

# Women in Mathematics Around the World: Strategies for Gender Equality

Marie-Françoise Roy

Emerita Professor, IRMAR, Université de Rennes

Former Chair of the International Mathematical Union

Committee for Women in Mathematics (2015-2022)

Marie-francoise.roy@univ-rennes.fr

**Wednesday 14 January 2026,**

**Retreat for women in applied mathematics 2026**

# Strategies

Organize associations for Women in Mathematics : **networking**

Celebrate Women in Mathematics : **visibility**

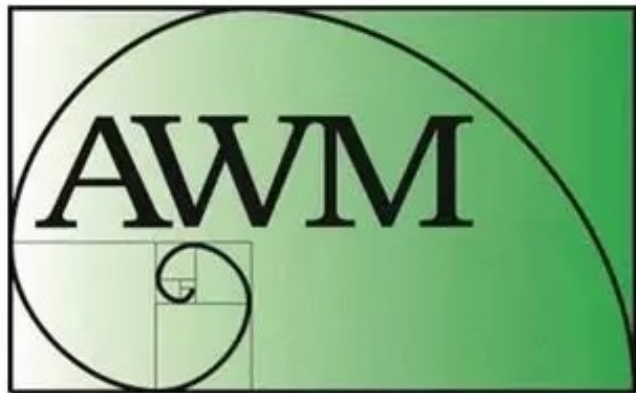
Promote **interdisciplinary collaboration**

Encourage a **variety of initiatives**

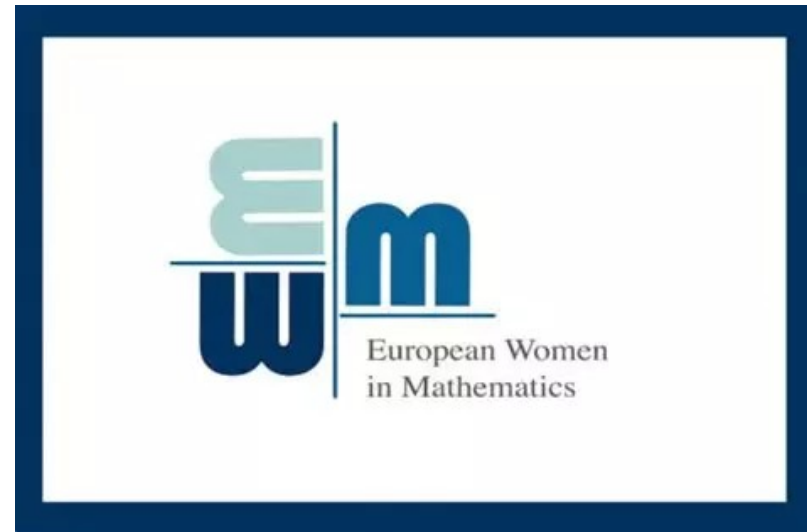
# **Creating organizations for Women in Mathematics**

# AWM, EWM

- ❖ Association for Women in Mathematics, more than 50 years ago



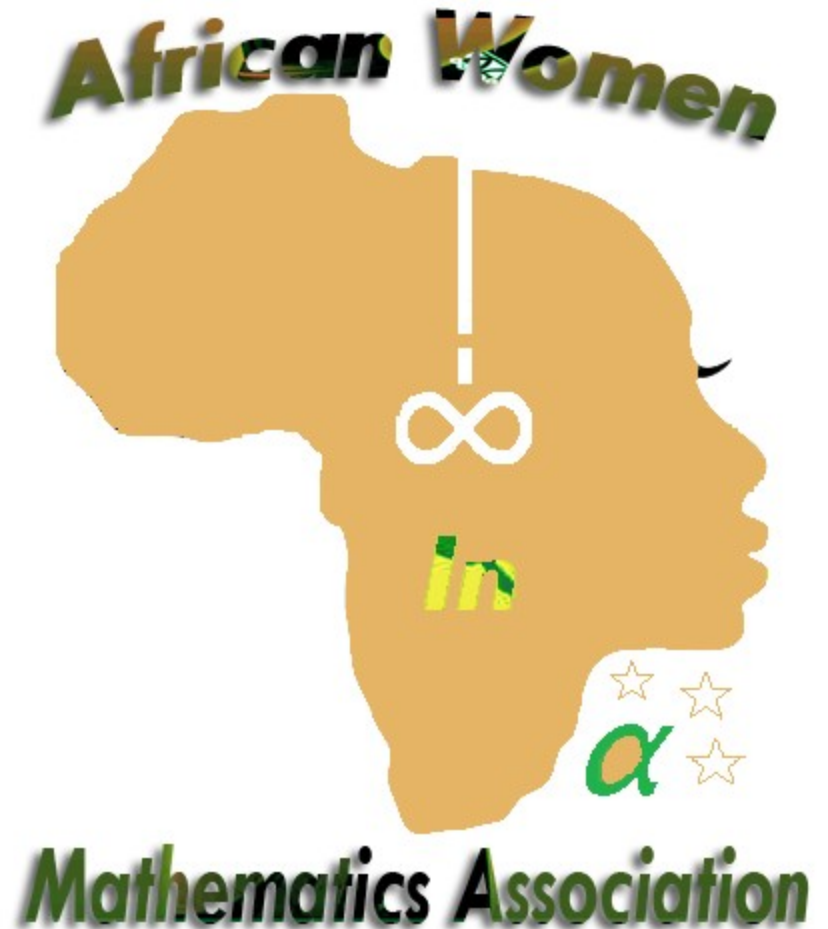
ASSOCIATION FOR  
WOMEN IN MATHEMATICS



- ❖ European Women in Mathematics, created in 1986, after a panel organized at ICM Berkeley by AWM, coordinators per country

# AWMA

- ❖ African Women in Mathematics Association,
- ❖ created in 2013
- ❖ structure similar to EWM
- ❖ A vice president in each of the five zones defined by the African Union



# International Congress of Women in Mathematicians

- ❖ In ICM Hyderabad 2010, related to the launch of Indian Women and Mathematics
- ❖ In ICM Seoul Séoul 2014, related to the creation of the Committee for Women in Mathematics of the International Mathematical Union

# Maryam Mirzakhani

Received the Fields Medal in Seoul in 2014

Ingrid Daubechies was at that time the first woman president of the International Mathematical Union



# Committee for Women in Mathematics

- ❖ Committee of the International Mathematical Union
- ❖ Created in March 2015, after ICM Seoul
- ❖ The only global organization for Women in Mathematics!
- ❖ Website **[www.mathunion.org/cwm](http://www.mathunion.org/cwm)**

# CWM ambassadors

- ❖ One or more per country, more than 150
- ❖ Disseminate CWM call, CWM Newsletter etc in their national network
- ❖ Give information about their initiatives to CWM
- ❖ Appear on **[www.mathunion.org/cwm](http://www.mathunion.org/cwm)**

# AOWM

- ❖ Asian and Oceanian Women in Mathematics,
- ❖ created in 2023
- ❖ structure similar to EWM



