Fundamental Physics and Accelerator Sciences in Africa

Christine Darve

Main organizer of the ASP 2010 European Spallation Source, ESS, Sweden
Former staff member at CERN and FNAL


Session B2: Invited Session: Science Diplomacy: Africa and the Middle East
Outlines

Mission of the African School of Fundamental Physics and its Applications

Stakeholders:
- Students
- Founding Agencies, Institutes and Universities
- The committees
- The lecturers

The first edition: South-Africa – August 2010

The second edition: Ghana – July 2012
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“African School of Fundamental Physics and its Applications”

A non-profit organization created by a small group of worldwide scientists

A High-Story to stimulate and include more talented physics students from the less developed countries in the world scientific community

The aim of the school is to build capacity to harvest, interpret, and exploit the results of current and future physics experiments with particle accelerators, and to increase proficiency in related applications and technologies.

- To contribute to a world w/ equal access to knowledge
- To establish a biennial school to be hosted across Sub-Saharan Africa
- To cover the African students 3-week classes attendance
- To provide high quality classes by international re-known Scientists
University Education and African Diversities

[Le Journal du CNRS - May 2010]

(Enseignement supérieur en Afrique)

Effectifs de chercheurs

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<tr>
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<th>Nombre total</th>
<th>Nombre par million d'habitants</th>
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<td>Sénégal</td>
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<td>722</td>
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<tr>
<td>Togo</td>
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<td>132</td>
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(Depenses en recherche et développement)

<table>
<thead>
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<th>Part du PIB en %</th>
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Distribution of All CERN Users by Nationality on 10 November 2010

MEMBER STATES: 6477
- AUSTRIA: 98
- BELGIUM: 109
- BULGARIA: 79
- CZECH REPUBLIC: 188
- DENMARK: 65
- FINLAND: 80
- FRANCE: 809
- GERMANY: 1158
- GREECE: 165
- HUNGARY: 65
- ITALY: 1694
- NETHERLANDS: 168
- NORWAY: 68
- POLAND: 248
- PORTUGAL: 138
- SLOVAKIA: 88
- SPAIN: 354
- SWEDEN: 74
- SWITZERLAND: 210
- UNITED KINGDOM: 619

OTHERS: 1289
- AFGHANISTAN: 1
- ALBANIA: 5
- ALGERIA: 11
- ARGENTINA: 15
- ARMENIA: 21
- AUSTRALIA: 21
- AZERBAIJAN: 5
- BANGLADESH: 3
- BELARUS: 38
- BOLIVIA: 2
- BOSNIA AND HERZEGOVINA: 1
- BRAZIL: 78
- CANADA: 142
- GEORGIA: 9
- GHANA: 1
- CHINA: 208
- GIBRALTAR: 1
- CUBA: 1
- COSTA RICA: 25
- HONG KONG: 3
- ICELAND: 1
- IRELAND: 3
- MALTA: 1
- MEXICO: 46
- MOLDOVA: 2
- MONGOLIA: 1
- NIGERIA: 1
- PORTUGAL: 1
- ROMANIA: 104
- SPAIN: 29
- SOUTH AFRICA: 10
- SRI LANKA: 5
- SYRIA: 3
- TUNISIA: 6
- UKRAINE: 42
- UZBEKISTAN: 2
- VIET NAM: 8

TOTAL: 7766
A Possible Recipe

- Academic Training for students
- Forum for local scientists and policy makers
- Public lectures for everybody

Contribute to foster Science in Africa

Research Infrastructures: Knowledge Triangle

- Research
- Education
- Innovation

To be a genuinely competitive knowledge economy:
- Produce knowledge through research
- Diffuse it through education
- Apply it through innovation

Courtesy of Daniel Adams, SA chief director: Emerging Research areas & Infrastructure
# The topics of interest

