

Chapter 14

ICMI 1966–2016: A Double Insiders’ View of the Latest Half Century of the International Commission on Mathematical Instruction

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Abstract This paper concentrates on the latest five decades of the International Commission on Mathematical Instruction. We had the privilege of occupying leading positions within ICMI for roughly half the period under consideration, which has provided us with a unique standpoint for identifying and reflecting on main trends and developments of the relationship between ICMI and mathematics education. The years 1966–2016 have seen marked trends and developments in mathematics teaching and learning around the world, at the same time as mathematics education as a scientific discipline came of age and matured. ICMI as an organisation has not only observed these developments but has also been a key player in charting and analysing them, as well as in fostering and facilitating (some of) them. We offer, here, observations, analyses and reflections on key issues in mathematics education as perceived by us as ICMI officers, and as influenced by ICMI.

Keywords ICMI (International Commission on Mathematical Instruction)
History of ICMI · Mathematics education as a scientific discipline
Internationalisation of mathematics education

14.1 Introduction

The year 2016 marks more than a century of existence of the International Commission on Mathematical Instruction (ICMI) since its establishment in Rome in 1908. This paper concentrates on the last five decades of that period.

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During the years 1966–2016, ICMI witnessed and took note of marked trends and developments in mathematics teaching and learning around the world, in terms both of the socio-economic and institutional boundary conditions and of the diverse and multi-faceted practices of mathematics education. This half century is also the one in which mathematics education as a scholarly and scientific discipline came of age and matured. ICMI as an organisation has not only observed these developments but has also been a key player in charting and analysing them, as well as in fostering and facilitating (some of) them, for instance by way of conferences, studies or other activities.

It has been our privilege to having occupied leading positions in the Executive Committee (EC) of ICMI for roughly half the period of time under consideration, including those of consecutive Secretaries-General from 1991 to 2009. This has provided us with a unique platform from which we could identify and reflect on the main trends and developments of the relationship between ICMI and mathematics education from the perspective of two “insiders”.

Our paper thus offers observations, analyses and reflections on key issues in mathematics education as perceived by us as ICMI officers, and as influenced by ICMI.

The history of ICMI and the roles played by some of its protagonists have also been subject of attention at recent International Congresses on Mathematical Education (ICMEs). This is reflected for instance by the regular lecture by Howson (2008) presented at ICME-10 (Copenhagen, 2004), as well as by the talk by Arzarello et al. (2008) at ICME-11 (Monterrey, 2008).

Although the focus of our paper will be on the years 1966–2016, we have found it necessary to provide a brief outline of ICMI’s first 58 years, so as to set the stage for understanding and appreciating the target years. The paper is thus divided into four sections:

- 1908–1982: Foundation, (re)formation and “the first crisis” around ICMI;
- 1983–1998: Consolidation and expansion;
- 1999–2016: Calm waters, but with “a second crisis” around ICMI; and finally
- ICMI and the field of mathematics education.

14.2 1908–1982: Foundation, (Re)Formation and “The First Crisis” Around ICMI

Following a suggestion of the US mathematician and teacher educator David E. Smith made in the then recently created journal *L’Enseignement Mathématique* (Smith 1905, p. 469), ICMI was first established at the General Assembly of the 4th International Congress of Mathematicians (ICM) held in Rome in 1908, based on the following resolution:

The Congress, recognizing the importance of a comparative study on the methods and plans of teaching mathematics at secondary schools, charges Professors F. Klein, G. Greenhill, and Henri Fehr to constitute an International Commission to study these questions and to present a report to the next Congress. (Lehto 1998, p. 13)¹

This instigated what might be called the “Klein Era” of ICMI—from the name of ICMI’s first President, Felix Klein (1849–1925), see Bass (2008)—characterised by activities focusing on curricular reflections and comparisons. The first host of results of the Commission’s work, undertaken by mathematicians with educational interests, teachers of high reputation and institutional representatives, were presented at the ICM in Cambridge (UK), in 1912. The mandate of the Commission was extended and the work continued during WWI. By 1920, 310 reports (totalling more than 13,500 pages) had been produced from eighteen countries plus the so-called Central Committee, the ancestor of the EC—see Lehto (1998, p. 14) and Fehr (1920–21, p. 339). Even though the Commission was international and open to all countries, it was, in fact, highly Euro- and US-centric.

Because of difficulties in international relationships caused by WWI, the so-called “Central Powers” were excluded from the then newly established International Mathematical Union (IMU)—historically named the “Old IMU” in the parlance of Lehto (1998). Nevertheless, the mandate of the Commission was re-confirmed during the 1920s and 1930s, but activity was progressively reduced.

