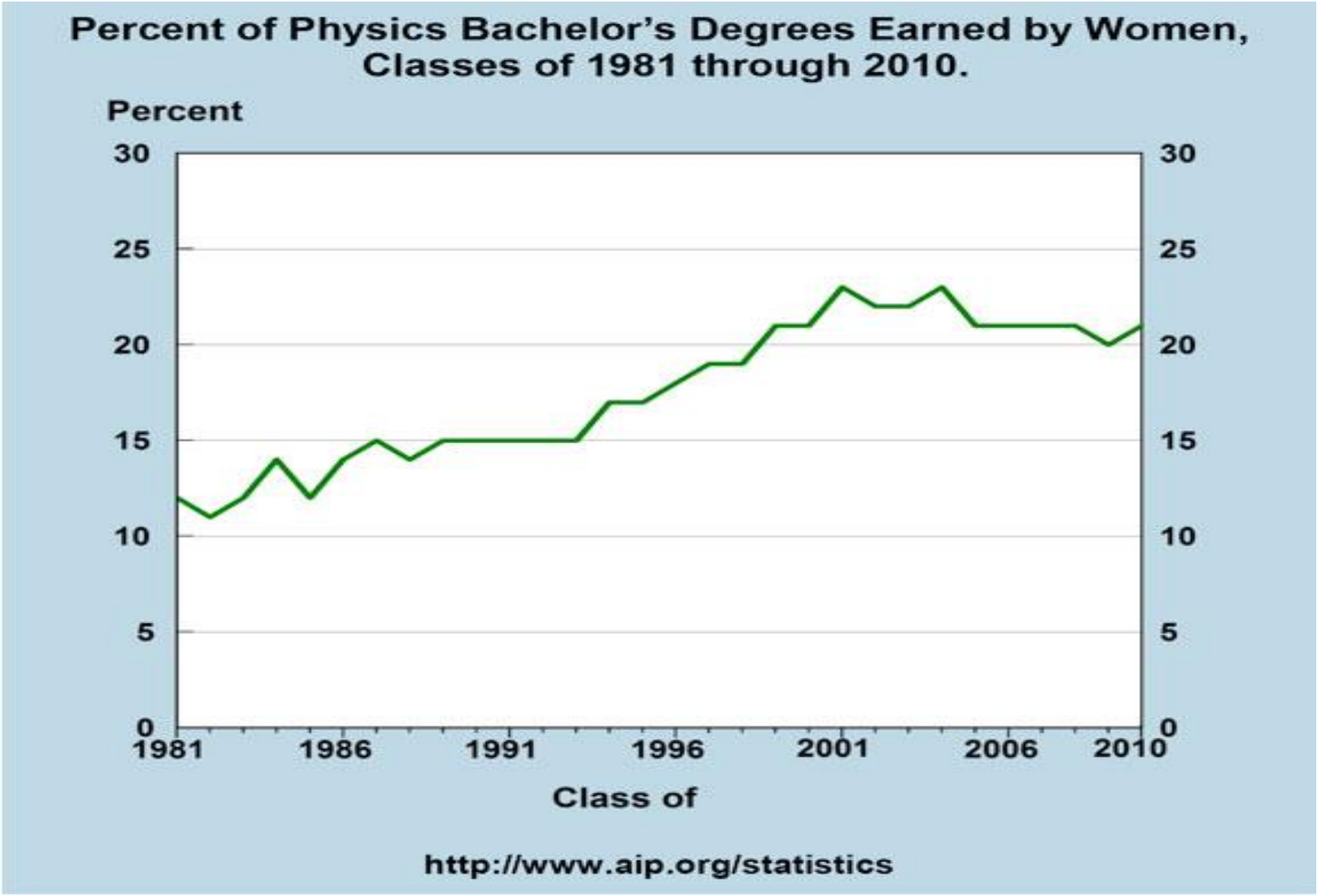
- Florida State University
- Indiana University
- Ohio State University
- University of Central Florida
- University of South Florida
- Cal. State Long Beach

Other Programs:

- University of Michigan
- Columbia University
- Fisk/ Vanderbilt University
- MIT
- Princeton University
- University of Chicago
- Others under development

Women in physics





GENDER EQUITY

- Eight research findings in three areas:
  - How social and environmental factors shape girls' achievement and interest in math and science
  - The climate of college and university science and engineering departments
  - Continuing influence of bias
- The issues cut across cultures:
  - Stereotype threat
  - Imposter syndrome
  - Growth versus Fixed Mindset

AAUW, 2009

Project Juno

IOP gender equality awards for physics in the UK and Ireland

Project Juno is an awards scheme managed by the Institute of Physics. The scheme recognises and rewards physics departments, institutes and groups that can demonstrate they have taken action to address the under-representation of women at all levels, and are encouraging better working practices for all.

