

The African School of Fundamental Physics and its Applications

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Abstract. We have established a biennial school of physics in Africa, on fundamental subatomic physics and its applications. 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, such as medicine, and technologies. The school 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. We propose the second edition of the biennial school in Ghana on 15 July – 8 August 2012.

1. Introduction

A school of fundamental physics and its applications, ASP2010, took place in Stellenbosch, South Africa, on August 1–21, 2010 [1, 2]. The school was based on a close interplay between theoretical, experimental, and applied physics. It covered a wide range of topics: particle physics, particle detectors, astro-particle physics and cosmology, computing, accelerator technologies and some of the applications, such as medical physics, light sources and magnetic confinement fusion. The participating students were selected from all over Africa and beyond. A selection of lecture topics in theory, experimental and applied physics was proposed for the school. Scientists from Africa, Europe and the USA were invited to prepare and deliver lectures according to the proposed topics taking into account the diverse levels of the students. The duration of the school allowed for networking — interactions among students and between students and lecturers. The school was funded by institutes in Africa, Europe and the USA.

The ASP2010 was a very successful school as can be seen from the final report and the numerous press releases [3]. The success of the school is due to the financial support from fifteen institutes in the USA, in Europe and in South Africa, to the dedication of the organising committee, to the devotion of the lecturers, and to the interests of the students themselves. Many students in Africa face challenges in terms of the logistical support, the quality of education and the opportunity for higher education abroad. It is often the case in Africa that even the best students do not have the needed support to succeed or to acquire the necessary skills to be competitive at an international level. It was particularly important for the ASP2010 organising committee to help resolve some of the challenges that students from Africa face. It is not to suggest that this particular school has solved all the issues, not at all. However, it is hoped that this school was useful in terms of networking, which in turn will help prepare the students to find practical answers to many issues that they may need to resolve.

Looking at the long term objectives (to help improve high training and education in Africa) that motivated the organisation of ASP2010, the success of ASP2010 is encouraging and provides motivation to work harder towards the original objectives by organising the school again in the future, and in doing so, truly contribute in a significant way to development in Africa. To build up on the success of ASP2010, the organising committee proposes a similar school in 2012, ASP2012, but in a different African country. The committee has explored this option, and of the various host countries proposed, Ghana was selected to host ASP2012 on 15 July 2012 to 8 August 2012.

2. Topics

Four main topics will form the backbone of the school: 1) Theoretical Physics, 2) Experimental Subatomic Physics, 3) Accelerators, Technologies and Applications, 4) Grid computing. In addition to lecture courses, each topic will include hands-on exercises on computing-related aspects, including Grid and high-performance computing.

Further, each main topic will contain a number of additional exercises for student projects. These will be completed in groups, with a single lecturer (mentor) assigned to each group. These groups will also provide opportunities for discussing questions arising from the lecture material. The groups will be assigned on arrival, and time will be reserved for this activity each working day during the school. These daily discussion sessions will provide a framework for mentoring students from different backgrounds. Each group will deliver a short presentation at the end of the programme.

3. Venue and Scope

Initially, a few countries were considered to host ASP2012. After discussions with several experts familiar with the physics community in Africa, Ghana has been selected as the venue for the second edition of this school. More precisely, the school will take at the Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi, Ghana. The proposed duration of the school is three and half week from July 15 to August 8, 2012. We received 132 applications from which 58 students were selected to attend the school. The selected students will receive full bursaries. The distribution of selected students by country is shown in Figure 1.

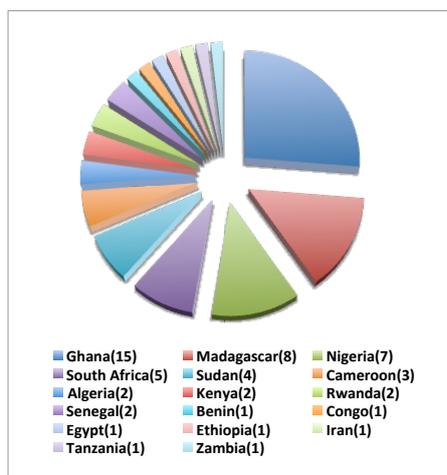


Figure 1. The distribution of selected students to attend the African school of physics and its applications. A total of 132 applications were received of which 58 students were selected.

4. Relevance to Scientific Development in Africa

International cooperation is a large common denominator of the culture of scientific activities. However, in many scientific disciplines and especially in our field of Fundamental Physics, the

cooperation among African countries and between them and Northern countries is not sufficiently developed. This is especially the case for sub-Saharan Africa. We therefore want to extend the usual international scientific ties in our field to this geographical zone.

