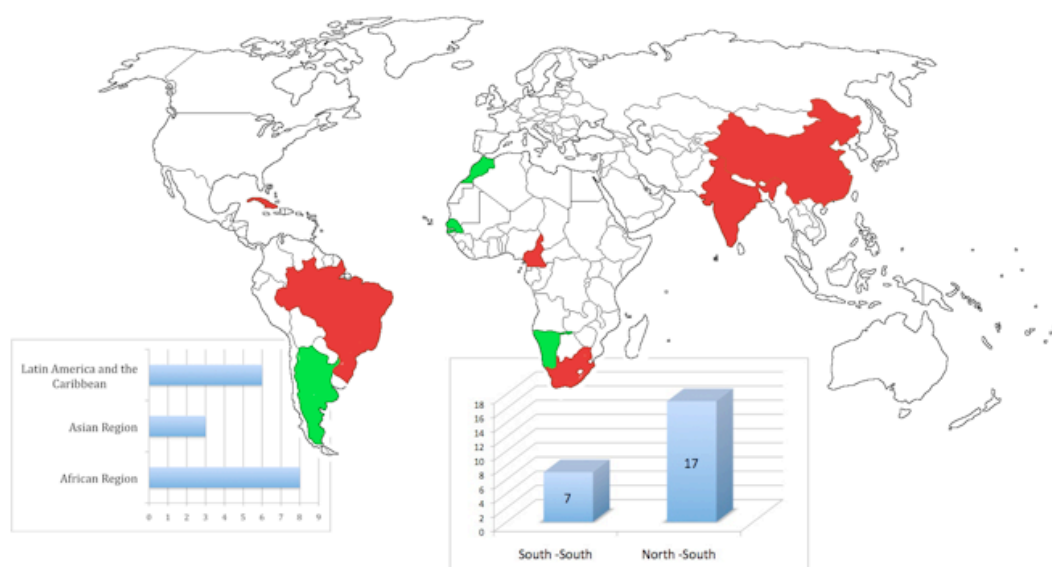


# The Office of External Activities:

*An Abdus Salam ICTP 25-year pathway for  
progress of science in the emerging world*



**A 5-year Report  
(2007-2011)**





## Foreword

The year 2010 was a significant date for the Abdus Salam International Centre for Theoretical Physics (ICTP). Firstly, that year was the 25 anniversary of the creation of the Office of External Activities (OEA), one of the major efforts of this Centre for sponsoring the progress of science in the emerging nations. Secondly, the ICTP started the Strategic Plan 2010-2014 (*"Science and Development for a Changing World"*). This forward-looking instrument for guiding the pathway that the ICTP is to follow in the near future intended to provide a vision and to identify clear goals, in order to move forward from the considerable and laudable achievements of OEA during its first 25 years.

We have organized this report along this line of action, stressing the achievements of the OEA during its first quarter of a century. For this purpose we have drawn a series of 11 diagrams and charts with the most significant year, namely, 2010, the data for which is available in the OEA files. This compilation of data is intended to serve as a basis for subsequent appreciation of the progress in years 2010-2014, beginning with a complete set of data in a large set of tables for the years 2007-2011. The initial step taken in this Report, uses the information received by the OEA, which is now complete and is fully incorporated in the present work.

In the appendices we have provided the set of 39 tables including the new 2011 data. (Subsequently, the same updating will be done for the remaining years covered by the ICTP Strategic Plan, namely the years 2012, 2013 and 2014.

To review the work of the OEA was a singular privilege, as well as a daunting challenge that in July 2010 the author gladly and eagerly undertook by the kind invitation of the ICTP Director Professor Fernando Quevedo.

There was no precedent for such a task, in spite of the considerable amount of excellent and significant work that the OEA—a cornerstone of ICTP influence in the emerging countries—had done for over a quarter of a century. In view of the considerable size of the OEA archives, it seemed reasonable to restrict our attention only to a brief and significant recent period for which the data available was complete and rapidly increasing due to the recent acceleration provided by the current ICTP Strategic Plan.

This report has been constrained to the period 2007-2011. Besides the present Report, three additional Regional Reports are in preparation for Africa, Asia and Latin American/Caribbean regions. They will also be focused on the same 5-year period as the present work.

We hope that this Report will help to fully appreciate the high priority that this Office has recently been granted within the well-focused ICTP Strategic Plan for the period 2010-2014.

**Professor Julian Chela-Flores**

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Adjunct to the OEA

Staff Associate ICTP

1 December 2012

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Last, but certainly not least, thanks are due to the Head of the OEA Office, Dr. George Thompson, for his continued relevant, critical and constructive advice with timely suggestions since July 2010.



## **Introduction**

The Office of External Activities (OEA) was established in 1985 and is currently headed by Professor George Thompson, research scientist of the High Energy, Cosmology and Astroparticle Physics Scientific Section, who joined the OEA in 2005. For a brief history of the Office we refer to Appendix 1.

The objective of OEA is mainly to help the research and training activities of physicists and mathematicians living and working in developing countries. OEA provides assistance to scientists in their home countries. Such support complements the training and research provided to scientists from developing countries at the Abdus Salam ICTP. The OEA programmes provide funds for student grants, fellowships for young researchers, visits of research collaborators and other activities.

The OEA actions are aimed at providing a backup to individuals, groups or institutes in the developing countries to accelerate their promotion to an international level (North-South collaboration) and to stimulate networking of scientists in the developing regions to reach a critical mass of researchers (South-South collaboration).

The present administration of the ICTP has undertaken a Strategic Plan for the period 2010-2014 "Science and Development for a Changing World". In this document it is ratified that the ICTP has a dual mission: to pursue high quality research and to nurture science in the developing world. In order to achieve these goals, the ICTP intends to enhance substantially the role of OEA by a complementary set of activities:

- • Affiliated Centres
- Projects
- Networks
- Visiting Scholars/Consultants
- Scientific Meetings

with a new major activity focusing on the creation of ICTP branch institutes.

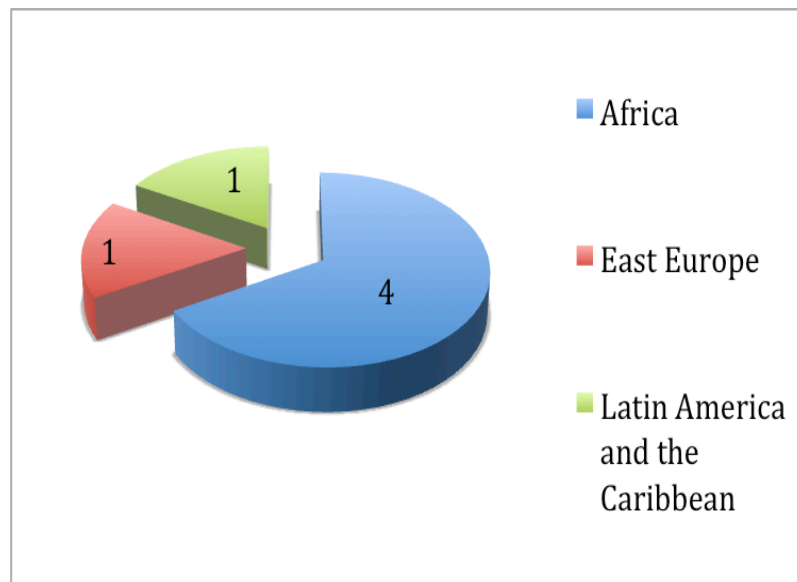
The purpose of the present report is to assess what OEA has done over the last 5 years. The academic activities are illustrated with graphics and images. The emphasis has been placed on the turning point of the renewed efforts of the ICTP, which began in the year 2010. This has been illustrated in the diagrams, while the data for the period 2007-2011 has been reported in full in the appendices.

## The Affiliated Centre Programme

An Affiliated Centre is an Institute or University Department of Physics or Mathematics that carries out a specific long-term research project on a definite subject with well-defined purposes. The Affiliated Centres have a regional character and are strongly supported by the local authorities and the hosting institute. The work corresponding to the period 2007- 2011 can be consulted in Appendix 2. In some more detail in 2011 the OEA supported 7 Affiliated Centres with 5 of them in Africa.

The OEA has encouraged, with special emphasis, graduate schools, which in 2011 had an ongoing set of 23 Ph.D. (or Troisième Cycle) students with partial, or full support from the OEA funds. The OEA has sponsored other graduate school programmes in Africa. These activities include Master, or Diploma courses.

In Fig. 1 we show the distribution when the major effort of the OEA began to line up with the current ICTP Strategic Plan:



**Fig. 1.** Distribution of Affiliated Centres supported by the OEA. (The data refers to the year 2010.) The full data for the period 2007-2011 is shown in Appendix 2.

## THE AFRICAN AFFILIATED CENTRES

**The Affiliated Centre located at L'Institut de Mathématiques et de Sciences Physiques (IMSP), at the University of Abomey-Calavi, Porto Novo, Benin.** The IMSP is a centre for education and research in pure and applied mathematics, physical sciences and engineering (cf., Fig. 2).





**Fig. 2.** L'Institut de Mathématiques et de Sciences Physiques (IMSP), Porto Novo, Benin.

IMSP is a focal point for Advanced Schools and conferences in the region. One striking example is represented by the biannual series of workshops in mathematical physics, the GIRAGA workshops. These events take place in alternative venues between IMSP and the University of Yaounde I (Cameroon). The abbreviation stands for the Inter-African Group of Research in Analysis, Geometry and Applications.

Their activities have created a stimulating environment for African mathematicians to keep abreast with current international trends in mathematical research [*From the IMSP Scientific Report, 2009-2010.*]. The considerable growth of IMSP in their Graduate School, as well as in their successful flow of research publications has been summarized in Appendix 2.

**The Affiliated Centre located at Université Cheikh Anta Diop (UCAD),** Dakar, Senegal is named after the Senegalese historian and anthropologist Cheikh Anta Diop. The Centre itself is at the UCAD Laboratory of Atoms and Lasers of the Physics Department. The OEA appointed them in 1992. The main vocation of the Dakar Affiliated Centre is to promote and to enhance teaching, training and research programmes in the field of lasers, atomic and molecular physics (LAM).

From the beginning their intention is to interact with similar centres in other African nations of that region, including amongst others Ghana, Sudan and the Ivory Coast. Through different academic activities the LAM Centre has developed strong partnerships with world organizations, such as SPIE (the International Society for Optical Engineering) and ICO. These affiliations clearly demonstrate that the visibility of the Dakar Centre has extended from a regional influence to the international Optics community (the International Commission for Optics). [*From the 2000 and 2009-2010 Annual Reports.*]

The high level of their Graduate School, as well as in their Research can be inferred from the corresponding table in Appendix 2. A total of 34 research papers were published in the period 1999-2006. The figure shows the UCAD library (cf., Fig. 3 and also "Networks"). [*From the Evaluation Report, 1999-2006, Annex 3.*]



**Fig. 3.** The Cheikh Anta Diop University (UCAD), Dakar, Senegal.

**The Laser and Fiber Optics Centre (LAFOC)** is located at the University of Cape Coast, Ghana. This University was established in 1962, whereas its affiliation with OEA dates back to 1992 (cf., Fig. 4). The training program became a reality due to another ICTP initiative, the TRIL Program (Training and Research in Italian Laboratories).

LAFOC does research in Optical Metrology, namely light scattering in fluids, optoelectronics and interferometry. Other areas are laser-induced fluorescence, and fiber optics for optical communications. [*From “Optics Development in Africa”, a 2006 Report P. K. Buah-Bassuah.*] Figure 4 recalls the inauguration of LAFOC.



**Fig. 4.** Professor Gallieno Denardo the OEA Director at the time of the inauguration of LAFOC.

**The Centre of Atomic, Molecular Physics and Quantum Optics (CEPAMOQ)** is an Affiliated Centre located at the University of Douala, Cameroon (cf., Fig. 5).



**Fig. 5.** The University of Douala, Douala, Cameroon.

Ever since the beginning of their collaboration with OEA, it has been evident that the CEPAMOQ Affiliated Centre is in a privileged position to help neighbouring countries at an academic level that includes both graduate-school training and in research. These collaborations have been implemented, for instance with Chad and the Central African Republic. The specific collaborations have encompassed the University of N'Djamena, the leading institution in Chad that was created in 1971 as the University of Chad, and was renamed to "University of N'Djamena" in 1994. The other outstanding example is the University of Bangui, a public university located in Bangui, Central African Republic. As of 2006, it is the only university in the Central African Republic. [*From the 2006 Report 012/06/UD/FS/FS/CEPAMOQ.*]

The presence of external collaborators at the UCAD Affiliated Centre from neighboring countries, including Congo, Gabon and Rwanda underlines their regional impact.



Finally, even though **The Affiliated Centre at the Zewail City for Science and Technology** (ZCST) lies outside the scope of this report, we make a brief reference to this important partner that the OEA has been supporting earlier.

