

CIMPA, Supporting Mathematics in the Developing World

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An Introduction to CIMPA

The Centre International de Mathématiques Pures et Appliquées (CIMPA), founded in France in 1978, is a nonprofit organization working to promote mathematical research in developing countries. A UNESCO Category 2 Centre located in Nice, CIMPA belongs to France's Laboratoire d'Excellence CARMIN (Centre d'Accueil et de Rencontres Mathématiques Internationales) and benefits from the financial support of France, Norway, Spain, and Switzerland. In order to introduce CIMPA to the members of the International Association for Mathematical Physics, we describe here CIMPA's mission, activities, and history, and then share testimony by two mathematicians who have participated in CIMPA activities, one working in Africa and the other in the US.

CIMPA's 2018 activities can be viewed at https://www.cimpa.info/sites/default/files/CIMPA_POSTER_2018.pdf

CIMPA's Mission and Activities

Each year, CIMPA co-organizes and sponsors numerous activities in developing countries across all continents. Each of those activities is awarded through a call for proposals process within one of the following categories:

- **CIMPA Research Schools:** This is the historical activity of CIMPA, it focuses on areas where there is a real drive to develop mathematics and where there is scope for a research project. Calls for proposals are launched every year to organize about twenty research schools per year.

- Support for Training in Research: This program consists in funding the organization of a series of research-level courses in mathematics within the geographic areas of activities of CIMPA (Africa, Central and South America, Asia). Every year, two calls for proposals are launched, with deadlines in early January and early July.
- Short-Term Thematic Programs: CIMPA funds the participation of young mathematicians from developing countries to short-term thematic international programs organized by some of our partner institutions. A call for applications is opened for each such program.

Other actions strongly supported by CIMPA include activities developed in close collaboration with continental mathematical unions such as the Schools in Partnership whose purpose is to introduce undergraduate and master students to the research in mathematics. For most of its activities, CIMPA works in partnership with other bodies with similar objectives like the International Mathematical Union (IMU), the European Mathematical Society (EMS) and the International Centre for Theoretical Physics (ICTP).

History

Following a recommendation made during the 18th session of the General Conference of UNESCO in Paris in 1974, the creation of CIMPA was decided during the 19th session of the General Conference of UNESCO in Nairobi in 1976. On the initiative of the French Government and a group of founding members (J.P. Aubin, J. Ca, P. Deheuvels, F. Dress, C. Godbillon, H. Hogbe Nlend, J.L. Lions, J.L. Koszul, E.J. Picard, A. Revuz, P. Sabourin), the International Center for Pure and Applied Mathematics was formally created as an association of the law of 1901, on 30 October 1978. According to its statutes, its mission is the training of mathematicians coming in priority from developing countries, by means of study visits during the university academic year and of summer schools, and with the help of the development of means of documentations. The seat of CIMPA is fixed at Nice, and its host university is the University of Nice Sophia Antipolis.

The association CIMPA gathers individual members, institutional members and member states. Originally purely French, CIMPA has recently taken on a European dimension with the entrance of two new members states, Spain in 2009 and Norway in 2011, and the strong financial support of Switzerland since 2011. Currently, the main sources of funding for CIMPA are: the

French Ministry of Higher Education and Research, the University of Nice Sophia Antipolis, the Laboratory of Excellence CARMIN, the National Institute of Mathematical Sciences and their interactions (INSMI) of the Centre National de la Recherche Scientifique (France), the Ministry of Economics, Industry, and Competitiveness (Spain), the Ministry of Education and Research (Norway), and the Secrétariat d'État la formation, à la recherche et à l'innovation (Switzerland) via the University of Neuchâtel. Ever since its creation, CIMPA is led by a President, together with a Vice-President, a Secretary and a Treasurer, work in collaboration with the Executive team: an Executive Director in charge of the day-to-day running of the center and a dozen Scientific Officers. An IT Manager, an Executive Secretary and a Communication Officer take care of operational activities in Nice.

Mathematics in Africa, and the roles of EMA and CIMPA

At least half a century ago, real efforts were under way in Africa to train mathematicians, though not coordinated among countries. This had initial results, even if overall insufficient. In 1976 the African Mathematical Union (AMU) was created in Rabat, Morocco. Henri Hogbe Nlend was the first president of AMU and, thanks to the interpersonal skills of first African mathematicians. there followed within AMU, the creation of four commissions: on the history of mathematics in Africa, on women and mathematics in Africa, on the teaching of mathematics and new technologies, and on the pan-African mathematics Olympiad. We can say with certainty that a milestone was already reached. However, a regional or sub-regional framework for exchanges between students in mathematics, young mathematicians, and the more experienced was lacking.

It is important to stress that a large majority of the population of sub-Saharan Africa are young people aged under 25, and there is a crucial need for teachers and researchers in mathematics. It is of note that in the past (mainly in the 70s, 80s, and 90s), several initiatives for the development of research in mathematics in sub-Saharan Africa started. Most of them struggled to reach their goal, however, because of the low number of active researchers in mathematics in Africa. Since then, real efforts have been made by researchers publishing papers and defending theses in various topics in mathematics such as analysis, geometry, algebra and applied mathematics. However, topics like mathematical physics remain to be included.

The positive effects of the CIMPA activities on the life of mathematics in the world in general and in Africa in particular, with its schools of research, are indisputable. They have allowed not only young people but also researchers scattered across African countries to be in contact with leading scientists. These exchanges have allowed African researchers to pursue participation in the concert of the mathematical exchanges in the world. But still an environment of further initiation and strengthening in mathematics are desired.

In 2010, after the general assembly of the African Mathematical Union (AMU) held at Yamoussoukro in Ivory Coast, the African Mathematics Schools (EMA) were created by Professor Saliou Touré, who was President of AMU from 2010 to 2014. These EMA have the primary goal of strengthening the mathematical level of young people, to develop contact with relevant topics of current or major interest, and to stimulate the best among them toward more in-depth studies. CIMPA supports and accompanies this beautiful initiative to strengthen African students in various areas of mathematics at license and master levels. Besides CIMPA's support, other efforts are ongoing, such as the Non-Linear Analysis, Geometry, and Applications (NLAGA) project, funded by the Simons Foundation through its African Mathematics Project (AMP), initiated in 2011. A second example we would like to point out is the initiative of the World Bank supporting scientific research in Africa via Centers of Excellence. At least two of these are oriented to mathematics and computer science, in Benin and in Senegal.

Funding from donors such as the Simons Foundation and the World Bank by creating Centers of Excellence oriented toward mathematics, as in Senegal and in Benin, is intended to foster the organization of more and more EMA to prepare students for occupations in (medium-secondary and higher) teaching and in research. That is why we wish to launch a vibrant appeal, encouraging African colleagues to organize EMA, including in mathematical physics, which are relatively easy and not costly to run. Once a series of EMA have taken place, we can expect several very positive outcomes such as: the strengthening of skills, greater frequency of exchanges among African mathematicians and physicists, and, finally, more frequent exchanges between this community of mathematicians and physicists in Africa countries and that of the rest of the Earth.