Gabonese Workshop in Arithmetic and beyhond

October 24 – November 4, 2024

REPORT

COORDINATORS

− Cécile Armana, University of Franche-Comté, France.
− Tony Ezome, École Normale Supérieure de Franceville, Gabon.
− Christian Maire, University of Franche-Comté, France.
− Ariane Mézard, École Normale Supérieure de Paris, France.
− Maurice Obame, École Normale Supérieure (ENS), Libreville, Gabon − local coordinator.

Website:
https://indico.math.cnrs.fr/e/workshopgabon24
https://redagaac.math.cnrs.fr/

I. THEME AND GOALS

The Gabonese Workshop in Arithmetic and Beyond took place in École Normale Supérieure (ENS) in Libreville, Gabon, from October 24 to November 4, 2024. It consisted of three main activities.

• A Series of Research Lectures

For this event, we welcomed 40 participants, mostly from Central Africa. This event was open to all mathematicians, particularly young African researchers. We supported the participation of women.

Young researchers, especially PhD students, had the opportunity to present their recent work. Notably, among the African PhD students who took part in this workshop, two have a scholarship from the GRAID Program of the IMU-CDC.

Speakers (females are indicated with [F]):

- Cécile Armana (University of Franche-Comté, France)[F]
- Demba Barry (University of Bamako, Mali)
- Régis Babindamana (Marien Ngouabi University, Republic of Congo)
- Moustapha Camara (Assane Seck University, Senegal)
- Gérémino Ella (USTM, Franceville, Gabon)
- Fulgence Eyi (USTM, Franceville, Gabon)
- Tony Ezome (ENS Libreville, Gabon)
- Moussa Fall (Assane Seck University, Senegal)
- Roslan Ibara (Marien Ngouabi University, Republic of Congo)
- Vincent Kouakou (University Nagui Abrogoua, Ivory Coast)
- Christian Maire (University of Franche-Comté, France)
- Saïdou Mahmoudou (CERMEL, Gabon)
- Paule Joyce Mbenangoye (USTM, Franceville, Gabon)[F]
- André Mialebama Bouesso (Marien Ngouabi University, Republic of Congo)
- Brice Miayoka (Marien Ngouabi University, Republic of Congo)
- Jules Ntsiri (USTM, Franceville, Gabon)
- Judicaël Obame (USTM, Franceville, Gabon)
- Winnie Ossete (Marien Ngouabi University, Republic of Congo)[F]
- Ephraim Poncho-Kotey (University of Ghana, Ghana)
- Karim Sankara (Nazi Boni University, Burkina Faso)
- Hermann Sore (Nazi Boni University, Burkina Faso)

Slots have also been reserved for young students (Masters):

- Copernic Bougouendji (USTM, Franceville, Gabon)
- Pierre Ebayi (USTM, Franceville, Gabon)
- Joseph Fomekong (USTM, Franceville, Gabon)
- Drame Oumarou (USTM, Franceville, Gabon)
- Aldo Lokossa (USTM, Franceville, Gabon)

• Two Advanced Courses for PhD and Master students

One course was delivered by Frédéric van Wijland, Professor at University Paris-Cité, on mathematical aspects of physics, and was open to physicists and mathematicians at the ENS Libreville and USTM of Franceville: This course was offered as part of a CIMPA program.

The second course was jointly delivered by Ariane Mézard, Professor at Paris Sorbonne University, and ENS Paris, and by Cécile Armana, maîtresse de conferences, Franche-Comté University. It featured two series of lectures given in pairs by ENS Libreville and ENS Paris: Mozer Maleghi (ENS Libreville) / Jules Fressonnet (ENS Paris), and Geordann Igouwe (ENS Libreville) / Santiago Reyes (ENS Paris).

• A series of events to promote mathematics

This event was organized in partnership with the Institut Français in Gabon:

- Two half-days were planned for high school students,

- A 2-hour presentation of our project for the economic community of Gabon,
- A screening of the movie "Le théorème de Marguerite", which tells the story of a young female mathematician in France.