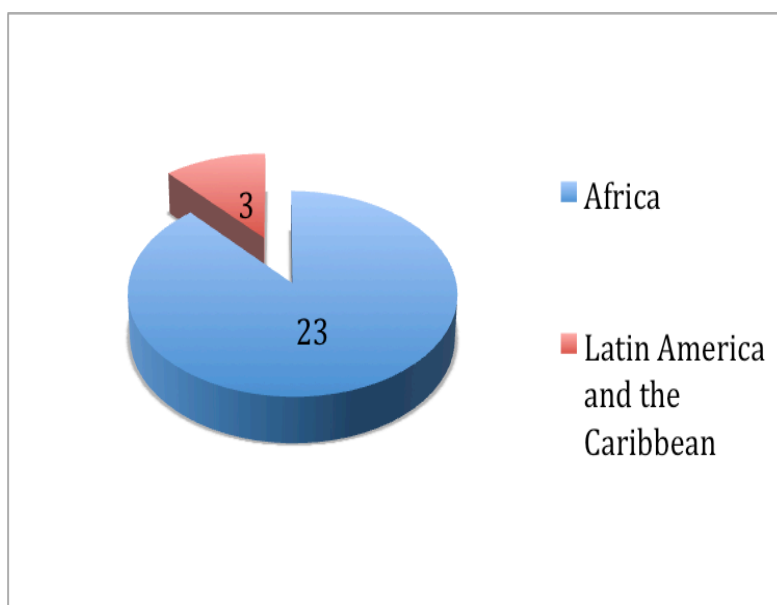
It was originally a Project “Physics Beyond the Standard Model” going back to 2002 and it is reviewed in Appendix 3 for the period 2007-2011. Its scope at that time was to provide Egypt and the region of the Middle East and Africa with a preeminent scientific institute that contributes to fundamental research in physics, astronomy and their interfaces. [*From the Proposal for ICTP Affiliated Centre for Theoretical Physics 2008.*]

The Centre for Theoretical Physics (CTP, cf., Fig. 6) is now part of The Zewail City of Science and Technology: Egypt’s National Project for scientific Renaissance. This initiative has received generous support from local sources. This is the most recent addition to the family of the Abdus Salam Affiliated Centres.



**Fig. 6.** The British University in Egypt, the former venue for the CPT, now an OEA Affiliated Centre that is hosted at the Zewail City for Science and Technology.

Throughout its Affiliated Centres, the OEA has always encouraged graduate schools. The full data for the period 2007-2011 is shown in Appendix 2. The distribution of all the graduate students supported by the OEA in the initial year of 2010 is shown in Fig. 7:



**Fig. 7.** In 2010, the typical year of our illustrations, the Office was supporting a group of 19 Ph.D. (or Troisième Cycle) students with partial, or full support. The OEA has sponsored other graduate school programmes in Africa and Latin America, including Master, or Diploma courses. The full data for the period 2007-2011 is shown in Appendix 2.

## AN EAST EUROPEAN AFFILIATED CENTRE

**The Pavel Sukhoi Gomel State Technical University** (PSGSTU, cf., Fig. 8) is an Affiliated Centre located at Belarus. The University is one of the leading technical educational institutions in the Republic of Belarus. The Laboratory for Physical Studies (LPS) of this University has been carrying out high-level research projects in the field of High Energy Physics. Their research has been centred on the search for new physics scenarios that are needed to rationalise the new physics that is emerging from the new instrumentation that has been made available to the physics community at the Large Hadron Accelerator at CERN in Geneva, as well as at the International  $e^+ e^-$  Linear Collider.

Having funds from different sources, including those of the OEA this Affiliated Centre has been supporting a Fellowship Programme for the benefit of scholars, not only for Belarus, but also for the region of Eastern Europe.

It provides training for the graduation of engineering personnel and higher scientific qualification personnel for such branches of industry, as mechanical engineering, metallurgy, power engineering, economy, radio-electronic engineering and information technologies.



**Fig. 8.** The Pavel Sukhoi Gomel State Technical University, Belarus.

## THE LATIN AMERICAN AND CARIBBEAN AFFILIATED CENTRE

**The Instituto de Matemática y Ciencias Afines (IMCA)** is an Affiliated Centre located at Lima, Peru (cf., Fig. 9). In 1989 the Institute began a programme supporting the regional development in mathematics in Peru. Its funds came from the Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy. This programme was based for its scientific organization on the Instituto de Matematica Pura e Aplicada (IMPA), Rio de Janeiro until 1997.

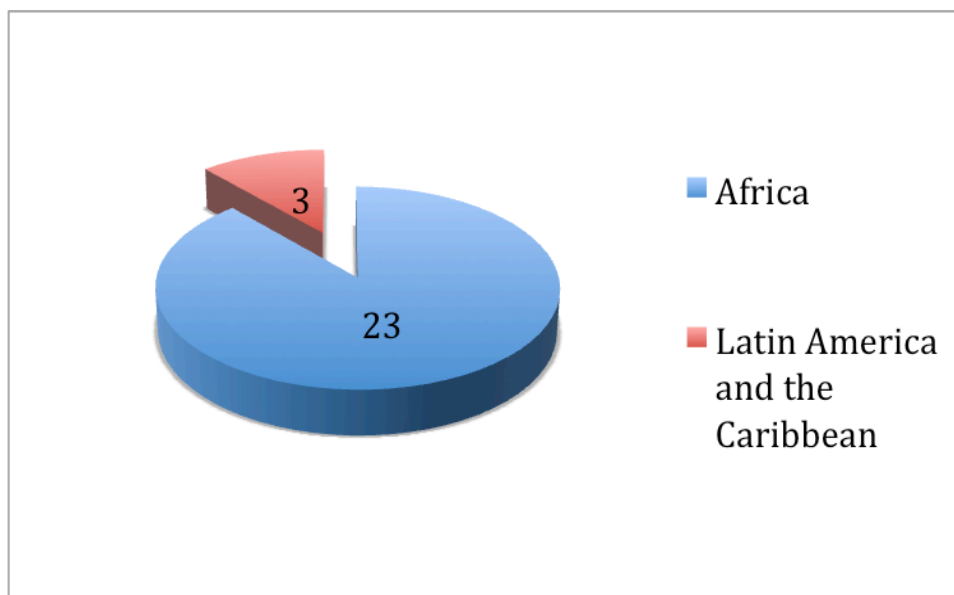
Since that date IMCA took over regional development. This Institute belongs to the Universidad Nacional de Ingenieria (UNI), a polytechnic school that receives the best Peruvian students in sciences and engineering. The initial project was prepared by special request of Professor Abdus Salam who strongly encouraged the establishment high-level mathematical activities in Peru.

From the early support provided by the OEA, IMCA began to set up a library that was a focal point for the whole country. Besides its affiliation with the OEA, IMCA benefits from associated institutes and universities, such as Pontificia Universidad Catolica del Peru, Universidad Nacional de Ingenieria, Instituto de Matematica Pura e Aplicada (IMPA), Rio de Janeiro, Brazil, Centre International de Mathématiques Pures et Appliquées (CIMPA), Nice, France and Centre de Recerca Matematica, Barcelona, Spain. [From the IMCA website <http://www.imca.edu.pe/sitio/>.]



**Fig. 9.** Instituto de Matemática y Ciencias Afines (IMCA), Lima, Peru.

Throughout all its Affiliated Centres the OEA has encouraged graduate schools. The distribution of all the graduate students supported by the OEA is shown in Fig. 10:



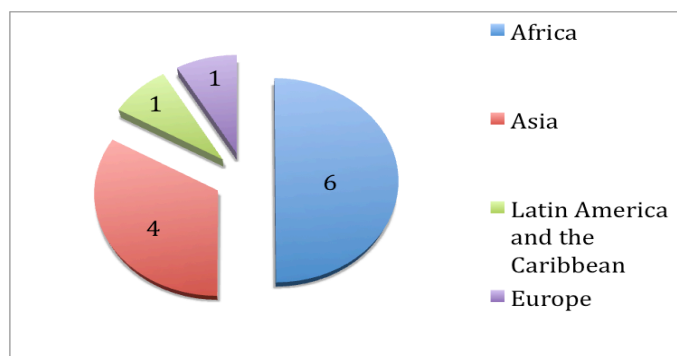
**Fig. 10.** In 2010 the Office was supporting a group of 19 PhD (or Troisième Cycle) students with partial, or with full support. The OEA has sponsored other graduate school programmes in Africa and Latin America, including Master, or Diploma courses.

## Projects

Given the lack of trained personnel in physics and mathematics at universities in some developing countries and the fact that many students from these countries who pursue their graduate studies in industrialized countries do not return to their countries of origin, the OEA supports specific PhD courses. OEA also supports several research projects that do not currently fit the category of Affiliated Centres.

There are 9 active projects, of which 3 are in Africa, 4 in Asia, 1 in Latin America and 1 in South-Eastern Europe. The areas of research covered are: Earth Sciences, Mathematical Sciences, Physical Sciences and Space Sciences. Post-doctoral fellows and graduate school students, mainly Ph.D. candidates with a strong representation from African nations, are implementing the research projects. The OEA is supporting 20 PhD students distributed amongst its 9 Projects. The Office is also supporting other graduate students amongst these projects.

At the beginning of the ICTP Strategic Plan 2010-2012 there were 12 active projects, whose distribution is shown in Fig. 11:

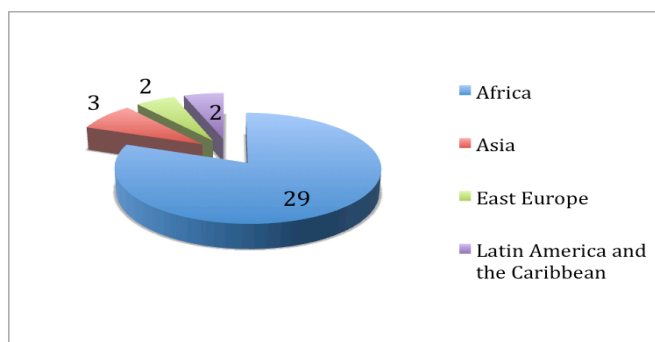


**Fig. 11.** Distribution of projects supported by the OEA in the year 2010.

The areas of research covered are: Earth Sciences, Mathematical Sciences, Physical Sciences and Space Sciences. The majority of these projects are in Africa and Asia with a presence in East Europe and Latin America and the Caribbean. Post-doctoral fellows and graduate school students, mainly PhD candidates with a strong representation from African nations, are implementing the research.

The graduate student distribution for the period 2007-2011 can be consulted in Appendix 3. In detail, by regions the earlier work corresponding to 2010 is shown in Fig. 12:





**Fig. 12.** The distribution of graduate students supported as part of the Projects Programme.

## THE AFRICAN PROJECTS

**The PhD Program in Mathematics in Sub-Saharan Africa** is based at Nsukka, Nigeria. This project focuses on a Graduate School with a significant number of doctoral students from the region. It was formerly based at the University of Nigeria and currently it is based at the African University of Science and Technology (AUST) in Abuja, Nigeria, which has an excellent library (cf., Fig. 13).

The long collaboration with the OEA goes back to 1998. The mission of AUST is to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the African continent in the 21st century. From its beginnings the intention was to establish 2 focal points in Sub-Saharan Africa for a PhD degree programme.



**Fig. 13.** The Sid Ahmed Baba Library, African University of Science and Technology (AUST) in Abuja, Nigeria

**The International Chair in Mathematical Physics and Applications (ICMPA)** is based at the University of Abomey-Calavi (UAC) at Cotonou in Benin (cf., Fig. 14) which was formerly called the Université Nationale du Bénin. This institution is the largest and oldest university in Benin. It was established in 1970.

The ICMIPA became the UNESCO Chair of Mathematical Physics and Applications in April 2006. Besides its Graduate School, ICMIPA organizes an International School every two years providing a fruitful venue for mathematicians, mathematical and theoretical physicists for scientists from the African continent. The collaboration with the OEA goes back to 2005.



**Fig. 14.** University of Abomey-Calavi (UAC) at Cotonou in Bénin.

**The PhD Programme in Mathematics** is based at the Institute of Mathematical Sciences in Accra, Ghana. The Institute of Mathematical Sciences is a centre for the development and training of young mathematicians towards postgraduate study. Its Graduate School has students on Sandwich PhD and MSc/ MPhil programmes. The participating universities in Ghana are: The University of Ghana at Legon, the Kwame Nkrumah University of Science and Technology (KNUST) at Kumasi (cf., Fig 15) and the University of Cape Coast. This Project also organizes regional conferences, workshops and colleges in order to promote the mathematical sciences in the region.



**Fig. 15.** The main entrance of the KNUST, Kumasi, Ghana. In the foreground we can appreciate the statue of the first president of the Republic of Ghana, who was also the founder of this university.

**The Regional Postgraduate Diploma in Mathematics** is based at the University of Botswana in Gaborone, Botswana (cf., Fig. 16). The mission of the University of Botswana is to improve economic and social conditions for the Nation while advancing itself as a distinctively African university with a regional and international outlook. The OEA has been collaborating with the Graduate School both with at the PhD and MSc Levels.