# Continental Organizations



**AWM**  
**1971**



**CGD**  
**UMALCA**  
**2020**



**EWM**

**1986**



**AWMA**  
**2013**



**AOWM**  
**2022**

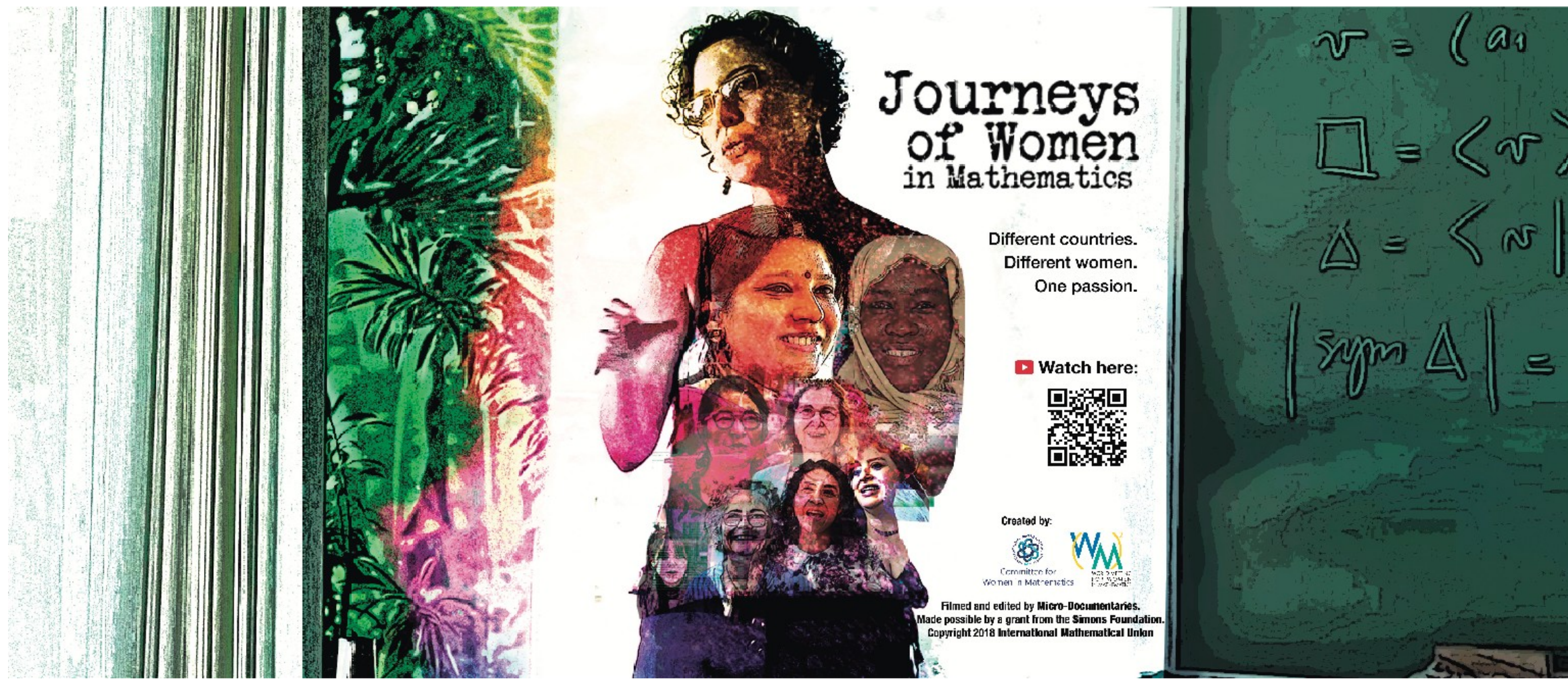


# **Celebrating Women in Mathematics**

# (WM)<sup>2</sup> 2018 in Rio de Janeiro




# (WM)<sup>2</sup> 2018 in Rio de Janeiro



**Journeys of Women in Mathematics**

Different countries.  
Different women.  
One passion.

Watch here:



Created by:  
Committee for Women in Mathematics  
International Mathematical Union

Filmed and edited by Micro-Documentaries.  
Made possible by a grant from the Simons Foundation.  
Copyright 2018 International Mathematical Union

$v = (a_1$   
 $\square = \langle v$   
 $\Delta = \langle v |$   
 $|\text{Sym } \Delta| =$

Association for Women in Mathematics Series

Carolina Araujo  
Georgia Benkart  
Cheryl E. Praeger  
Betül Tanbay *Editors*

# World Women in Mathematics 2018

Proceedings of the First World Meeting  
for Women in Mathematics (WM)<sup>2</sup>



 Springer



# Maryam Mirzakhani

Received the Fields Medal in Seoul  
In 2014

Died in July 2017 from breast cancer



# (WM)<sup>2</sup> 2018 in Rio de Janeiro



Remember Maryam Mirzakhani Exhibition



# (WM)<sup>2</sup> 2018 in Rio de Janeiro



# May 12 Initiative

<https://may12.womeninmaths.org/>

May 12<sup>th</sup>, the birth date of Maryam Mirzakhani, a special day for

## Celebrating women in mathematics

Voted by (WM)<sup>2</sup> 2018 attendees, proposed by the Women's Committee of the Iranian Mathematical Society.





**#May12**

Celebrating women in mathematics

<https://may12.womeninmaths.org/>

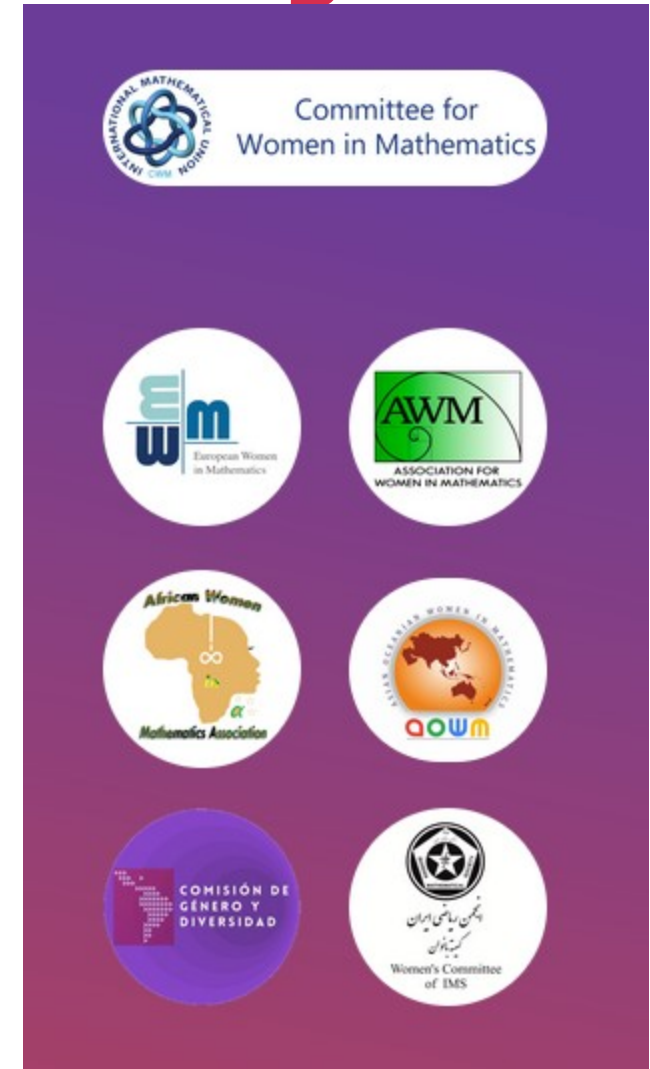
# May 12 Initiative

<https://may12.womeninmaths.org/>

Very successful since 2019

Coordination group with representatives from the European Women in Mathematics, the Association for Women in Mathematics, the African Women in Mathematics Association, Asian and Oceanian Women in Mathematics CGD-UMALCA (Comisión de Género y Diversidad de Unión Matemática de América Latina y el Caribe) and the Women's Committee of the Iranian Mathematical Society.