<table>
<thead>
<tr>
<th>Theoretical Physics</th>
<th>Experimental Physics</th>
<th>Accelerator and Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Nuclear and Particle Physics</td>
<td>• Particle Detectors</td>
<td>• Accelerator physics and Technology</td>
</tr>
<tr>
<td>• Beyond the Standard Model</td>
<td>• Particle Identification and Data Analysis</td>
<td>• Physics of Particle Beams</td>
</tr>
<tr>
<td>• Astro-particle physics and Cosmology</td>
<td>• Exp. Particle physics, current status of the field</td>
<td>• Instrumentation</td>
</tr>
<tr>
<td>• Theoretical Heavy-ion physics</td>
<td>• Exp. Nuclear Physics</td>
<td>• Medical Applications</td>
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</table>

**Information Technology and GRID tools, e.g. Computing**

**Experimental Physics**

**Theoretical Physics**

**Accelerator and Applications**

**MC, PHYTHIA, ROOT**
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Stakeholders:
✓ Students
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✓ The committees
✓ The lecturers

The first edition: South-Africa – August 2010

The second edition: Ghana – July 2012
ASP Students

Goals: Provide partial or full financial support to 60-70 students and create a scientific melting pot of cultural diversity

- Diversity of academic levels
  - Mainly Master and PhD students

- Diversity of education background
  - From theoretical physics to engineering sciences

- Diversity of the countries of origin
  - Priority to Sub-Saharan African students

- Women participation
  - Role of women in LDC

- Local Universities
  - Involve students and professors
Founding Agencies and Institutes

Financial support of the ASP 2012 is possible by developing a new Joint Collaboration formed of:

Institutional Support
AIMS, SA
BNL, USA
CEA, France
CERN, Switzerland
CNRS/IN2P3, France
DESY, USA
DITANET, UK, Euro
EPFL, Switzerland
ESS, Sweden (+private donation)
FNAL, USA

ICTP, Italy
INFN, Italy
IUPAP, USA
JLAB, USA
JSA, USA
NEI-AIMS
NItHeP, South Africa
PSI, Switzerland
SLAC, USA

Governmental Institutions
Department of Energy, USA
Department of Science and Technology, South Africa
French Embassy Accra
NRF, South Africa
NSF, USA

CD 02/27/2012 - APS meeting - Fundamental Physics and Accelerator Sciences in Africa
ASP 2012 - International and Local Organizing Committees

International Organizing Committee
Bobby S. Acharya, ICTP
Ketevi A Assamagan, BNL
Christine Darve, ESS
Jonathan R. Ellis, CERN, King's College
Steve Muanza, CNRS-IN2P3

Local Organizing Committee:
E. H. K. Akaho, Director General, GAEC
B. Agui-Tuffour, University of Ghana
F. K. A. Allotey, IMS, Legon-Accra
P. Amoako-Yirenki, KNUST, Kumasi
S. K. Danuor, Head of Physics, KNUST
I. K. Drontwi, Director of National IMS
A. L. Mahu, KNUST
M. L. McIntyre, University of Ghana
S. Y. Mensah, University of Cape Coast
R. K. Nkum, Provost, College of Science, KNUST
B. G. K. Nkrumah-Buandoh, University of Ghana
ASP 2012 - International Advisory Committee

E. Auge, CNRS-IN2P3, Paris, FR
H. Bachacou, CEA, FR
V. Breton, CNRS-IN2P3, Orsay, FR
J. Cleymans, University of Cape Town, SA
S. Connell, U. of Johannesburg, SA
A. Dabrowski, CERN, CH
R. Daantonj Tabrizi, SFU, CA
L. Elhouadiri, TJNAF, USA
T. F. kelof, Uppsala University, SE
E. G. Ferreiro, USC, Sante de Comp., SP
F. Ferroni, INFN, IT
H. Gordon, BNL, Upton, NY, USA
J. Govaerts, UCL, Louvain, BE
N. Holtkamp, SLAC, USA
J. Huston, SU, USA
M. Kado, CNRS-IN2P3, FR
Y.-K. Kim, FNAL, Batavia, IL, USA
M. Lindroos, ESS, SE
G. Margaritondo, EPFL, Lausanne, CH
B. Masara, SAIP, Pretoria, SA
H. Montgomery, TJNAF, VA, USA
F. Quevedo, ICTP, Trieste, IT
L. Rykin, PSI, Villigen, CH
E. T. semelis, CERN, Geneva, CH
T. Vickers, U. of the Witwatersrand, SA
S. Vigor, BNL, Upton, NY, USA
Z. Vilakazi, iThemba LABS, Cape Town, SA
R. Voss, CERN, CH
World-Class Lecturers

