Chapter 9
ICMI, The Resilient Nucleus of the IMU

Today the *International Commission for Mathematical Instruction* (ICMI) is by far the most prolific of the three commissions of the IMU. But treating ICMI just as a commission of the current IMU misses its peculiar historic significance. Rather than being a daughter of the mother union IMU, ICMI is the IMU's elder sister. An elder sister opens doors; she calls to reason; her presence makes you feel that she was there before.

ICMI celebrated the centennial of its creation in 2008.[1] As we have seen in Part II of this book, the first IMU was founded only in 1920. Since it did not survive the 1930s, a second IMU had to follow suit, but there "has been some confusion over whether the Union came again into being in 1950, 1951, or 1952."[2] The history of ICMI has its own discontinuities and uncertainties as well. Most of them are intimately connected with the fate of the first IMU. Roughly speaking, ICMI was hibernating when the first IMU was alive. This alternating activity of the first IMU and ICMI was a corollary of the politics of exclusion of the old IMU and the fact that German participation had strongly marked the work of ICMI until World War I.

In spite of these discontinuities of ICMI's history, some chroniclers of that commission have presented aspects of its history by way of variations on the theme of *longue durée*. The latter approach to history, developed by the historians of the *Annales* school, insists on the long-term evolution of structural historical patterns. In contrast, those reporting on the activity of ICMI tend to orient their accounts according to influential mathematicians who have left their footprints both in the history of Mathematics International in general and in ICMI. At the beginning of Section 1.3, for example, we have already quoted Hyman Bass's generous division of ICMI's first 100 years into the 'Klein Era', from 1908 to World War II, and the 'Freudenthal Era', post World War II until 2008, thereby blissfully skipping over the fact that both Felix Klein and Hans Freudenthal died some 20 years before the end of 'their' period.

[1] See the proceedings of the splendid centennial conference in Rome, [Menghini et al. 2009].

[2] See [Lehto 1998], p. 88.

N. Schappacher, *Framing Global Mathematics*,
https://doi.org/10.1007/978-3-030-95683-7_9

Trying to do justice to the history of ICMI in a brief survey, there is thus the dual difficulty of finding a fitting periodization and of doing justice to individual actors, whose activities often span a broad variety of fields: as research mathematicians, as organizers of international enterprises, or as colleagues interested in mathematical instruction at various levels. Highly distinguished researchers may have strongly divergent ideas about the teaching of mathematics. For instance, Henri Fehr, Heinrich Behnke, Marshall Stone, Hans Freudenthal, and Hyman Bass, to name but them, have all played crucial roles for ICMI, but we cannot do justice to any of these personalities in this book. If framing mathematical excellence is one of the given duties of the IMU, many key mathematicians of the past century and a half have also taken questions of mathematical teaching to heart, both in their own countries and on a global scale. This concern has time and again connected with the grassroots activities of teachers and experts on the teaching of mathematics.

The modest goal of this short chapter is thus to present a condensed overview of the development of ICMI. This task is both facilitated and rendered more difficult by the overwhelming amount of literature about ICMI that has been published over the years. In what follows we will quote from just a few of these texts. Another excellent way to get into the history of ICMI is by exploring the timeline webpage prepared on the occasion of the centennial of ICMI by Livia Giacardi.[3]

From the Early Start in 1908 to World War I. ICMI is the only international association that was founded at an ICM before World War I. This happened at the 1908 ICM in Rome.

> The idea of an International Commission to enquire into mathematical education was first suggested in 1905 by the American David Eugene Smith [1860–1944], in *L'Enseignement Mathématique*, the revue founded in 1899 by Henri Fehr and Charles Laisant [1841–1920]. A formal proposal was considered at the Fourth International Congress of Mathematicians held in Rome in April 1908 and it was resolved to establish the *Commission internationale de l'enseignement mathématique* (CIEM or, as its anglicized form now is, ICMI).[4] The first president was the great German mathematician, Felix Klein, and the first Secretary-General, Henri Fehr. .....
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> The reasons for the formation of ICMI at that particular period are not hard to perceive. The educational systems of the major countries of Western Europe and North America had expanded during the early years of the century, new technologies set new demands, and innovators had attempted to carry out significant reforms of the (grammar) school mathematical curriculum. In Germany, Klein gave the lectures now known to us as *Elementary Mathematics from an Advanced Standpoint*, in France, a government decree of July 1905 invited 'teachers to follow a method entirely new in geometry', and in England, as a result of the efforts of John Perry [1850–1920] and others, Euclid's rule came to an end (not the spirit of Euclid, which Dieudonné was later to deplore, but the use of his *Elements*). Perry, indeed, wanted far more than just the reform of geometry. He laid stress on making mathematics useful and on linking its teaching with that of science and engineering: he argued for 'utility'

[3] See [URL 23].

