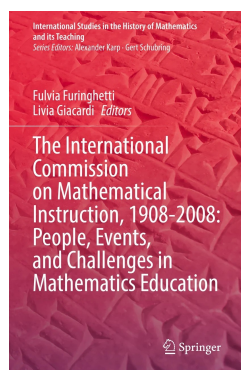


## Book review

*The International Commission on Mathematical Instruction, 1908–2008: People, Events, and Challenges in Mathematics Education* by Fulvia Furinghetti and Livia Giacardi (editors)

Reviewed by Carlo Toffalori

*English translation of the paper: Recensione di International Commission on Mathematical Instruction, 1908–2008: People, Events and Challenges in Mathematics Education. Mat. Cult. Soc. Riv. Unione Mat. Ital. (I) 8, 297–301 (2023).*



Tension underlies every scientific field, and it is generated by conflicts between forces that bring about progress. The first conflict – one that concerns us specifically – is between the research of unexplored horizons, new ideas, and the transmission of our findings, which is the heritage we have acquired through our investigation. In other words, there is a contrast between a first creative phase and the one that follows, dedicated to

translating that discovery into teachings.

Another conflict eliciting tension – intrinsically tied to the previous one, if not even partly overlapping it – can be found between the history of that scientific field, its creation of theories and methods, and its further development. The latter cannot be a simple addition to the premises set by tradition, but at the same time it cannot completely disregard them.

All that applies to mathematics as well. Indeed, its greater abstractness accentuates this duality, making it subtler and adding its own peculiarities. As stated in 1990 by Jean-Pierre Kahane, a scholar of harmonic analysis and the president of both the Société mathématique de France and the ICMI: “*In no other science is the distance between the taught and the new so large. In no other science has teaching and learning such social importance.*” On the same subject, he also added: “*In no other science is there such an old tradition of scientists committed to educational questions.*”

The book under review perfectly depicts this duality, in its retracing a hundred years of ICMI (1908–2008). Leaving acronyms aside, the *International Commission on Mathematical Instruction* is an organization whose purpose is already stated in its name. However, Hyman Bass – American algebraist, author of the famous book *Algebraic K-Theory* – and the ICMI’s general secretary, Bernard Hodgson, have also defined it as “*a forum for promoting reflection, collaboration, exchange and dissemination of ideas, and information on all aspects of the theory and practice of contemporary mathematics education, as seen from an international perspective.*” A goal that is easy to share and support in theory, but difficult to put into practice, as it does not deal solely with the evolution of mathematics, it also deals with that of society and single individuals. Indeed, as the subtitle of this work rightly reminds us, the first century of ICMI was made up of people, events, and challenges. The book gives us an extensive and in-depth account of them.

It is first and foremost a *tale of events*, often leading to successful outcomes, when not to failures and crises. The birth of the ICMI, which coincides with the fourth International Congress of Mathematicians (ICM) held in Rome, can be considered the result, if not the culmination, of a movement that had been growing for years, bringing together mathematicians such as Felix Klein and educators the likes of David E. Smith.

Let us not forget that 1908 was also the year Klein published his classic *Elementarmathematik vom höheren Standpunkte aus* (*Elementary Mathematics from an Advanced Standpoint*). And Klein himself was the first president of an international committee founded in Rome which dealt with the teaching of mathematics. However, the member nations were limited to a few European countries – 17 in total – and the United States, although another 15, mostly non-European countries, were keen to join the organization.

However, it did not take long for the newly founded committee to experience local bias, misunderstandings, doubts, and disagreements between mathematicians who even came from the same country, so much so that Klein himself found a few opponents in Germany.

The committee had a bilingual name: *Commission Internationale de l'Enseignement Mathématique* (CIEM) in French and *Internationale Mathematische Unterrichtskommission* (IMUK) in German. From a political standpoint, it tried to assure adequate representation to all its various member states by also constituting national subcommittees, while from a scientific point of view, it discussed the teaching of mathematics in general – its organization, programs, methods – with a focus on applied mathematics too. Its mandate was renewed at the ICM every four years. The organization carried out its activities until 1914, when it dissolved due to the outbreak of World War I.

The end of the war did not suffice to revive the committee, as it needed to find a new balance between victorious nations, such as France, and defeated ones, like Germany. It was restored in 1928, at the ICM held in Bologna, but it had yet to relive its past glory, due to the political upheavals of those decades.