✧ People-oriented lecturers willing to share their experience with less developed countries students

✧ Highly motivated characters

✧ Most of ASP lecturers are financially supported by their home institutes

✧ Provide fruitful interactions with students

✧ Lectures typically attend the ASP for 3 - 7 days
World-Class Lecturers

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- The first edition: South-Africa – August 2010

The First School:

The ASP2010 took place in the “Rainbow Nation”, from August 1st till 21st, 2010

Financial support was provided by 15 institutes from Africa, America and Europe.

CERN, ICTP,
- France: CEA, CNRS-IN2P3, Institut des Grilles,
- Spain: Univ. S. de Compostela,
- South Africa: NITheP, NRF/SAIP,
- Switzerland: EPFL, PSI,
- USA: BNL, FNAL/DOE, IUPAP, J-Lab/TJNAF, NSF
✧ 50 students from 17 African countries with full financial support.

✧ Additional students from Canada, Germany, Switzerland, US and India.

✧ 16% of the students were women.

✧ > 10% of local students
Balancing the Budget

- Students travel cost: 34,450 €
- Cost for student lodgings, meals and catering: 29,000 € for 20 days

<table>
<thead>
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<th>Region</th>
<th>Accommodation</th>
<th>Travel</th>
<th>Total</th>
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<tbody>
<tr>
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<td>27,302</td>
<td>50,879</td>
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<tr>
<td>North Africa</td>
<td>3,173</td>
<td>6,086</td>
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<tr>
<td>India</td>
<td>635</td>
<td>1,061</td>
<td>1,696</td>
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<tr>
<td>Europe</td>
<td>1,904</td>
<td>-</td>
<td>1,904</td>
</tr>
<tr>
<td>North America</td>
<td>1,904</td>
<td>-</td>
<td>1,904</td>
</tr>
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</table>
Lectures and lecturers – Theoretical Physics

Monday 02
Opening address by Frederik SCHOLTZ, NIfheP Director, SA
TH1 - Theory Recaps
  Jan GOVAERTS (Louvain U., BE)
Visit of Stellenbosch University
TH1 I - Foundations of Nuclear and Particle Physics
  Jean CLEYMANS (UCT, SA)

Tuesday 03
TH1 I - Foundations of Nuclear and Particle Physics and
TH1 - Discussion Session
  Jean CLEYMANS (UCT, SA)
TH6 I - Computer Physics
  Peter SKANDS (CERN)
TH2 I - The Standard Model
  Alan CORNELL (Wits U., SA)

Wednesday 04
TH6 II - Computer Physics
  Peter SKANDS (CERN)
TH2 II - The Standard Model
  Alan CORNELL (Wits U., SA)
TH4 I - Astrophysics & Cosmology
  Bruce BASSET (SA Astron, Observ.)

Thursday 05
TH4 II - Astrophysics & Cosmology
  Bruce BASSET (SA Astron, Observ.)
TH2 The Standard Model: Discussion Session
  Bruce BASSETT (South African Astron. Observ., SA)
TH5 I - Theory of Heavy-Ion Collisions
  Elena GONZALEZ FERREIRO (Uni. de Santiago de Compostela)
THX - Theory Star Lecture
  John Ellis (CERN)

Friday 06
  and TH4 - Astrophysics & Cosmology: Discussion Session
  Bruce BASSETT (South African Astron. Observ., SA)
TH6 Computer Physics: Lab Session I
  and TH6 Computer Physics: Lab Session II
  Peter SKANDS (CERN)
TH5 - Theory of Heavy-Ion Collisions: Discussion Session
  Elena GONZALEZ FERREIRO (U.de Sant. de Comp.)
Lectures and lecturers - Experimental Physics

Monday 09
EP1 II - Particle Detectors and
EP1 - Statistics & Detectors
Daniel FROIDEVAUX (CERN)

EP2 I - Particle ID & Data Analysis
Ketevi Adikle ASSAMAGAN (BNL, USA)