Since 2024, officially sponsored by IMU.



# May 12 Initiative

<https://may12.womeninmaths.org/>

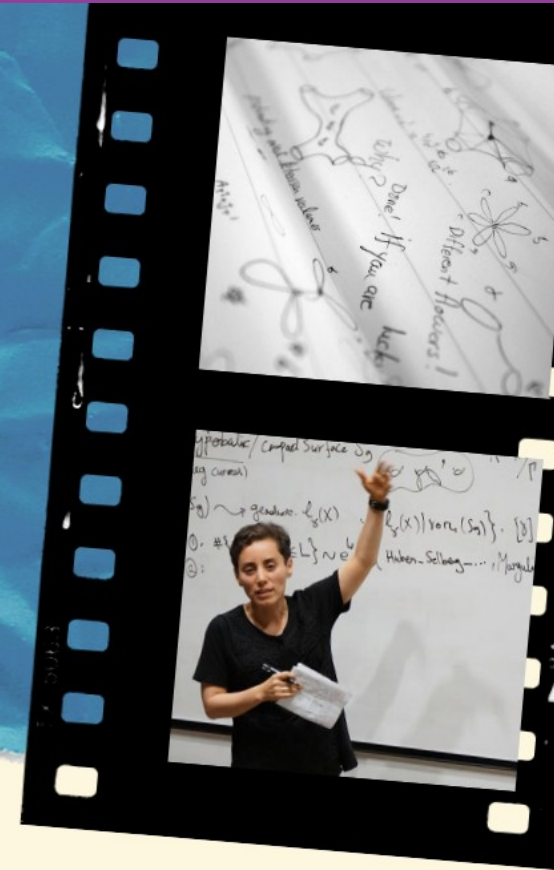
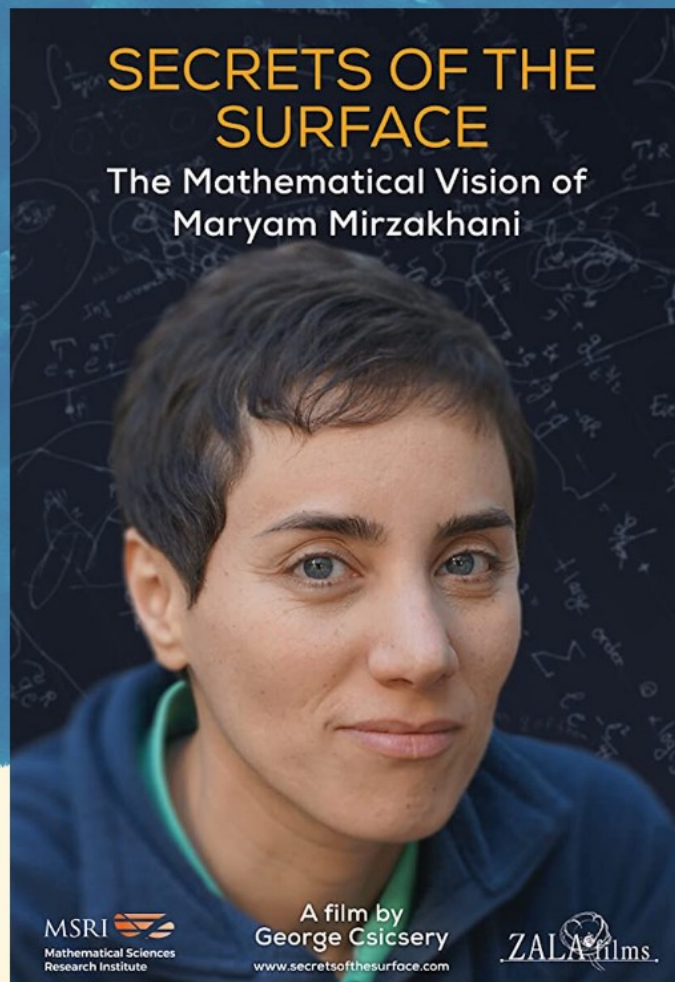
Very successful since 2019

More than 1 000 events in more than 100 countries

Every year agreement for a free screening of films  
collective and individual campaign

Lots of different initiatives

In 2020  
Covid crisis  
Virtual events  
Agreement  
with Zalafilms  
for free  
screening  
Huge success  
Multilingual with  
translations from  
our network



GRADQUANT  
MOVIE NIGHT

SECRETS OF THE SURFACE:  
THE MATHEMATICAL VISION OF  
MARYAM MIRZAKHANI

Free documentary showing provided  
by May12 Women in Mathematics  
Initiative of International  
Mathematical Union and Zala Films.

TUE, MAY 12, 2020 | 6PM | ZOOM

# An example May 12 Initiative 2022

# Poster in many languages

# Women in Mathematics

**Hypatia (350–415/416)**  
BEST KNOWN FOR: being recognized as the first female mathematician in the development of mathematics.

**Émilie du Châtelet (1706–1749)**  
BEST KNOWN FOR: her translation of Newton's Principia into French, her own work on mechanics, and her collaboration with Leibniz on calculus.

**Maria Agnesi (1701–1792)**  
BEST KNOWN FOR: being the first woman to write a mathematics textbook. She was also the first woman appointed as a mathematics professor at a university.

**Marie-Sophie Germain (1776–1831)**  
BEST KNOWN FOR: her correspondence with Laplace, Lagrange, and Gauss under a male pseudonym. Her work on number theory is known as Fermat's Last Theorem.

**Mary Somerville (1780–1872)**  
BEST KNOWN FOR: being a polymath who studied mathematics and astronomy. She was one of the few women who were elected as a full member of the Royal Astronomical Society. The Somerville College of the University of Oxford is named after her.

**Ada Lovelace (1815–1842)**  
BEST KNOWN FOR: being the first woman to write computer code. She is known for her work on Charles Babbage's Analytical Engine and her algorithm for the engine.

**Florence Nightingale (1820–1910)**  
BEST KNOWN FOR: her work on statistics, particularly being the first to use bar charts to represent data.

**Sofya Vasilyevna Kovalevskaya (1850–1891)**  
BEST KNOWN FOR: her work on partial differential equations. She was the first woman to become a full professor of mathematics in the history of mathematics.

**Alicia Boole Stott (1860–1940)**  
BEST KNOWN FOR: coining the term "polyhedron", a four-dimensional convex solid and discovering its regular ones.

**Emmy Noether (1882–1935)**  
BEST KNOWN FOR: being the first woman to obtain the top position in the mathematics department of a university in Germany.

**Philippa Foot (1917–2005)**  
BEST KNOWN FOR: her work in abstract algebra and theoretical physics. The theorems that she proved about general relativity and elementary particle physics are known as "Noether's Theorem".

**Mary Lucy Cartwright (1900–1998)**  
BEST KNOWN FOR: being one of the first women to work in mathematics. She is known for her work on the theory of functions.

**Gertrude Mary Cox (1900–1978)**  
BEST KNOWN FOR: her work on experimental design statistics. She became the first woman elected to the International Statistical Institute.

**Marie-Louise Dubreil-Jacotin (1905–1977)**  
BEST KNOWN FOR: being the second woman to win a doctorate in pure mathematics and the first woman to become a full professor of mathematics in France. In addition to her expertise in fluid mechanics and abstract algebra, she authored a work in the history of mathematics.

