

Report of the International Mathematical Union **Committee for Women in Mathematics** **from 2015 to 2018**

CWM terms of reference

CWM was created by the EC in March 2015, with the following terms of reference

- (1) To promote international contacts between national and regional organizations for women in mathematical sciences;
- (2) To maintain up-to-date content on the Women in Mathematics part of the IMU website and, with appropriate assistance from the IMU, to ensure its technical development;
- (3) To consider how best to facilitate electronic communications among the community of women mathematicians internationally;
- (4) To work with groups, committees and commissions of IMU on topics pertaining to women mathematicians and their representation;
- (5) To publicise, and where needed to suggest, working practices that ensure equal opportunities for women mathematicians in universities and research institutions, for example appropriate funding arrangements, family friendly policies and facilities;
- (6) To report annually to the IMU Executive Committee and to propose actions that would foster equal treatment of women in the mathematical community and lead to an increase in the representation of women in mathematics at all levels

Committee Members in the period 2015-2018

Marie-Françoise Roy, France (Chair, in charge of electronic communication); Caroline Series, UK, (Vice Chair, in charge of the CWM website); Carolina Araujo, Brazil; Bill Barton, New Zealand; Ari Laptev, UK and Sweden; Kristin Lauter, USA ; Sunsook Noh, S. Korea; Marie-Françoise Ouedraogo, Burkina Faso; Sujatha Ramdorai, Canada; Betül Tanbay, Turkey. Non-voting EC Liaison: John Toland, UK.

CWM also has two associate members Neela Nataraj (IIT Mumbai - Coopted for coordinating grant reports) and Petra Bonfert-Taylor (Dartmouth College, USA - Coopted for website).



Activities funded by CWM

The following activities were supported by CWM from the 2015 budget

- Creation of the African Women in Mathematics Association (AWMA) website <http://africanwomeninmath.org/>, launched in July 2015. The site is in both English and French, has the same format as the EWM website, and is hosted on the same server.
- Support of AWMA general meeting in Kenya (July 2015) and a Meeting in Sao Paulo Brazil (March 2016)
- Design of (WM)² logo (December 2015)

The CWM 2016 call was for supporting and encouraging the formation of networks of female mathematicians on a regional basis in developing or emerging countries. It received almost 50 applications from 28 countries, mostly in the developing world. Seven proposals fit precisely with the stated aims and were funded: in Colombia, India, Indonesia, Kazakhstan, Mexico, Senegal, and Tunisia. All the activities took place successfully. There were about 500 participants in total, among them about 430 women.

The CWM 2017 call received 50 applications of which CWM decided to support 12. These are for networks, schools and other projects and will take place in Brazil, Canada (round table "*Women in Mathematics in the Americas*" during the Mathematical Congress of the Americas 2017), Morocco, Chile, India, Nepal, Tunisia, South Africa, Iran, Vietnam, Mexico and Japan. In total, there were about 960 participants, among them about 675 women. Our call for Supplementary Grants for individuals received 23 applications, of which 6 were granted. It was noted that only one application completely fulfilled the conditions of the call. Gabriel Araujo Pardo (UNAM, Mexico) was also supported to attend the AWM Symposium in Los Angeles (April 2017) where she gave a well-appreciated short presentation of CWM.

The CWM 2018 call received 55 applications of which CWM decided to support 10. Most grants are for developing regional networks for Women in Mathematics, in Africa (Kenya, Nigeria), Europe (Macedonia) and Asia (India, Uzbekistan). A Workshop in El Salvador (supported by the Vice Minister of Science and Technology and the ICSU Regional Office of Latin America and the Caribbean) will be focussed on less developed Central American countries. An activity inspired by the series of meetings "Women in ..." (see for example "Women in numbers") will take place for the first time in South America, in Uruguay. AWMA will also be writing portraits of African women mathematicians, both to post on their website and to publish as a booklet to be used for promoting mathematics among young African women. An ICTP school in Trieste (Italy) on Dynamical Systems, with all female organizers and lecturers, and the European Women in Mathematics General Meeting taking place in Graz (Austria) are also supported, the CWM grant being used to support the attendance of women from developing countries.