EPFR I - Experimental Recaps: Part 1. Interactions Particle-Matter and Particle detectors
Daniel FROIDEVAUX (CERN)

Tuesday 10
TH3 - Beyond the Standard Model and
Jim GATES (Maryland Uni., USA)

EP7: Astroparticle Physics Experiments I
Mathieu DE NAUROIS (CERN)

Wednesday 11
Marumi KADO (LAL, IN2P3)

EP3 I - Experimental Particle Physics
Steve Guy MUANZA (CNRS, IN2P3)

Andrea DOTTI (CERN)

Thursday 12
EP6 II: Part 2. Introduction to GRID Computing and
Bruce BECKER (SA-GRID)

EP4 - Programmes in Experimental Nuclear Physics and applications in SA
Zeblon VILAKAZI (iThemba Labs, SA)

EPX - Experimental Star Lecture
Albert DE ROECK (CERN)

Friday 13
EP5 - Heavy-Ion Collisions Experiments I
Valerie RAMILLIEN BARRET (Lab. de Phys. Corpusculaire, F)

EP6 Lab II
Bruce BECKER (SA Grid)

EP7 DS
Mathieu DE NAUROIS (LPNHE, F)
### Lectures and lecturers – Accelerator and Applications

**ASP2010, SA - Accelerator and Technology week**

**Preliminary Schedule - by Ch. Darve / May 28, 2010**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Monday 16</th>
<th>Tuesday 17</th>
<th>Wednesday 18</th>
<th>Thursday 19</th>
<th>Friday 20</th>
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</thead>
<tbody>
<tr>
<td>Lecturers</td>
<td>Bernhard Holzer</td>
<td>Ph. Lebrun, Bernhard Holzer, John Weisend</td>
<td>Uli Raich, John Weisend, Ch. Darve, Marco Silari</td>
<td>Lenny Rivkin, Giorgio Margaritondo, Marco Silari, Manjit Dosanjh, Thierry Muanza</td>
<td>Norbert Holtkamp, Heinrich Schwoerer, Lenny Rivkin</td>
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#### Classes

<table>
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<tr>
<th></th>
<th>Monday 16</th>
<th>Tuesday 17</th>
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<th>Thursday 19</th>
<th>Friday 20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>h1 9:00-10:00</td>
<td>History &amp; Applications (BH)</td>
<td>Fundamental Physics, Cryogenics (PHL)</td>
<td>Beam Diagnostics (UR)</td>
<td>Synchrotron Radiation (LR)</td>
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<td>h2 10:00-11:00</td>
<td>Beam Dynamics &amp; Stability (BH)</td>
<td>RF Cavities (+long. dyn. (BH)</td>
<td>Magnets and RF Instrumentation (CD+JW)</td>
<td>Magnetic Confinement Fusion (NH)</td>
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<td>h3 11:15-12:15</td>
<td>Accelerator Operation (BH)</td>
<td>Warm Magnets (JW)</td>
<td>Intro to Medical Accelerator (MS)</td>
<td>Laser driven plasma accelerator (HS)</td>
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<tr>
<td></td>
<td>h4 13:30-14:30</td>
<td>Accelerator Operation (BH)</td>
<td>Cold Magnets (JW)</td>
<td>Radionuclide Production and Radiation Therapy (MS)</td>
<td>Light Sources (LR)</td>
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#### Tutors