II. THE CONTEXT

This workshop was a part of a multi-year program which aims to promote a research activity in Central Africa involving young researchers. It is built upon a core of African and French mathematicians, most of them who already collaborated both in research and in organizing many workshops and conferences in Africa in the recent years. Our program has its dedicated website: https://redagaac.math.cnrs.fr/.

A remarkable result of these collaborations has been the creation in 2012 of the *Pole of Research in Mathematics and Applications in Africa* (PREMA) which was awarded for funding by the *Simons foundation*, USA. As a continuation of PREMA, one of the main objectives we focus on are the mentoring and the education of young researchers by reinforcing and completing their background through research schools and workshops. We are stabilizing a group of young researchers in order to implement for the first time a research team on arithmetic geometry and number theory in Central Africa, based at École Normale Supérieure in Libreville in Gabon.

More recent steps in our program took place in December 2022 and March 2024 during the Third and Fourth editions of the *Algebraic Days of Gabon*, where our group of 15 young researchers received intensive courses on basic algebraic number theory and arithmetic geometry, as well as more specialized courses in order to raise up their level. In the last few years we also organized other events, in Gabon and other parts of Sub-Saharan Africa (in person), on related topics:

- A Research School on *Number Theory and Applications*, December 6 to 18, 2021, Institut de Mathématiques et de Sciences Physiques (IMSP) in Dangbo, Benin;
- The first *Workshop of Women Mathematicians living and working in the Western-center of Africa* (Cameroon, Congo Brazzaville and Gabon), April 5 to 7, 2022, at the Institut National de la Poste, des Technologies de l'Information et de la Communication (INPTIC) in Libreville, Gabon. Indeed PREMA has closely collaborated with the *Committee for Women in Mathematics* of the IMU and the *African Woman in Mathematics Association* to reduce the gender gap in mathematics in Africa;
- Working sessions involving some students from Congo Brazzaville and Gabon about questions related to their Phd topics, April 8 to 23, 2022, at the ENS in Libreville, Gabon;
- A CIMPA School on *Algebra, arithmetic and application*, June 13 to 24, 2022, at the Institut de Mathématiques et de Sciences Physiques (IMSP) in Dangbo, Benin;
- A CIMPA School on *Cryptography, theoretical and computational aspects of number theory*, August 15 to 26, 2022, at AIMS Senegal, Mbour, Senegal.

This workshop was not a recurring event but rather an important step of our program. In particular, we initiated a novel partnership with ENS Paris, which we aim to make sustainable. More details on this multi-year program can be found on https://redagaac.math.cnrs.fr/ but also on the webpages of C. Armana and of C. Maire.

III. FINANCIAL REPORT

Expenses

Transport (plane, train and bus) for non-local participants	18,800 €
Visas	1,000 €
Housing	7,500 €
Lunches for all participants	4,000 €
Breakfast and dinners for non-local participants	3,000 €
Coffee break, water	500 €
Dinner buffet at Institut Français	900 €
Dinner of the workshop	300 €
Opening ceremony	500 €
Outreach activities	500 €
Secretariat expenses (local transport, communication, internet, badges, notebooks, etc.)	1,000 €
Total	38,000 €

Non-local participants were Gabonese participants not from Libreville, and participants from abroad.

Funding

École Normale Supérieure de Paris	11,000 €
Ambassade de France au Gabon	5,000 €
CNRS, DEI	5,500 €
International Mathematical Union (IMU)	2,500 €
CNRS, France: Project in Senegal	2,500 €
CNRS, France: AFRIMath project	2,000 €
Institut Universitaire de France	2,600 €
ANR projects, France	2,000 €
CNRS, RT2N	1 500 €
Centre International de Mathématiques Pures et Appliquées (CIMPA)	1,200 €
European Mathematical Society	1,000 €
Journal de Théorie des Nombres de Bordeaux, France	1,000 €
Top Sciences, Gabon	200 €
Total	38,000 €

No registration fees were charged.