

# **The history and future of IUPAP**

**Bruce McKellar, Past President on Council,  
International Union of Pure and Applied Physics (IUPAP)**

**At the session commemorating the centenary of IUPAP  
at the 24th AIP National Congress**

You will find much of the material here on the IUPAP website [iupap.org](http://iupap.org)  
But there are some personal comments in here which are not on the website

# IUPAP is born in Brussels in 1922

- Formation of the International Research Council in 1919, led by the Royal Society, London and the National Academy of Sciences, Washington to co-ordinate international efforts in the different branches of sciences, under whose aegis international associations or unions in different branches of science could be formed.
- A number of Unions were established in 1919, including Pure and Applied Chemistry and the Mathematics Union, but the Physics Union was not formed until 1922
- the 1922 General Assembly of the IRC convened at Brussels and a number of physicists present decided that the formation of a Physics Union was imperative, and they created the **International Union of Pure and Applied Physics**

# The initial structure of IUPAP

- **Thirteen countries formed the International Union of Pure and Applied Physics**

- **Belgium**
- **Canada**
- **Denmark**
- **France**
- **Holland**
- **Japan**
- **Norway**
- **Poland**
- **Spain**
- **Switzerland**
- **United Kingdom**
- **United States of America**
- **Union of South Africa**

**President**

*W Bragg,*

**Vice Presidents**

*M Brillouin,*

*M Corbino,*

*M. Kundsens,*

*M LeBlanc,*

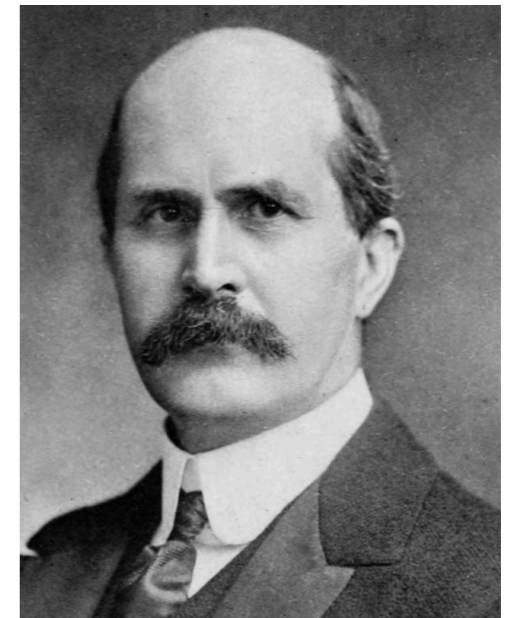
*R. A. Millikan,*

*H. Nagaoka,*

*E Van Abel,*

**Secretary**

*H. Abraham,*



William Henry Bragg  
President of IUPAP

1922-1931

Elder Professor of Physics,  
University of Adelaide,

1886-1908

# The First IUPAP General Assembly, Paris, 1923

- Accepted Statutes
- Fees: Set at 200 French Francs, which is worth about 1,363 EUR now
- Members: Italy, Sweden, Czechoslovakia joined, now 16 members (Australia was invited to attend, but did not)
- Council: M LeBlanc died, replaced by M RATEAU
- Commissions: C1 (Finance) formed
- Relationship with parent body: Bragg as Liaison with the International Research Council
- Resolutions: “That all scientific papers be published with an abstract, and the abstract to be widely distributed in many forms” Moved by Marie Curie who was disturbed by the explosion of papers.
- Next General Assembly in Brussels in 1925, establishing 3 year cycle
- Responsibility of managing the 1927 International Conference on Physics handed to the 1925 GA
- Help to physics institutions with external difficulties: Member countries and publishers urged to replace the books and journals destroyed in the Japanese earthquake