[4] Added by N.Sch.: At the time, the commission would be known in the English speaking world as the *International Commission on the Teaching of Mathematics* (ICTM); in Germany as the *Internationale Mathematische Unterrichtskommission*, or IMUK for short; in Italy as the *Commissione Internazionale dell'insegnamento matematico*.

> rather than 'rigour', laboratory-based experience rather than abstraction. His influence was worldwide, ranging from the U.S.A. to Japan, whilst German educators coined the term *Perryismus*.[5]

The Central Committee of ICMI consisted of Klein, Fehr, and George Greenhill as Vice-President.

> Why these three persons? Klein was an entirely understandable choice given his reputation as a mathematician and his active involvement in the German reform movement. The Swiss Henri Fehr was likewise obvious: As editor of *L'Enseignement Mathématique*, he was well informed about national developments in mathematics teaching and about persons active in this field. But why George Greenhill? He was an applied mathematician at the Royal Artillery Institution in Woolwich, but was retired and had not been known to be involved in questions of school teaching. . . . He seems to have been nominated for purely political reasons: Smith gave as a reason that Britain would host the next ICM.[6]

At a first get-together of the Central Committee in September 1908 in Cologne, to which Klein also invited Walther Lietzmann (1880–1959) as his assistant, a work plan was drawn up. In the early stage the Commission counted on 18 member countries. The core outcomes of the Commission were detailed reports about the educational system and the teaching of mathematics practiced in the member nations:

> The main work of the Commission at this time was . . . the preparation of a vast survey of teaching practices in member countries. Each participating country appointed a sub-commission to prepare national reports, often in many volumes, and the result was outstanding both in terms of quantity and quality. Thus, for example, the French report ran to five volumes and that of the U.S.A. to eleven. The British contributed only two volumes, but the first of these had over 600 pages! Certainly, nothing on the same scale had been attempted before, or has been attempted since. Moreover, not only did countries comment on their own systems: but, for example, as part of the German contribution G. Wolff . . . wrote a fascinating account of secondary education in England, . . . which still remains a model of a successful comparative case study. That its delayed publication should have taken place in 1915 when the two countries were locked in battle is just one further bewildering and poignant fact to be recorded from those years.[7]

The flow of national reports was held together by regular international meetings.

> [T]he proper work of the Comité Central and of the Commission as a whole progressed remarkably well. The CC met every year, and from 1910 on, there were general meetings of the entire Commission. . . . thematic reports were prepared, presented, and discussed in Brussels (1910), Milan (1911), Cambridge (1912), and Paris (1914), the last report having been prepared at a 1913 meeting of the CC in Heidelberg . . . The climax of these activities was the Paris meeting. It was prepared in the most intense manner; it had the best participation and the most vivid discussions. There was even a satellite congress on philosophy of mathematics. It is legitimate, therefore, to speak of the work of the Commission before the First World War as a success story.[8]

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[5] See [Howson 1984], pp. 75–76.

[6] From G. Schubring's account of the early years of ICMI in [Menghini et al. 2009], p. 115.

[7] See [Howson 1984], pp. 77–78.

[8] From G. Schubring's account in [Menghini et al. 2009], p. 119.

The 1911 meeting in Milan was the first plenary meeting of the commission. The subsequent congress in 1912 was held on the occasion of the Cambridge ICM.[9] By April 1914, the following countries were represented in ICMI: Australia, Austria, Belgium, Brazil, Bulgaria, Cape Colony (South Africa), Denmark, Egypt, France, Germany, Greece, Holland, Hungary, Italy, Japan, Mexico, Norway, Portugal, Rumania, Russia, Serbia, Spain, Sweden, Switzerland, the UK, and the USA.[10]

From One World War to the Other. We have seen in Section 3.1 above how Felix Klein, the president of the commission, compromised himself very early on in the Great War by being the only mathematician to sign the infamous German *Aufruf* "To the Civilized World." And in Section 3.2 we have seen examples from France of the intellectual warfare in the academic realm. It is therefore hardly surprising[11] that Henri Fehr published the following note about the commission already in the 1914 volume of *L'Enseignement mathématique*, in which he explicitly alludes to the academic mindset at the beginning of the war.

> The European war affects the international institutions severely. In the countries at war and their neutral neighbors all of the nation's capable men are mobilized. This makes it factually impossible to continue working as before, with the help of many collaborators. The works of peace like ours have to stand back. Besides, as they follow a common, freely chosen ideal, they require a goodwill for union that would be impossible to ask from scholars in a period as troubled as the one we are going through. Our work will inevitably be put on hold. We hope this will not be for long.
>
> Under these circumstances it is understood that a meeting of the *Commission internationale de l'enseignement mathématique* in 1915 is out of the question, and the *Comité central* finds itself obliged to adjourn its projects.
>
> H. Fehr, Secrétaire général de la Commission.[12]

By the end of the war, as we know, the scene for Science International had changed completely, and brought about the creation of the *International Research Council* in 1919 under inter-allied rule, based on the exclusion of colleagues from the central powers. Under this new regime, the (first) IMU was created and the Strasbourg ICM was held in September 1920—see Chapter 4 above. Recognizing this newly imposed politics of exclusion, Fehr announced the dissolution of ICMI in July 1920, even before the official founding of the first IMU.[13] As a result, the commission was already defunct when the first IMU was created, and no mention of earlier achievements of ICMI can be found in the Proceedings of the Strasbourg ICM.