**Ruth Moufang (1906–1988)**  
BEST KNOWN FOR: ground-breaking work on non-associative algebraic structures, including the Moufang loops named after her and a new branch of geometry called "Moufang planes".

**Dorothy Vaughan (1915–2008)**  
BEST KNOWN FOR: being the first woman to work as a mathematician at NASA. She was a pioneer in the field of computer programming.

**Melba Roy Mouton (1919–1996)**  
BEST KNOWN FOR: being the only female program manager of the Manhattan Project. She was the first woman to work at the Government Code and Cryptography School. She became the deputy head of the section afterwards.

**Christine Darden (b. 1944)**  
BEST KNOWN FOR: being the first woman to work as a mathematician at NASA. She was a pioneer in the field of computer programming.

**Joan Elisabeth Lowther Murray (1921–1994)**  
BEST KNOWN FOR: being the first woman to win the Fields Medal in 1978. She was the first woman to be elected as a full member of the French Academy of Sciences and the Grand Officer of the Legion d'honneur.

**Olga Aleksandrovna Ladyzhenskaya (1922–2004)**  
BEST KNOWN FOR: her work on partial differential equations, fluid dynamics, and the convergence of a finite difference method for the Navier-Stokes equations. She was in the shortlist for the Fields Medal in 1968.

**Yvonne Choquet-Bruhat (b. 1923)**  
BEST KNOWN FOR: her contributions to the study of Einstein's general theory of relativity. She was the first woman to be elected as a full member of the French Academy of Sciences and the Grand Officer of the Legion d'honneur.

**Olga Arsenievna Oleinik (1925–2000)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the Russian Academy of Sciences and the Grand Officer of the Legion d'honneur.

**Anneli Lax (1927–1995)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the American Academy of Arts and Sciences and the Grand Officer of the Legion d'honneur.

**Phyllis Nicolaï-Löcherer (1927–1986)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the German Academy of Sciences and the Grand Officer of the Legion d'honneur.

**Julia Robinson (b. 1919)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the American Academy of Arts and Sciences and the Grand Officer of the Legion d'honneur.

**Maria Wonenburger (1927–2000)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the American Academy of Arts and Sciences and the Grand Officer of the Legion d'honneur.

**Shakuntala Devi (1929–2013)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the Indian Academy of Sciences and the Grand Officer of the Legion d'honneur.

**Marina Evseevna Ratner (1938–2009)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the American Academy of Arts and Sciences and the Grand Officer of the Legion d'honneur.

**Nancy Jane Kopell (b. 1941)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the American Academy of Arts and Sciences and the Grand Officer of the Legion d'honneur.

**Idun Reiten (b. 1941)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the Norwegian Academy of Sciences and the Grand Officer of the Legion d'honneur.

**Karen Uhlenbeck (b. 1941)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the American Academy of Arts and Sciences and the Grand Officer of the Legion d'honneur.

**Ingrid Isaković (b. 1941)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the American Academy of Arts and Sciences and the Grand Officer of the Legion d'honneur.

**Claire Voisin (b. 1941)**  
BEST KNOWN FOR: her work on the theory of partial differential equations. She was the first woman to be elected as a full member of the American Academy of Arts and Sciences and the Grand Officer of the Legion d'honneur.

**Maryam Mirzakhani (1977–2017)**  
BEST KNOWN FOR: being the first woman and the first Iranian to win the Fields Medal. Her research topics included Teichmüller theory, hyperbolic geometry, ergodic theory, and symplectic geometry.

# May 12 Initiative 2025 Agreement with Zalafilms

Multilingual with translations  
from our network

Also Creating Pathways  
And again Secrets of the  
surface

## JOURNEYS OF BLACK MATHEMATICIANS *Forging Resilience*



A film by George Csicsery

# **Promoting interdisciplinary collaborations**

# Proportion of women in math publications

What is the current proportion of women authors of mathematical research ?  
How did it change in the last decades?

# Methodology

The gender gap in science project, an International Science Council (ISC) funded interdisciplinary project

- global survey of scientists
- publication patterns
- data base of good practices

# THE GENDER GAP IN SCIENCE

**A Global Approach to the Gender Gap in  
Mathematical, Computing, and Natural  
Sciences: How to Measure It, How to Reduce It?**



**A multidisciplinary and  
multicultural project funded by the  
International Science Council**



@GenderGapSTEM



fb.me/GenderGapSTEM



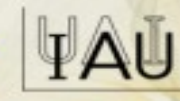
**International  
Science Council**



**International  
Mathematical  
Union  
(IMU)**



INTERNATIONAL UNION OF  
PURE AND APPLIED CHEMISTRY



**Gender  
InSITE**



**IUHPST**  
International Union of History and  
Philosophy of Science and Technology

## Project 2017-2019

funded by ISC, lead by IMU and IUPAC

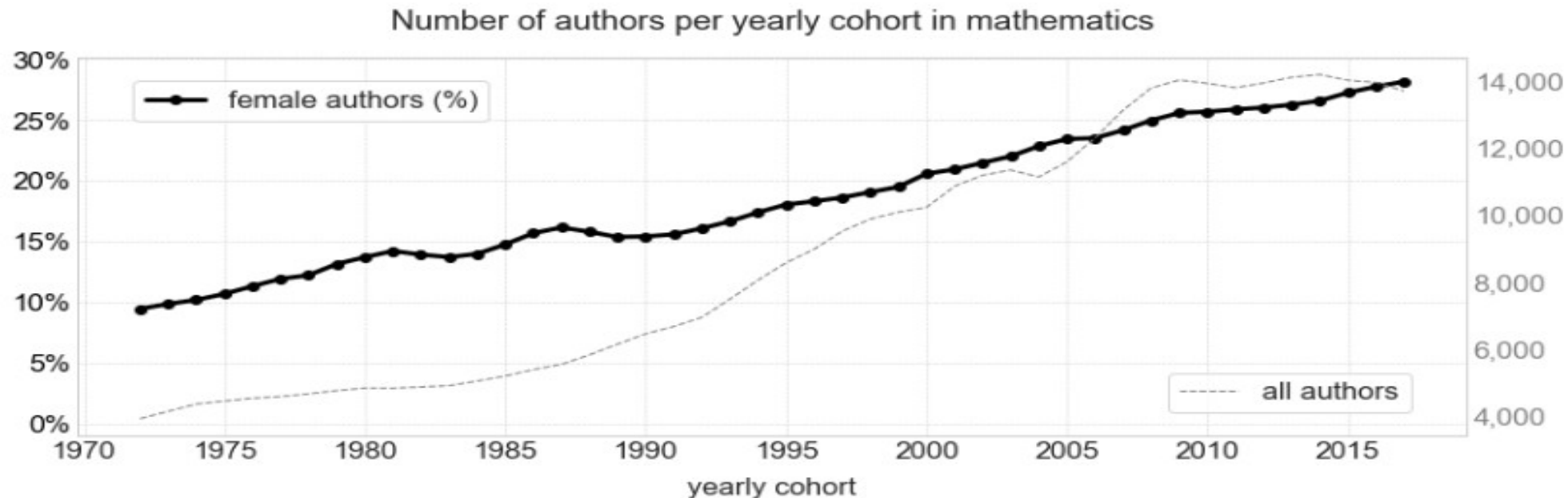
<https://gender-gap-in-science.org/>

# Proportion of women in math publications

What is the current proportion of women authors of mathematical research ?  
How did it change in the last decades?