<table>
<thead>
<tr>
<th>Monday 16</th>
<th>Tuesday 17</th>
<th>Wednesday 18</th>
<th>Thursday 19</th>
<th>Friday 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Holzer + A. Dabrowski + J. Weisend + Ch. Darve + U. Raich + B. Becker</td>
<td>B. Holzer + A. Dabrowski + J. Weisend + Ch. Darve + U. Raich + Ph. Lebrun</td>
<td>i-Themba Labs Visit * Cyclotrons for medical applications * Neutron&amp;X-ray beamlines for Acc.-driven Sources * Laser Practises</td>
<td>Medical App. + Hadron Therapy (MD)</td>
<td>AT5_DS1: Magnetic Confinement Fusion (NH)</td>
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<tr>
<td></td>
<td></td>
<td>Lecturers + SA</td>
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<td>AT5_DS2: SLS (LR)</td>
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<td></td>
<td>AT1_DS1: Accelerator Optics Design (BH, LB, JW, CD, AD)</td>
<td>Star lecture: LHC (Ph. L)</td>
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<tr>
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<td></td>
<td>AT2_DS1: Accelerator System Design (Part I)</td>
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<td>Medical Therapy - Cancer th. w/ part. Beam (TM)</td>
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<td></td>
<td>AT2_DS2: Accelerator System Design (Part II)</td>
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<td>AT5_DS1: Magnetic Confinement Fusion (NH)</td>
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<td>AT2_DS3: Accelerator System Design (Part III)</td>
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<td>AT5_DS2: SLS (LR)</td>
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<td>AT4_DS1: Radio-Isotope&amp;Cancer Rad. Th. eGRID(MD, MS)</td>
<td></td>
<td>AT5_DS3: Laser Practices - TBD or Radio-Protection</td>
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<tr>
<td></td>
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<td>AT4_DS2: Accelerator System Design (Part II)</td>
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<tr>
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<td>AT4_DS3: Accelerator System Design (Part III)</td>
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<td>AT4_DS4: Accelerator System Design (Part IV)</td>
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<td></td>
<td></td>
<td>AT4_DS5: Accelerator System Design (Part V)</td>
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Hands-on activities

**iThemba Lab. for Accelerator Based Science**

- Radiation Environment: @ iThemba
- Scintillator:

- Medical Applications by M. Dosanjh and M. Silari

- Laser Instrumentation: @ Stellenbosch

Students became acquainted with the use of scintillation detectors and performed measurements of environmental radioactivity

- GEANT4 at Stellenbosch Uni.
"As well as being an important producer of radioisotopes, it is the only laboratory in the southern hemisphere where hadron therapy is performed with neutron and proton beams, which have to date treated more than 1400 and 500 patients, respectively," explains Zeblon Vilakazi, director of the iThemba LABS.

iThemba LABS

iThemba L(aboratory) for A(ccelerator)-B(ased) S(ciences) is a multi-disciplinary research centre, operated by the NRF (National Research Foundation). It provides accelerator and ancillary facilities for:

- Research and training in the physical, biomedical and material sciences
- Treatment of cancer patients with energetic neutrons and protons and related research
- Production of radioisotopes and radiopharmaceuticals for use in nuclear medicine, research and industry and related research
### Some Accelerators in South Africa

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Type</th>
<th>Date</th>
<th>Particle</th>
<th>Energy (MeV)</th>
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<tbody>
<tr>
<td>CSIR</td>
<td>Cyclotron</td>
<td>1956/60</td>
<td>H$_2^+$</td>
<td>5.8 - 15.2</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>²H$^+$</td>
<td>11.5 - 17.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>³He$^{++}$</td>
<td>18 - 39</td>
</tr>
<tr>
<td>SUNI / iThemba LABS</td>
<td>VdG</td>
<td>1964</td>
<td>p a.o.</td>
<td>6</td>
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<td>NECSA</td>
<td>VdG</td>
<td>1962</td>
<td>p a.o.</td>
<td>4</td>
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<td>University of Potchestroom</td>
<td>VdG</td>
<td>1972</td>
<td>p a.o.</td>
<td>2</td>
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<tr>
<td>University of Pretoria</td>
<td>VdG</td>
<td>1964</td>
<td>p a.o.</td>
<td>2.5</td>
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<tr>
<td>WITS iThemba LABS</td>
<td>Tandem</td>
<td>Nov. 72</td>
<td>p a.o.</td>
<td>12 (6)</td>
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<tr>
<td></td>
<td>Cyclotron</td>
<td>1984</td>
<td>p a.o.</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Cyclotron</td>
<td>1986</td>
<td>p a.o.</td>
<td>11.5 - 227</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Xe</td>
<td>790</td>
</tr>
<tr>
<td>De Beers</td>
<td>Cyclotron</td>
<td>1994</td>
<td>p to Xe</td>
<td>8 (41.6)</td>
</tr>
<tr>
<td>De Beers</td>
<td>RFQ</td>
<td>1997</td>
<td>d</td>
<td>4 and 5</td>
</tr>
<tr>
<td>Pretoria Private Hospital</td>
<td>RFQ</td>
<td>2003</td>
<td>d</td>
<td>4 and 5</td>
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<tr>
<td>NECSA</td>
<td>Cyclotron</td>
<td>2007</td>
<td>p</td>
<td>PET isotopes</td>
</tr>
</tbody>
</table>