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[9] For more information on this meeting, see the ICMI History website [URL 24].

[10] See *L'Enseignement mathématique* 16 (1914), p. 166

[11] I thus beg to differ from Gert Schubring's account, which scolds Fehr for his "one-sided actions"—see [Menghini et al. 2009], pp. 120–124, as well as [Schubring 2008].

[12] See *L'Enseignement mathématique* 16 (1914), pp. 477–478; my translation from the French.

[13] See *L'Enseignement mathématique* 21 (1920), pp. 137–138.

Yet, several national subcommittees of ICMI kept working. Since the original ICMI was essentially based on the coordination of input prepared by the various national subcommittees, what was lacking in the early 1920s was primarily the international networking between them.

In fact the elder sister of the IMU was just hiding in the closet during those years, waiting to step out once the exclusionist wave had passed. As we know—see Section 4.4.3 above—this happened in 1928 at the Bologna ICM. Henri Fehr was there, of course; he had participated at every single ICM since the first one in 1897. In 1924 in Toronto, he had been elected one of the Vice-Presidents of the IMU, and in Bologna he acted as secretary of the unofficial IMU General Assembly that congratulated Pincherle on having ended the exclusionist politics, against the resistance of the IMU Secretary General.[14]

And at the same ICM in Bologna, on Wednesday, 5 September 1928, Henri Fehr presented before Section VI of the Congress a fairly detailed report on the activities of ICMI since its foundation in 1908.[15] The discussion following his presentation pleaded for a revival of the commission. As if this was already done, the report bestowed on Fehr the title of "Segretario generale della Commission Internationale de l'enseignement mathématique."[16] At the same ICM, Nilos Sakellariou (1882–1955) from Athens presented a *Projet pour la constitution d'une commission internationale pour l'enseignement des mathématiques*.[17]

Since the first IMU was liquidated at the 1932 ICM in Zürich, it was only during the four years 1928–1932 that the first IMU and ICMI coexisted. However, the *Commission internationale de l'enseignement mathématique* was never a commission of the first IMU. It worked as autonomously as in the first years of its existence. However, there were no yearly congresses devoted to the teaching of mathematics any more, as had been the case before World War I. There were only the corresponding sections at the ICMs in 1932 and 1936. At these ICMs, both in Zürich and in Oslo, the mandate of ICMI and its Central Committee were renewed; a renewal that had to be understood to be valid until the next Congress. This is why Henri Fehr could claim in 1952 that the commission was still in existence. Fehr had been the Secretary-General of ICMI (when it existed), ever since its creation in 1908. After Klein's presidency, which may be said to have officially ended with the dissolution

[14] See Proceedings ICM 1928, Vol. I, p. 83. The assembly was unofficial because it had not been convened by Gabriel Kœnigs, the Secretary General of the IMU. Cf. Section 4.4.3.2 above.

[15] See Proceedings ICM 1928, Vol. I, pp. 106–113. The impressive count of the publications of the various countries for ICMI can be seen at [URL 25].

[16] See Proceedings ICM 1928, Vol. I, p. 113.

[17] See Proceedings ICM 1928, Vol. III, pp. 157–158.

of ICMI in 1920, D.E. Smith stepped in as president in 1928, followed by Hadamard as of 1932.[18]

Starting Afresh in 1952. At the first General Assembly of the newly created IMU, which was held in Rome in March 1952, ICMI was reborn as a permanent subcommission of the IMU. Precise terms of reference for ICMI were adopted at the 1954 General Assembly in The Hague. We have described in Sections 7.2.3 and 8.1 the global constellation that stood at the cradle of the new IMU after World War II. Among other factors, we mentioned the new branches of applied mathematics which had emerged from war-related research and continued to mark the image of the sciences during the Cold War. That this general background also marked the timely reincarnation of ICMI can be felt, for instance, in a remark made by Marshall Stone, the first president of the new IMU, in his report before the 1952 General Assembly:

> The problem of determining the place of mathematics [in society] cannot be divorced from technical considerations concerning teaching methods. If we judge by the results, we must find it difficult to escape from the conclusion that our attempts to teach mathematics as part of a program of mass education have so far been, to put it bluntly, a colossal failure, traceable to our ignorance and complacency in respect to the art of teaching.[19]