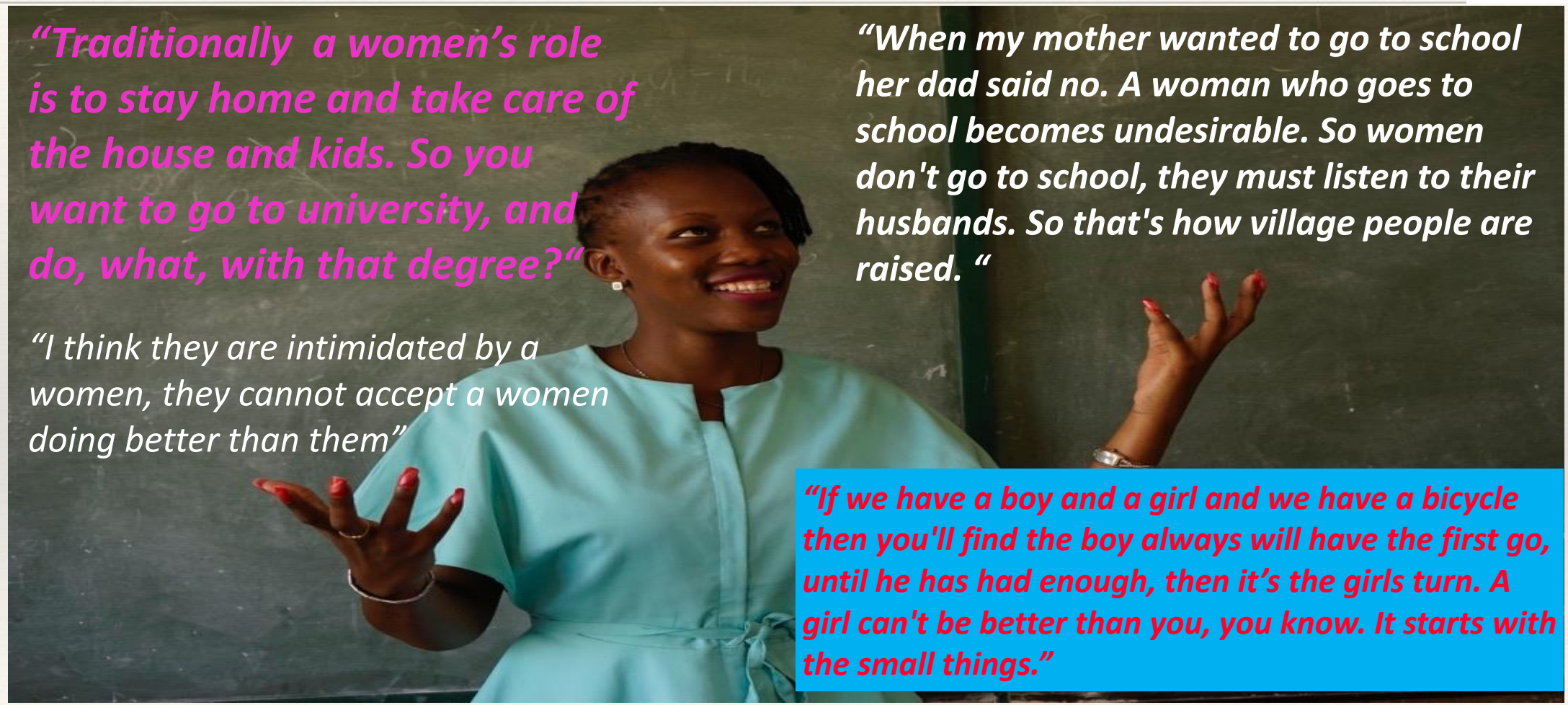
1. A robust organisational framework to deliver equality of opportunity and reward.
2. Appointment and selection processes and procedures that encourage men and women to apply for academic posts at all levels.
3. Departmental structures and systems which support and encourage the career progression and promotion of all staff and enable men and women to progress and continue in their careers.
4. Departmental organisation, structure, management arrangements and culture that are open, inclusive and transparent and encourage the participation of all staff.
5. Flexible approaches and provisions that enable individuals, at all career and life stages, to optimise their contribution to their department, institution and to SET.