# Analysis of Academic Publications (millions of publications, since 1970)

- Steady increase of the proportion of women authors of scientific papers (10% to 27%)



**Figure 13:** Number of active (publishing) mathematicians since 1970 and percentage of them that are women.

# How was it done ?

Use the zbMath open source database.

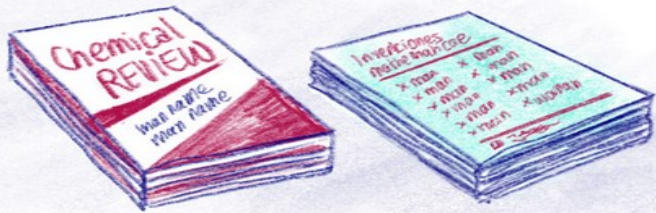
Hope to be able to say something for geographical zones (in progress).

# Proportion of women in top math journals

What the proportion of women authors in top mathematical journals ?  
How did it change in the last decades?

# Publications in “Top Journals”

1970



< 10 % of top journals  
papers are authored by women

2020



20% in astronomy, astrophysics  
and chemistry and still < 10%  
in mathematics and theoretical  
physics

# Fundamental math/applied math

The situation of women is better in applied math than in fundamental math.

General fact also true in physics, astronomy :  
less women in more theoretical science.

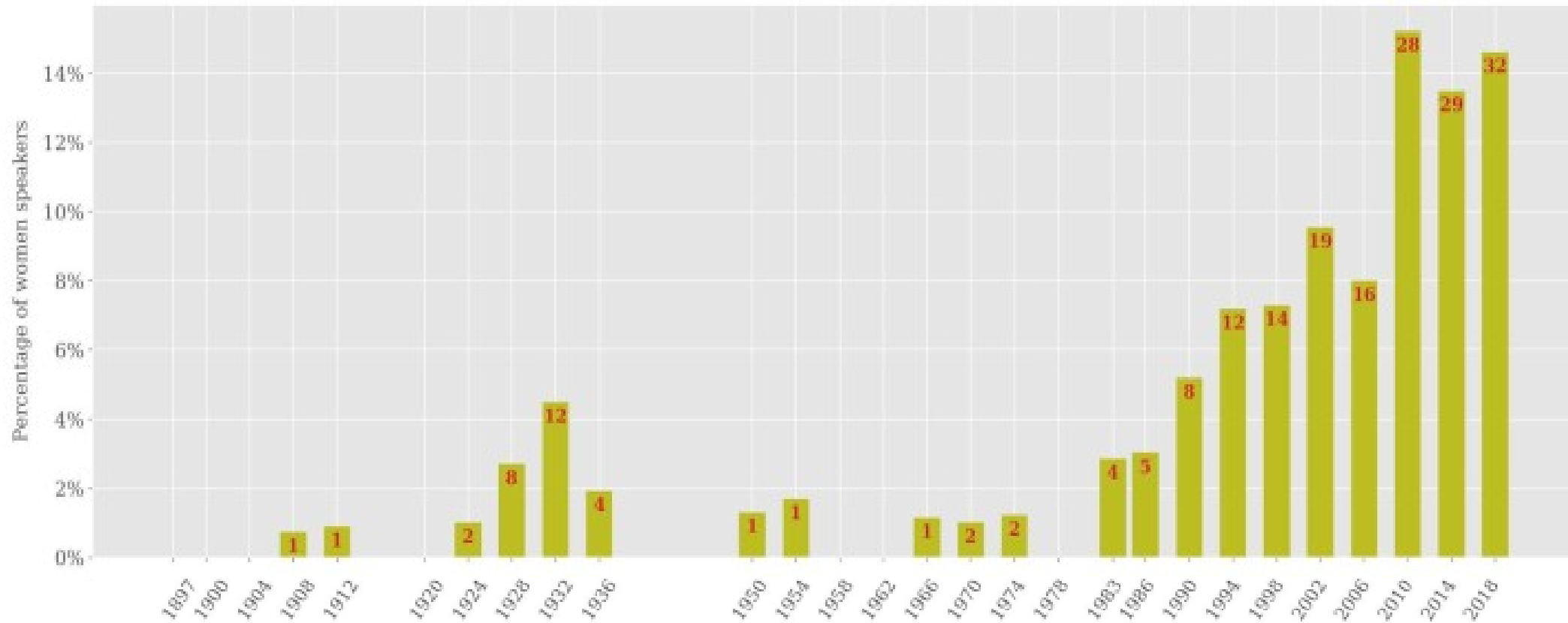
Also true in philosophy ...

# International Congress of Mathematicians

How many women have been lecturers at ICM  
in the past ?

What is their current proportion at vICM 2022?

# Women lecturers at ICM



## Percentage of women speakers per ICM Total numbers of invited women

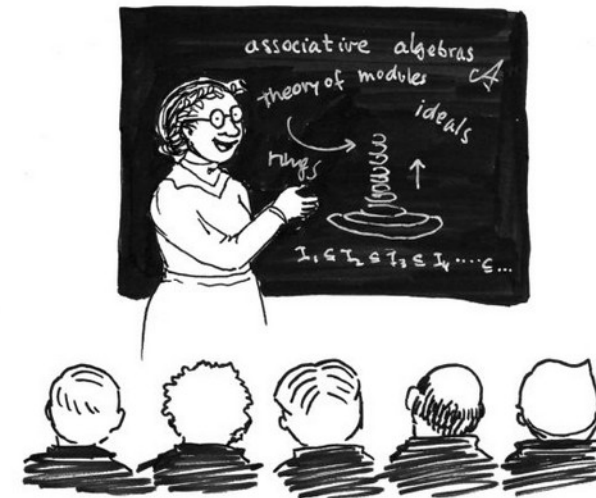
H. Mihaljevic, M.-F. Roy. A data analysis of women's trails among ICM speakers<sup>37</sup>  
(preliminary version arXiv:1903.02543v2). C. Araujo et als (eds.). World Meeting for Women in Mathematics 2018.  
Association for Women in Matematics Series, Volume 20, Springer, 111-128 (2019).

# First plenary lecture Emmy Noether 1932, Zurich

#Noethember  
Constanza Rojas Molina

#Noethember Day 14

"Alfred Ackermann-  
Teubner Memorial  
Award for the promotion  
of the mathematical sciences"