Contrary to the work model of the old commission, national subcommittees—to the extent that they still existed at all—would no longer play a major role in the activities of the new ICMI. What shaped the new ICMI most decisively during its first two decades were the personalities and politics of its successive presidents—the only exception being the rather passive Albert Châtelet, who was president from 1952 to 1954, when he was about 70 years old. Heinrich Behnke first was ICMI Secretary-General under Châtelet and then served as president from 1955 to 1958. He was followed by Marshall Stone himself, who had been Vice-President under Behnke. From Stone, André Lichnerowicz (1915–1989) took over in 1963. Hans Freudenthal chaired ICMI from 1967 to 1970, and would continue to serve on ICMI's Executive Committee—as it was called since the commission's reincarnation in 1952—through 1974.

During their mandates, Behnke and Freudenthal had to sort out the relation between ICMI, the IMU, the ICMs, and the mathematical community at large, with a view to obtaining a reasonable autonomy for ICMI. In this endeavour Freudenthal would be more aggressive than Behnke. The latter's orientation was largely guided by his high esteem for Felix Klein, but he was well aware of the fact that he could not measure up to Klein's omnipresent role on the national and international scenes

[18] See [Lehto 1998], p. 316. For the composition of ICMI and its CC, and for the reports delivered in the 1930s, see also [URL 25], as well as [Howson 1984], pp. 79–80, and [Hollings & Siegmund-Schultze 2020], pp. 231–234.

[19] We take this quote from the first section of [Furinghetti & Giacardi 2022]. This article, which the authors have graciously allowed me to read when it was in the making, is my main source for the account given here of the first twenty years of the new ICMI.

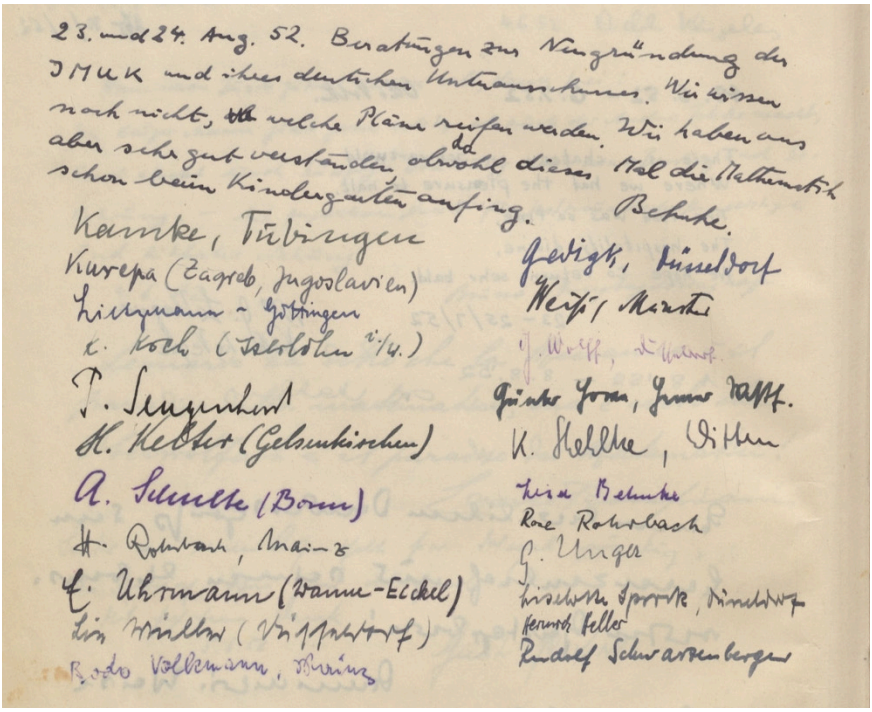

Fig. 9.1 Entry in the Oberwolfach Guestbook of a meeting about the renewal of (the German subcommittee of) ICMI, held in Oberwolfach, 23–24 August 1952. Behnke writes: "Debates about the refoundation of IMUK and of its German subcommittee. We do not know yet which plans will come to fruition. However, we did get along well with each other, although/because this time mathematics started as early as the *kindergarten*."

of the past. During his mandate he tried, with modest success, to render ICMI less dependent on the IMU, and he was the first to open up ICMI for educational debates of the time.[20]

> In the USA the University of Illinois Committee on School Mathematics (UICSM), headed by Max Beberman [1925–1971], was established in 1951. In the years that followed there were further initiatives in mathematics education and, eventually, the launch of the Soviet Sputnik in October 1957 persuaded the United States Congress to designate an unprecedented amount of dollars for science education. This event also led the OEEC—created to administer the funds allocated by the United States (Marshall Plan) to rebuild Western Europe after the Second World War—to deal with problems relating to the teaching of science and mathematics. . . .
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> In 1958 the American mathematician Edward Begle was appointed director of the School Mathematics Study Group (SMSG), the largest and most influential of the so-called New Math curriculum projects in the USA. SMSG published and distributed extensive collections of books and films for teachers as well as a series of monographs for students, the New Mathematical Library. American educators feared that the Soviet Union was surpassing

[20] Cf. [Furinghetti et al. 2020].