**Fig. 16.** Regional Postgraduate Diploma in Mathematics based at the University of Botswana in Gaborone, Botswana.

**The Graduate School of the Department of Physics** is located at the Addis Ababa University in Ethiopia receiving its current status in 1975 (cf., Fig. 17). The University was originally named "University College of Addis Ababa" It had been founded by the former Ethiopian emperor Haile Selassie I in 1962.

The OEA collaborated with this Graduate School from 2006 till 2009. This university had already developed a tradition in their Graduate School offering its first master's programs in 1979 and its first PhD programs in 1987.



**Fig. 17.** Addis Ababa University, Ethiopia.

## THE ASIAN PROJECTS

**The Salam Chair** is an OEA Project based in Lahore, Pakistan that initiated in 2000. The Federal Government of Pakistan had established the Salam Chair in Physics at Government College University, Lahore in 1999. It was named after the Nobel Laureate of Pakistan, Professor Abdus Salam (cf., Fig. 18).



**Fig. 18.** GCU Tower, Government College University, Lahore, established in 1864.

The OEA has been collaborating with its Graduate School, both in its Ph.D and M.Phil programmes. This project, directed by Dr. G. Murtaza distinguishes itself for its research publications and the successful Graduate School; some of its successes are summarized in the Appendix 3. The OEA has been a significant source of support for the Salam Chair that, in addition, has been pursuing various research projects with the Pakistan Science Foundation and the Pakistan Atomic Energy Commission. This emphasis in research, especially in the area of plasma physics, has provided a favourable environment for their high-level Graduate School that the OEA has singled out as a valuable Project. [*From Salam Chair in Physics GC University Lahore Summary Progress Report (March 2000-February 2007).*]

**The Project Fellowships** (at Former Affiliated Centre) is based at Islamabad, Pakistan. This project is based at the Department of Physics at the Quaid-i-Azam University. QAU was established in 1967 and assumed its present name in 1976. Since its foundation it has been contributing to the rapid advancement of Pakistan in areas of its relevance (cf., Fig. 19).





**Fig 19.** Quaid-i-Azam University Entrance

They specialize in a significant condensed matter problem, namely superconductivity that was discovered by Nobel Laureate Kamerlingh Onnes in 1911, in metallic mercury below 4 K ( $-269.15^{\circ}\text{C}$ ). The same phenomenon is possible at considerably higher temperatures with a potential technological implication. Nobel Laureates Karl Muller and Johannes Bednorz discovered high-temperature superconductors (HTS) in 1986 at the International Business Machines Corporation, IBM. Since its beginnings in 2009 the **Project Fellowships** focuses on the mechanism for HTS.

The mechanism for superconductivity is known at the lower temperatures. John Bardeen, Leon Cooper and J. Robert Schrieffer pointed it out in their seminal contribution, which was also highlighted by another Nobel Prize. In this case the flow of electrons cannot be resolved into individual electrons, but instead consists of many pairs of bound electrons, the so-called Cooper pairs. These pairs are formed when an electron moving through the material distorts the surrounding crystal lattice, which in turn attracts another electron and forms a bound pair that is capable to flow without resistance, the normal conductivity properties become truly “super”.

However, in the case of HTS the favourable flow of electrons has a different origin, which is where the QAU researchers have been publishing their work in peer-reviewed journals with the OEA support. In HTS the Cooper pairs are formed close to a magnetic transition allowing the quantum phenomenon of spin-density waves that lead to the superconductivity. The investigation of the mechanism that drives the QAU researchers is regarded as one of the experimentally accessible methods just shedding light on the transport properties of HTS. This Project has not only enhanced research activities, but provides a useful tool to understand the mysterious mechanisms underlying HTS. [*From a QAU Report to OEA, November 24, 2009.*]

**The Theoretical Astrophysics** is an OEA Project that is based at the Uleg Beg Astronomical Institute, Tashkent, Uzbekistan (cf., Fig 20). A series of cutting-edge topics have recently been covered, including low-frequency signals in ionosphere for anticipating tectonic phenomena. Collaboration with Stanford University has

provided the Uleg Beg Astronomical Institute with instrumentation capable of approaching the study of very low frequency electromagnetic phenomena in ionosphere and the magnetosphere. (Very low frequency or VLF refers to radio frequencies in the range of wavelengths from 10 to 100 kilometres).



**Fig. 20.** Observatory of Ulugh Beg.

On the other hand, extremely low frequency (ELF) is a term used to describe electromagnetic radiation (radio waves) with frequencies from 3 to 300 Hz corresponding to wavelengths from 100,000 to 1000 kilometres. This collaboration has allowed The Theoretical Astrophysics Project to set up an ELF/VLF radio receiver that can monitor signals above the atmospheric noise floor, a fundamental capability for analysis in electromagnetic phenomena in the ionosphere and in the magnetosphere. [*From the 2008 Evaluation Report.*]

The Theoretical Astrophysics Project is also oriented towards research in astronomy and astrophysics, including galaxy formation, gravitational lenses and gravitational models. Some emphasis has also been put on the role of magnetized gravitational objects. There are a number of significant publications in these fields in the specialized literature.

**The ICTP Fellows at the Centre for Space Physics (CSP)** is a Project of the OEA that is based in Kolkata, India (cf., Fig. 21).



**Fig. 21.** Indian Centre for Space Physics, Kolkata in India is a Government Aided Autonomous Institute.

In instrumentation they are responsible for the development of payloads for an Indo-Russian satellite with an X-Ray Laboratory for testing and evaluating such payloads. CSP is an upcoming space research centre located in the Eastern part of India, the only one of its kind. It was established in 1999 and has been recognized, amongst others, by the University of Calcutta and the prestigious Indian Space Research Organization (ISRO).

Their Graduate School currently has many PhD students (one of which, from Nepal, has been funded by the OEA since 2008 until his graduation, cf., Appendix 3). They have programmes in astrobiology, astrochemistry and satellite payload making significant contributions that are of vital relevance for ISRO in Moon exploration. India is now a leading nation in space research with the success of the Chandrayan 1 mission that was launched by ISRO in October 2008, and operated until August 2009. [*Partially from the CSP Report to OEA of 22 May 2006.*]

The location of CSP is ideal for collaborating with other emerging nations, such as: Bangladesh, Bhutan, Myanmar, Nepal (with the successful collaboration mentioned above) and Thailand. Graduate students from this region have joined CSP with fellowships from OEA. One special research project has led to better understanding of emission from galactic centres due to the presence of black holes. [*From 2011 Evaluation Report.*]

## THE EUROPEAN PROJECT

**The Southeast European Network in Mathematics and Theoretical Physics** (SEENET-MTP) is a project based at the Department of Physics, Faculty of Science and Mathematics, University of Nis in Serbia. Their research includes cosmology, string and field theory. It has been active in the exchange visits of researchers and students (cf., Fig. 22).

The String and Cosmology Group is a most active field of cooperation that has been stimulated by the OEA Project. These efforts have encouraged progress in Particle Physics, Quantum Field Theory and Mathematical Physics. The Project has aimed at establishing a self-sustained Balkan Research and Training Network in Physics and Mathematics [*From the Project and Budget Proposal for the year 2011.*]

The OEA contribution towards the activities of SEENET-MTP is used for exchange of visits and short-term grants. Collaborations with neighbouring countries in the South-East European Region, such as Bulgaria, and Bosnia-Herzegovina have taken place. [*From the Evaluation Report, March 3, 2011.*]



**Fig. 22.** University of Nis in Serbia was founded in 1965.



## THE LATIN AMERICAN AND CARIBBEAN PROJECT

**The Diploma Programme** is a project that is based at the Instituto Balseiro, Bariloche, Argentina (cf., Fig. 23). The Institute was founded in 1955 but was named in honour of physicist Dr. José Antonio Balseiro in 1962. Dr. Balseiro (1919 – 1962) was director of the physics department of the Facultad de Ciencias Exactas y Naturales of the Universidad de Buenos Aires. The Institute admits students who have completed two years of university studies (either in Physics or Engineering) and have implemented a careful admission procedure since 1958. The collaboration with the OEA involves a Diploma Programme, leading to a Master Degree. The Diploma/Master Programme started in the year 2003 as a one-year programme.

From the year 2006 it became a full Diploma/Master Programme with two possible orientations “Particles and Field Theory”, including astrophysics, cosmology field theories and string theory.

The second orientation is in “Condensed Matter”, which includes strongly correlated electrons, superconductivity, semiconductors, low dimensional systems and magnetism [*From the Report on the Evolution of the Diploma/Master Programme, Bariloche, October 25, 2006.*]

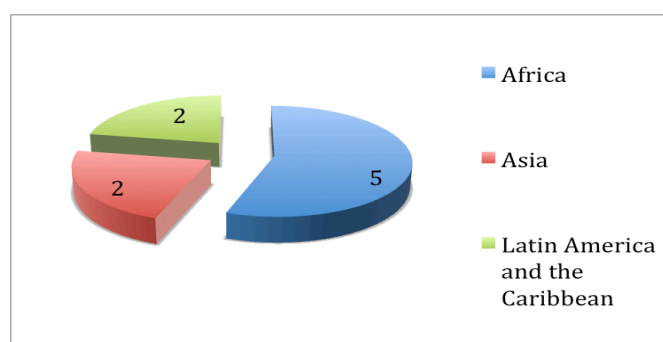


**Fig. 23.** Instituto Balseiro, Bariloche, Argentina.

## The Network Programme

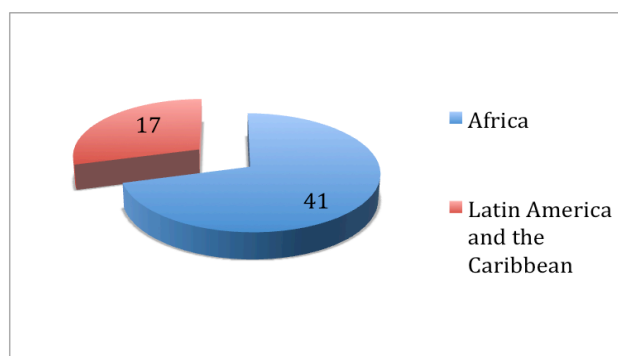
A Network is a system of research groups in an entire region, or among different regions, that pursue a common scientific project over an extended period. The OEA supports networks because they are an efficient approach to overcoming the problem of isolation and counteracting the brain drain, emphasising South-South collaboration and the sharing of expertise and facilities. At present the OEA supports 11 networks in mathematical and physical sciences that will be reviewed below.

But the area of influence of the Networks is much wider since, for instance, in Africa they have a continental coverage. The related research is leading to 39 doctoral theses spread over the above-mentioned three regions, as well as by 19 other graduate school students. The present situation should be compared with the initial effort at the beginning of the implementation of the 4-Year ICTP Strategic Plan, which is illustrated in Fig. 24:



**Fig. 24.** Distribution of Networks supported by the OEA.

Once again, the OEA is building up the achievements during its first 25 years, as demonstrated in 2010, when the graduate schools that the OEA supported led to 39 doctoral theses spread over the above-mentioned three regions, as well as by 19 other graduate school students. These previous successes are shown in Fig. 25:



**Fig. 25.** The distribution of graduate students supported as part of the Network Programme.

## THE AFRICAN NETWORKS

**The African Lasers, Atomic, Molecular and Optical Science Network (LAM)** has continental influence. It is based at the University of Cheik Anta Diop in Dakar, Senegal. We have already met this prestigious French West African University in the Section of Affiliated Centre Programmes (cf., Affiliated Centres). The Network itself was launched in Dakar in 1991 during the First International Workshop on the physics and Modern Applications of Lasers (held in Dakar, Senegal).

From its beginnings this Network defined its objectives firstly, to develop amongst its members exchange programmes in research and teaching in the fields of laser physics and secondly, to organize scientific meetings, including schools, conferences and workshops. [*From the Report for 1995-1996.*]

**The North African Group for Earthquakes and Tsunamis (NAGET)** is a Network that is based in Algeria. NAGET started its activities, once again, in 2011. Its main node is at the Centre of Research of Astronomy, Astrophysics and Geophysics (CRAAG), Algeria, cf., Figure, counting amongst its many disciplines Astronomy where the Algiers Observatory is located. It was founded as a Network in 2000 (cf., Fig. 26).

The renewed efforts of this significant Network are strongly motivated by the unprecedented range of seismic activity in the region of North Africa. Hence the Network has focused the attention of scientists and local communities on geo-hazards. Since the 1990s large earthquakes have caused severe damage and loss of life in the region, including Algeria itself, Morocco and Egypt. [*From the NAGET Annual Report 2011.*]



**Fig. 26.** The Algiers Observatory was built in the late nineteenth century.

**The African Network on Lasers, Atomic and Medical Physics** is based in Tunisia. It has widespread influence in both North Africa and Sub-Saharan Africa, namely the specific countries involved are: influencing Algeria, Burkina Faso, Cameroon, Republic of Central Africa, Chad, Tunisia and Senegal. Its main node is located at the

Laboratoire de Spectroscopie Atomique Moléculaire et Applications (LSAMA) in the Faculté des Sciences de Tunis, Université Tunis El Manar, Tunis, Tunisia (cf., Fig. 27).