Courtesy of Zeblon Vilakazi
Discussion Sessions

Following the classes, discussion sessions permitted to answer questions and develop specific topics of interest.
What is the origin of mass for fundamental particles?
Why are there so many kinds of particles?
Do all the forces become one?
Are there extra dimensions of space?
What are neutrinos telling us?
Do charged leptons change from one kind to another?
Are there undiscovered principles of nature: new symmetries, new physical laws?
What happened to the antimatter?
What is dark matter? dark energy?
How did the universe come to be?

In 1872: Gauguin was wondering:
"Where Do We Come From? What Are We? Where Are We Going?"
CERN Control Centre

✧ A special movie dedicated to each ASP 2010 student by the CCC team to experience a live demonstration of proton acceleration.

✧ Life communication with the CERN experts using remote connection from SA to CCC.

✧ Broadcasted connection
Forum/Outreach Day: A Gateway to Innovation

ASP Closure of ASP 2010 and Introduction of Outreach, Forum Day
Christine DARVE (ASP 2010 Main organizer)

DST Address
Daniel ADAMS (Chief Director, Emerging Research Areas & Infrastructure - Human Capital and Knowledge Systems)

The Road Map of Hadron Colliders (Tevatron and LHC) - Physics Views
By Peter JENNI (ATLAS Former Spokesperson)

The Road Map of Particle Accelerators - Technological Views
By Philippe LEBRUN (Former Head of CERN Accelerator Technology Dep.)

Knowledge & Technology Transfer
By Claudio PARRINELLO (CERN Head of Knowledge and Technology Transfer)

Energetics and Fusion
By Norbert HOLTKAMP (ITER Principal Deputy Director General)

Progress in Particle therapy in Europe
By Manjit DOSANJHI (ENLIGHT Coordinator and Life Sciences Adviser)

Posters:
Naima Zahar: Fast neutron filter design for the neutron diffraction technique
Ahmed Rebai: Radio Detection of Ultra High Energy Cosmic Rays With The CODALEMA Experiment

Dedicated to Knowledge and Transfer of Technology

The South African government was represented by Dr. Daniel Adams, chief director: Emerging Research areas & Infrastructure, Human Capital and Knowledge Systems.
Several Public lectures

@ NTM science center in Cape town

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<th>August 6th, 2010</th>
<th>August 13th, 2010</th>
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| “Gauguins questions in Physics”  
  John ELLIS (CERN, CH) | “The LHC - Searching for the Higgs Boson”  
  Ketevi Assamagan (Brookhaven Lab, USA) |
| “How to answer Gauguins questions”  
  Christine Darve (Fermilab, USA) | “The Future? Beyond the LHC”  
  Anne Dabrowski (CERN, CH) |
| Steve MUANZA (IN2P3, France) |

To share experience with society

The MTN Sciencentre address is 407 Canal Walk (Upper level, Entrance 5), Century City near Cape Town. There is no cost to attend the event but seating is limited and booking is advised. Secure parking is available.

Contact Jani on 021 529 8100 or jani@mtnscentrec.org.za to book your seat. Visit http://www.mtnsciencentre.org.za for more details.
Excursion and School Banquet

- Guided bus tour of the Cape Peninsula

- School banquet hosted by Stellenbosch Lodge
  complimentary wine and chocolate tasting

- Dinner and Western Cape Jazz band
  creating a relaxed and warm atmosphere.

- During the evening, students representing each of their countries, made heartfelt speeches, introducing themselves, their countries and expressed their experiences of the school thus far.
Student Feedback

On a scale of 1 to 5, where 1 is terrible, 3 is somewhat good, and 5 is great, and 5 being great, on average, how would you grade the lecturers in the following areas?