> the United States in educational emphasis on science and mathematics, so in September 1959 a conference was held at Woods Hole on Cape Cod in the USA with the aim of improving science education in primary and secondary schools, bringing together scientists, mathematicians, educators, biologists, psychologists and other professionals. . . .
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> In Europe, the Bourbaki group, which beginning in the 1930s had attempted to generalize, formalize, and unify all of pure mathematics, stimulated the emerging of the movement usually known as Modern Mathematics. Among the promoters were Dieudonné, Choquet, and Lichnerowicz, founding members of CIEAEM [*Commission Internationale pour l'Étude et l'Amélioration de l'Enseignement des Mathématiques*].
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> On 28 May 1958, during the meeting of the Executive Committee of ICMI in Münster-Westfalen, Kay Piene, Member of ICMI, proposed, among the topics to be discussed by the Commission in the period 1959–1962, the study of which themes and applications of modern mathematics might find a place in the teaching programs of secondary schools.[21]

Stone and Lichnerowicz were open to projects beyond the traditional scope of ICMI or the IMU, establishing contacts with other institutions. Specifically, Stone chaired the Inter American Conference on Mathematical Education (Bogotà, 1961), which would be affiliated to ICMI as an effective regional group in 1965, and the momentous seminar at the Centre Culturel de Royaumont in 1959, where the introduction of Modern Mathematics in secondary instruction was amply discussed. On the other hand, when it came to adopting new Terms of Reference for ICMI in 1960, Stone was instrumental in mitigating Behnke's original draft, which had envisaged a greater independence for ICMI. In the end, ICMI was allowed as of 1960 to "cooperate, to the extent it considers desirable, with effective regional groups which may be formed spontaneously, within, or outside, its own structure", and it was stipulated that the "Commission may, with the approval of the Executive Committee of IMU, coopt, as members of ICMI, suitably chosen representatives of non-IMU countries, on an individual basis."[22]

These activities of ICMI reflect the general pattern of international associations that had emerged after World War II—see Sections 8.1.1 and 8.1.2 above.

> In the 1960s the action of ICMI broadened considerably: thanks to Stone and Lichnerowicz, collaborations both scientific and organizational were established with other associations such as OEEC (Organization for European Economic Cooperation) and UNESCO (United Nations Educational Scientific and Cultural Organization). These led to a greater internationalism and to the organization of numerous thematic congresses in various parts of the world.[23]

One should add here a reminder of analogous concerns with questions of science instruction, not just on the level of the IMU, but of ICSU, thus potentially pertaining to all the sciences. We have already alluded to this, and to the precocious role of ICMI in that respect, in Section 8.1.2 above.

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[21] See [Furinghetti & Giacardi 2022], Section 5.2.

[22] The quotes are from points (f) and (g) of the 1960 Terms of Reference. See [Furinghetti & Giacardi 2022], Section 5.3.

[23] See [Furinghetti & Giacardi 2010], pp. 16. Again, these activities are discussed in detail in various sections of [Furinghetti & Giacardi 2022].

> There are few indications of major concern with science education in ICSU in its early years. The role of Unesco in stimulating ICSU's interest in education and training appears to be primordial. One of the first of Unesco's long series of publications on science education entitled *Suggestions for Science Teachers in Devastated Countries* appeared in 1948. Unesco's own interest in science education was particularly stimulated by a meeting of experts convened in 1950 to examine the place of science in general education. The fifth General Conference of Unesco in Florence in 1950 invited Member States "to develop teaching in the Natural Sciences and the dissemination among the adult public of knowledge of the methods, discoveries and applied uses of these sciences." This General Conference also drew attention to the importance of the interactions between science and society, to the application of science to the solution of urgent problems and to the need to study different methods for the popularization of science. One of the activities that developed in this field was the organization of travelling exhibitions, the first of which showed recent discoveries in physics and astronomy and was visited by almost half a million people in Latin America. . . .
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> While these developments had been taking place in Unesco the interest in ICSU and the Scientific Unions had also been developing. Initially this was on the basis of individual science teaching commissions in the Unions, of which the . . . [ICMI] appears to have been the first and predated Unesco. . . .
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> In 1961 ICSU created an Inter-Union Commission on Science Teaching (IUCST) which organized in Dakar in 1965 a congress on Science Teaching and Economic Progress. Its second congress, on the Integration of Science Teaching, began a series on integrated science education that continued in close association with Unesco for more than a decade. At the Dakar Congress the IUCST made cooperative agreements with the Sector for Science and Education of Unesco. The commission worked closely with Unesco during its existence and played an important role in the development of integrated science teaching.[24]

