

ICMI in the 1950s and 1960s: The internationalization process and the emergence of Mathematics Education as a research discipline

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Abstract

This paper aims to analyze the evolution of the objectives and fields of action of the International Commission on Mathematical Instruction (ICMI) in the period from its reconstitution as a permanent subcommission of the newly refounded International Mathematical Union (IMU) in 1952 to the presidency of Hans Freudenthal (1967–1970), who impressed a real turning point in the Commission's activities. This period was crucial in the life of ICMI because of the need to better define its status as a subcommission and the concomitant events in politics, technology, research and society. The new ICMI as a subcommission of IMU depended on it both for the choice of members of the Executive Committee and for funding. The lack of precise Terms of Reference to regulate the relations between the two bodies produced friction that arose mainly from ICMI's desire for greater independence from IMU. Furthermore, the Commission's old agenda, which placed emphasis mainly on curricula issues and organizational aspects of mathematics teaching in the various countries, was now outdated.

In this paper we will focus in particular on the contributions of presidents Marshall H. Stone and André Lichnerowicz and their efforts to broaden the scope of ICMI both geographically and in terms of the agenda. We will also try to show how awareness of the weaknesses of the Commission progressively identified by the various presidents led to ICMI's Renaissance. Finally, we will outline the main steps of the emergence of mathematics education as a new research field.

Our research is based on a selection of unpublished letters and documents belonging to the period 1952–1974 (from the IMU Archive and others), which made it possible to highlight unknown or lesser-known aspects of the history of ICMI.

Introduction

At the Symposium celebrating ICMI's first centenary, president Michèle Artigue (2008) looked back over the Commission's 100 years, choosing the perspective of seeing the Commission as an interface institution between mathematics and mathematics education. This perspective highlights a crucial element in the development of ICMI and its policies, which is the relationship between mathematicians and mathematics educators¹ In this article, we take this relationship as a thread to answer the following research questions:

- How did the Commission and its policy change after WWII?

¹ An account of the first 100 years of ICMI is in (Furinghetti & Giacardi, 2022a) and in the website (Furinghetti & Giacardi).

- What role did ICMI play in the development of mathematics education as research discipline in the years 1960-1970?

It is well known that ICMI, in its primitive incarnation as *Commission Internationale de l'Enseignement Mathématique* (CIEM) or *Internationale Mathematische Unterrichts-Kommission* (IMUK), was born in a mathematical context, namely during the Fourth International Congress of Mathematicians (ICM) in Rome in 1908. Felix Klein was the first president until 1920. His prestige as a mathematician contributed greatly to the development of the new body in its initial phase. It must be remembered, however, that the voice of the educators was present from the very beginning as the idea of an international Commission to study problems concerning mathematics teaching was launched in a letter by David Eugene Smith, an American mathematics educator, published in 1905 in the journal *L'Enseignement Mathématique*. At the end of World War I, the exclusion of the former Central Powers from international scientific cooperation caused the dissolution of the international scientific associations, including the Commission in 1920. It was reconstituted in 1928 at the ICM in Bologna and Smith was its president from 1928 to 1932, when Jacques Hadamard succeeded him. The restored Commission limited itself to concluding the projects begun in the past, without launching new projects. The outbreak of World War II produced a second forced stop, see (Schubring, 2022a).

By the end of World War II, the mathematical world and society had changed: old institutions, such as the International Mathematical Union (IMU) and CIEM/IMUK, were restored according to new paradigms. The IMU was refounded in 1952, CIEM/IMUK became a subcommission of it and took the new name of ICMI. In the following two decades, the new role and context implied cultural and political changes for the Commission.

In order to understand these changes and to answer our research questions, we have focused on the actions of successive presidents in the 1950s and the 1960s, after the two transition years of the presidency of Albert Châtelet. This approach is suggested by the consideration that, despite the fact that ICMI had retained more or less its initial structure, the cultural and political choices were mainly due to presidents because of the minor role of subcommissions, and the not always easy contacts between the officers, as we will see below.

In (Furinghetti, Giacardi, & Menghini, 2020), we have taken into consideration the work of presidents Heinrich Behnke and Hans Freudenthal, mainly to show their efforts to renew the Commission and to define its relationship with the mathematical community. In this paper we focus on the contributions of presidents Marshall H. Stone (1969–1962), and André Lichnerowicz (1963–1966). They, under the stimulus of the initiatives of new international bodies interested in mathematics education such as UNESCO and CIEAEM, etc.), made significant efforts to broaden the field of action and objectives of ICMI and to gain greater independence from IMU. Moreover, we will try to show how awareness of the weaknesses of ICMI progressively identified by the various presidents led to the Commission's Renaissance. Finally, we will outline the main steps of the emergence

of mathematics education as a research discipline, trying to understand the actual role of ICMI in this process.