- Well organized
- Communicates clearly
- Treats students equally
- High expectations for all students
- Understands subject matter really well

Chart showing feedback ratings for different areas.
Student Feedback

On a scale of 1 to 5, where 1 is no impact at all, 3 is somewhat of an impact, and 5 is a major impact, how much of an impact do you believe that participation at the ASP2010 has had in terms of:

- Connecting to the international physics community
- Applying for grad schools in Europe/North America
- Sharing the experiences gained at ASP2010 with your colleagues in you...

Better understanding of the state of different research areas in other... Encouraged to continue in your field of research Applying for grad schools in African countries (including your country)
Student Feedback

On a scale of 1 to 5, where 1 is terrible, 3 is good, and 5 is great, Which of the following are the three most important qualities for lecturers?

- Working with all students' styles of learning.
- Subject matter expertise.
- Building trust and respect with students.
- Working well with students from different backgrounds.

Explanations:

- Orange: 1
- Blue: 2
- Purple: 3
- Red: 4
- Green: 5

Legend:
Track various training opportunities are available (email, facebook or by web page):

* Summer studentships at CERN funded by US Foundation & CERN itself
  - 2 months of lectures & research experience
  - Suitable for advanced undergraduates, Masters students

* Possibilities for co-supervised Masters / PhD theses
  - e.g., in France, at Jefferson Laboratory in US

* Postdoctoral fellowships at FNAL

→ Please propose fellowships to our rising stars ..
Mission of the African School of Fundamental Physics and its Applications

Stakeholders:
- Students
- Founding Agencies, Institutes and Universities
- The committees
- The lecturers

The first edition: South-Africa – August 2010

The second edition: Ghana – July 2012
Modeled after the ASP 2010 agenda

Additional topics:

- Digital library
- CERN-KNUST agreement
- OSG Grid Workshop

Connection to ASP 2012, a dedicated Grid School will follow on Aug. 6-8 2012
Ghana Atouts

Local expertise

Students housing

Ghana Atomic Energy Commission

Lecture hall
Ghana - Infrastructure

Physics classes-room

Radiation laboratory

Computing room

Engineering School: solar panels
MISSION STATEMENT

College of Science provides high quality teaching, research, and entrepreneurship training and service in the pure and applied sciences for the sustainable industrial and socio-economic development of Ghana and Africa.

CORE VALUES

- Excellence
- Teamwork
- Dedication to duty
- Discipline

VISION STATEMENT

Producing high caliber Science graduates to support and sustain the industrial and socio-economic development of Ghana and Africa.
Further Contacts in Ghana

- Meeting in ACCRA Legon University
  - Prof. George Nkrumah, Head of the Physics Dep. U. of Accra Legon
  - Prof. Yaa Ntiamoah-Baidu, Vice-chancellor

- Meeting with Government officials
  - Prof. Mahama Duwiejua (Exec. Secretary of the Nat. Council for Tertiary Education, NCTE)
  - Prof. Dontwi (Director, National Institute for Mathematical Sciences)

- Contacts with the Embassies of France and of the US
For more information visit
http://africanschoolofphysics.web.cern.ch

The African School of Fundamental Physics and its Applications 2012

The African School of Fundamental Physics and its Application has been established to build capacity to harvest and interpret the results of current and future physics experiments with particle accelerators, and to increase proficiency in related applications, such as medicine, and technologies, such as IT.

The school is being organized in a Sub-Saharan African country every second year and is based on a close interplay between theoretical, experimental, and applied physics. The first school took place in Stellenbosch, South Africa on 1-21 August 2010 and the second edition of the biennial school in KNUST, Kumasi, Ghana from July 15th to Aug 4th 2012. The poster of the school can be downloaded here: PDF/JPEG

The School is a non-profit organization, which provides partial or full financial support to 50 of the selected students, with priority to Sub-Saharan African students.

The lectures are addressed to students in Fundamental Physics with at least a background of 4 years of university formation. Lectures may be an interesting complement for PhD academic lectures. Depending on circumstances we may consider opening the school to young researchers as well.

Announcements: In connection to ASP2012, a dedicated Grid School will follow on August 6-8 2012.

CD 02/27/2012 - APS meeting - Fundamental Physics and Accelerator Sciences in Africa