A short film for International Women's Day 2018, *Faces of Women in Mathematics*, was proposed by Eugenie Hunsicker, Chair of the London Mathematical Society Women in Maths Committee, and Irina Linke, a filmmaker. It consists of an edited sequence of film clips of women saying into the camera "I am (name) from (country), and I am a mathematician!" in the language of their choice. The 146 clips, sent in as a result of a message circulated to CWM ambassadors (see below), featured 243 women mathematicians from 36 different countries speaking in 31 different languages. CWM used a small part of its budget for editing the clips and the film has been greatly appreciated by all who have seen it. See <https://vimeo.com/259039018>.

(WM)² and CWM panel at ICM Rio

CWM initiated the idea of the World Meeting for Women in Mathematics (WM)². (WM)² in Rio will have a strong Latin American focus and will take place immediately prior to Rio ICM, on Tuesday July 31st, 2018. A professional designer created a logo and poster, the domain name worldwomeninmaths.org was reserved and a website company designed the website (see <https://www.worldwomeninmaths.org/>). CA is the main organiser (WM)²'s and also a local organizing member for ICM 2018. CA's proposal for (WM)² to become a satellite meeting of the ICM in December 2015 was approved on 15 February 2016. The scientific committee chaired by Georgia Benkart (University of Wisconsin-Madison) has selected a key-note lecturer (Monique Laurent), three

invited lecturers (Alicia Dickenstein, Salome Martinez, Maria Eulalia Vares) and a public lecturer (Maria Esteban). The program will also include group discussion, posters (both mathematical and on women in mathematics), and a tribute to Maryam Mirzakhani. The 293 Female OpenArms grantees have been offered free registration for (WM)² provided they register before 31 March. As of 31 March, 309 people had registered, among them 155 from the OpenArms programme.

During the ICM itself, CWM is organizing a panel discussion "*The gender gap in mathematical and natural sciences from a historical perspective*", followed by a reception, on 2 August 2018. A brief description of IMU-CWM by MFR will be followed by presentations by June Barrow Green (Open University, UK): *Historical context of the gender gap in mathematics* and Silvina Ponce-Dawson (University Buenos Aires, Argentina): *The International Union of Pure and Applied Physics Working Group on Women in Physics: activities and perspectives*. The panel will be chaired by CS. Formally, this panel is totally independent of (WM)², but of course activities will be coordinated.

CWM website and Publicity

Prior to the establishment of CWM, a group of female mathematicians led by Ingrid Daubechies gathered and organised information for a new Women in Maths section of the IMU website. The website was launched at the ICM in Seoul 2014. When the CWM started the website was updated accordingly; publicity for the new committee was done at the same time. Since then CS has kept the site continuously updated based on information supplied by the CWM committee and others. Items (events, new women in maths organisations, newsworthy items, resources etc) are added every week. The site lists an impressive number of events in 2015-18 in all parts of the world. In addition, 36 countries are listed with some form of organisation, activities or contacts. The site has a unique and important function as the only platform for coordinating so much diverse worldwide activity. The entire IMU website has recently been redesigned with CS's participation both in the overall design and the CWM pages in particular. The new website is easier to work with and PBT is taking over from CS. She is working in coordination with MFR and CS. See <http://www.mathunion.org/cwm/>

Gender Gap in Science <https://icsugendergapinscience.org/>

CWM decided to join forces with the International Union of Pure and Applied Physics (IUPAP) and the International Union of Pure and Applied Chemistry (IUPAC) to submit a project to ICSU entitled "*A Global Approach to the Gender Gap in Mathematical, Computing and Natural Sciences: How to Measure It, How to Reduce It?*". In the process, IMU became the lead applicant, with IUPAC as co-lead applicant, and coordinators MFR and Mei-Hung Chiu. The project was approved by ICSU on 7 February 2017 (with a budget from ICSU of €100 000 per year in 2017, 2018 and 2019). There are 9 other partners in the project: International Union of Pure and Applied Physics (IUPAP), International Astronomical Union (IAU), International Council for Industrial and Applied Mathematics (ICIAM), International Union of Biological Sciences (IUBS), International Union of History and Philosophy of Science and Technology (IUHPST), United Nations Educational, Scientific and Cultural Organization (UNESCO), Gender in Science, Innovation, Technology and Engineering (GenderInSITE), Organization of Women in Science for the Developing World (OWSD), Association for Computing Machinery (ACM).