Freudenthal's presidency 1967–1970, which followed his presence as a member of the Executive Committee since 1963, marked a major turning point in the history of the commission, both from an organizational point of view and for the objectives of ICMI. It was on Freudenthal's initiative—about which the IMU was not informed ahead of time—that ICMI decided to hold congresses that were separate from the ICMs, and to create a new journal exclusively devoted to mathematics education.[25] The first issue of the new specialized international journal *Educational Studies in Mathematics* (ESM) appeared in May 1968. The traditional press of ICMI, *L'Enseignement mathématique*, continued to appear, publishing a wide range of articles, only few of which were devoted to questions of mathematical instruction. The first International Congress on Mathematical Education (ICME) was held in August 1969 in Lyon, France.

Both in the first two decades of ICMI's life as a commission of the IMU and afterwards, there were tensions between the two sisters. During Freudenthal's presidency they are particularly tangible in the correspondence that is preserved in the archives of the IMU and ICMI.[26] As usual, such disputes tend to be a mixture of personal and structural issues. For this brief overview, let us single out one structural source of potential discord between many working mathematicians and colleagues engaged

[24] See [Baker 1986], pp. 15–16.

[25] I am paraphrasing a passage from the conclusion of [Furinghetti & Giacardi 2022].

[26] See [Furinghetti & Giacardi 2022] for a few telling examples.

with ICMI: the increasing professionalization, since the late 1960s, of the domain that deals with questions of teaching.

Didactics as a Discipline. In the forthcoming paper [Furinghetti & Giacardi 2022], the authors illustrate the beginning of the new discipline by listing a few institutions created in the late 1960s and early 1970s in Europe: In 1967 the *Nordic Committee for the Modernization of School Mathematics* (Denmark, Finland, Norway, and Sweden) presented a new syllabus inspired by New Math. In 1968 the *Zentrum für Didaktik der Mathematik* was founded in Karlsruhe, Germany. In 1973 the *Institut für Didaktik der Mathematik* (IDM) was founded in Bielefeld, Germany. Starting from 1969 the first French IREMs (*Instituts de Recherche sur l'Enseignement des Mathématiques*) were established in Paris, Lyon, and Strasbourg. In 1971 Hans Freudenthal himself founded the *Institut Ontwikkeling Wiskunde Onderwijs* (IOWO), i.e., the Institute for the Development of Mathematics Instruction, at the University of Utrecht. Today it is simply called the *Freudenthal Institute*.

Focussing more on the content, the emergence of new issues in mathematics education has been described under the heading *ICMI Renaissance* in a separate chapter of the centennial proceedings, authored by Fulvia Furinghetti, Marta Menghini, Ferdinando Arzarello, and Livia Giacardi.[27] We quote a few extracts from this chapter in order to illustrate characteristic subjects discussed at the first ICMEs. The first reference, from Section 4.1 of that chapter, starts out from the *Commission Internationale pour l'Étude et l'Amélioration de l'Enseignement des Mathématiques* (CIEAEM), which has already been mentioned once above. This International Commission was founded in 1952 around a Europe-based collaboration between mathematicians, psychologists such as Jean Piaget (1896–1980), pedagogues like Caleb Gattegno (1911–1988), and secondary-school teachers. As an organization, it is independent of both ICMI and the IMU.

> [O]ne of the main features of the activity of CIEAEM . . . was the use of concrete materials. This topic has a great emphasis in ICME-1 (1969) and ICME-2 (1972).
>
> In various contributions to ICME-1 we find mention of games, worksheets, films, manipulatives, even the 'modern' overhead projector, which allowed lessons to be prepared in advance, to perform movements and overlapping. . . .
>
> We agree with Howson's opinion that educators look at the 1960s as the period of New Math, but that actually the main long-lasting idea that gathered strength in that period was the emergence of new styles of teaching and a more systemic transfer of teaching materials and ideas in the various countries.[28]

The following section of the chapter highlights the influence of psychologists.

> Piaget's theories are an important feature of the first two ICMEs. At ICME-2 the contribution of Piaget (not present) still outlines the analogy of Bourbaki's three mother structures with his structures of thinking; he identifies the causes of the failure of modern mathematics in the use of traditional teaching methods based on oral transmission. . . .

[27] See [Menghini et al. 2009], pp. 131–147.

[28] See [Menghini et al. 2009], p. 141.

> The influence of Piaget's methods also permitted broadening the range of mathematical topics in primary school.[29]

Next, we read about the relation with the world of mathematics.