It was only after World War II that ICMI was reborn under its current name, as a permanent subcommittee of the *International Mathematical Union* (IMU). Its mandates were no longer determined by the ICM. As a result, the ICMI grew and gained momentum, to the point that, throughout the years, it prompted important initiatives such as a journal (*Educational Studies in Mathematics*), a collection of studies (*ICMI Studies* series), an international congress of its own – the *International Congress on Mathematical Education* (ICME) – and, in recent times, a website.<sup>1</sup> In 2008 the member states were over eighty, while today they are more than ninety worldwide.

However, the organization's new framework generated different scientific, political, and social problems. Indeed, the newly found ICMI needed to:

- define its relationship with the IMU itself, and acquire a precise and autonomous identity;
- open a dialogue with the other movements and organizations outside the IMU, but equally invested in the study and promotion of mathematical teaching;
- establish a similar connection with UNESCO and with global institutions that further the progress of culture;
- renew mathematics curricula and the ways of implementing them (fluctuating, during the twentieth century, between Bourbakist rigour and reliance on intuition);
- assess the very particular role of mathematics, a science in of itself, and at the same time the foundation of all the others;
- study the advent of information science and technology and the educational use of its tools;
- extend its focus to other nations and civilizations, in particular developing countries of the third and fourth world, or those, such as India and China, bearing mathematical heritages that are partly different from the traditional, Euclidean one, inspired by the classical Greek culture;

- understand and reappraise these “alternative” approaches, but also incorporate them to the most widespread methods in Western culture;
- create and support the teaching of mathematics in less developed nations, without concentrating on syllabi alone, but also on schools and places of learning.

The first century of ICMI is also marked by *challenges*.

The first, and perhaps the most relevant, arose within the mathematical world itself, and concerned the role of teaching within it. From a political standpoint, this issue was tied to the problem mentioned above regarding the identity of the ICMI and the position it held in various institutions, primarily the IMU.

It was also necessary to pinpoint the very essence of the mathematics that needed to be taught and passed down. In a period as frenetic as the twentieth century, this implied the search for the right balance between the so-called pure and applied mathematics.

Growing attention was drawn to the “vertical” development of mathematics education – from primary school to university – which was, and still is, intertwined with pedagogical issues.

Another vital matter concerned the progressive awareness of emerging nations, as well as the acknowledgement of the mathematical heritage of every single civilization and its people.

Similarly, there was a rise in awareness concerning gender issues and female representation.

ICMI dealt with these challenges by finding a common path, a synthesis of “tradition” and contributions from different cultures. To face them, it created study groups, meetings and conferences all over the world. At the same time, the didactics and history of mathematics gained further autonomy as academic disciplines.

The three chapters featured in the first part of the book deal with the events and challenges that ICMI had to face between 1908 and 2008. The authors are, from the first to the third chapter:

- Gert Schubring, who wrote on the foundation and development of CIEM/IMUK up to World War I, on the committee's dissolution in 1920, and on the attempted reconstitution in 1928;
- Fulvia Furinghetti and Livia Giacardi, who focused on the period starting from 1952, which saw the rebirth of ICMI, and on the progressive establishment of mathematics teaching as an autonomous field of research;
- Marta Menghini, who explored the “renaissance” of ICMI in the late sixties and its subsequent developments up to 2008.

Adding to these three chapters, the second part of the book, edited by Fulvia Furinghetti and Livia Giacardi, provides detailed and documented information on many of the aspects of the commission's century-old history.

However, the history of the ICMI is also undoubtedly made of – and by – *people*, starting from personalities like Felix Klein, Jean-Pierre Kahane, Hyman Bass to many others, often renowned

<sup>1</sup> <https://www.mathunion.org/icmi>

mathematicians not specialized in teaching, or teaching alone, but sensitive to the transmission of their science and, as such, called to give their contribution to the commission, or even lead it. Here are a few significant examples extracted from the list of ICMI presidents (1908–2008):

- Marshall Stone, an American mathematician who gained notoriety for the duality theory between Boolean algebras and Boolean spaces, the so-called Stone–Čech compactification, and was president of the IMU even before leading the ICMI;
- Hans Freudenthal, a Dutch expert in algebraic topology, and an energetic guide and leader of the development of ICMI in the 1960s;
- André Lichnerowicz, a French scholar of differential geometry and mathematical physics, president of the Société mathématique de France, as well as of the ICMI;
- Shokichi Iyanaga, a Japanese researcher in topology and functional analysis.

In more recent times, there have been female leaders at the head of the ICMI, such as the president in office in 2008, Michèle Artigue, a French mathematician specialized in teaching. Among her successors, in the period following the one under scrutiny, it is worth mentioning the South African Jill Adler. Her nationality underlines the increasingly international scope of the ICMI. It is not surprising, then, that the current president, Frederick Koon-Shing Leung, is Chinese from Hong Kong, and the current executive committee includes Mercy Kazima, a representative from Malawi.