# Much the same work is now done in the IUPAP GA

## Part 1

- Accepted Statutes
  - The 2021 General Assembly accepted new Articles of Association and Internal Regulations to give IUPAP legal status as an Association under the Swiss Civil Code (<https://iupap.org/documents/statutes-bylaws/articles/>  
<https://iupap.org/documents/statutes-bylaws/regulations/>)
- Fees: Set at 200 French Francs, which is worth about 1,363 EUR now
  - The fees are now from 2420 EUR to 43560 EUR
- Members: Italy, Sweden, Czechoslovakia joined, now 16 members (Australia was invited to attend, but did not)
  - At most General Assemblies, new members are admitted. Occasionally resignations occur Now 60 members
- Council: M LeBlanc died, replaced by M Rateau
  - At each General Assembly, new Council members are elected, and any who have died are recognised

# Much the same work is now done in the IUPAP GA

## Part 2

- Commissions: C1 (Finance) formed
  - Now 19 Commissions, 4 Affiliated Commissions and also 15 Working Groups
- Relationship with parent body: Bragg as Liaison with the International Research Council
  - Michel Spiro is now our contact with the International Science Council
- Resolutions: “That all scientific papers be published with an abstract, and the abstract to be widely distributed in many forms” Moved by Marie Curie who was disturbed by the explosion of papers.
  - Now many resolutions, 20 in 2017
- Next General Assembly in Brussels in 1925, establishing 3 year cycle
  - Always establish the next GA
- Responsibility of managing the 1927 International Conference on Physics handed to the 1925 GA
  - Supporting Conferences are now a major part of the work of the GA
- Help to physics institutions with external difficulties: Members countries and publishers urged to replace the books and journals destroyed in the Japanese earthquake
  - We admitted Ukraine as a member in 2021 with zero dues for the time being, to assist our colleagues in Ukraine
  - We have issued statements about the war in Ukraine and the situation in Iran

# Australia and IUPAP

**Joined in 1925 as member 17**

- Australia was invited to come to the first GA in 2023, as one would have expected from the Australian connections of William Bragg. Apparently they could not find the 200 French Francs in 1923
- Australia joined IUPAP in 1925, now having the financial support of the Australian Research Council to do so. The Australian Research Council that provided the support is not that Australian Research Council that supports many of you. It was in fact the forerunner of the Australian Academy of Science, which is now formally the Australian member of IUPAP.
- Australians now play a significant role in the activities of IUPAP. All the people you see in this session have done so. Given the size of our annual dues which is 4 times the basic rate, now 9695 EUR, we should expect 4 members of Commissions, and there are 5 in the 2021-2024 period:
- Nicole Bell on C11, Manjula Sharma, vice chair of C14, Igor Bray on C15, Jan de Gier C18, Derek Leinweber C20

# Officers 2021-2024

Absent

Bruce McKellar,  
Past President on Council

Rudzani Nemitudi  
Associate Secretary General

Boris Sharkov  
Treasurer

Phua Kok Khoo  
Honorary Secretary General

Kwek Leong Chuan  
Honorary  
Deputy Secretary General



Executive Council Officers (2021 – 2024) at the new Secretariat in Trieste (Italy). From Left: Prof Stefano Fantoni (General Secretary for Administrative Affairs), Cecilia Cressi (Trieste Secretariat), Jens Vigns (General Secretary for Financial affairs), Prof Monica Pepe-Altarelli (Vice-President at Large for IUPAP Centenary), Prof Michel Spiro (President), Prof Silvana Ponce Dawson (President Designate) and Prof Sandro Scandolo (Deputy General Secretary for Administrative Affairs).



# **Our Mission**

**To assist in the worldwide development of physics, to foster international cooperation in physics, and to help in the application of physics toward solving problems of concern to humanity.**

# Our Goals

- Assist in the worldwide development of physics and promote physics as an essential tool for development and sustainability;
- Engage in the strengthening and improvement of physics education, particularly in developing countries;
- Increase diversity and inclusion in physics, enhancing the participation and recognition of women and of people from underrepresented groups;
- Foster international cooperation and sponsor suitable international physics meetings;
- Promote the free circulation of scientists and the open access to data;
- Enhance the vital role of early career physicists;
- Strengthen the links with physicists working outside academia and with other scientific communities;
- Promote international agreements on symbols, units, nomenclature and standards