After WWII there was a strong desire to avoid international division, so all countries were invited to take part in the international mathematical collaboration. Thus IMU was re-established in 1951, and in 1952 ICMI was re-constituted as a sub-commission of IMU with the following brief, forming part of the Terms of Reference (and still in force today):

The Commission shall be charged with the conduct of the activities of IMU, bearing on mathematical and scientific education, and shall take the initiative in inaugurating appropriate programmes designed to further the sound development of mathematical education at all levels and to secure public appreciation of its importance. (ICMI Terms 1954)²

The members of ICMI were then national representatives of IMU member states, plus an Executive Committee elected by the General Assembly at the ICMs.³ During the years 1952–1966, ICMI gradually moved from “Old ICMI” style

¹Original text: “Il Congresso, avendo riconosciuto la importanza di un esame accurato dei programmi e dei metodi d’insegnamento delle matematiche nelle scuole secondarie delle varie nazioni, confida ai Professori Klein, Greenhill e Fehr l’incarico di costituire un Comitato internazionale che studii la questione e ne riferisca al prossimo Congresso.” (Castelnuovo 1909, p. 33)

²It is interesting that this brief asks for the furthering of “sound development of mathematical education” and the securing of “public appreciation”, both of which are of a normative nature.

³This is in distinction to the current situation, where the *members* of ICMI are now countries, as was always the case with IMU. Hence the members of the ICMI EC are no longer considered as “members of ICMI”. This change in the definition of ICMI membership was formalised in the 2002 revision of the ICMI Terms of Reference—see <http://www.mathunion.org/icmi/icmi/icmi-as-an-organisation/terms-of-reference/>. The members of the Commission, as in the original 1954 wording, now form the ICMI General Assembly.

actions, where mathematics education was predominantly seen as a “national business”, to more international activities, marked by the concerns of individual actors on the stage and involving, along the road, mathematics educators (“didacticians of mathematics”). This evolution eventually led to the emergence of an international mathematics education community, collaborating with organisations such as OEEC/OECD and UNESCO, which in turn gave rise to initiatives towards developing countries. One instance of this development was the launching in 1961 of the *Comité Interamericano de Educación Matemática* (CIAEM)—see Hodgson et al. (2013, pp. 911–913)—on the initiative of Marshall Stone (1903–1989), ICMI President for the term 1959–1962.

The 1950s saw an emerging interest in curriculum design and reform combined with approaches to teaching aligned with these reforms, whilst paying attention to contributions from psychology and general education (e.g., Jean Piaget and Jerome Bruner). One also began to gradually realise that (good) teaching is not the same as (good) lecturing. The establishment of the *Commission Internationale pour l'Étude et l'Amélioration de l'Enseignement des Mathématiques* (CIEAEM)—(Hodgson et al. 2013, pp. 910–911)—initiated by Caleb Gattegno and with early members including Gustave Choquet, Jean Dieudonné, Georges Papy and Piaget, also exerted an influence on ICMI's development. Among the founding members of CIEAEM were also André Lichnerowicz (1915–1998), ICMI President for the term 1963–1966, and Hans Freudenthal (1905–1990), Lichnerowicz' successor as ICMI President—André Delessert (1923–2010) served as Secretary-General under both Lichnerowicz and Freudenthal. During the presidencies of Stone and Lichnerowicz, ICMI became an agent for fostering and promoting the set-theory based New Math (or *mathématiques modernes*) in school curricula around the world. This can be seen in the first volumes of UNESCO's series *New Trends in Mathematics Teaching* (from 1966), published in collaboration with ICMI.

With this historical background in view, we now enter the first segment of the time span covered by this paper, 1967–1982.

A significant turning point in ICMI's life was the presidency of Hans Freudenthal (1967–1970). Even though this presidency lasted only one term, as was usual in those days, Freudenthal introduced so many new features into ICMI and to mathematics education that his influence lasted more than a decade after his presidency. So, it is fair to use the term the “Freudenthal Era”—in the spirit of Bass (2008)—for the years 1967–1980. His presidency marked a break away from New Math and—albeit slowly at first—from the dominance of research mathematicians in mathematics education that had been prevalent up till then. One of Freudenthal's most significant moves regarding mathematics education was the inauguration of the International Congresses on Mathematical Education (the ICMEs), the first of which was held in Lyon in 1969. At the same time, but not formally under the auspices of ICMI, he launched the world's first international journal of mathematics

education *Educational Studies in Mathematics* (ESM) in 1968.⁴ The developments leading to these decisions are captured in a resolution adopted at ICME-1:

The theory of mathematical education is becoming a science in its own right, with its own problems both of mathematical and pedagogical content. The new science should be given a place in the mathematical departments of Universities and Research Institutes, with appropriate academic qualifications available. (Editorial Board of Educational Studies in Mathematics 1969, p. 284)

It would be wrong to say that these initiatives were received with applause by IMU. Secretary Otto Frostman wrote as follows to Freudenthal in December 1967 (Frostman 1967):

On the ESM: “I must admit that I am not too happy about the new pedagogical journal. Do you really think that there is a market for two international journals of that kind (I do not)? If you are not satisfied with *L'Enseignement*, ICMI's official journal, perhaps it would be better to try to reform it.”

On ICME: “I can agree with very much of your criticism of the meetings of ICMI at the International Congresses [of Mathematicians], but I am not sure that ICMI should isolate itself from those who have, primarily, a scientific interest but who have, nevertheless, very often taken part in the discussions of ICMI.”