1932 International Congress  
of mathematicians  
Zürich

# Olga Alexandrovna Ladyzhenskaya

Invited lecture ICM Moscow

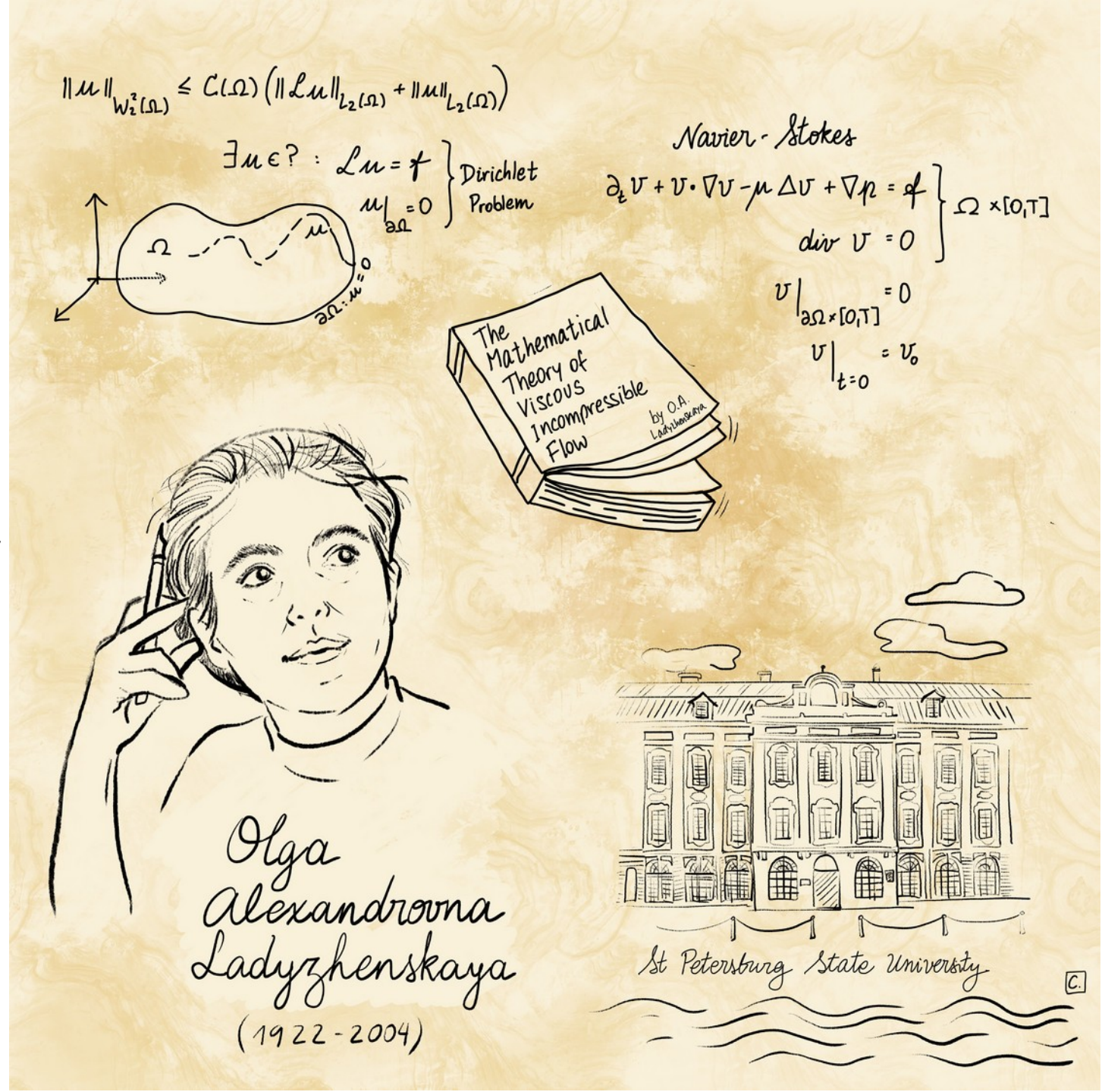
1966

ICM Emmy Noether lecture

1994

Constanza Rojas Molina

For v(WM)<sup>2</sup> 2022



# Second plenary lecture

Karen Uhlenbeck  
Kyoto 1990



# International Congress of Mathematicians

ICMs : Hyderabad 2010, Seoul 2014, Rio 2018,  
stable proportion around 15 %

Proportion at vICM 2022 : slightly above 20 %

Proportion at ICM 2026 : slightly under 20 %

# Maryna Viazovska

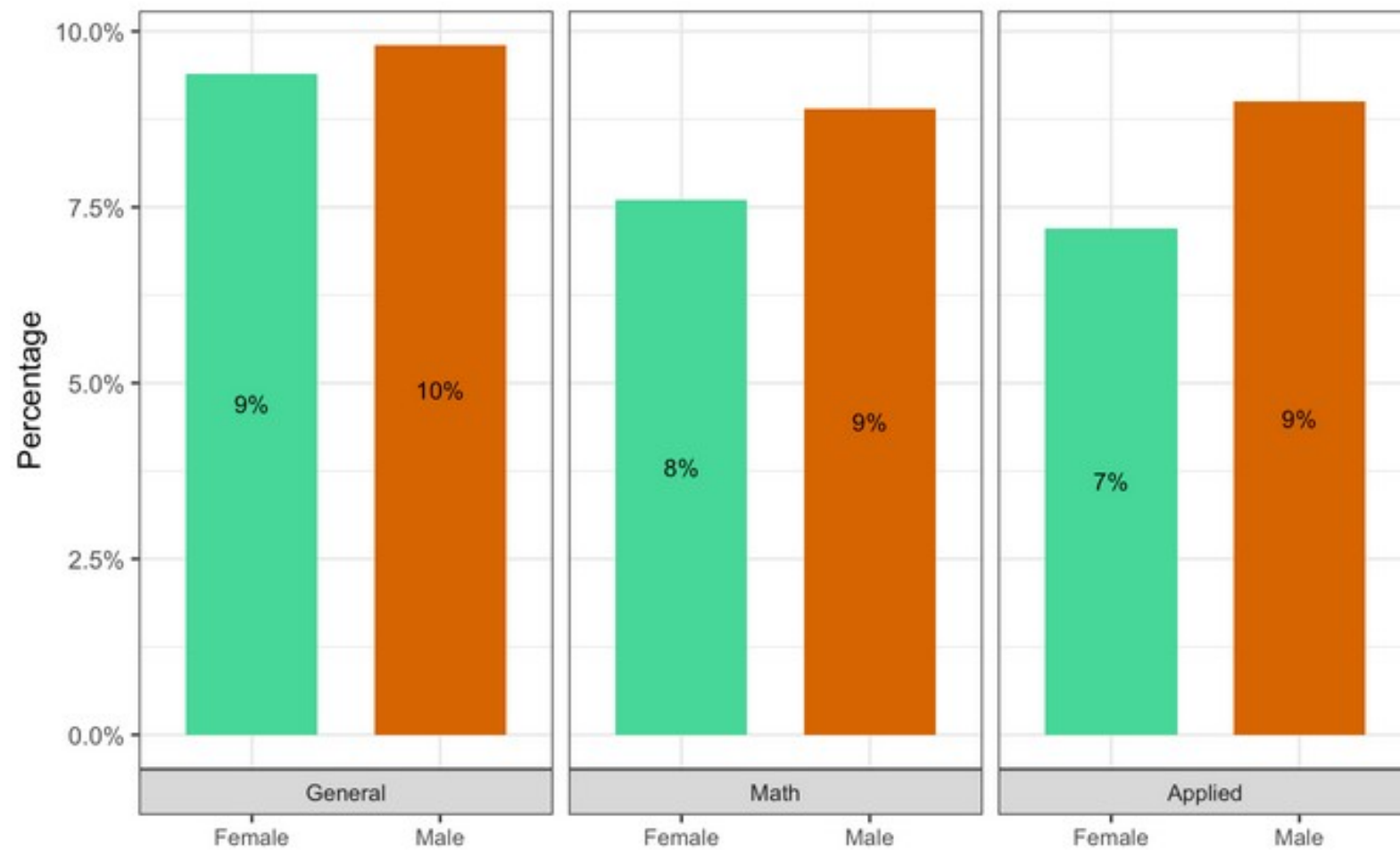
Received  
the Fields Medal  
in vICM Helsinki  
in 2022



# A women friendly community?

Is the mathematical community more or less women friendly than the other scientific communities ?