**Fig. 27.** Faculty of Mathematical, Physical and Natural Sciences of Tunis. The Tunis El Manar University (UTM) is a university located in Tunis, Tunisia. It was founded in 2000 and is organized in 11 Faculties.

The network aims to continue the common research activities developed since 2001, especially aiming to strengthen South-South collaborations. Their project aims to study theoretical and experimental approaches to structural interactions, dynamics and kinetics of reactions of molecules with plasma, keeping in mind environmental applications, and the life sciences, including medical physics. [*From the Proposal for the 2012 Renewal of Network Project.*]

It is also remarkable the interaction of this network with one of the OEA affiliated centres. It has been training researchers from sub-Saharan Africa providing an excellent example of South-South cooperation that the OEA has been striving to implement. The CEPAMOQ has played an important role in the progress and direction of research, especially through the PhD programme.

**The Partial Differential Equations, Modelling and Control** is a network based in Burkina Faso. Its main node is in Burkina Faso at the University of Ouagadougou, which was founded in 1974. It is located in the area of Zogona in Ouagadougou, Burkina Faso.

The fruitful relation with the Abdus Salam ICTP goes back to May 1999. It has been influencing researchers gathered from the Sub-Saharan region in the area of Mathematics, namely Ivory Coast, Mauritania, Senegal and Burkina Faso itself.

The network came into being in order to promote a sub-regional critical mass of active mathematics researchers in the fields of Partial Differential Equations and Modelling and Control. It maintains good links with the international scientific community, maintaining a doctoral programme in Applied Mathematics with the additional intention of building research capacity in the regional universities. The network has contributed to avoid to some extent the problem of the brain drain. It has maintained an active academic programme of international events that in recent years have included schools and workshops.

Since 2003 the Network has maintained an International Conference on Mathematics and Applications to Development Problems in Sahel every three years. The major aim of the organizers has been to give an opportunity for mathematicians in the Network and in the African Region to present the result of their research. *[From the Network's 2009 Activity Report.]*

**The African Network in Geometry and Algebra Applied to Development (RAGAAD)** was founded in 2003. It has representatives in the following countries: Algeria, Benin, Burkina Faso, Cameroon, Congo, Ivory Coast, Guinea, Mali, Mauritania, Morocco, Niger, Senegal and Tunisia.

The network is based at the University of Yaounde 1 at the Department of Mathematics, Faculty of Sciences in Yaounde, Cameroon. This university was built with the help of France and opened in 1962. In 1993 there was a university reform splitting the original institution into two (Université de Yaounde I and Université de Yaoundé II).

This Network has made significant impact on the Sub-Saharan region, especially in its Least-Developed Countries with the collaboration of the University of Rennes. Two successful Graduate Schools have been maintained by the network: firstly at Niamey, Niger and, secondly, at Dakar, Senegal. Some additional details are provided in Appendix 4.

**The Nano African Network Initiative (Nano-Afnet)** is a network based in South Africa (continental influence). NanoAfNet has continental coverage. Its foundation originated in the ICS-UNIDO North-South Dialogue workshop held in Trieste-Italy in 2005. It was created the same year. It is coordinated from the iThemba Laboratory



for Accelerator-Based Sciences, which is a group of multi-disciplinary research laboratories administered by the National Research Foundation, Somerset West (part of the City of Cape Town metropolitan municipality), and South Africa.

It is based at two sites in the Western Cape and Gauteng. The coordination of the Network is at iThemba LABS (laboratory for accelerator based sciences), a multidisciplinary facility aiming to become the leading African organisation for research, training and expertise in accelerator based science and technologies.

The objectives of the National Research Foundation (NRF) overlap considerably with those of the Abdus Salam ICTP: to support and promote research through funding, human capacity development and the provision of the necessary research facilities, in order to facilitate the creation of knowledge, innovation and development in fields of the natural sciences, and technology, including indigenous knowledge systems (cf., Fig 28).



**Fig. 28.** iThemba LABS (laboratory for accelerator based sciences), a multidisciplinary facility aiming to become the leading African organisation for research, training and expertise in accelerator based science and technologies.

Even though **The African Network for Solar Energy (ANSOLE)** lies outside the scope of this report, we make a brief mention to provide an indication of the growth of the OEA Networks. ANSOLE is based at the Johannes Kepler University, Linz, Austria (cf., Fig 29). This Network joined the ICTP System in 2011. ANSOLE aims to foster research activities in the field of solar energy among African scientists

working in and out of Africa. For this reason countries in which there are already representatives are from four continents:

- **In Africa:** Algeria, Burkina Faso, Chad, Ivory Coast, Cameroon, Congo-Brazzaville, Egypt, Ethiopia, Kenya, Malawi, Morocco, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Togo, Tunisia and Zimbabwe.
- **In America:** USA
- **In Asia:** Jordan
- **In Europe:** Austria, Belgium, France, Germany, Greece, Italy, Netherlands and the Russian Federation.

The list is in the process of being extended. The network hopes to facilitate the exchange of ideas between students and scientists involved in solar energy research, formulate joint project proposals, put out joint publications, organize workshops and implement a graduate programme on solar energy.



**Fig. 29.** The Main Library of the Johannes Kepler University, Linz, Austria.

## THE ASIAN NETWORKS

**The Relativistic Astrophysics, Cosmology and Gravitation** is a network based in Pakistan the National University of Sciences and Technology (NUST), at the Rawalpindi Campus. This Network has adopted the acronym BIPTUN, from the initial of the countries themselves Bangladesh, India, Pakistan, Turkey and Uzbekistan (cf., Fig. 30):



**Fig. 30.** NUST Pakistan Navy Engineering College (PNEC). The campus is home to the Computer Aided Designing and Manufacturing Centre and the Professional Development Centre. The university is co-educational offering undergraduate and postgraduate degrees leading to PhD in the fields of engineering, information technology, medical sciences, and management sciences.

Their research activity has centred on the effects of the electromagnetic field on special objects of some relevance in astrophysics and cosmology, such as “gravastars” (objects hypothesized in astrophysics as an alternative to the black hole theory), wormholes (hypothetical topological feature of space-time that would be, fundamentally, a “short-cut” through space-time), black holes in a brane-world (this is an extended mathematical concept that appears in string theory and related theories). [*Based on the 2008 Scientific Report.*]

**The Bangkok-Beijing-Shanghai Network in High Energy Physics** is based at Fudan University in Shanghai, P. R. China, whose large graduate school comprises 134 sub-disciplines that are authorized to confer PhD degrees, 201 Master degree programs. Its foundation goes back to 1917. Besides the Popular Republic of China the influence extends to South East Asia and Pakistan (cf., Fig. 31). The activities of collaboration between the OEA and this Network go back to 2007.

The scientific focus is on fundamental physics, including cosmology and high-energy physics. During its first year scientists from Fudan University collaborated



with Chulalongkorn University, the oldest university under the Thai modern educational system, founded in 1917. The Network benefitted the Graduate-School programme in Shanghai. [*Based on the 2007 Scientific Report.*]



**Fig. 31.** Fudan University historic gate. The two Chinese characters Fu and Dan, literally mean "(heavenly light shines) day after day", were chosen by a distinguished educator in modern Chinese history, Father Ma Xiangbo S. J. from the Confucian Classics.

## THE LATIN AMERICAN AND CARIBBEAN NETWORKS

**The Caribbean Network of Quantum Mechanics, Particles and Fields** is based in Cuba. It began its association with the ICTP in 1998. It has been responsible for a large number of publications and its influence has gone beyond its national boundaries. This network enjoys a fruitful collaboration with Mexican and Brazilian academic centres (cf., Fig. 32):



**Fig. 32.** Aerial view of the University of Sao Paolo, Brazil that takes part in the Network collaboration.

The groups forming this Network are focused on four areas of expertise:

Firstly, electronic and optical properties of molecular and semiconductor nanosystems arising from a collaboration between the Centre of Applications and Nuclear Development (CEDEAN) and the Faculty of Chemistry of Havana University.

Secondly, astroparticle physics and cosmology coordinated at Instituto de Cibernética, Matemática y Física (ICIMAF), Havana, Cuba (cf., Fig. 33) with a collaboration extending from ICN of Universidad Autónoma de México to the University of Porto Alegre in Brazil.





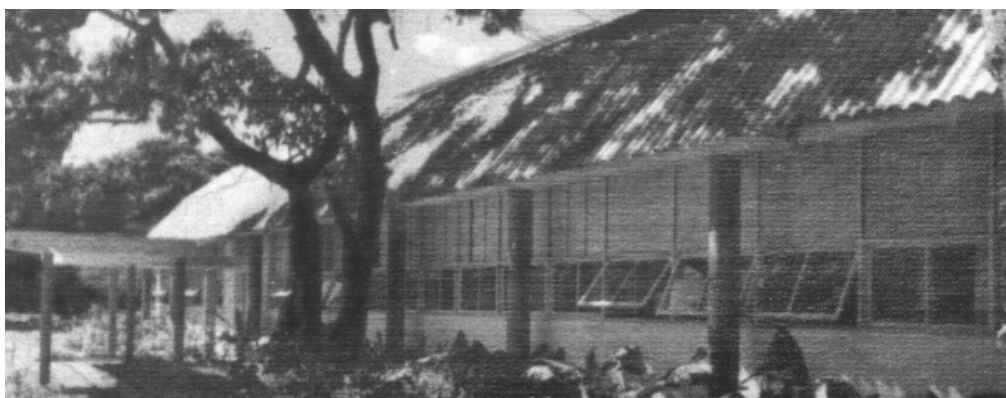
**Fig. 33.** The ICIMAF building where the Departments of Mathematics and Theoretical Physics are located.

Thirdly, external fields in quantum field theory. This node of the Network is coordinated once again from ICIMAF and its collaborations extend to Centro Brasileiro de Pesquisas Físicas (CNPF) and University of Sao Paulo, Brazil.

Finally, quantum field theory and its applications in high energy physics and condensed matter physics, coordinated from ICIMAF and extensive collaborations ranging from Universities of Sao Paulo and Para, both in Brazil; Pontificia Universidad Catolica de Chile, Santiago and Universidad Catolica del Norte, Antofagasta, Chile.

**Centro Latinoamericano de Fisica (CLAF)** is based in Brazil at Centro Brasileiro de Pesquisas Físicas (CBPF), in Rio de Janeiro with continental influence and a long history of stimulating various countries of that region (cf., Fig. 34).

CLAF was founded two years before the Abdus Salam ICTP. Since then it has been a robust promoter of South-South Cooperation. An early Cooperative PhD Programme has been maintained to the present, in which the origin of the students was from a wide range of countries, including Argentina (at the Universidad de la Republica de Montevideo), Cuba and Paraguay (at the Centro Atómico, Bariloche, Argentina), Bolivia, Mexico and Peru (at the Centro Brasileiro de Pesquisas Físicas).



**Fig. 34.** The Mario de Almeida Pavilion is the venue of the CLAF offices. This Centre was founded on 26 March 1962, in a joint meeting between UNESCO and the Brazilian Government, in Rio de Janeiro, with the participation of 20 Latin American countries.

In subsequent years the Graduate Schools of the Latin America and the Caribbean Region proceeded along the same lines producing a large number of scholars that graduated at the PhD level due to this fruitful Network. The areas that were stimulated in 2011 included astroparticle physics, statistical mechanics, nanomaterials, general relativity and medical physics. [*From: 40 Years of CLAF, A Faheem Hussein monograph, 2002; Report of Luis Masperi, 1999*].

**The Latin American Network of Ferroelectric Materials** is based in Cuba with its main node at La Havana University, but with fruitful exchanges with Brazilian institutes (cf. Fig. 35).



**Fig. 35.** The University of La Havana, where the Latin American Network of Ferroelectric Materials has its main node.

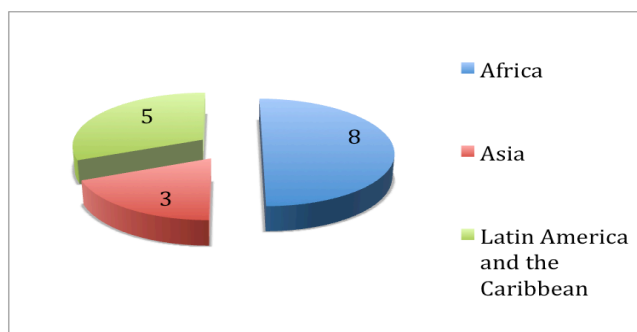
Since its inception in 2000 with 7 member institutions the Network has doubled in size. It has consistently contributed to linking the national community in ferroelectric materials with other countries in Latin America.

In recent activities a special effort has been made in the relevant area of the wider use of experimental techniques, including scanning and transmission electron microscopy observations (SEM and TEM), dynamic recrystallization (DRX) and extended X-ray absorption fine structure (EXAFS).