One reason for such reactions from IMU might well have been that Freudenthal launched these initiatives without much interaction with IMU officials, so that IMU was often facing *faits accomplis* from ICMI. This constituted the first ICMI/IMU crisis. This is well captured by a comment of IMU President Henri Cartan, in reaction to an initiative taken by Freudenthal concerning ICME-2. In October 1970, right at the beginning of a letter to IMU Secretary Frostman, Cartan wrote: “Freudenthal me donne encore du souci” (“Freudenthal again causes me worries”) (Cartan 1970). This time, Cartan was worried because Freudenthal wanted the outgoing ICMI Executive Committee to appoint the International Programme Committee for ICME-2 with only 2½ months left of his presidency. This inaugurated some tension between the ICMI President and the IMU leadership, arising again from time to time in the years to come.

However, these were also years with an abundance of initiatives on the part of ICMI. Quite a few of these initiatives were taken during the presidencies of James Lighthill (1924–1998)—ICMI President for 1971–1974 with Edwin Maxwell (1907–1987) as Secretary-General—and Shokichi Iyanaga (1906–2006)—1975–78 President with Yukiyooshi Kawada (1916–1993) as Secretary-General. In addition to sponsoring the ICMEs (ICME-2, 1972; ICME-3, 1976; and ICME-4, 1980—quadrennial except for the first interval), ICMI affiliated two Study Groups at ICME-3,

⁴ICMI's official organ since its inception in 1908, *L'Enseignement Mathématique* (launched in 1899), was never really a mathematics education journal, even though it did—and still does—publish education reports and papers from time to time. In the opinion of Freudenthal, in relation to the launching of ESM, the “contributions [of *L'Enseignement Mathématique*] on education were not pedagogical but organisatory and administrative.” (Freudenthal 1967)

the *International Group for the Psychology of Mathematics Education* (PME) and the *International Study Group on the Relations between the History and Pedagogy of Mathematics* (HPM), instigated the so-called ICMI Regional Conferences, and held other ICMI-related symposia in Europe, Africa, India, Latin America, and Southeast Asia as an expression of the first outreach efforts of the Commission. Finally, ICMI established the *ICMI Bulletin* as a rather informal means of communication within the “ICMI family”.

These developments of ICMI were concurrent with the emergence of mathematics education as a scientific and scholarly discipline, a field of systematic reflection and investigation. At the institutional level this was marked by the establishment—in addition to ESM, founded by an ICMI President—of the *Journal for Research in Mathematics Education* (JRME) and the *International Journal of Mathematical Education in Science and Technology* (IJMEST) in 1970, and of *For the Learning of Mathematics* (FLM) and *Recherches en Didactique des Mathématiques* (RDM) in 1980. Whilst secondary education received most of the attention in the first fifty years of ICMI, primary and tertiary education now entered the field of interest as well. The fourth volume of UNESCO’s *New Trends in Mathematics Teaching* series, which appeared in 1979 (volume I had been published in 1966, II in 1970, and III in 1972), contained chapters on the goals of mathematics teaching (by Ubiratan D’Ambrosio), on applications (by Henry Pollak) and on algorithms (by Arthur Engel), which went beyond the teaching of established mathematical areas and topics.

The 1979–1982 term of Hassler Whitney (1907–1989) as President and Peter Hilton (1923–2010) as Secretary-General turned out to be a difficult one as far as relationships both with the IMU and within ICMI itself were concerned. In the minutes of an IMU Executive Committee meeting held in 1980, one can read: “The [IMU] EC expresses concern about the lack of communications between IMU and ICMI.” And again in 1981: “Much concern concerning the difficulties that arose in the [ICMI] EC.” (IMU EC Minutes 1980, p. 14, and 1981, p. 25)

The difficulties were to do with Whitney’s wilfulness in his way of undertaking his office—for example the EC only rarely met—and with the fact that the EC seemed to think of Hilton’s role as Secretary-General to be that of an office clerk rather than that of an organiser and decision making executive officer. At least this was the perception he expressed in a confidential letter to one the Ex-Officio members of the ICMI EC, IMU Secretary Jacques-Louis Lions: “It is clear to me that I was expected by some of my colleagues on the EC to act purely in a ‘secretarial’ capacity, (...) and that I could not exercise the influence I hoped to have from that position” (Hilton 1980). That perception had led Hilton to present his resignation from the Secretary-General’s office. However, for reasons (yet) unknown this resignation did not materialise and Hilton finally remained as the ICMI Secretary-General till the end of his term.

The controversies were also due to the fact that members of the ICMI EC put forward as its candidate for the next President the Danish mathematics educator Bent Christiansen (1921–1996), ICMI Vice-President for two terms, since 1975. This was not well received by the IMU leadership. Thus the IMU President,

the Swedish mathematician Lennart Carleson, in a letter to the ICMI EC at the end of 1981 wrote: “The [next] President should be a well-known mathematician with established interests in education” (Carleson 1981). Evidently, IMU officers thought that mathematics education was far too important to be left to the mathematics educators.

Eventually, IMU elected the French mathematician Jean-Pierre Kahane (1926–2017) as the next President and the British mathematician/mathematics educator Geoffrey Howson as the Secretary-General. Besides, Bent Christiansen was elected to a third term as Vice-President. The—perhaps implicit—mandate of Kahane and Howson was to put ICMI back on track, or at least—as can be seen in the video interview with Kahane made for the ICMI Centennial in 2008 (under “Interviews and film clips” on the *History of ICMI* site at <http://www.icmihistory.unito.it>)—to revitalise ICMI. This takes us to our next section.