Barriers to achievement by women in mathematical, computing and natural sciences persist, especially in developing countries. The aim of the project is to produce sound data to support the choices of interventions that ICSU and member unions can feasibly undertake. It will provide evidence for informed decisions, including trends – since the situation for women continues to change around the world, with some negative developments – and will provide easy access to materials proven to be useful in encouraging girls and young women to study and work in these fields. It will do this through a Joint Global Survey (Task 1) planned to reach 45,000 respondents in more than 130 countries using at least 8 languages, together with a Joint Study on Publication Patterns (Task 2) which will analyze relative to gender and location comprehensive metadata sources corresponding to publications of more than 500,000 scientists since 1970. Finally, it is impossible to ignore that there are many initiatives around the world that aim to enhance the participation of girls and women in science and mathematics. Which ones work? What is the evidence for effectiveness? Can effective practices developed in one place be used in other contexts? How do we know? These are some of the questions that will structure an online database of good

practices (Task 3). The contrasts and common ground across regions and cultures, less developed and highly developed countries, men and women, mathematical, computing and natural sciences, will be highlighted.

A launch meeting in Paris and three regional workshops have been organized during the first year 2017: in Asia (with participants from Australia, China, France, India, Israel, Japan, Korea, Nepal, Malaysia, Taiwan, Thailand, USA), Latin-America (with participants from Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, El Salvador, Mexico, Peru, USA) and Africa (with participants from Algeria, Burkina Faso, Botswana, Cameroon, Ethiopia, France, Kenya, Lesotho, Morocco, Madagascar, Malawi, Nigeria, South Africa, Swaziland, Uganda, USA and Zimbabwe). In all these workshops, the proportion of male participants was very low (less than 5%).

The second year 2018 is devoted to data collection and analyses from the 3 project tasks. A coordination meeting will take place in Paris on 11-12 June 2018.

The final conference of the project will take place at the end of 2019. A proposal has been made to ICTP Trieste to host a jointly sponsored conference. It will include a public lecture directed at the whole scientific community present at ICTP about the findings of our project

Film project "Journeys of Women in Mathematics"

With the help of a recommendation from Ingrid Daubechies, CWM proposed making a short film "*Journeys of Women in Mathematics*" to the Simons Foundation. Micro-Documentaries has been selected to create the film. Micro-Documentaries is the company which created the short films on the Fields Medal winners in Seoul and they will make similar films this year for the Fields Medal winners in Rio. The focus will be the quality and diversity of women mathematicians worldwide. Rather than showcasing "famous women mathematicians", the first version (to be shown at (WM)²) will present women active in organizing regional networks. We suggested three names, Carolina Araujo (Rio), a CWM member, (WM)² main organizer and also an ICM lecturer; Neela Nataraj (Mumbai), CWM associate and active member of Indian Women in Mathematics and Amina Pecha (Yaounde, Cameroon), the founding chair of the Cameroon Women in Mathematics Association. Micro-Documentaries will meet them in their home countries. The second augmented version will highlight some of the best women mathematicians internationally, with female speakers at (WM)² and ICM 2018 providing possible subjects.

CWM ambassadors

Based on SN's list of contacts from ICWM Seoul and various other sources, CWM has compiled and contacted a list of about 120 so-called *CWM Ambassadors*, each of whom has the job of disseminating information such as CWM funding calls in her geographical or mathematical neighbourhood, and equally of keeping CWM informed about relevant activities or initiatives. The list is posted on the CWM website.

CWM flyer, poster and roll-up

CWM created a flyer and poster, which was distributed through CWM Ambassadors and organizers of CWM funded events. A CWM roll-up for use in displays has been designed in the same style. Three posters (one for Africa, one for Asia, one for Latin-America) reporting on CWM funded activities since ICM Seoul have been designed for display at (WM)² and ICM. The planning and implementation has all been done by BT and a professional designer.

CWM operation mode and Liaison with IMU EC and Office

Most of the CWM work has been done through email, with skype meetings and phone calls also used. CWM met once in Cortona in 2015 and twice in Berlin in 2016 and 2017. MFR and CS met twice in London. The liaison with EC through JT -and Alicia Dickenstein in the Cortona meeting period- has been active and regular.

We would like to thank Sylwia Markwardt and all the other members of the IMU office staff who have consistently been very helpful.

Report by Marie-Françoise Roy and Caroline Series, Chair and Vice Chair of CWM



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