These names are no longer those of cutting-edge scholars who have turned their attention from various fields of mathematical research to the problems of teaching. On the contrary, they belong to those who have specialized in the teaching of mathematics itself, thus proving that a change has occurred over the last decades. Indeed, learning and education have progressively become academic disciplines, with their own identities and specificities.

But now let us go back to the people who have furthered the development of the ICMI in the century around which this book revolves, that is between 1908 and 2008. The third and final part of this study provides a very accurate series of short portraits of these protagonists. There are overall 54 biographies of members of the Central/Executive Committee of the ICMI who have succeeded one another in a hundred years, as well as those of ten eminent figures.

An extensive section of the first part is devoted to introducing these personalities and furthering our knowledge about them. Indeed, we hear their voices through a collection of unpublished letters concerning the ICMI and its problems. This extraordinary collection of documents, edited by Livia Giacardi, is the result of her extensive and thorough research. It is worth noting that at the time there were no e-mails, no messaging apps, no computers equipped with an almost unlimited memory and data storage. On the contrary, old paper mail travelled between countries that were

sometimes at war and across borders often impenetrable, sealed in distinctive envelopes such as that of the air mail with its typical red and blue edges.

The documents thus recovered show exchanges of opinions, scientific and diplomatic discussions on the life of the ICMI, sometimes expressed in different languages. They involve many scholars including IMU presidents – prestigious figures such as Rolf Nevanlinna, Georges de Rham, Henri Cartan. This work also offers readers reproductions of the original letters.

*The Italian contribution* shines through all this documentation – a source of national pride, if we may. Not only because the two dates that mark the beginning and the end of the century under scrutiny are linked to Rome, home of the ICM congress that gave birth to the ICMI in 1908 and the same city that hosted its centennial celebration in 2008; nor because the 1928 ICMI congress that attempted, albeit unsuccessfully, to revive the commission was held in Bologna. The Italian contribution was made invaluable by its various influential Italian figures who enriched the ICMI and furthered its progress. From Guido Castelnuovo – one of the representatives of the original CIEM/IMUK, together with Enriques and Scorza, and later vice-president of the commission after its renewal in 1928 – to his daughter Emma, who was a guest speaker at the first ICMI held in Lyon in 1969. And let us not forget that in 2007 Mariolina Bartolini Bussi became a member of the Executive Committee and in 2013 Ferdinando Arzarello became president.

For the sake of brevity, we have limited ourselves to just a few names, but this book offers an extended list. Furthermore, one of the ICMI awards, established in 2013, was named after Emma Castelnuovo herself.

In conclusion, the book edited by Fulvia Furinghetti and Livia Giacardi paints a very rich and detailed picture of the first century of ICMI. It is the result of the impressive and formidable work of its two editors, and of other equally prestigious authors who collaborated with them on the single chapters of the book. It employs an historical approach, aimed at gathering news, facts, chronicles, documents, and biographies. As was said at the beginning, we strongly believe that the accurate account of the past is the main way to inspire new reflections on the impulses and ideas that those events have generated, to stimulate discussions and in-depth analysis of the present, and ultimately suggest future choices.

What this book wants to convey – structurally and thematically – is the fundamental role of history and teaching in preserving and enlivening mathematics and every other science, as well as the importance of a dialogue between different cultures. Today, history and teaching have become highly specialized, as is natural in any discipline that grows, refines, and evolves. Thus, the works of influential researchers who were also passionate about education, like Jean-Pierre Kahane, might seem outdated. It is difficult for nowadays scientists to concentrate on multiple fields, as history

and teaching require a full-time commitment from those who cultivate them.

However, the close cooperation between “mathematicians,” “historians” and “experts in mathematical education,” is one of the main assets of ICMI, as it has transpired throughout its long history, and we wish that it may carry on in new, different forms.

We hope that this work will make its way into the libraries of all departments of mathematics and that it will be frequently, extensively, and fruitfully consulted. After all, the aim of the ICMI, as finely expressed by the book and briefly summarized in these few lines is, and should be, shared by all mathematicians.

*Acknowledgements.* Thanks to Noemi Toffalori for her invaluable help in translating from Italian to English.

Fulvia Furinghetti and Livia Giacardi (editors), *The International Commission on Mathematical Instruction, 1908–2008: People, Events, and Challenges in Mathematics Education*. International Studies in the History of Mathematics and its Teaching, Springer, 2022, xxvi+735 pages, Hardcover ISBN 978-3-031-04312-3, Softcover ISBN 978-3-031-04315-4, eBook ISBN 978-3-031-04313-0.

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DOI 10.4171/MAG/217