14.3 1983–1998: Consolidation and Expansion

Kahane and Howson both served for two terms: 1983–1989. This was the first time, since the presidency of Klein, that an ICMI President was elected twice. Their terms represented a much wanted consolidation and stabilisation of the ICMI leadership after a number of years of turbulence and tension.

During the Kahane-Howson era, ICMI instigated significant new activities (some of which had been proposed in previous terms), above all the first series of the ICMI Studies, according to the following format:

- for each Study, the ICMI EC selected a theme, described in general terms, and appointed an International Programme Committee;
- the Programme Committee produced a Discussion Document to be circulated internationally, inviting written reactions;
- based on the written reactions, a rather small invited symposium/Study Conference was organised;
- based on the conference activities, a comprehensive Study Volume was written, typically with Kahane and Howson as the main authors. Sometimes also conference proceedings were put out.

The Study Volumes for the first five Studies (1–5), which were—as a deliberate choice—rather slim, were all published by Cambridge University Press in the *ICMI Study Series*. They were devoted to the following themes, four of which were already identified at the very outset of the Kahane-Howson term⁵:

⁵Howson (1982) presents the idea of ICMI Studies under the heading “Possibilities for future action” and describes the first four of these (but calling them “symposia”). In the report on ICMI for the year 1983, Howson (1983) uses the word “Studies”.

- *The Influence of Computers and Informatics on Mathematics and Its Teaching* (Strasbourg, 1985)
- *School Mathematics in the 1990s* (closed seminar, Kuwait, 1986)
- *Mathematics as a Service Subject* (Udine, 1987)
- *Mathematics and Cognition* (no conference, written under the auspices of PME, published in 1990)
- *The Popularization of Mathematics* (Leeds, 1989).

[A report on these five Studies presented in 1990 at the Kyoto ICM can be found in Hodgson (1991).] The Studies can be seen as a reflection of needs pertinent to new issues and developments in mathematics education concerning technology, school mathematics, service subject, cognition and popularisation. In the first series, the Studies hadn't yet found a uniform format.

During the Kahane-Howson era, the *International Organisation of Women and Mathematics Education* (IOWME) in 1987 became the third ICMI Affiliated Study Group, and regional meetings continued to be supported, as was collaboration with UNESCO. The activities and roles of the representatives of member countries caused concern, as the links between many of them and the EC were frail or non-existent. So, the IMU General Assembly held on the occasion of the 1990 Kyoto ICM passed a resolution (#5) limiting the number of consecutive terms served by representatives—this came to be known as the “Kobe rule”, from the name of the host city of the General Assembly:

All Adhering Organizations are reminded that they should review their national representation on ICMI and that normally national representatives should not be asked to serve for more than two consecutive four-year terms. (IMU General Assembly 1990, p. 8)

Two ICMEs, both of which added new facets to the format and perspectives of the congresses, were held during their terms, ICME-5 (Adelaide, 1984) and ICME-6 (Budapest, 1988).

The range and scope of mathematics education as a field of research and development expanded considerably during the Kahane-Howson era. The educational levels dealt with expanded “downwards” to kindergarten and pre-school children, and “upwards” to tertiary programmes, especially those involving mathematics as a service subject. Also the public image and perception of mathematics and their influence on mathematics education received increasing attention, hence the Study on “popularisation”.

With particular regard to research, foci moved from curriculum design and teaching to mathematics learning on the one hand, and to classroom communication in mathematics on the other. But new foci concerning mathematical substance per se gained momentum as well—such as problem solving, applications and modelling, and technology in mathematics education.

These different sorts of expansion led people to begin to systematically reflect on the nature of mathematics education research, not least the German mathematics educator Hans-Georg Steiner, who established a forum, *Theory of Mathematics Education* (TME), for discussing these issues—first at ICME-5 in 1984, leading to

the paper (Steiner 1985), and in subsequent colloquia elsewhere (see also Hodgson and Rogers (2012) for comments about TME).

The following two ICMI EC terms, 1991–1998, for which the Spanish mathematician with a strong interest in mathematics education Miguel de Guzmán (1936–2004) and the Danish mathematician/mathematics educator Mogens Niss were President and Secretary-General, respectively, can be characterised as one of continued consolidation and expansion of ICMI and its activities along the lines established in the Kahane-Howson years. This era was one of continuity and calm reform, not one of abrupt changes and revolution, even though some dark clouds emerged at the end of the second de Guzmán-Niss term (see the next section).

One of the most significant changes during those years was the re-shaping of the ICMI Studies. First, their goals were clarified as being to provide a state-of-the-art account and review of the *problématiques* and topics chosen for the Studies, for which developments in research were to receive increased emphasis. Moreover, there was an increased uniformisation of the Study formats as regards the nature and role of their main components (see above): International Programme Committee—Discussion Document—Study Conference—Study Volume. There was a growing and widening interest and participation in the Studies, which considerably expanded the “ICMI family”. This was also meant to be stimulated by the fact that the relatively expensive Study Volumes were made available to individuals at reduced rates by agreements between ICMI and the publishers (first Kluwer, then Springer when they bought Kluwer). Unfortunately, however, these agreements were never as widely known or used as anticipated. Six Study Conferences were held during the Guzmán-Niss era, the resulting volumes being published in the *New ICMI Study Series* (Studies 6–11):

- *Assessment in Mathematics Education* (Calonge, 1991, resulted in two books)
- *Gender and Mathematics Education* (Höör, 1993)
- *What is Research in Mathematics Education and What are its Results?* (College Park, 1994)
- *Perspectives on the Teaching of Geometry for the 21st Century* (Catania, 1995)
- *The Role of the History of Mathematics in the Teaching and Learning of Mathematics* (Luminy, 1998)
- *The Teaching and Learning of Mathematics at University Level* (Singapore, 1998).