# Meeting the Goals now set out in the Strategic Plan

<https://iupap.org/strategic-plan/>

**STRATEGIC PLAN**

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**ACTION PLAN**

**ETHICS AND SCIENCE  
INTEGRITY**

**DIVERSITY IN PHYSICS**

**PHYSICS FOR DEVELOPMENT**

**PHYSICS OUTSIDE ACADEMIA**

**PHYSICS EDUCATION**

**OUTREACH**

# Some of our work towards those goals

- **Increase diversity and inclusion in physics, enhancing the participation and recognition of women and of people from underrepresented groups;**

The IUPAP has a long history of working to support diversity in physics. It created the [Working Group on Women in Physics](#) in 1999 (the then President, Burt Richter, told me that he regarded this as the most important action taken during his presidency)

The position of Vice-President at Large with responsibilities of [Gender Champion](#) was created in 2011.

Guidelines for the sponsorship of conferences ensure that [women are fairly represented among participants](#), speakers and members of committees, and that conferences take place in an atmosphere free of [sexual harassment](#) and [discrimination](#).

Now IUPAP requires that in the IUPAP Presidential Line, and in each group of three officers of a Commission.

At least one person is a woman and at least one is a man

# Diversity

## Continued

Physicists need to see data so Conferences report on the fraction of women who are participants, speakers, and committee members  
The Gender Champion reports on these numbers to the Executive Council and to the General Assembly

The IUPAP is planning to build on this work on gender (which is still necessary) to consider other areas where there is discrimination, conscious and unconscious, such as disability and ethnicity.

Kennedy Reed, President from 2017 to 2019, was the first African American IUPAP President.

In June 2020 IUPAP issued a statement against racism and in favor of diversity and inclusiveness.

# **The ICWIP developed the Waterloo Charter**

**Adopted by the 2021 General Assembly**

## **Guiding Principles of the Waterloo Charter for Gender Inclusion and Diversity in Physics**

- People of all genders are equally good in doing excellent science and deserve equal opportunity.
- Diversity contributes to excellence in science so that the full participation of people of all genders will enhance excellence in the field of physics.
- Both thought and action are necessary to ensure equal participation for all.
- The attainment of equal opportunity should be measured by outcomes. Thus, as long as the percentage of women in the next level of advancement does not equal the percentage in the pool, equal opportunity cannot be considered to exist.
- Long-term change requires periodic evaluation of progress and consequent action to address areas where improvement is necessary.

# **The International Conference on Women in Physics**

## **ICWIP**

The International Conference on Women in Physics (ICWIP) is held every three years, bringing together men and women from around the world to report on the situation of women in physics in their country, to share good practice, to suggest and implement means of improvement and to network. Over 92 different countries and over 1300 delegates have attended the ICWIPs and many new national bodies on women in physics have been created and regional meetings have taken place. The ICWIP has given IUPAP connections with many territories which are not yet members. The Conference Proceedings, available online, are a source of statistics and good practice across the world. The seventh ICWIP was held in Melbourne Australia in 2021 in an hybrid format, and was a great success.

WG5 is the only IUPAP working group which has a conference with guaranteed IUPAP funding attached to it

Every year WG5 awards travel grants to women from developing countries to enable them to attend conferences that will support them in their career. Over 16 years, nearly 500 grants have been awarded.

# The ISC project on Gender Gap in Science

## Working with partner unions

- IUPAP played a major role in writing the application of the IUPAC and the IMU in applying for the significant ISC grant “Gender Gap in Science
- We received a good slice of the 500,000 EUR grant over 3 years for an analysis of the gender gap in Science
- The results were presented in a conference in Trieste in November 2019, and then written up as a report in book form  
<https://zenodo.org/record/3882609>



# The Gender Gap Project

## Global survey

37

Measuring and Analyzing  
the Gender Gap in Science  
through the Global Survey of Scientists

The gender gap is very real  
in mathematics and science.  
Women's experiences are  
consistently less positive