# Who most encouraged you? Neighborhood, community or friends

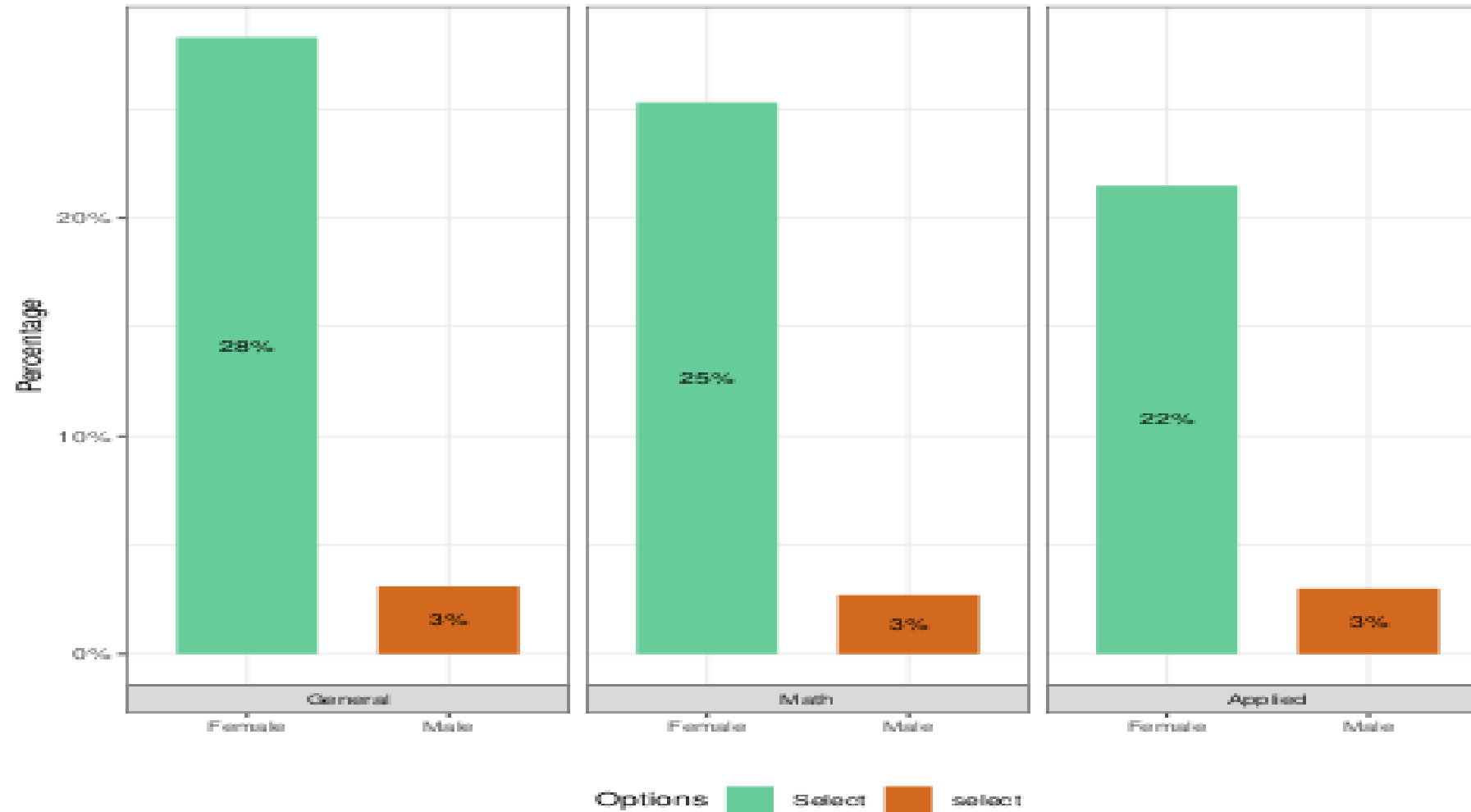


# Sexual harassment and discrimination

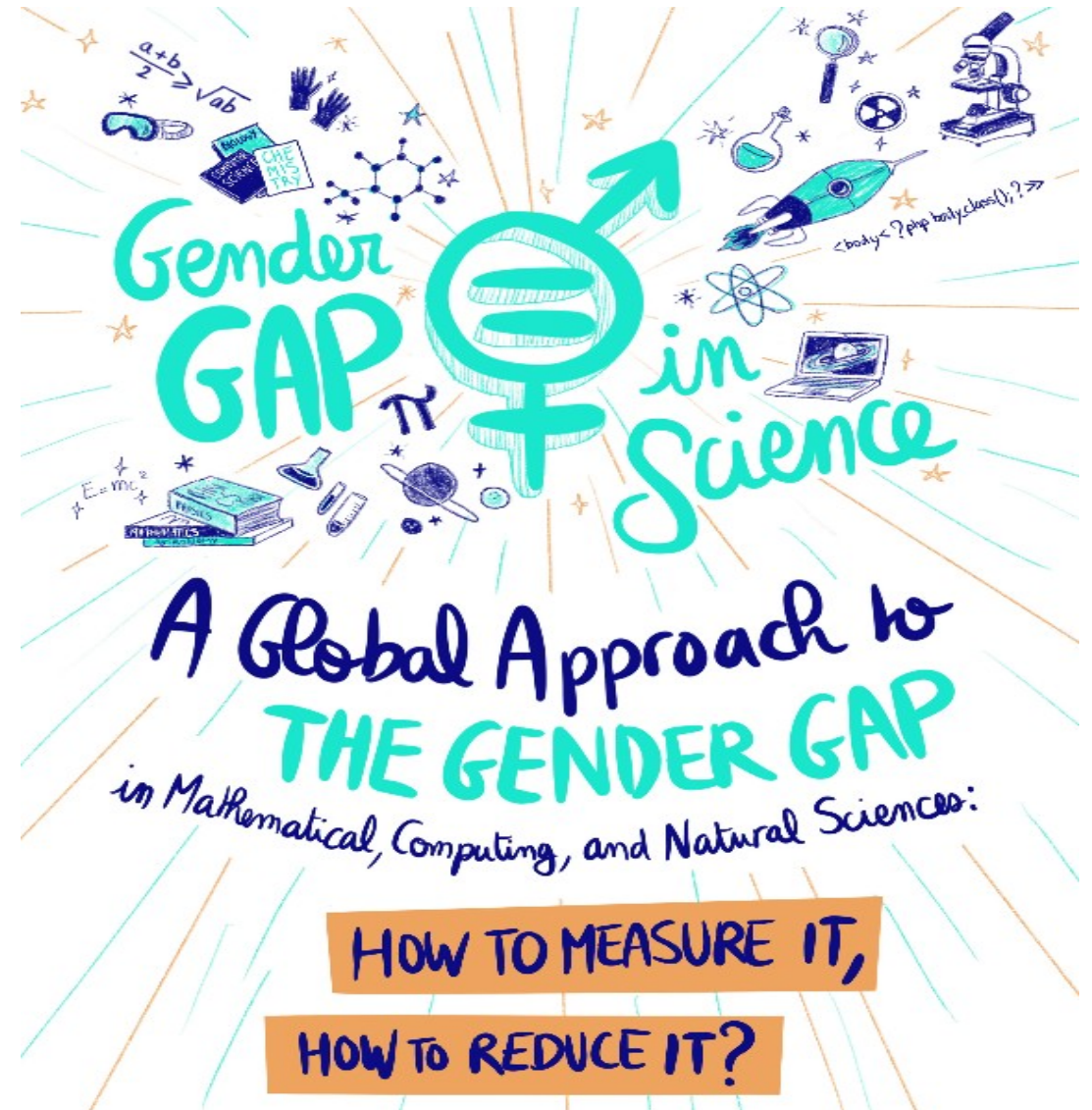
Is sexual harassment and discrimination towards women similar in mathematics and in other sciences?