It was systematically attempted by the ICMI EC, during those years, to always have three Studies underway in different stages of completion at the same time: one for which the International Programme Committee has been appointed and the Discussion Document is in the process of being written; one for which the Study Conference is under planning; and one for which the Study Volume is being written and edited. (This resulted in having roughly three Study Conferences per four-year term of a given ICMI EC.) Along with the above-mentioned key purpose of an ICMI Study as being to capture and gauge the state-of-affairs and trends concerning

pertinent issues and topics, the Studies also had a dual purpose, namely, for ICMI to identify, shape and facilitate work with new foci.

During the de Guzmán-Niss era the *World Federation of National Mathematics Competitions* (WFNMC) was accepted as a new Affiliated Study Group (1994). On the personal initiative of de Guzmán, announced in his Presidential address at ICME-7, a so-called Solidarity Programme and Fund were established. At the same time it was decided to include a 10% Solidarity Tax on ICME conference fees as part of a concerted effort to reach out to new places and groups in mathematics education, in both geographical, socio-economic and cultural terms. Moreover, efforts were made by the ICMI EC to stimulate the creation of Sub-Commissions of ICMI so as to provide a bridge between ICMI and its member states and to compensate for the sometimes insufficient functioning of some country representatives. Finally, the *ICMI Bulletin* was consolidated both in format and publishing regularity during those years.

The ICMEs held during the de Guzmán-Niss terms were ICME-7 (Québec, 1992) and ICME-8 (Sevilla, 1996). As a reflection of the general growth of ICMI activities and undertakings, the time line for deciding upon and planning the ICMEs became extended considerably, roughly 5–6 years in advance. And in that respect, controversies and conflicts sometimes began to arise.

A look at the concurrent development of mathematics education as a field reveals an extension of its radius of action to encompass

- assessment;
- history and philosophy of mathematics and their impact on mathematics education;
- teacher education and professional development;
- students' and teachers' beliefs and affect in mathematics;
- socio-cultural factors influencing mathematics teaching and learning;
- equity.

New international journals were established in those years, including the *Mathematics Education Research Journal* (MERJ—1989), *Nordisk Matematikdidaktik* (NOMAD—1993), *ZDM—Mathematics Education* (1997), the *Journal of Mathematics Teacher Education* (JMTE—1998), *Mathematical Thinking and Learning* (MTL—1999), whilst some “national” journals became increasingly international, as was the case with the *Journal für Mathematik-Didaktik* (JDM—1980). Moreover many new ideas for Studies were in the pipeline by the end of 1998.

14.4 1999–2016: Calm Waters, but with “A Second Crisis” Around ICMI

With the election by the 1998 IMU General Assembly of Hyman Bass (President) and Bernard Hodgson (Secretary-General), an ICMI leadership duo once again took office for what turned out to be two consecutive terms (1999–2006). According to

the 2002 revision of the Terms of Reference for ICMI, “Secretary-General” was then instituted as the official title of what was previously named “Secretary”⁶—see Bass (2002). Right away the Bass-Hodgson era opened with some problematic issues that the new leadership had to deal with “on the first day in the office”.

As part of the transition from the previous era, it was assumed that ICME-10 was going to be held in Brazil (the planning of ICME-9, Makuhari/Tokyo, 2000, was already well under way). However, already in December 1998, the incoming ICMI President received a letter, signed jointly by the Brazilian representative to ICMI and the President of the Brazilian Mathematical Society, speaking against the possibility of ICME-10 being hosted by Brazil. This point of view was presented as being “shared by the Council” of the Society—see Soares and Cordaro (1998). Since holding an ICME requires the concerted effort of all relevant parties in a country, including of course the research mathematicians, this was in effect a veto statement. So, the new ICMI leadership had to work hard for several months to find an alternative host country, eventually persuading the so-called Nordic Countries (Denmark, Iceland, Finland, Norway and Sweden) to expedite previously expressed ideas to host ICME-11 in that region. Eventually, Copenhagen was chosen as the venue for ICME-10. This course of events urged ICMI to develop a more closely monitored bidding process for future ICMEs, including a 7-year in advance “preliminary declaration of intention of presenting a bid to act as host.” (Hodgson 2000, p. 14)

The other problematic issue, too, was a leftover from the previous term. At the 1998 ICM, held in Berlin, serious problems about the education section of the scientific programme occurred. Instead of accepting ICMI—IMU’s commission for mathematics education—as the responsible body for the education activities of IMU’s own ICM, the general Programme Committee for the congress designed these activities by itself. De Guzmán and Niss reacted vigorously to the IMU leadership, who agreed to sort things out for future ICMs together with the new ICMI EC. This was achieved during the Bass-Hodgson era.