Rachel Ivie



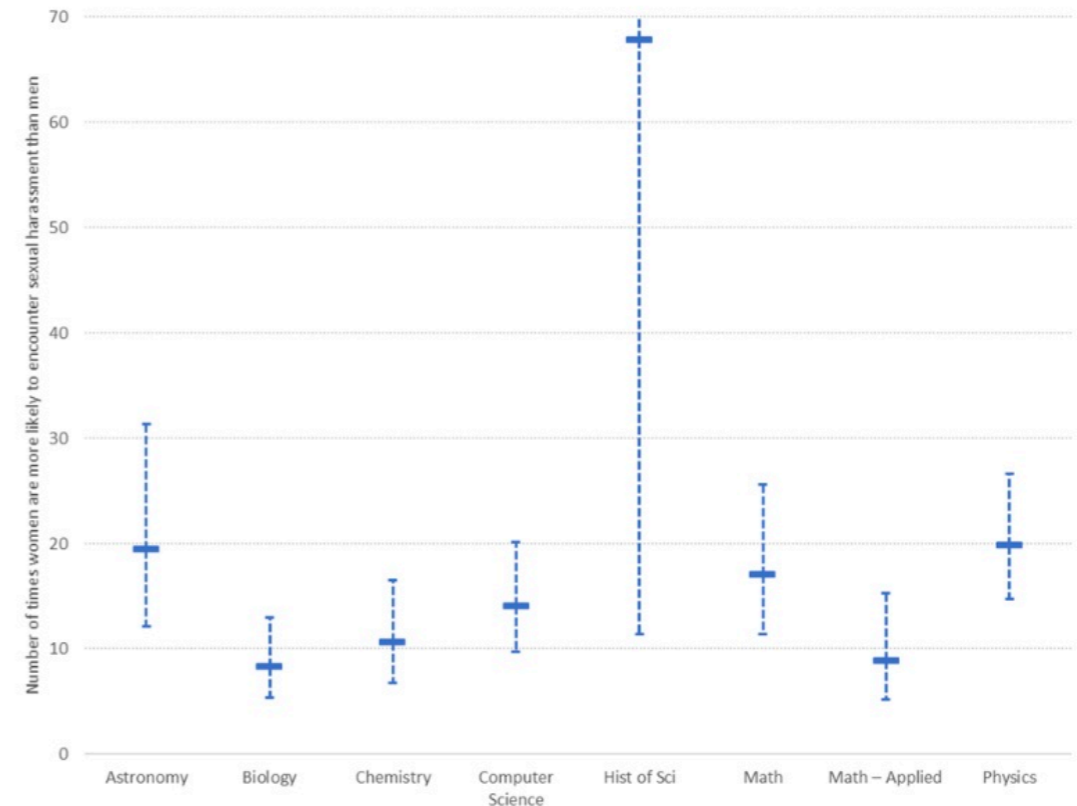
Men and women do not  
have the same experiences  
in science

Regardless of discipline,  
geographical zone and level  
of development (HDI)

17



Susan White



The horizontal bar indicates the point estimate, and the dashed lines indicate the standard error. The standard error is much larger for History of Science due to a smaller number of respondents.

Figure 3: Encountering sexual harassment at school or work by discipline.

# Gender Gap Closing Conference

How to measure it, how to reduce it?

199

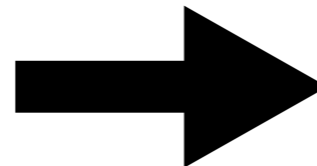


I was there



Figure 1: Conference participats.

*“According to UN and UNESCO instructions, one conference director Mei-Hung Chiu was not allowed by ICTP to attend the meeting. The reason is that she has a non-UN passport, being from Taiwan. Fortunately the regulations are not the same at SISSA and you will meet her in person during our roundtable. Her welcome video is on the Gender Gap in Science website <https://gender-gap-in-science.org/>.”*