> Professional mathematicians have always been present in ICMI, first as founding members and supporters, and later as ICMI presidents. Moreover, for a long time ICMI inquiries were planned during the ICMs. In the first ICMEs the presence of mathematicians is rather high, while it decreases in the more recent congresses. Often the contributions of mathematicians consisted in examples of applications of mathematics to the real world and, as a consequence of this, in stressing the key role of mathematics and science in society. The presence of mathematicians offered support and encouragement for the various ICMI activities.
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> . . . At ICME-1 and ICME-2 New/Modern Math is still present, with contributions both for and against it. The most important of them, by René Thom (1973), stresses the contradiction of a teaching that is heuristic in principle, but is based on abstract mathematics. Thom claims that Piaget is much too confident in the potentialities of mathematical formalism: Modern Mathematics has not produced new theorems and, as far as education is concerned, does not produce new knowledge. The actual problem is not rigour, but rather the development of meaning. Modern Mathematics has eliminated Euclidean geometry in favour of algebra, but it is precisely Euclidean geometry that is the link between natural language and abstraction. Because of Thom's contribution, many authors date the end of Modern Mathematics to ICME-2. In successive ICMEs we still find echoes of the debate, in particular the discussions about the movement Back to Basics at ICME-4 in 1980.[30]

Finally, the description of the new trends of research in mathematics education comes back to the influence of CIEAEM on the Congresses held by ICMI.

> One of the key ideas in Gattegno's way of working, developed in the CIEAEM meetings of the 1950s, was to put the researcher in direct contact with the classroom. This idea was given new life at ICME-1 by the Mathematics Workshop, which included a class of children at work. . . .
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> A call for more in-depth research in mathematics education was also present at ICME-2 in the plenary of the mathematician Hassler Whitney, who had in mind the failure of New Math. In ICME-2 a WG was devoted to Research in the teaching of mathematics. Successive ICMEs would show the strengthening of research in mathematics education as a scientific discipline with new results, new theoretical frameworks, new hypotheses, and new methods of gathering and recording data.[31]

We thus see that, starting with Freudenthal's presidency, most of the colleagues working for ICMI projects tend to be "professional researchers in the teaching and learning of mathematics, i.e., didacticians." These include "significant examples of research mathematicians becoming professionally engaged with mathematics education even at the scholarly level."[32]

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[29] See [Menghini et al. 2009], p. 142.

[30] See [Menghini et al. 2009], p. 143.

[31] See [Menghini et al. 2009], pp. 143–144.

[32] See [Hodgson 2015], p. 49.

Sisterly Skirmishes and Successes. Here is how one of the actors and keen observers, Bernard Hodgson, summed up some future consequences of Freudenthal's reshaping of ICMI.

> [T]he presidency of Freudenthal resulted in what might be rightly seen as "years of abundance" for ICMI, in the sense that the scope and impact of its actions expanded considerably. Not only were the newly established [journal] ESM and [the congresses] ICMEs highly successful, but also new elements were gradually added to the mission of ICMI. To name a few, ICMI introduced in the mid-1970s a notion of Affiliated Study Groups, serving specific segments of a community becoming more and more diverse. There was also a regular collaboration between ICMI and UNESCO, contributing in particular to outreach actions of ICMI towards developing countries. And later, in the mid-1980s, the very successful program of ICMI Studies was initiated. Still this deep evolution of ICMI, notably through the influence of Freudenthal himself, did not happen without some tensions with IMU, in particular as it was often the case that IMU faced decisions that were *faits accomplis*, taken without any consultation between the Executive Committees of ICMI and IMU—such had been the case for instance with the launching of the first ICME congress.
>
> Another moment of tension between IMU and ICMI happened in connection with the program of the section on the Teaching and Popularisation of mathematics at the 1998 International Congress of Mathematicians. As a consequence, the first Executive Committee of ICMI on which I served, under the presidency of Hyman Bass, had to deal with an episode of misunderstanding, and even mistrust, between the communities of mathematicians and didacticians as represented by IMU and ICMI.[33]

The President of the commission, Michèle Artigue (b. 1946), described the constellation of the two sisters in her remarkable closing address to the centenary celebration of ICMI.

> ICMI was still a structure at the interface, an interface between mathematicians and an increasing number of communities that tended to be institutionalized inside the mathematics education world. The creation of the first ICMI Affiliated Study Groups in the seventies and eighties evidences this phenomenon: PME [The International Group for the Psychology of Mathematics Education (1976)], HPM [The International Study Group on the Relations between the History and Pedagogy of Mathematics (1976)], IOWME [The International Organization of Women and Mathematics Education (1987)]. ICMI's Executive Committees (EC), whose election were controlled by IMU and its General Assembly, are insightful from this point of view: the President was always a first rank mathematician and mathematicians with an interest in education were well represented in the EC, but mathematics educators with a diversity of fields of expertise were also well represented and had officer responsibilities, being Vice-President or Secretary-General. Under the Presidency [1991–1994] of Miguel de Guzmán [1936–2004], the balance between the two communities inside ICMI executive committee progressively evolved. New tensions also arose all the more as at that time the supposed influence of mathematics educators was considered by some mathematicians as an important, if not the major, source of the observed difficulties in mathematics education, leading to such extremes as the so-called Math War in the USA. In 1998, when Hyman Bass was elected as President, Bernard Hodgson as Secretary-General, and when I entered the EC together with Nestor Aguilera as Vice-Presidents, the tension was at its maximum. At the 1998 International Congress of Mathematicians in Berlin, the project proposed by ICMI for the section on Teaching and Popularization of mathematics had been partially rejected,