The “ICM crisis” provided momentum to thoughts prevailing in some ICMI quarters about the justification of having ICMI as an organization living “inside” the IMU, leading to the question: “Should ICMI seek independence from IMU?”. Michèle Artigue, at that time Vice-President of ICMI, later returned to this issue in her Presidential address at the ICMI Centennial Symposium held in Rome in 2008:

Retrospectively this crisis was beneficial. It obliged the ICMI EC to deeply reflect about the nature of ICMI and what we wanted ICMI to be. This led us to reaffirm the strength of the epistemological links between mathematics and mathematics education. (Artigue 2008, p. 190)

⁶This change of nomenclature, to some extent of a trivial nature, is nonetheless related to the perception and understanding of the role attached to this position within the ICMI EC—see the Hilton episode discussed above.

So, there was, at the very outset of the Bass-Hodgson terms, an urgent need to re-establish a relationship of mutual understanding and respect between IMU and ICMI, and to reinvigorate links through concrete actions. This became a central objective of the ICMI EC. As a first step it was agreed that the ICMI President and Secretary-General would regularly be invited to the IMU EC meetings, whilst the IMU President or Secretary would attend ICMI EC meetings. However, the most marked outcome of the growing harmony and intensive collaboration between IMU and ICMI was a new constitutional foundation of ICMI as a commission of IMU. In fact a truly historic and unexpected change of the governance of ICMI took place during the years 2002–2006.

The 2002 IMU General Assembly requested a change in the election procedure of the IMU EC, introducing a Nominating Committee to produce a slate of proposals for the EC members. The first proposal of IMU was that this same Nominating Committee would also produce the slate for the ICMI election, but it was promptly stressed by the ICMI EC that this scheme would not pay sufficient attention to the specificity of ICMI and its community. The ensuing discussions eventually gave rise to an agreement between the IMU President John Ball and the ICMI EC, reached at the ICMI EC meeting during ICME-10 in 2004, leading to the introduction of a specific ICMI Nominating Committee whose task is to propose a slate to be voted on, not by the IMU General Assembly, but by the ICMI General Assembly. This major change of constitution was put before the following IMU General Assembly, held in 2006 in Santiago de Compostela Spain, which—after a rather fierce debate in which ICMI President Hyman Bass, in his capacity as a distinguished mathematician, played a crucial part—decided to adopt the proposed change. The first election according to the new scheme took place at ICME-11 in Monterrey in 2008, where the 2010–2012 EC was elected by the ICMI General Assembly.⁷

Another reflection of the improved relationship between ICMI and IMU was the so-called “Pipeline Project”, launched in 2004 on the request of IMU in order to chart the supply and demand for mathematics students and personnel in educational institutions and in workplaces. One task was to provide data for decision making and for a better understanding of the situation internationally. Reports were presented at ICME-11 (2008) and ICM-2010.

Several other new initiatives were taken during the Bass-Hodgson era. For instance collaboration with UNESCO, which because of funding problems had been rather dormant during the previous era, was renewed. The two organisations thus collaborated on establishing the travelling exhibition “Experiencing Mathematics”, which was launched at ICME-10 in 2004 and was thereafter visited by around 1 million pupils, students, teachers and parents in 50 cities in 20 countries. There were also actions towards reinforcing the links with *L’Enseignement Mathématique*,

⁷Consecutive 3-year terms of office for the 2007–2009 and 2010–2012 ICMI ECs allowed transferring the election year from the IMU to the ICMI General Assembly.

the official organ of ICMI since its inception in 1908, notably through a joint *L'Enseignement Mathématique*-ICMI symposium held in 2000 to celebrate the first one hundred years of the journal, established in 1899—see Coray et al. (2003).

At a late stage in the last term of de Guzmán and Niss, the ICMI EC had received a proposition to establish ICMI awards so as to recognise outstanding contributions to mathematics education research and development.⁸ The proposition was carried over to the first Bass-Hodgson EC, which decided to establish two ICMI Awards, named after legendary ICMI Presidents: the Felix Klein Award, honouring lifetime achievement, and the Hans Freudenthal Award, honouring a major cumulative programme of research. These awards are awarded in odd-numbered years, from 2003 on.

The ICMI Study Series was continued during the Bass-Hodgson terms with Studies 12–17, thus pursuing the rhythm of having three Studies in progress at a given time:

- *The Future of the Teaching and Learning of Algebra* (Melbourne, 2001)
- *Mathematics Education in Different Cultural Traditions: A Comparative Study of East Asia and the West* (Hong Kong, 2002)
- *Applications and Modelling in Mathematics Education* (Dortmund, 2004)
- *The Professional Education and Development of Teachers of Mathematics* (Águas de Lindóia, 2005)
- *Challenging Mathematics in and Beyond the Classroom* (Trondheim, 2006)
- *Digital Technologies and Mathematics Teaching and Learning: Rethinking the Terrain* (Hanoi, 2006).

On the organisational side, the *International Study Group for Mathematical Modelling and Applications* (ICTMA) was adopted as a new Affiliated Study Group in 2003, and several ICMI Regional Conferences were held, including the *Conferencia Interamericana de Educación Matemática* (CIAEM—launched in the 1960s), the *ICMI-East Asia Regional Conference in Mathematics Education* (EARCOME—1998, but originating from a series started in 1978), *Espace Mathématique Francophone* (EMF—2000), based on the notion of a “region” being conceived in linguistic terms, and the *Africa Regional Congress of ICMI on Mathematical Education* (AFRICME—2005).