This conference provided an example of discrimination in action

# STATEMENT AGAINST RACISM AND IN FAVOUR OF INCLUSIVENESS AND DIVERSITY

## The IUPAP statement on Racism, Diversity and Inclusion

### The Executive Council of IUPAP takes a strong stand against Racism and in favor of Inclusiveness and Diversity

In view of the ongoing global events triggered by the brutal killing of George Floyd at hands of the police in the US, the Executive Council of the International Union of Pure and Applied Physics (IUPAP) reaffirms its strong stand against all forms of racism and discrimination. Sadly, the practice of science is itself not immune from both subtle and overt forms of discrimination and intimidation. The actions of the IUPAP are guided by the principle of the Universality of Science which is fundamental for scientific progress. We actively uphold this principle which requires equal access to education, resources, and advancement for all without any discrimination on the basis of such factors as ethnic origin, religion, citizenship, language, political stance, gender, or age.

We firmly believe that without exception, all people are equally capable of pursuing scientific excellence, and hence deserve equal opportunity as a basic human right. Giving them that opportunity will also advance science itself

Unfortunately, equitable access to higher education is yet to be realized. Large social groups remain hugely under-represented as is clearly reflected in the composition of the various structures within the STEM community. The STEM community must deeply reflect and debate how to diversify its composition and then take appropriate actions to implement those changes. Society requires nothing less of us. The Executive Council of IUPAP, being deeply committed to increasing diversity in physics, will participate in this reflection and debate, and in the definition of the actions that could make the practice of science more human and inclusive. Our strong commitment to searching for a lasting solution to these societal challenges is based on the IUPAP mission “*to assist in the worldwide development of physics, to foster international cooperation in physics, and to help in the application of physics toward solving problems of concern to humanity*”.

# A work in progress

## ETHICS AND SCIENCE INTEGRITY

The IUPAP thinks that scientific integrity is indissolubly linked to the practice of science. The Union is deeply committed to promoting scientific and ethical standards that will help eliminate research misconduct, handle conflicts of interest, increase transparency and induce the internalization of values such as trust, accountability and fairness. These values are essential for collaborative work and for the way in which the results of science research are perceived by the general public.

With the contribution of members of the Affiliated Commission on the History and Philosophy of Physics (AC6) and the direct involvement of the Vice-President at Large with responsibility for Outreach and Ethics and of the Working Group on Ethics (WG18), which creation was approved by the 30<sup>th</sup> IUPAP General Assembly, we foresee to define a set of guidelines that will help IUPAP promote scientific and ethical standards and address ethical issues of great current concern. In this regard, guidelines have been established to address sexual harassment during IUPAP sponsored conferences and new regulations have been added to make decisions on awards. The [Waterloo Charter for Gender Inclusion and Diversity in Physics](#) also entails a list of good practice recommendations that are directly related to ethics and science integrity.

Besides establishing rules of conduct for individual scientists, there are other problems that concern with undesirable behaviors by other players of the scientific ecosystem. In particular, we have observed in recent years significant increases in the solicitation to contribute to predatory journals and conferences. Such vulturine practices not only have financial consequences, but the lack of serious peer reviews in some cases could result in “fake science”, which could significantly undermine trust in science, in addition to the financial consequences of such faulty publications. The IUPAP will take a lead in seriously combatting such predatory and/or fake practices in physics and applied physics.

Laura Greene, who was to talk in this session

# Personal remarks about ethics and integrity

- All physicists are familiar with systematic errors which can distort results
- In physics one can get funds to repeat an experiment, perhaps in a modified form, to track down systematic errors. The dark matter experiment going into the mine at Stawell is an example
- Errors can creep into theoretical work. In the case of Andrew Wyles proof of Fermat's Last Theorem errors were found after the first announcement, and it took Wyles and Richard Taylor a year of intense work to correct the errors. Theoretical physics and calculational physics have to be checked too.
- Results must be reproducible!