Journey started by most physics departments and schools in UK.

Project Juno gives support and guidelines and stimulate actions within the schools.

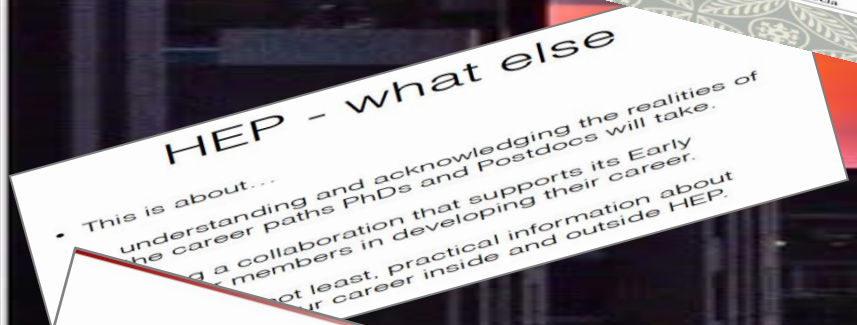
Juno committees involve staff and students at all levels and include also head of school/management figures. Promotes awareness within the schools.

Lots of concrete actions have started thanks to this project and more are being started.



Promoting Women in Physics in South Africa

The early career, gender, and diversity actions within the LHCb Collaboration



OUTREACH together CO-CREATION

Audience:
Supporters ⇔ Challengers

Domain:
Physic's ⇔ Stakeholders

Process:
Understanding ⇔ Experiencing

Co-creation turns Diversity & Inclusion from a moral obligation into a fundamental necessity

THE Port.ch

Conclusion: Why is Diversity important ?

- **Large collaborations** = small communities
- → competences → ideas → **BEAUTIFUL PHYSICS**

[K. Phillips et al, PSPB, Vol. 35 No3, March 2009 336-350]

- **Diversity improves quality & performance**
- **Different views, experiences, approaches**
- **Enhances creativity, innovation**
- **Problem solving**
- **Ability to defend decisions**

- **Lack of diversity = Loss of talent!**

- Responsibility: **respect and inclusion**
- → healthy and functioning environment

Attractiveness
→ reach other things

Silence about biases makes unfair distribution of power surviving
- → raise **awareness** about sexism, racism, patriarchy and homophobia

Communicating clearly with one another to effect a more diverse and inclusive culture of science calls for

- A need to create an enabling environment for inclusiveness across all domains : Geo-Political, Ethnic, Gender and Intersectionality.

Science is a global human effort

"It is always seems impossible until it's done."

Nelson R Mandela (1918-2013)

Thank you

- ✓Brian Nord
  - Setting ground rules
- ✓Rohini Godbole
- ✓Paula Eerola
- ✓Irais Bautista Guzman

Speakers of the D& I Session

LOCAL ORGANIZING COMMITTEE :

Z. Buthelezi (iThemba)
J. Cleymans (UCT) (chair)
S.H. Connell (UJ)
A.S. Cornell (Witwatersrand)
T. Dietel (UCT)
N. Haasbroek (iThemba)
(Conference Manager)
W.A. Horowitz (UCT)
D. Kar (Witwatersrand)
B. Mellado (Witwatersrand)
S. Yacoob (UCT)

INTERNATIONAL ADVISORY COMMITTEE:

T. Camporesi (CERN)
D. Charlton (Birmingham, UK)
A. Deandrea (Lyon)
J. Ellis (CERN, London)
P. Giubellino (CERN)
H. Gray (CERN)
J.W. Harris (Yale)
U. Heinz (Ohio State)
P. Jenni (Freiburg, CERN)
G. Martinez (Nantes)
H. Oeschler (Heidelberg)
K. Redlich (Wroclaw)
H. Satz (Bielefeld)
Y. Schutz (IN2P3, France)
A.S. Sorin (Dubna)
D.K. Srivastava (Kolkata)
O. Steinkamp (Zuerich)
H. Stoecker (Frankfurt)
R. Voss (CERN)
G. Wilkinson (Oxford)
Nu Xu (Berkeley, Wuhan)

science & technology
Department: Science and Technology
REPUBLIC OF SOUTH AFRICA

UCT CERN

CERN

NRF National Research Foundation
iThemba LABS Laboratory for Accelerator Based Sciences