[33] See [Hodgson 2015], pp. 49–50.

> and the Math War in some sense had entered the section. Voices asking ICMI to take its independence from a mother institution that expressed such mistrust were becoming stronger and stronger.[34]

The crisis which had erupted between the two sisters on the occasion of the Berlin ICM was subsequently resolved thanks to a proposal, which made the election of the Executive Committee of ICMI a procedure independent of the IMU Executive Committee.[35] This proposal was adopted at the IMU General Assembly at Santiago de Compostela in 2006.

> Retrospectively this crisis was beneficial. It obliged 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 . . . At the same time, we were convinced that making these links productive needed combined efforts from IMU and ICMI; the relationships could not stay as they were. Since 1998, the situation has evolved very positively thanks to the joint efforts of the successive EC and especially of their presidents: Jacob Palis and John Ball for IMU, Hyman Bass for ICMI. Hyman Bass had the credibility of a[n] outstanding research mathematician, being known as the father of K-theory, but he was also someone having much more than the 'peripheric interest' in mathematics education shown by his predecessors, to use the same expression as he did in his opening lecture at this Symposium, Hyman Bass claimed that he is not a mathematics educator and he was certainly right saying this, but he knows research in mathematics education from the inside not just as an empathic observer. This makes a great difference. For me, there is no doubt that without him for pushing and guiding the evolution, ICMI would not be the structure it is today, and I would not be serving it as ICMI President.
>
> ICMI is thus entering its second century of existence still at the interface between mathematics and mathematics education but certainly stronger for playing such a role and for coping with its ambitions. For the first time next July [2008], ICMI General Assembly will elect the new ICMI EC on the basis of a list of candidates established in full consensus by a nominating committee representing the two communities. ICMI and IMU are officially collaborating on specific projects . . . The two institutions are more and more coordinating their actions in the developing world thanks to the Developing Country Strategic Group (DCSG) and Commission for Development and Exchanges (CDE) structures where ICMI is represented. . . . less than one third of the existing countries in the world belong to IMU, and only some fifteen more are members of ICMI without belonging to IMU. One impediment to wider membership to IMU is the requirement of independent scientific activity, which is interpreted as being some kind of sustained presence in research mathematics, but all countries are engaged in mathematics education and are thus concerned with ICMI activities. An increased collaboration between IMU and ICMI was thus considered desirable for extending their outreach and making these institutions better serve the cause of both mathematics and mathematics education worldwide.[36]

CANP. Michèle Artigue's predicament remains valid today. An impressive manifestation of these goals, which goes well beyond the continuing regular activities of ICMI indicated above, and which reflects the relentless engagement of all contributors, is the Capacity & Networking Project (CANP). It is a joint enterprise, realized over the last ten years, of the IMU and ICMI, in conjunction with UNESCO

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[34] See [Menghini et al. 2009], p. 189.

[35] See [URL 26].

[36] See [Menghini et al. 2009], p. 189.

and the International Congress of Industrial and Applied Mathematics (ICIAM).[37] The originality of the program is to select groups of countries in given developing regions that share cultural traditions, in particular a common language, and to run long and intense workshops on the teaching of mathematics in these countries. These workshops are mounted in collaboration with regional organizations that are affiliated with ICMI.

The first program of CANP was held in Mali in September 2011. Its aim was to create a network in Sub-Saharan African countries, to face the challenges of mathematics education. Support was provided by UNESCO, CIMPA, and ICIAM. Four more regional CANP programs followed suit: CANP 2 Central America and the Caribbean was held in Costa Rica in August 2012; CANP 3 South East Asia took place in Cambodia in 2013; CANP 4 East Africa was held in Tanzania in September 2014, and CANP 5 for the Andean Region and Paraguay was held in Lima, Peru, in February 2016. Since then, the enduring challenge has been to enhance these five CANP programs and help them develop and maintain sustainable networks and activities.

This remarkable program CANP was also the activity that Jean-Luc Dorier, the Secretary-General of ICMI, chose to focus on in his presentation of ICMI at the 2021 IMU Celebration in Strasbourg.[38]

[37] See the website [URL 27] (and its appendices).

[38] See [URL 28].