## Visiting Scholars/Consultants

This programme promotes collaboration between scientists working in institutions in the developing countries and leading scientists throughout the world. The Visiting Scholar/Consultant is required to make at least two research visits over three years, each lasting at least a month. The Visiting Scholar/Consultant carries out joint research with his counterpart and lectures students in his or her field of expertise. This is another effective way to counteract the isolation of scientists and to allow them to maintain contacts and collaborate with leading experts from other countries. There are currently 21 active Visiting Scholars: the African region has 9, Asia has 4, while Latin America and the Caribbean have 8. The total number of grants awarded during 2011 is 8. In detail the programme of Visiting Scholars is being implemented in 2011 by a system of 21 grants that are distributed in the following areas: Earth, Life, Mathematical and Physical Sciences. In Africa this programme has benefited Benin, Ghana, Liberia, Morocco, Nigeria, Senegal and Zimbabwe, while in Asia the countries that have profited from these grants are Indonesia and Nepal. Finally, in Latin America and the Caribbean the countries involved in the programme are: Argentina, Brazil, Cuba and Perú.

The present situation should be compared with the initial effort at the beginning of the implementation of the 4-Year ICTP Strategic Plan, which is illustrated in Fig. Fig. 36.



**Fig. 36.** Distribution of Visiting Scholars supported by the OEA.



The Visiting Scholar/Consultant is required to make at least two research visits over three years, each lasting at least a month. The Visiting Scholar/Consultant carries out joint research with his counterpart and lectures students in his or her field of expertise. This is another effective way to counteract the isolation of scientists and to allow them to maintain contacts and collaborate with leading experts from other countries.

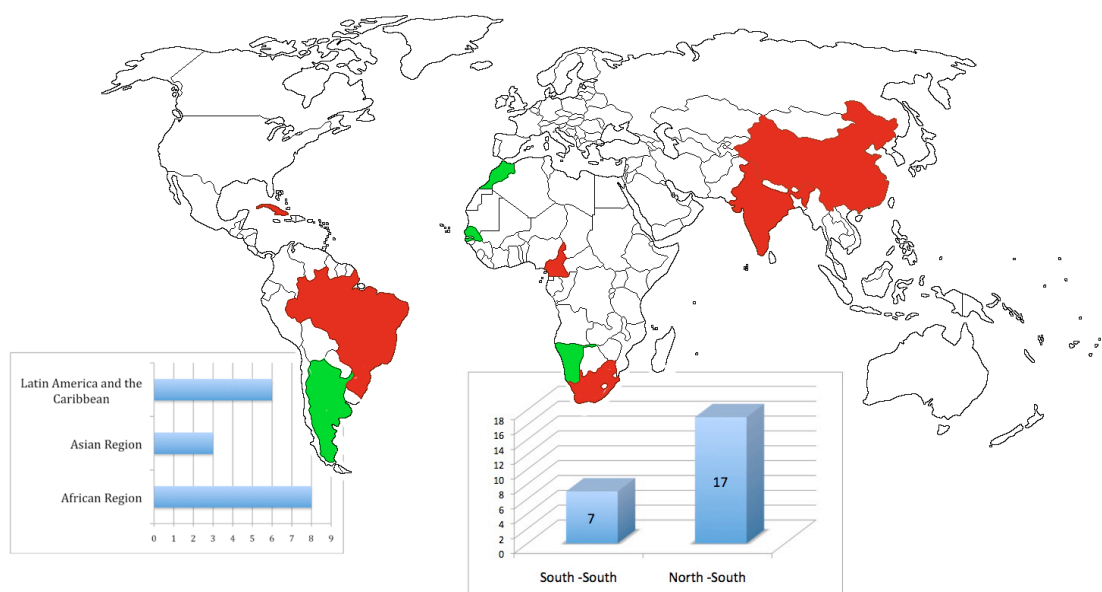
## **Regional encouragement**

We would like to emphasize two aspects of the regional encouragement of OEA: South-South and North-South cooperation. The active programme of Visiting Scholars for the emerging countries that we are supporting are, in a good proportion, scientists from the South itself—a fact that we are pleased to highlight. For the year 2011 these programmes included 5 South-South cooperation agreements. The scientists from Europe, North America and Oceania are distributed among 11 nations (Australia, Austria, Belgium, Canada, Denmark, France, Italy, Poland, Spain, United Kingdom and the United States). The OEA has been supporting 2 South-South cooperation agreements in the African Region between Morocco and Brazil and between India and Nigeria.

On the other hand, the OEA has 16 North-South cooperation agreements. Those in African Region were 7 collaborations: Benin-Canada, Benin-USA, Ghana-UK, Ghana-USA, Liberia-Canada, Senegal-USA, and Zimbabwe-Austria.

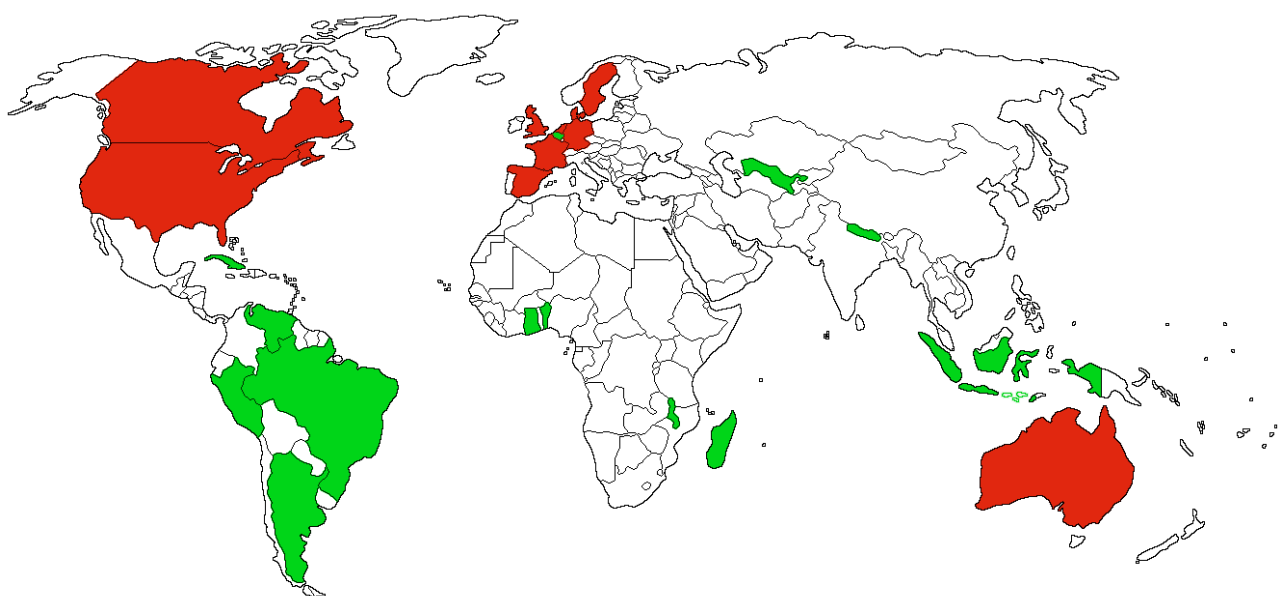
The Visiting Scholars/Consultants awarded in 2011 are 8 of which 2 are South-South cooperation agreements between Nigeria/India and between Nepal/Malaysia. The other awards concern the African Region North South cooperation between: Benin/USA, Liberia/Canada, Senegal/USA and Zimbabwe/Austria.

In Fig. Fig. 37 we show the world distribution of South-South cooperation:



**Fig. 37.** Worldwide distribution of South-South cooperation supported by the OEA.<sup>2</sup> Colour code: Nation of origin of the Visiting Scholar (red), host country (green). The insets: (centre) comparison of the regional cooperation that has encouraged by the OEA; (left) relative distribution of the regional collaborations that have been encouraged by the OEA.<sup>3</sup>

Besides, at the end of the first 25 years of activities the OEA supported 17 North-South cooperation agreements that were distributed, as shown in Fig. 38.



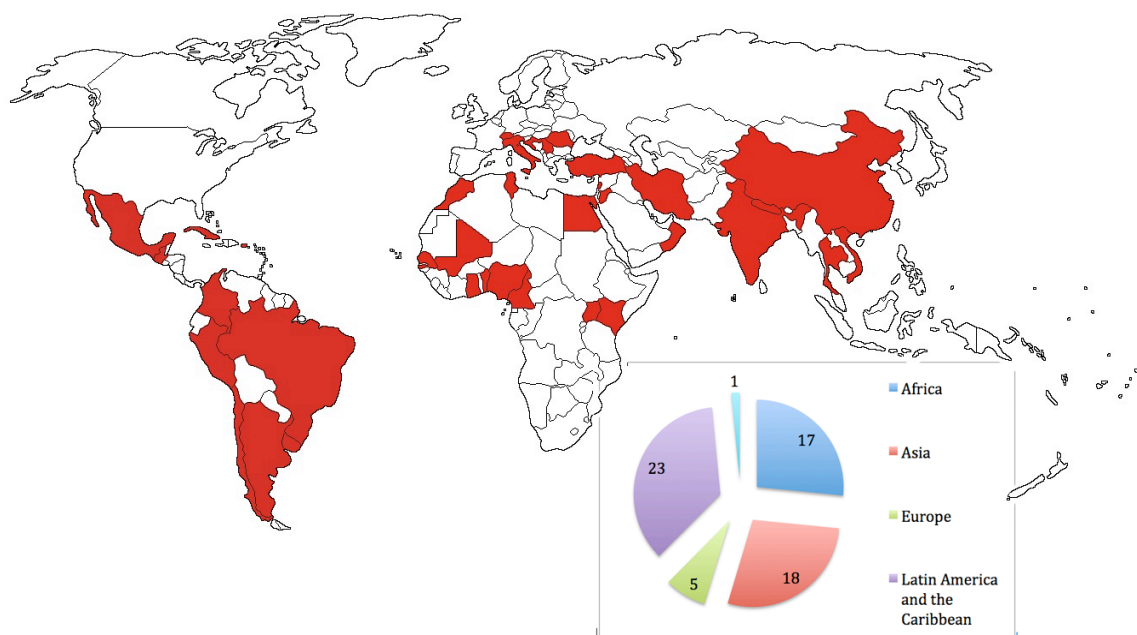
**Fig. 38.** Worldwide distribution of North (red)-South (green) cooperation supported by the OEA in the year 2010.<sup>3</sup>

## Scientific Meetings

The OEA encourages the organization of international and regional scientific meetings in developing countries by offering financial assistance to the organizers of conferences, workshops, and schools.

In 2011 OEA has distributed 67 grants in five areas of knowledge: climate, education, mathematical sciences, physical sciences and space sciences. The grants assigned to the meetings in the African Region have been 20: Benin (2), Cameroon (2), Egypt, Ethiopia, Ghana (2), Madagascar, Morocco (5), Nigeria, Rwanda, Senegal, South Africa (2) and Tunisia. Meetings held in Asia received 26 grants: Armenia, Cambodia, Georgia (2), India (4), Indonesia (2), Islamic Republic of Iran, Jordan (2), Malaysia (2), Nepal (2), Pakistan, Philippines, People's Republic of China, Singapore, Sultanate of Oman, Thailand and Vietnam (3). OEA assigned 4 grants for meetings that were held in Europe: Bosnia & Herzegovina, Bulgaria, France and Serbia. In Latin America and the Caribbean 17 events were supported: Argentina (4), Bolivia, Brazil (2), Chile, Colombia (3), Cuba (2), El Salvador (2), Honduras and Mexico.

The present situation should be compared with the initial effort at the beginning of the implementation of the 4-Year ICTP Strategic Plan, which is illustrated in Fig. 39



**Fig. 39.** Worldwide distribution of grants supported by the OEA for scientific meetings. <sup>4</sup> Inset: Distribution of grants for scientific meetings supported by the OEA.



## APPENDIX 1: A BRIEF HISTORY OF THE OFFICE OF EXTERNAL ACTIVITIES

The Office became operational in 1986 under the direction of Professor Jan S. Nilsson (1932-2010) till 1988 (cf., Fig. 40).



**Fig. 40.** Professor Jan S. Nilsson.

Dr. Nilsson was an associate fellow of the Academy of Sciences for the Developing World, as well as president of the International Union of Pure and Applied Physics (IUPAP). One of Sweden's leading physicists, Nilsson was a professor of mathematical physics at Chalmers University of Technology, the dean of the Faculty of Mathematics at the University of Gothenburg, and for six years rector at the same university.

Professor Gallieno Denardo (1935-2007) was Head in the period 1988-2003 (cf., Fig. 41).



**Fig. 41.** Professor Gallieno Denardo during his period at the OEA (1988-2003).

Professor Denardo was associated with ICTP since the Centre's inception. He served as head of the Office of External Activities for 10 years as well as a consultant of the Office after his retirement up until he passed away in the year 2007. From July 2002 to October 2003, he was appointed Acting Administrative Director. In 2005 the SPIE Educator Award recognized Denardo for his outstanding contribution to training in optics hundreds of postdoctoral students and professors, mainly from developing countries, by organizing international schools and colleges at the ICTP for 20 years.