With this project it is therefore our aim to initiate and support academic and research cooperations in Fundamental High Energy Physics with countries in sub-Saharan Africa.

It is *not* our aim to set this up as a strictly one-way effort to bring our knowledge and experience to African colleagues and students, but rather to establish a genuine Integrating Global Network.

For this reason, the programme we propose includes as an essential aspect mentored group sessions working on projects with discussions, so that each student may draw the maximum individual benefit from the schools.

The second edition of the school will utilise the existing scientific foundation in Ghana as a base from which students and scientists from neighbouring sub-Saharan countries and beyond can be reached. The continuity of a biennial school will contribute to the needed mid-term development of Fundamental Physics knowledge in Africa. In particular, by organising the school again in Ghana in 2012, we will build upon the success of the first school held in 2010 in South Africa.

5. Financial Support

The main funding item on the school budget is the student bursaries, covering the travel and stay of all the attending students. We strongly believe being able to provide such bursaries is vital to the success of the project.

5.1. Financial Support Requested

The budget assumes 70 students supported for the full three and half weeks of the school, 24 lecturers supported for 6 days each, and 5 organisers supported for the full duration of the school (possibly rotating between a larger pool of individual organisers). Note that the total of 25 required lecturers is arrived at by assigning at least one organiser to act as lecturer as well. Table 1 contains the detail of the foreseen incomes and expenditures.

5.2. Sources of Financial Support

The major contributors to the school consists of the International Center for Theoretical Physics (ICTP, Trieste, Italy), The INFN Italy, CERN Geneva Switzerland, Fermilab (FNAL, USA), Brookhaven National Laboratory (BNL, USA), Jefferson Lab (USA), the National Science Foundation (NSF, USA), and the National Institut of Theoretical Physics (NITheP, South Africa).

Some of these institutes supported the first edition of the school in 2010, and were particularly pleased with the success of the school in 2010 [2].

6. Conclusions

For the past two years, a group of local and international organising committee members have worked very hard to prepare for the second biennial school of fundamental physics and its applications in Africa. Finally, the efforts of the organising committee and all the supporting institutes and concerned individuals paid off and the school will take place in Kumasi, Ghana on July 15 to August 8, 2012. A total of about 58 students from all over Africa (including one from Iran) will attend the school. There will also be the participation of high profile international and local lecturers who lecture at the school. The school will concentrate on theoretical and experimental particle physics, particle accelerators, practical applications and Grid computing.

BUDGET

<u>Income</u>	
Total International Support Needed	152,500
Support for students from local Ghanaian Institutes	20,000
Total Income	€172,500
<u>Preparation Costs</u>	
Meetings of the Committees (travel, subsistence)	7,500
Communication (Poster, Web development)	500
Subtotal	8,000
<u>Cost of Bursaries</u>	
Student bursaries (70 students \times 20 days \times €50)	70,000
Lecturer bursaries (24 lecturers \times 6 days \times €62)	8,928
Organiser bursaries (5 organisers \times 20 days \times €62)	6,200
Subtotal	85,128
<u>Travel Costs</u>	
Travel - Non-Ghanaian Students (55 \times €700 on average)	38,500
Travel - Lecturers & Organisers (26 \times €700 on average)	18,200
Local Transportation	2,500
Subtotal	59,200
<u>School Organisation, Events, and Overheads</u>	
Opening Function (80 \times €10)	800
School banquet (80 \times €28.75)	2,300
Paper materials & stationery, postage, resource CDs	600
Bags and name badges (100 \times €5)	500
Social events (3 \times €500 - transport, visits, refreshments)	3,000
Insurance for non-Ghanaian Students	2,500
Other expenditures and overheads	1,000
Subtotal	10,400
Contingencies	10,000
Total Expenditure	€172,428

Table 1. Incomes and expenditures for the school. All amounts are in € unless otherwise specified. The bursaries include accommodation and catering.

- [1] Steve Muanza, et al, "African School of Fundamental Physics and its Applications", <http://AfricanSchoolofPhysics.web.cern.ch>, August 2010
- [2] Kétévi Adiklé Assamagan, et al, "African School of Fundamental Physics and its Applications, August 1-21, 2010, Stellenbosch, South Africa, **ASP2010 Final Report**" <http://africanschoolofphysics.web.cern.ch/AfricanSchoolofPhysics/asp2010.pdf>, December 2010
- [3] Christine Darve, et al, "First African School of Fundamental Physics and its Applications", American Physical Society, Forum on International Physics, <http://www.aps.org/units/fip/newsletters/201103/darve.cfm>, APS April Meeting, 2011