# Physics for Development

## C13 is the Commission on Physics for Development

- Established 1981 to
  - Help in, appropriate ways, the improvement of conditions of physics and physicists in developing ways
  - Propose and if appropriate support initiatives to promote the contribution to industrial development
  - Collect and distribute relevant information on opportunities for Physics Development
- One difficulty that many developing countries have is the lack of access to the expensive infrastructure needed for modern physics. With the International Union of Crystallography IUPAP ran the program Light Sources for Africa, the Americas, Asia, Middle East and the Pacific to give physicists and crystallographers opportunities to work on facilities in more advanced countries and also to lobby for local synchrotron light sources, especially in Africa

# Physics outside Academia

## About half the physicists with a BSc in physics do not work in Academic Physics — IUPAP should connect to them

- Many IUPAP presidents have worked to have IUPAP pay more attention to the **Applied** in its title, heretofore with little to show for it
- Kennedy Reed Established a Working Group on Physics in Industry (WG16) to help us do this
- This is very much a work in progress. If you glance at the talks in this conference there are many, mostly from Academic Physicists about problems connected with Industry, and other sciences like archeology and medicine. I think IUPAP needs to talk with those academic physicists to find out how best to talk with and connect to the physicists not working in academic physics.

# Physics Education

## C14 Commission on Physics Education

- Given that many students with talent in physics do not continue their education in STEM, working on physics education must continue to be a major task of IUPAP
- The Commission was established in 1960, and has been working hard since then, but there is much more work ahead of it.
- Australia has played an important part in C14, both Ian Johnston and Mandula Sharma taking on key roles. Our national activity on physics education is on display at this Conference



# **The international year for Basic Sciences in Sustainable Development IYBSSD 2022-2023**

- Envisaged by our President, after he had agreed to accept nomination as President Designate, but before he was even nominated, about 2014
- 2022 was the centenary of the creation of IUPAP, and we were looking of some way of celebrating that centenary. An International Year of Physics would not get up.
- After a long campaign in 2019 UNESCO declared 2022 as the International Year for Basic Sciences for Sustainable Development, and the UN made the formal declaration, delayed by political manoeuvring and by COVID

## The international year for Basic Sciences in Sustainable Development IYBSSD 2022-2023

**Agenda 2030** for Sustainable Development is the ambitious program that the Member States of the United Nations have agreed on to ensure a balanced, sustainable and inclusive development of the planet.

**Basic sciences** have an important contribution to make to the implementation of this program. They provide the essential means to meet crucial challenges such as universal access to food, energy, health coverage and communication technologies. They enable us to understand the impact of the currently nearly 8 billion people on the planet and to act to limit, and sometimes even to reduce those impacts: depletion of the ozone layer, climate change, depletion of natural resources, extinction of living species.

**Applications of technology** are easy to recognise. On the other hand, contributions of basic, curiosity-based, sciences are not well appreciated. They are nonetheless at the basis of major technological advances that stimulate innovation, as well as essential for training future professionals and for developing capacity of populations who can take part in decisions that affect their future.

**The international year for Basic Sciences in Sustainable Development  
IYBSSD  
2022-2023**

**The International Year of Basic Sciences for Sustainable Development 2022** is a key moment of mobilization to convince economic and political leaders, as well as every citizen, of the importance of taking into account and mastering basic sciences to ensure a balanced, sustainable and inclusive development of the planet.

Led by IUPAP

With 50 partners – Scientific Unions and Scientific Establishments

Opened September 2022, Closing October 2023

# The second century of IUPAP

- IUPAP is expanding its membership
- IUPAP is covering more of physics, but does it need to expand more?
- IUPAP is embracing Applied Physics
- IUPAP is collaborating more with other Unions and other scientific bodies
- IUPAP is moving vigorously into its second century
- IUPAP needs to find more financial resources to realise all its dreams and ensure its own sustainability

# Acknowledgements

- To my many colleagues in IUPAP with whom I have worked since I first became a Vice President at Large, ie not from a Commission, in 2015
- Especially to the IUPAP Presidents, Alan Astbury, Katsu Ushiodia, Cecilia Jarlskog, Kennedy Reed and Michel Spiro, with whom I have worked
- Tony Thomas who, I understand, played a role in establishing my first connection with IUPAP
- My wife Loris who has tolerated the time I have spent working on IUPAP, and as the trustee of the McKellar Superannuation Fund has supported that work, including my attendance at this meeting