He was instrumental in establishing and running all ICTP activities on optics and lasers, including the Laboratory and the ICO/ICTP Award. Since 2008, the Award is called "ICO/ICTP Gallieno Denardo Award" to honour the memory of Gallieno Denardo, as a recognition of the coordination of the optics activities at ICTP for more than twenty years.

From 1997 till 2004 Professor Faheem Hussein (1942-2009) was Head of the OEA (cf., Fig. 42).



**Fig. 42.** Professor Faheem Hussein, who headed the OEA in the period 1997 till 2004.

Professor Hussein was a theoretical physicist born in what is now Pakistan. He attended Chelsea College, London, and completed a BSc (hons.) in physics in 1963. He went on to an MSc in physics from Imperial College, London under Abdus Salam. Finally, in 1966 he obtained a PhD in Theoretical physics under the supervision of Professor Paul Matthews.

He collaborated with the ICTP in many other functions since the Centre's foundation. He officially joined ICTP in 1990, though he had been a regular visitor to the institute since its inception. A former Associate and a member of the High Energy Physics group, Faheem also coordinated ICTP's Diploma Programme and headed the OEA. He was always a strong and vocal advocate for the promotion of science in developing countries.

## APPENDIX 2: Affiliated Centres (2007-2011)

In the tables below we list those students that were supported with ICTP funds. Research papers are listed as published or submitted. Those submitted in one year are most probably part of those that are accepted in the following year.

### The Centre of Atomic, Molecular Physics and Quantum Optics (CEPAMOQ), The University of Douala, Douala, Cameroon

Year	Fellowships		Obtained (PhD)	Gender	Research papers	
	PhD	MSc			Published	Submitted
2007	1	9	2	—	10	6
2008	2	9	1	—	13	1
2009	7	—	1	—	9	7
2010	10	—	2	—	6	6
2011	7	—	6	—	6	1

### Pavel Sukhoi State Technical University of Gomel (PSGSTU), Gomel, Belarus

Year	Fellowships		Obtained (Ph.D)	Gender	Research papers	
	PhD	MSc			Published	Submitted
2007	5	—	3	—	4	1
2008	4	—	2	—	6	2
2009	5	—	2	—	4	1
2010	4	—	2	—	6	2
2011	2	—	—	1(F)	5	2

### L'Institut de Mathématiques et de Sciences Physiques (IMSP), Porto Novo, Benin

Year	Fellowships		Obtained (PhD)	Gender	Research papers	
	PhD	MSc			Published	Submitted
2007	15	—	—	1 (F)	—	—
2008	11	—	3	—	7	2
2009	11	—	2	1 (F)	4	—
2010	11	—	2	2 (F)	5	4
2011 (*)	12	14	5	2(F)	19	4

(\*) Twelve Fellowships were funded by the OEA.

### Instituto de Matematica y Ciencias Afines (IMCA), Lima, Peru

Because of the type of courses that are followed (2 types of Master programme) and the split of the academic year the numbers below refer to an average over students. The first PhD student from the institute was awarded in 2006. Three students received their Master degrees in that year. (Their

academic activity (publications) is mainly implemented by means of a substantial number of book publications.)

Year	Fellowships		Obtained		Gender	Research papers	
	PhD	MSc	PhD	MSc		Published	Submitted
2007	5	14	1	3	—	—	—
2008	4	11	1	1	—	—	—
2009	4	15	—	1	—	2	—
2010	3	15	1	2	—	—	—
2011	3	14	—	5	—	—	—

### Department of Physics, Cheikh Anta Diop University (UCAD), Dakar, Senegal

Year	Fellowships		Obtained (PhD)	Gender	Research papers	
	PhD	MSc			Published	Submitted
2007	9	—	—	2 F	1	—
2008	10	—	—	—	2	—
2009	8	—	—	1 F	1	—
2010	4	—	—	1 F	2	2
2011	4	—	—	—	4	2

### Laser and Fiber Optics Centre (LAFOC), The University of Cape Coast, Ghana

Here, while the number of fellowships appears small, roughly half of the ICTP funds are spent on equipment that benefits all the students.

Year	Fellowships		Obtained		Gender	Research papers	
	PhD	MSc	PhD	MSc		Published	Submitted
2007	5	4	—	1	2 F	2	—
2008	4	3	—	2	2 F	3	—
2009	1	4	—	—	—	—	—
2010	3	4	—	—	1 F	—	—
2011	1	4	—	—	1 F	—	—

For the CPT Affiliated Centre, we refer the reader to Project Physics Beyond the Standard Model based at the Center for Theoretical Physics (CPT). This project has been promoted to an Affiliated Centre in 2011.

Year	Fellowships		Obtained		Gender	Research papers	
	PhD	MSc	PhD	MSc		Published	Submitted
2011	—	3	—	—	1 F	13	7

## APPENDIX 3: Projects (2007-2011)

### PhD Program in Mathematics in Sub-Saharan Africa

Year	Ph. D	Obtained (PhD)	Gender	Research Papers	
				Published	Submitted
<b>2007</b>	6	1	—	3	9
<b>2008</b>	7	—	—	11	6
<b>2009</b>	7	2	—	4	—

### The Salam Chair, Lahore, Pakistan

Year	PhD	MPhil	Obtained (PhD)	Obtained (MPhil)	Gender	Research Papers	
						Published	Submitted
<b>2007</b>	3	—	—	4	2F	21	4
<b>2008</b>	3	—	1	—	2F	16	—
<b>2009</b>	3	3	1	—	1F	8	—
<b>2010</b>	3	2	—	3	1F	7	—
<b>2011</b>	3	3	—	1	2F	10	—

The Chair has on average some 12 students in total, the majority are PhD students and some are MPhil students. The OEA has funded 3 PhD Fellowships every year since 2007.

### The Southeast European Network in Mathematics and Theoretical Physics (SEENET-MTP)

Year	PhD	MSc	Obtained (PhD)	Obtained (MSc)	Gender	Research Papers	
						Published	Submitted
<b>2007</b>	—	—	—	—	—	—	—
<b>2008</b>	—	—	—	—	—	—	—
<b>2009</b>	3	—	—	—	1F	—	—
<b>2010</b>	3	2	—	—	—	—	—
<b>2011</b>	3	2	—	—	1F	10	2

### The International Chair in Mathematical Physics and Applications based at Cotonou, Bénin (ICMPA)

Year	PhD	MSc	Obtained (PhD)	Obtained (MSc)	Gender	Research Papers	
						Published	Submitted (or in press)
<b>2007</b>	14	—	4	—	2F	16	13
<b>2008</b>	4	—	—	—	—	—	—
<b>2009</b>	5	—	2	—	—	13	3
<b>2010</b>	4	—	—	—	—	11	2
<b>2011</b>	1	9	1	9	—	10	6



The research has also been communicated in several book chapters. It has also been recorded in numerous internal reports and preprints.

**Ghulam Ishaq Khan (GIK) Institute of Engineering Sciences and Technology at Topi, Pakistan**

Year	Ph.D	Obtained (PhD)	Research Papers	
			Published	Submitted
<b>2007</b>	2	1	4	1

**Diploma Programme based at Bariloche, Argentina**

Year	MSc	Obtained (MSc)	Research Papers	
			Published	Submitted
<b>2007</b>	3	1	—	—
<b>2008</b>	4	3	—	—
<b>2009</b>	5	1	—	—
<b>2010</b>	2	2	—	—
<b>2011</b>	3	—	—	—

**Ph. D. Programme in Mathematics based at Accra, Ghana**

Year	Ph.D	MPhil	Obtained (PhD)	Obtained (MPhil)	Gender	Research Papers	
						Published	Submitted
<b>2007</b>	8	11	1	4	—	4	1
<b>2008</b>	7	8	4	—	1F	6	3
<b>2009</b>	9	13	1	2	4F	—	—
<b>2010</b>	6	8	1	14	1F	—	—
<b>2011</b>	3	8	4	8	—	—	—

**Regional Postgraduate Diploma in Mathematics based at Gaborone, Botswana**

Year	Ph.D	MSc	Obtained (PhD)	Obtained (MSc)	Research Papers	
					Published	Submitted
<b>2007</b>	1	2	1	1	1	—
<b>2008</b>	2	1	—	—	—	—
<b>2009</b>	1	1	1	—	—	—
<b>2010</b>	—	2	—	—	—	—
<b>2011</b>	1	1	—	—	—	—

**Mechanics and Mathematics Department, National University of Uzbekistan at Tashkent**

Year	MSc and other group members	Obtained (PhD)	Research Papers	
			Published	Submitted
<b>2007</b>	6	—	—	2
<b>2008</b>	7	—	—	—
<b>2009</b>	9	—	1	—

### Fellowships at Former Affiliated Centre, based at Islamabad, Pakistan

Year	Ph.D/MSc	Obtained (PhD)	Research Papers	
			Published	Submitted
<b>2007</b>	—	—	11	—
<b>2008</b>	—	—	9	1
<b>2009</b>	1 MSc	1	5	—
<b>2010</b>	1 MSc	—	1	—
<b>2011</b>	—	—	—	—

### Theoretical Astrophysics based at the Uleg Beg Astronomical Institute, Tashkent, Uzbekistan

Year	PhD	Obtained (PhD)	Gender	Research Papers	
				Published	Submitted
<b>2007</b>	—	—	—	7	8
<b>2008</b>	—	—	—	15	9
<b>2009</b>	3	3	—	15	—
<b>2010</b>	2	2	1F	20	1
<b>2011</b>	6	2	—	18	2

### Physics Beyond the Standard Model based at the Center for Theoretical Physics (CPT) based at the British University of Egypt

Year	PhD	Obtained (PhD)	Research Papers	
			Published	Submitted
		—		
<b>2007</b>	8	—	13	—
<b>2008</b>	5	—	8	6
<b>2009</b>	6	—	—	—
<b>2010</b>	3	—	18	5

In 2011 the Project became an Affiliated Centre.

### Department of Physics, Addis Ababa University, Ethiopia

Year	Ph.D	Obtained (PhD)	Research Papers	
			Published	Submitted
<b>2007</b>	1	—	—	—
<b>2008</b>	1	—	—	—
<b>2009</b>	1	1	1	1

**ICTP Fellows at the Centre for Space Physics (CSP) based in Kolkata, India.**

Year	PhD	Obtained (PhD)	Research Papers	
			Published	Submitted
<b>2007</b>		—	—	—
<b>2008</b>	1	—	—	—
<b>2009</b>	1	—	—	—
<b>2010</b>	1	1	—	—
<b>2011</b>	1	—	1	1

## APPENDIX 4: Networks (2007-2011)

### African Lasers, Atomic, Molecular, Optical Science Network (LAM), based in Senegal (continental influence)

Year	Support for training, fellowships and field work	Other activities	
		Conference organization	Travel support
<b>2007</b>	3 (Mauritania). 2 (Mali). 1 (Senegal).	<ul style="list-style-type: none"> <li>• 1 meeting in Algiers.</li> <li>• Support for an Affiliated Centre (Cameroon).</li> </ul>	<ul style="list-style-type: none"> <li>• 1 for promoting the Network.</li> <li>• 1 for an Egyptian to attend a conference in Algiers.</li> </ul>
<b>2008</b>	<ul style="list-style-type: none"> <li>• 4 PhDs (1 Mauritania, 3, Senegal).</li> <li>• 1 sandwich (Dakar/Mali).</li> </ul>	<ul style="list-style-type: none"> <li>• 1 meeting in Douala, Cameroon.</li> <li>• 1 meeting in Dakar, Senegal.</li> <li>• 1 regional African meeting (ICT).</li> </ul>	<ul style="list-style-type: none"> <li>• 3 for the Network coordination.</li> <li>• 2 students from Senegal sent to Nigeria and Kenya.</li> </ul>
<b>2009</b>	<ul style="list-style-type: none"> <li>• 2 students (Mauritania),</li> <li>• 4 students (Senegal),</li> <li>• 1 research grant to a female student in Algiers.</li> </ul>	<ul style="list-style-type: none"> <li>• 3 workshops.</li> <li>• Contributed as a Founding Member to the African Laser Centre (ALC).</li> <li>• Launching of the African Physical Society.</li> </ul>	<ul style="list-style-type: none"> <li>• 1 student from the University of Bamako (Mali) sent to Senegal.</li> <li>• 3 students from Senegal sent to Ghana.</li> </ul>
<b>2010</b>	<ul style="list-style-type: none"> <li>• 2 students (Mauritania).</li> <li>• 5 students (Senegal).</li> <li>• 1 PhD. sandwich student at the universities CAD of Dakar and Bamako, in Mali.</li> </ul>	<ul style="list-style-type: none"> <li>• 1 International Conference on Optical Science and Applications for Sustainable Development.</li> <li>• 1 workshop (LAM 9).</li> <li>• 1 Training Course on Mass Spectrometry in Nutrition.</li> </ul>	<ul style="list-style-type: none"> <li>• A programme of exchange of scientific visits.</li> <li>• Financial support to the ETOP</li> <li>• Meeting in Tunisia (US\$ 1,000).</li> <li>• Support of a Moroccan Research Fellow to attend a meeting in Tunisia.</li> </ul>
<b>2011</b>	<ul style="list-style-type: none"> <li>• Continued the student support of 2010.</li> </ul>	<ul style="list-style-type: none"> <li>• LAM/IAEA African Regional training Course on Mass Spectrometry.</li> <li>• Multispectral Imaging Spectroscopy in nutrition (Bamako, Mali).</li> </ul>	<ul style="list-style-type: none"> <li>• The LAM President participated in the ICO Congress in Puebla, Mexico, and in the ICTP Winter College.</li> </ul>

### Caribbean Network of Quantum Mechanics, Particles and Fields, based in Cuba

Year	Ph.D/Troisième Cycle	MSc	Research Papers	
			Published	Submitted (or in ArXiv)
<b>2007</b>	2	2	12	3
<b>2008</b>	—	—	8	5
<b>2009</b>	4	4	—	—
<b>2010</b>	4	1	15	3
<b>2011</b>	4	3	13	2

In addition, there has been support for post-doctoral fellows. There were also several events organized, or with participation of Network members.