Having in mind to pave the way for a smooth transition to the new governance structure, a new EC was established by the 2006 IMU General Assembly for a 3-year term, 2007–2009. Former Vice-President Michèle Artigue was elected not only as the first female ICMI President ever,⁹ but also as the first President in the “New ICMI” era, inaugurated in 1952, whose credentials are primarily based on the reputation as a mathematics educator rather than as a classical research

⁸The idea of having “a medal (or possibly two) to be awarded to someone who has made an outstanding contribution to mathematics education” had been raised earlier by ICMI Secretary-General Howson (1982, p. 8).

⁹But certainly not the last, as Jill Adler was elected ICMI President for 2017–2020 at ICME-13.

mathematician. To ensure continuity from the past to the future, Bernard Hodgson was exceptionally asked to serve as the Secretary-General for a third term, also a complete novelty since the time when Henri Fehr (1870–1954) served for decades as Secretary-General of the “Old ICMI”.

This term saw further consolidation of established ICMI activities. Thus ICMI Studies 18 and 19 were conducted:

- *Statistics Education in School Mathematics: Challenges for Teaching and Teacher Education* (Monterrey, 2008), organised jointly with IASE, the International Association for Statistical Education
- *Proof and Proving in Mathematics Education* (Taipei, 2009),

and ICME-11 was held in Monterrey (2008), for the first time in a country outside what used to be called the “First World”.

It was in this very eventful term that the ICMI Centennial 2008 was celebrated in Rome in a symposium organised in Palazzo Corsini, home of the Accademia Nazionale dei Lincei and the very birthplace of ICMI at the 1908 ICM. The centennial is commemorated in the symposium proceedings, edited by Menghini et al. (2008).

The year 2008 also saw the inception of a new ICMI project whose subsequent underpinnings are related to the thematic session on the *Legacy of Felix Klein* held at this congress. The Klein project stems from a proposal made by Vice-President Bill Barton, at the first meeting of the 2007–2009 ICMI EC, to foster the promotion of mathematics through the revisiting of Felix Klein’s famous *Elementary Mathematics from an Advanced Standpoint*, originally published in 1908—see ICMI EC Minutes (2007, p. 1). The aims of the project are to produce resources for secondary teachers about contemporary mathematics, so as to help them make connections between their teaching and the field of mathematics as a living subject.

At that same ICMI EC meeting, a decision was made to launch an electronic newsletter for prompt, efficient and brief communication with the community, a project that had already been considered for a while, partially inspired by the *IMU-Net* initiated in 2003. The first issue of *ICMI News* appeared in December 2007. The aim of this new and “light” channel of communication was to complement the *ICMI Bulletin*, which retained interest in a long-term archival perspective, but whose size and scope, since the turn of the century, had become more ambitious while its appearance was more erratic, as only ten issues were published between 1999 and 2009. Less than a year after its launching, *ICMI News* had more than a thousand subscribers. Also in the year 2009, the project of updating the ICMI website, which had been in progress for a few years, was finally completed. (The initial version of the ICMI website, originally a mere page on the IMU server, went back to 1995.)

New Terms of Reference for ICMI were adopted in 2009. The Terms themselves, under the jurisdiction of the IMU EC, are accompanied by Guidelines, concerning some ICMI internal rules of operation. For instance the definition of the ICMI General Assembly and the voting rights therein are part of the Terms,

whereas the details of the ICMI EC election procedure are under the jurisdiction of the ICMI General Assembly. With the 2009 revision of the Terms of Reference, the traditional notion of an Affiliated Study Group was extended and generalised to that of an *Affiliate Organisation*. The *International Group for Mathematical Creativity and Giftedness* (MSG) was accepted in 2011 as the sixth ICMI Affiliated Study Group, whilst existing multi-national mathematical education societies became affiliate organisations shortly after the adoption of the new scheme: CIAEM (2009), CIEAEM (2010), the *European Society for Research in Mathematics Education* (ERME—2010) and the *Mathematics Education Research Group of Australasia* (MERGA—2011).

A new EC was elected for a 3-year term, 2010–2012, at ICME-11 in Monterrey (2008) with Bill Barton as President and Jaime Carvalho e Silva as Secretary-General. Under their leadership, ICMI Studies 20 and 21 were conducted:

- *Educational Interfaces between Mathematics and Industry* (Lisbon, 2010), organised jointly with the International Council for Industrial and Applied Mathematics (ICIAM)
- *Mathematics Education and Language Diversity* (Águas de Lindóia, 2011).

ICME-12 was held in Seoul in 2012, and the Klein Project underwent considerable development.¹⁰ Moreover it was decided at the 2011 EC meeting to launch the *Database Project*, with the ultimate goal of building a free access database of mathematics curricula from all over the world.

This EC also saw, in 2011, the inauguration of the IMU Secretariat in Berlin, where a position of ICMI Administrator had been established. This event turned out to be a major change in the daily maintenance of ICMI business thanks to the most welcome support thus provided to the work of the EC.