# Sexual harassment: Yes, it happened to me

Fig. 1: Distribution of gender for General, Math and Applied-math samples



# Gender Gap in Science Book February 2020 11 K downloads



<https://zenodo.org/record/3882609>

# Gender Gap in Science Booklet

Summary of the project in  
8 pages:

Currently in English, French,  
German and Spanish, as well  
as Chinese

(both simplified Chinese and traditional  
Chinese characters)

*A Global Approach to the Gender Gap  
in Mathematical, Computing, and Natural Sciences:  
How to Measure It, How to Reduce It?*



The **gender gap** is the difference between women and men "in terms of their levels of participation, access, rights, remuneration or benefits". According to the UNESCO Institute of Statistics, **fewer than 30% of the world's researchers are women**, which reflects the existence of a clear gender gap in science. To truly **understand and reduce** it, it is necessary to identify the various factors that deter women from pursuing careers in scientific disciplines.

The project "A Global Approach to the Gender Gap in Mathematical, Computing, and Natural Sciences: How to measure it? How to reduce it?" contributes to this analysis from three complementary perspectives:

- The **Global Survey of Scientists** addresses issues related to missing role models, feelings of critical exclusion, harassment, or low participation and retention rates.
- The **Study of Publication Patterns** provides insights on the proportion of women as research authors or the presence of women publishing in renowned journals.
- The **Database of Good Practices** introduces a conceptual framework to analyze them, in order to provide evidence of effectiveness and impact.



Website of the project: <https://gender-gap-in-science.org/>

<https://gender-gap-in-science.org/promotional-materials/>

# Keeping up the network

<https://gender-equality-in-science.org/>



Standing Committee  
for **Gender Equality** in Science

# Twenty-five scientific unions

Association for Computing Machinery (ACM) \*

International Astronomical Union (IAU)\*

**International Council for Industrial and Applied Mathematics (ICIAM)\***

International Federation of Societies for Microscopy (IFSM)

International Geographical Union (IGU)

**International Mathematical Union (IMU)\***

International Union for Quaternary Research (INQUA)

International Political Science Association (IPSA)

International Union of Biochemistry and Molecular Biology (IUBMB)

International Union of Biological Sciences (IUBS) \*

International Union of Crystallography (IUCr)

International Union of Geodesy and Geophysics (IUGG)

International Union of Geological Sciences (IUGS)

# Twenty-five scientific unions

International Union of History and Philosophy of Science and Technology (IUHPST)\*

International Union of Immunological Sciences (IUIS)

International Union of Materials Research Societies (IUM)

International Union of Pure and Applied Chemistry (IUPAC)\*

International Union of Pure and Applied Physics (IUPAP)\*

International Union of Physical and Engineering Sciences in Medicine (IUPESM)

International Union of Psychological Science (IUPsyS)

International Union of Soil Sciences (IUSS)

Scientific Committee on Antarctic Research (SCAR)

Scientific Committee on Oceanic Research (SCOR)

Union Internationale de Spéléologie/International Union of Speleology (UIS)

World Anthropological Union (WAU)

# Main activities

<https://gender-equality-in-science.org/>

**Webinars** organized by SCGES or by one or two unions

## **Annual report**

Very few unions know the proportion of women in their scientific community

*Astronomy* 21% in western countries (EU and USA); below 20% in Africa, Asia, Middle East, Oceania, and Southern America.

*Immunological Sciences* around 60 %

*Math* about 30 %

*Physics* about 20 %

# Main activities

<https://gender-equality-in-science.org/>

**Women scientists around the world: strategies for gender equality** (interviews of women scientists)

**SCGES Recommendations for Scientific Unions**

**Advancing gender equality in scientific organizations**  
(joint project of the InterAcademy Partnership (IAP),  
International Science Council (ISC) and SCGES)

# Encouraging initiatives

# Innovative Initiatives for Women in Mathematics

Third Joint SIAM/CAIMS Annual Meetings (AN25)

- Inclusive gender balanced activities : International Day of Mathematics (Pi Day) *Christiane Rousseau* (Canada)
- Gender equality committee of a math society : preventing gender-based violence, making the work of women mathematicians visible *Carmen Martínez Adame* (Mexico)
- Retreat for women in Applied Math: mentoring and support of the new generation *Apala Majumdar* (UK)
- Women in geometry : an example of women only research meeting *Alina Stancu* (USA)

Women in ....dozens of them, such as

WIC: Women in Control

WIG: Women in Geometry

WIMB: Women in Math Biology

WIN: Women In Numbers

WINASc: Women in Numerical Analysis and  
Scientific Computing, etc, etc

# Women in SAGE in Africa

- Original concept slightly adapted
- Collaborative workshop organized by AWWMA
- All group leaders are women
- Younger participants are mostly women but also men
- Already held in Sénégal, Nigeria, Ouganda et Burundi. Tunisia in 2025

# Innovative Initiatives for Women in Mathematics: ideas from the discussion

- On going difficulties : budget cuts for women studies, new administration in the US ...

- Progress is not linear

**BUT**

- Remember where we come from

- We are here to stay

- We can do a lot, even with little budget

# SIAG-EDI

SIAM Activity Group on Equity, Diversity, and Inclusion (SIAG-EDI) established in 2022 to promote fairness, diversity, and inclusion within applied mathematics by advocating for underrepresented groups and sharing best practices for fostering inclusive environments.

# SIAG-EDI first ever track in 2025

Fascinating variety of initiatives

- mathematical approach to advancing women health
  - Sonia Kovalevsky Lecture (joint AWM-SIAM)
  - AWM workshop : Science of data and mathematics
- (and much more, this is only the first day program ...)

# Women in Mathematics all over the world

Equity : YES

Diversity : YES

Inclusion : YES

However **"Women are the half of the sky"**.

All over the world.

# IMU's approach

Committee for Women in Mathematics

and

Committee on Diversity

<https://www.mathunion.org/activities/ad-hoc-committee-diversity-cod>

# World Meeting for Women in Mathematics



In 2022, vICM with one day in Helsinki

II World Meeting for Women in Mathematics  
with a virtual part and hybrid Olga  
Alexandrovna Ladyzhenskaya Celebration  
Proceedings to appear

# World Meeting for Women in Mathematics



On July 22 2026, satellite event of ICM  
Philadelphia

III World Meeting for Women in Mathematics  
Participation and visibility of women at ICM

# Strategies

Organize associations for Women in Mathematics : **networking**

Celebrate Women in Mathematics : **visibility**

Promote **interdisciplinary collaboration**

Encourage a **variety of initiatives**

# Strategies

Encourage a **variety of initiatives** with two aims in mind

- **attract girls to science**
- **keep women in the community, caring for them**

# Current situation

- On going difficulties : budget cuts for women studies, new administration in the US ...

- Progress is not linear

**BUT**

- Remember where we come from

- We are here to stay

- We can do a lot, even with little budget

# Long term perspective

Reaching gender equality in mathematics all over the world will take tremendous efforts and a very long time.

By working together to support the international community of women in mathematics, we can accelerate this transformation.

**Thanks for the invitation**