**CLAF (Centro Latinoamericano de Fisica) based in Brazil with continental influence  
(especially Brazil, Cuba, Mexico and Peru)**

Year	Ph.D/Troisieme Cycle	PhD (approved)	Research Papers	
			Published	Submitted
<b>2007</b>	<b>9 PhDs:</b> 2 Cubans in Brazil. 3 Cubans in Mexico. 1 Bolivian in Brazil. 1 Colombian in Mexico. 2 Peruvians in Mexico.	—	2	—
<b>2008</b>	<b>5 PhDs:</b> 1 Peruvian in Mexico (female). 1 Peruvian in Mexico. 1 Colombian in Mexico. 2 Cubans in Mexico.	—	3	—
<b>2009</b>	<b>3 PhDs:</b> 1 Cuban in Mexico. 1 Colombian in Brazil. 1 Cuban in Brazil.	—	—	—
<b>2010</b>	<b>11 PhDs:</b> 1 Peruvian in Mexico. 1 Colombian in Mexico. 1 Cuban in Mexico (completed the degree). 1 Cuban in Cuba (female). 7 others.	—	3	1
<b>2011</b>	<b>5 PhDs</b> (Cuba). <b>3 PhDs</b> (Brazil). <b>2 PhDs</b> (Mexico).	2	7	3

**North African Group for Earthquakes and Tsunamis based in Algeria, starting once again in  
2011 (influencing Egypt, Lybia, Morocco, Sudan and Tunisia)**

Year	Support for training, fellowships and field work	Other activities	
		Conference organization	Travel support
<b>2007</b>	A scientist from Maulay Ismail University in Morocco did some field work in Egypt at the National Reserch Institute for Astronomy and Geophysics	—	2 Visiting Scientists form Egypt to Morocco
<b>2011</b>	—	—	—

**Latin American Network of Ferroelectric Materials based in Cuba  
(influencing Colombia and Brazil)**

Year	Support for training, fellowships and field work	Other activities		Publications	
		Conference organization	Travel Support	Published	Submitted
<b>2007</b>	5 students	<ul style="list-style-type: none"> <li>• Course on electron paramagnetic resonance.</li> <li>• Course on crystal growth and polarized light microscopy</li> </ul>	<ul style="list-style-type: none"> <li>• 1 lecturer at the EPR course.</li> <li>• The head of the Network visited the University of Puebla, Mexico.</li> </ul>	13	1
<b>2008</b>	2 Mexican students 1 Colombian student	<ul style="list-style-type: none"> <li>• Course on piezoelectricity and piezoelectric materials</li> </ul>	1 Mexican lecturer (F) 6 students: from Mexico (3), Colombia and Brazil (2).	15	6
<b>2009</b>	1 Cuban to Mexico 1 Cuban to Colombia 2 Mexicans and 1 Brazilian for the TF course	<ul style="list-style-type: none"> <li>• Course on ferroelectric materials.</li> <li>• Course on thin films.</li> </ul>	<ul style="list-style-type: none"> <li>• The head of the Network visited the University of Guadalajara for research activities.</li> <li>• 1 Mexican lecturer.</li> <li>• 1 Brazilian lecturer.</li> </ul>	7	10
<b>2010</b>	2 PhD students planning their theses (1 F)	<ul style="list-style-type: none"> <li>• Course on impedance spectroscopy</li> </ul>	<ul style="list-style-type: none"> <li>• For 2 graduate students</li> <li>• Travel grants for 2 scientists</li> </ul>	11 (and 2 chapters in books).	5
<b>2011</b>	2 PhD students planning their theses (1 F)	<ul style="list-style-type: none"> <li>• First Meeting of Young Network Researchers (at ICIMAF, Cuba)</li> </ul>	<ul style="list-style-type: none"> <li>• Travelling support for 2 PhD Cuban students to visit Brazil.</li> <li>• Travel grant for Network scientists to visit Brazil.</li> </ul>	9 (and 5 additional ones in proceedings).	4

**African Network on Lasers, Atomic and Medical Physics based in Tunisia (influencing Algeria, Burkina Faso, Cameroon, Republic of Central Africa, Tchad, Tunisia and Senegal)**

Year	Other activities		Publications	
	Support for training, fellowships and field work	Events (organized)	Published	Submitted
<b>2007</b>	2 PhD students (Tunisia and Morocco) 1 postdoc 1 sandwich course	3	2	4
<b>2008</b>	3 PhD students (including 1 from Algeria, female) Travel grants for 2 scientists	4 Workshops 2 Advanced Schools	8	3
<b>2009</b>	4 PhD students (including 1 Senegal, 1 Republic of Central Africa, 1 Tchad (female), 1 Algeria (female))	4 Workshops	1	1
<b>2010</b>	7 PhD students (including 3 females)	Workshops in Education for Trainers	1	1
<b>2011</b>	7 PhD students: Burkina Faso (1) Cameroon (2) Central African Republic (1) Senegal (1)	Alop International Workshop (Tunis)	1	1



**Partial Differential Equations, Modelling and Control, based in Burkina Faso (influencing Senegal and Mauritania)**

Year	Support for training, fellowships at PhD level	Support for training, fellowships at MSc (Memoire DEA) level	Conference organization	Publications	
				Published	Submitted
<b>2007</b>	7 PhD (defenses)  1 Thèse d'Etat (defense)	6 MSc (defenses)	<ul style="list-style-type: none"> <li>• 1 Workshop of mathematical modelling</li> <li>• 1 Training School</li> <li>• 1 African Conf. on Applied Mathematics</li> <li>• 1 Conf. in honor of C. Lobry</li> </ul>	7	6
<b>2008</b>	2 PhDs (defenses)	1 M.Sc (defense)	• PDE and nonlinear analysis	16	7
<b>2009</b>	6 PhD (defenses) including 1 female	2 MSc (defenses)	—	15	13
<b>2010</b>	4 PhD (defenses)	7 MSc (defenses)	<ul style="list-style-type: none"> <li>• 1 International School of models of epidemiology</li> <li>• 1 Colloquium on Informatics</li> </ul>	15	15
<b>2011</b>	4 PhD	—	<ul style="list-style-type: none"> <li>• Workshop of Mathematical Models and Data Processing of Water and Sound</li> <li>• Workshop on Control of Systems and Modelling (Senegal)</li> </ul>	Not available	Not available

**Relativistic Astrophysics, Cosmology and Gravitation, originally based in Pakistan but now divides into two nodes at:**

- 1. Bangladesh, India and Uzbekistan (BIU) and**
- 2. Pakistan and Turkey (PT)**

Year	Support for training, fellowships and field work	Other activities		Publications	
		Conference organization	Travel Support	Published	Submitted
<b>2007</b>	1 Pakistani scientist to Turkey. 1 Uzbekistani scientist to India	—	—	—	—
<b>2008</b>	3 Uzbekistan scientists to India	—	—	—	4
<b>2009</b>	—	—	—	—	—
<b>2010</b>	1 Uzbekistani scientist to India 1 Indian scientist to Turkey. 1 Pakistani scientist to Turkey	—	—	—	—
<b>2011</b>	Exchange of researchers visits within the Network	—	—	—	—

**South East Asia Consortium for Condensed Matter Physics based in Nepal (influencing Bangladesh and India)**

Year	Support for training, fellowships and field work PhD/MSc	Other activities	
		Conference organization	Travel support
<b>2007</b>	—	—	—
<b>2008</b>	—	—	—
<b>2009</b>	1 PhD 3 MSc	4	—
<b>2010</b>	—	—	—
<b>2011</b>	1 PhD 3 MSc	—	—

### Seismic microzoning of Latin American Cities (SMLAC), based in Havana, Cuba

Year	Support for training, fellowships and field work	Other activities (Travel Support)	Publications	
			Published	Submitted
<b>2007</b>	1 Meeting in Jamaica. 1 Meeting in R.B. Venezuela.	1 Cuban scientist for each of the two meetings.	1	—
<b>2008</b>	1 Meeting in R.B. Venezuela..	1 Jamaican scientist (female). 1 Cuban scientist.	—	—

### African Network in Geometry and Algebra Applied to Development (RAGAAD), based in Cameroon (influencing Benin, Burkina Faso, Congo, Mali, Mauritania, Niger, Senegal and Tunisia)

Year	Support for training, fellowships and field work	Other activities		Publications	
		Conference organization	Travel Support	Published	Submitted (or preprints)
<b>2007</b>	4 PhD	• WATS 1 (West African Training School).	2 students for a colloquium.	24	—
<b>2008</b>	10 PhD 4 MSc	• WATS 2 • A Workshop in Nigeria. • Conf. on African cryptology.	• 9 student travel grants. • 5 other travel grants.	20	—
<b>2009</b>	8 PhD 4 MSc (2 PhD defenses)	• WATS 3 • School on algebraic topics and cryptology.	• 4 scientists for local academic supervision • 5 student travel grants.	4	—
<b>2010</b>	12 PhD (3 PhD. defenses) 4 MSc	• WATS 4 • School of cryptology in Cameroon. • A Workshop in Nigeria. • Ecole CIMPA-UNESCO-MICNN Theorie de Nombres e Algorithmiques (in Bamaco, Mali)	• For 4 doctoral students in Niamey, Niger, and for doctoral and master students from sub-Saharan countries.  • For scientists from Senegal and Tunisia to travel to Cameroon.	—	—
<b>2011</b>	6 PhD (2 PhD. defenses)	• Atelier de Combinatoire • African Cryptology at UCAD, Dakar, Senegal	• For 2 scientists from Burkina Faso to visit the University of Aix Marseilles 2, and for doctoral students from Niamey, Dakar and Yaounde.	13	2

**Latin American Network on Slow Dynamics of Complex Systems, based in Havana, Cuba  
(influencing Argentina and Brazil)**

Year	Support for training, fellowships and field work	Other activities		Publications	
		Conference organization	Travel Support	Published	Submitted
2007	—	—	—	—	—
2008	—	—	—	—	—
2009	—	—	1 Cuban to Argentina. 1 Cuban to Brazil. 1 Brazilian to Cuba. 2 Brazilians to Argentina. 4 Argentinians to Brazil.	16 were reported for the period 2007-2008	—

**Nano African Network Initiative (Nano-Afnet), based in South Africa (continental influence)**

Year	Support for training, fellowships and field work	Other activities		Publications	
		Conference organization	Travel Support	Published	Submitted
2007	—	—	—	—	—
2008	1 PhD 4 MSc 30 graduate school trainees, including 6 females	9 conferences	<ul style="list-style-type: none"> <li>• 15 Visiting Scientists.</li> <li>• 14 travel grants for scientists.</li> </ul>	14	1
2009	1 PhD 33 graduate school trainees, including 12 females	—	14 Visiting Scientists. 13 travel grants for scientists.	67	—
2010	—	—	—	—	—

**Seismic Hazard in South East Asia, based in Bangalore, India**

Year	Support for training, fellowships and field work	Other activities		Publications	
		Conference organization	Travel Support	Published	Submitted
2007	—	—	—	—	—
2008	—	1 Workshop on Seismic Hazards in Asia (co-sponsored by the Director's Office of ICTP).	2 travel grants for scientists	—	—

**Bangkok-Beijing-Shanghai Network in High Energy Physics, based Sanghai, P. R. China  
(influencing South East Asia)**

Year	Support for training, fellowships and field work	Other activities		Publications	
		Conference organization	Travel Support	Published	Submitted
<b>2007</b>	—	1 postgraduate course on cosmology in Thailand.	1 Chinese scientist to Thailand. 1 Thai scientist to P.R. China.	2	—
<b>2008</b>	—	—	—	—	—
<b>2009</b>	—	—	—	—	—
<b>2010</b>	—	1 Advanced School. 1 Workshop.	1 Chinese scientist to Thailand. 3 Thai scientists to P.R. China.	—	—

**African Network for Solar Energy, based in the Johannes Kepler University, Linz, Austria (of continental influence).**

Year	Support for training, fellowships and field work	Other activities		Publications	
		Conference organization	Travel Support	Published	Submitted
<b>2011 (*)</b>					

(\*) No information has been received corresponding to the Academic Report for 2011, since the funds began to be assigned at the end of 2011.