But probably the most significant new development in the Barton-Carvalho e Silva era was the launching in 2010 of the so-called CANP (*Capacity and Networking Project*), meant to stimulate outreach to developing countries by fostering networking amongst teachers, mathematics educators and mathematicians within a given region. The project emerged as a joint initiative of ICMI and UNESCO, spurred by the renewed collaboration that had started in the early 2000s with the exhibition “Experiencing Mathematics” (see above). As a result of the regular links that then arose between the two bodies, UNESCO invited in 2009 ICMI President Michèle Artigue to pilot the preparation of a White Paper on *Challenges in basic mathematics education* (UNESCO 2011). Inspired by the recommendations of that document, UNESCO proposed to ICMI during the year 2010 to organise an event in Africa aiming at “reinforcing teacher education

¹⁰At the time of writing, more than 20 “Klein Vignettes” have been produced, each being a short piece on a selected mathematical topic likely to be new to most secondary teachers and typically requiring some undergraduate mathematical knowledge. Some vignettes are available in different languages.

capacities, building synergies between communities, and reinforcing South-South collaboration” (Artigue 2017). Led by the incoming President Barton, the ICMI EC developed, jointly with UNESCO, the CANP model, of which the first event actually took place in Africa in 2011.

Five CANP workshops—each with a follow up meeting held about a year later—took place in the period 2011–2016 (which goes into the term of the next ICMI EC):

- two in Africa: Mali (2011) and Tanzania (2014);
- two in Latin America: Costa Rica (2012) and Peru (2016); and
- one in South East Asia: Cambodia (2013).

These workshops and follow up events gathered more than 400 participants from more than 25 developing countries in five regions—see Koch (2016), a preliminary report on CANP by the ICMI Administrator. CANP is considered within ICMI as a most successful endeavour, notably with regard to the improvement in the individual scientific capacity of the participants, as well as to the fostering of regional network building—data supporting this view are provided in (Koch 2016, 2017).

The organisation of CANP workshops could be considered somewhat expensive, as the average cost per workshop for ICMI is of the order of 50,000 € (in addition to funding and support from local sources). However the cost per participant for these two-week workshops is very low. Moreover more than 85% of these expenses up till now have been covered by special grants, mainly from IMU but also from the International Council for Science (ICSU) and UNESCO (Koch 2016). In spite of the substantial amounts involved, the ICMI EC clearly finds the cost worth the while because of the most significant outreach impact obtained.

After the two 3-year terms, it was now time to go back to the usual 4-year terms. At the ICMI General Assembly in Seoul, 2012, a new ICMI EC was elected for the term 2013–2016, with Ferdinando Arzarello as President and Abraham Arcavi as Secretary-General. A major decision made by the EC was the establishment, announced early in 2015, of a third ICMI Award, the Emma Castelnuovo Award honouring excellence in the practice of mathematics education, to be awarded every four years, starting in 2016 at ICME-13 (Hamburg). The Arzarello-Arcarvi era also saw ICMI Studies 22 and 23:

- *Task Design in Mathematics Education* (Oxford, 2013)
- *Primary Mathematics Study on Whole Numbers* (Macau, 2015).

as well as the adoption by the EC of *Guidelines for conducting an ICMI Study* crystallising the goals and process of an ICMI Study (Arzarello et al. 2014, p. 83).

Regarding communication with the ICMI community, this new EC decided, at its very first meeting in 2013, to officially discontinue the production of the *ICMI Bulletin* (Arzarello et al. 2014, p. 92). The previous EC had supported in principle the importance of the role played by the *Bulletin*, but in practice no issue had been published during its term of office. The Arzarello-Arcarvi EC aimed at improving the use of *ICMI News* as the main communication channel, notably by producing a

more sophisticated version of the journal (still in a brief style), and also aimed at reinforcing the collaboration with *L'Enseignement Mathématique*.

14.5 ICMI and the Field of Mathematics Education

In this paper we have attempted to link a brief account of ICMI's organisational history to a portrayal of ICMI as a facilitator of international cooperation and collaboration in mathematics education in a broad sense. ICMI can be perceived as a body that reflects, and reflects on, important developments in mathematics education as a field of research and development. ICMI can also be perceived as a body that takes initiatives to identify new issues and needs in mathematics education and provides a platform for the exploration and unfolding of these issues and demands.

Thus, ICMI has engaged in a symbiotic relationship with mathematics education. However, it is important to understand that for the past half century, ICMI was never a body taking political stances on pertinent issues, e.g., by passing resolutions and making particular educational recommendations.¹¹ Nor was ICMI ever a managerial body that tried to “rule over” mathematics education. Since mathematics education is—of course—about mathematics, a key theme throughout those five decades has been to create and maintain strong and mutually respectful links between mathematics and mathematics education, and between research mathematicians and mathematics educators.

The half century covered by this paper has been an epoch of expansion and enlargement in a multitude of different respects. There is every reason to believe that thanks to new generations of concerned, committed and competent ICMI officers, new land will be reclaimed and charted during the next fifty years.

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¹¹In the words of ICMI President Kahane, then speaking of the ICMI Studies, one should not expect, as a result of ICMI endeavour, “any ICMI-labelled solution to any educational problem” (Kahane 1990, p. 3).

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