### APPENDIX 5: Visiting Scholars/Consultants (2007-2011)

COUNTRY	2007	2008	2009	2010	2011
Argentina	—	1	1	—	1
Benin	—	—	1	—	2
Brazil	2	—	—	2	2
Cuba	1	—	1	—	2
Egypt	1	—	—	—	—
Ghana	2	—	1	1	2
India	1	—	—	—	—
Indonesia	1	—	—	1	1
Liberia	1	—	—	—	1
Madagascar	—	—	1	—	—
Malawi	—	—	1	—	—
Morocco	1	—	1	—	—
Namibia	2	—	—	—	—
Nepal	1	—	—	—	1
Peru	—	—	—	—	1
Senegal	—	—	1	1	1
Thailand	1	—	—	—	—
Turkey	1	—	—	—	—
Uzbekistan	1	—	—	—	—
Zimbabwe	1	—	—	—	1
<b>TOTAL</b>	<b>15</b>	<b>1</b>	<b>8</b>	<b>5</b>	<b>15</b>

## APPENDIX 6: Scientific Meetings (2007-2011)

COUNTRY	2007	2008	2009	2010	2011
Algeria	—	—	1	—	—
Argentina	4	6	10	5	4
Armenia	—	1	—	—	1
Australia	1	—	—	—	—
Azerbaijan	—	2	—	—	—
Bangladesh	1	1	—	—	—
Benin	2	2	—	2	2
Bolivia	1	—	—	—	1
Bosnia & Herzegovina	—	1	—	—	1
Brazil	3	2	5	6	2
Bulgaria	1	2	1	1	1
Burkina Faso	—	—	1	—	—
Cambodia	—	—	1	—	1
Cameroon	1	3	2	1	2
Chile	—	2	2	5	1
Colombia	4	1	1	1	3
Congo	—	1	—	—	—
Côte d'Ivoire	1	—	—	—	—
Croatia	1	—	—	1	—
Cuba	1	2	—	1	2
Egypt	3	6	2	2	1
El Salvador	—	1	—	—	2
Ethiopia	—	1	1	—	1
France	—	1	—	—	1
Ghana	3	2	2	2	2
Georgia	—	1	—	—	2
Guatemala	—	—	1	1	—
Honduras	—	—	—	—	1
India	3	4	5	2	4
Indonesia	5	1	2	—	2
Islamic Republic of Iran	2	3	3	3	1
Italy	—	—	2	1	—
Jordan	—	1	—	1	2
Kenya	1	—	—	1	—
Lebanon	—	—	—	1	—
Macedonia	—	—	1	—	—
Madagascar	—	1	—	—	1
Malaysia	1	1	2	—	2
Mali	—	—	—	1	—
Mexico	3	—	1	2	1
Mongolia	1	1	—	—	—
Morocco	2	1	2	3	5
Nepal	—	—	2	1	2

Nicaragua	1	—	—	—	—
Niger	1	—	—	—	—
Nigeria	2	1	1	1	1
Pakistan	3	1	2	—	1
People's Republic of China	1	—	1	1	1
Peru	—	1	—	1	—
Philippines	2	—	—	—	1
Puerto Rico	—	—	—	1	—
Romania	—	—	1	—	—
Russian Fed.	—	1	—	—	—
Rwanda	—	—	—	—	1
Senegal	2	—	2	1	1
Serbia	1	1	—	1	1
Singapore	—	—	1	—	1
South Africa	3	1	—	—	2
Sudan	2	—	—	—	—
Sultanate of Oman	—	—	1	1	1
Switzerland	1	—	—	1	—
Tanzania	2	1	1	—	—
Thailand	2	—	1	1	1
Trinidad & Tobago	1	1	—	—	—
Tunisia	1	1	1	1	1
Turkey	2	1	1	3	—
Uganda	—	1	—	1	—
Ukraine	1	—	2	—	—
Uruguay	1	2	1	1	—
Uzbekistan	1	—	2	—	—
Vietnam	2	3	4	4	3
Zambia	—	1	—	—	—
<b>TOTAL</b>	<b>77</b>	<b>65</b>	<b>72</b>	<b>63</b>	<b>67</b>

## Footnotes

1. All data in the diagrams refers to the year 2010. The data reported in the Appendices covers the period 2007-2011.

2. We write our data as host country—country of origin of the Visiting Scientist. Firstly, in the African Region we sponsored the following South-South collaborations, Morocco-Brazil, Namibia-South Africa, Namibia-India, Senegal-Cameroon. Secondly in Latin America and the Caribbean three collaborations took place: one between Argentina-P. R. China and two between Brazil-Cuba (2).

3. In the African Region there were the following 8 collaborations: Benin-Canada, Benin-USA, Egypt-USA, Ghana-Netherlands, Ghana-Sweden, Ghana-UK, Madagascar-France and Malawi-USA. Secondly, in Asia we supported cooperation between Indonesia-Australia, Nepal-Denmark and Uzbekistan-Germany. Finally, in Latin America and the Caribbean 6 collaborations took place: Argentina-Spain, Brazil-France, Brazil-UK, Cuba-Belgium, Perú-Denmark, Republica Bolivariana de Venezuela-Belgium.

4. The 17 nations of the African Region were: Benin (2), Cameroon (2), Egypt (2), Ghana (2), Kenya, Mali, Morocco (3), Nigeria, Senegal, Tunisia and Uganda. Meetings held in Asia received 18 grants: India (2), Islamic Republic of Iran (3), Jordan, Lebanon, Nepal, Oman, People's Republic of China, Thailand, Turkey (3) and Vietnam (4). The OEA assigned 5 grants for meetings that were held in Europe, one for each of the following countries: Bulgaria, Croatia, Italy, Serbia, and Switzerland. In Latin America and the Caribbean 23 events were supported: Argentina (5), Brazil (6), Chile (5), Colombia, Cuba, Guatemala, Mexico (2), Peru and Uruguay. Finally, in North America a single event was sponsored in United States of America (Puerto Rico).

## Photographic credits

### Affiliated Centres

**Fig. 2.** L'Institut de Mathématiques et de Sciences Physiques, Porto Novo, Benin. Credit: *ICTP and Africa*. Compiled and edited by K. R. Sreenivasan. Printed in Trieste by the ICTP Publications and Printing Services (2007), p. 13.

**Fig. 3.** The Cheikh Anta Diop University (UCAD), Dakar, Senegal. Credit Wikipedia: [http://en.wikipedia.org/wiki/File: BibliothèqueCheikhAntaDiop.JPG](http://en.wikipedia.org/wiki/File:BibliothèqueCheikhAntaDiop.JPG)

**Fig. 4.** Professor Gallieno Denardo the OEA Director at the time of the inauguration of LAFOC. Credit: *ICTP and Africa*. Compiled and edited by K. R. Sreenivasan. Printed in Trieste by the ICTP Publications and Printing Services (2007), p. 14.

**Fig. 5.** The University of Douala, Douala, Cameroon. Credit: <http://www.cameroon-today.com/university-of-douala.html>.

**Fig. 6.** The British University in Egypt, the former venue for the CPT, now the OEA Affiliated Centre at Zewail City for Science and Technology. Credit Wikipedia: [http://en.wikipedia.org/wiki/File: British\\_University\\_in\\_Egypt.jpg](http://en.wikipedia.org/wiki/File:British_University_in_Egypt.jpg)

**Fig. 8.** The Pavel Sukhoi Gomel State Technical University, Belarus. Credit Wikipedia: [http://en.wikipedia.org/wiki/File: BLR\\_Gomel\\_Pavel\\_Sukhoi\\_State\\_Tech\\_Univ\\_1.jpg](http://en.wikipedia.org/wiki/File:BLR_Gomel_Pavel_Sukhoi_State_Tech_Univ_1.jpg)

**Fig. 9.** Instituto de Matematica y Ciencias Afines (IMCA), Lima, Peru. Credit: <http://www.imca.edu.pe/sitio/index.php>

### Projects

**Fig. 13.** The Sid Ahmed Baba AUST in Abuja, Nigeria. Credit: <http://aust.edu.ng/library>.

**Fig. 14.** University of Abomey-Calavi (UAC) at Cotonou in Bénin. Credit: <http://safe-africa.net/Abomey.htm>.

**Fig. 15.** The main entrance of the KNUST, Kumasi, Ghana. Credit Wikipedia: [http://en.wikipedia.org/wiki/Kwame\\_Nkrumah\\_University\\_of\\_Science\\_and\\_Technology](http://en.wikipedia.org/wiki/Kwame_Nkrumah_University_of_Science_and_Technology).

**Fig. 16.** Regional Postgraduate Diploma in Mathematics at the University of Botswana in Gaborone. Credit Wikipedia: [http://en.wikipedia.org/wiki/University\\_of\\_Botswana](http://en.wikipedia.org/wiki/University_of_Botswana).

**Fig. 17.** Addis Ababa University, Ethiopia. Credit Wikipedia: [http://en.wikipedia.org/wiki/File: Addis\\_Abeba\\_University\\_\(Sam\\_Effron\).jpg](http://en.wikipedia.org/wiki/File:Addis_Abeba_University_(Sam_Effron).jpg).

**Fig. 18.** GCU Tower, Government College University, Lahore, Credit Wikipedia: [http://en.wikipedia.org/wiki/Government\\_College\\_University](http://en.wikipedia.org/wiki/Government_College_University).

**Fig. 19.** Quaid-i-Azam University Entrance. Credit Wikipedia: [http://en.wikipedia.org/wiki/Quaid-i-Azam\\_University](http://en.wikipedia.org/wiki/Quaid-i-Azam_University).

**Fig. 20.** Observatory of Ulugh Beg. Credit: <http://dome.mit.edu/handle/1721.3/51749?show=full>.

**Fig. 21.** Indian Centre for Space Physics, Kolkata in India. Credit Official website: <http://csp.res.in/ICSP-WEB/publicoutreach.html>

**Fig. 22.** University of Nis in Serbia. Credit Wikipedia: [http://en.wikipedia.org/wiki/University\\_of\\_Niš](http://en.wikipedia.org/wiki/University_of_Niš).

**Fig. 23.** One of the Classroom Buildings at the Instituto Balseiro. Credit Wikipedia: [http://en.wikipedia.org/wiki/Balseiro\\_Institute](http://en.wikipedia.org/wiki/Balseiro_Institute).

### Networks

**Fig. 26.** The Algiers Observatory was built in the late nineteenth century. Credit Wikipedia: [http://en.wikipedia.org/wiki/Algiers\\_Observatory](http://en.wikipedia.org/wiki/Algiers_Observatory).

**Fig. 27.** Faculty of Mathematical, Physical and Natural Sciences of Tunis. Credit: Official website: <http://www.utm.rnu.tn/documents/presentation/annuaire/utm.jpg>

**Fig. 28.** iThemba LABS (laboratory for accelerator based sciences), a leading African organisation for research Credit the Official Site: <http://www.tlabs.ac.za/>



**Fig. 29.** The Main Library of the Johannes Kepler University, Linz, Austria. Credit Wikipedia:  
[http://en.wikipedia.org/wiki/Johannes\\_Kepler\\_University\\_of\\_Linz](http://en.wikipedia.org/wiki/Johannes_Kepler_University_of_Linz)

**Fig. 30.** NUST Pakistan Navy Engineering College (PNEC). Credit Wikipedia:  
<http://en.wikipedia.org/wiki/File:PNEC.jpg>

**Fig. 31.** Fudan University historic gate. Credit Wikipedia: <http://en.wikipedia.org/wiki/File:Fudan000.jpg>

**Fig. 32.** Aerial view of the University of Sao Paulo, Brazil. Credit Wikipedia:  
[http://en.wikipedia.org/wiki/University\\_of\\_São\\_Paulo](http://en.wikipedia.org/wiki/University_of_São_Paulo)

**Fig. 33.** The ICIMAF building of the Departments of Mathematics and Theoretical Physics. Courtesy of Professor Hugo Perez Rojas.

**Fig. 34.** The Mario de Almeida Pavilion, the venue of the CLAF offices. Credit:  
[http://www.claffisica.org/index.php?r=site/sobre\\_claf](http://www.claffisica.org/index.php?r=site/sobre_claf)

**Fig. 35.** The University of La Havana, where the Latin American Network of Ferroelectric Materials has its main node  
 Credit: Ismael Clark Arxer, UNESCO Science Report 2010 .

## Appendix 1

**Fig. 40.** Jan Nilsson. Courtesy of The ICTP Photo Archives.

**Fig. 41.** Gallieno Denardo. Courtesy of The ICTP Photo Archives.

**Fig. 42.** Faheem Hussein. Courtesy of The ICTP Photo Archives.