Our analysis is based on a wide selection of unpublished letters and documents² belonging to the period 1952–1974 (from the IMU Archive and others), which made it possible to highlight unknown or lesser-known aspects of the history of ICMI.

The rebirth of IMU and ICMI: the role of Stone and Fehr

At the end of World War II, the community of mathematicians had to face again—as had happened at the end of World War I—the dramatic experience of emerging from a global conflict and look to the future.

Oswald Veblen, president of the first International Congress of Mathematicians (ICM) held in Cambridge (1950) after World War II, recalled:

We are holding the Congress in the shadow of another crisis, perhaps even more menacing than that of 1940 ... It is true that many of our most valued colleagues have been kept away by political obstacles ... Nevertheless, we who are gathered here do represent a very large part of the mathematical world. (Graves, Smith, Hille, & Zariski, 1952, Vol. 1, p. 124).

These words allude to the difficult scenario of the second postwar period due to the cold war and the new geographical and political order in the new polarized world. Indeed, mathematicians from the Soviet Union and its satellite states could not participate in the congress. Moreover, other phenomena were affecting international relationships, such as the end of colonialism and the emerging needs of the developing countries.

In this new world the spirit of internationalization and cooperation led to the rebirth of old institutions and the creation of new ones. IMU, which was founded in 1920 and dissolved in 1932, was re-established officially during the General Assembly of IMU held in Rome from 6 to 8 March 1952, after a long and complex period of gestation.³ A leading role in the foundation of the new IMU was played by Stone who, as president of the American Mathematical Society (1943–1944) had worked to enhance the scientific level of the American mathematical community and to encourage contacts with the Latin American mathematicians. He showed that other lessons, beside the need of cooperation and collaboration, had come from the war, such as the relevance of science to “the high art of guiding human affairs at the level of complexity represented by the elaborately organized modern state” (Stone 1947, p. 507), as well as the importance of mathematics education, as he affirmed during the General Assembly of IMU in Rome:

The problem of determining the place of mathematics [in society] cannot be divorced from technical considerations concerning teaching methods. (Stone 1952, p. 1974)

² All these documents are available in (Giacardi, 2022a).

³ About the history of IMU from different points of view see (Lehto, 1998; Schappacher, 2022).

Stone also added that one of the most important tasks of IMU was to revive the International Commission on the Teaching of Mathematics, whose mandate had not been renewed in the ICM in 1950 in Cambridge. Two years later Henri Fehr, Secretary General of the old Commission and Erich Kamke, president of the German Mathematical Society, separately asked for reconstruction of the commission under the auspices of IMU. On 20 February 1952 Fehr sent the Interim Committee of IMU a letter, where he presented some proposals to be submitted to IMU General Assembly which would meet in Rome. He suggested that the Commission should be continued by the Union and offered the resignation of the old Commission, saying that he remained at the disposal of the new Commission. (H. Fehr to the Interim Committee of the Mathematical Union, Genève 20.2.1952, *LA* 14A 1952–1954.)

During the General Assembly of IMU in Rome, mentioned above, the proposals were accepted. ICMI became a subcommission of the Union; English, French, German, and Italian remained the official languages, and *L'Enseignement Mathématique* remained its official organ. The new denomination International Commission on Mathematical Instruction (ICMI) gradually became internationally used.

The Executive Committee of the new Commission was constituted during the meeting in Geneva on 20–21 October 1952 as follows: president Albert Châtelet, vice-president Đuro Kurepa, Secretary Behnke, Honorary president Henri Fehr. Later Saunders Mac Lane, whose name had been suggested by Stone, was appointed as the second vice-president.

The new socio-political and educational contexts after World War II

In the two decades we are considering the Cold War and the consequent atmosphere of tension between countries stimulated interest in science, including mathematics, and fostered the birth of specific projects aimed at research and teaching. Plans to help nations recover from the disasters of war and bodies such as UNESCO (United Nations Educational Scientific and Cultural Organisation) and OEEC (Organisation for European Economic Co-operation),⁴ also supported national and international initiatives in the field of education. In particular UNESCO was created to promote world peace and security through international cooperation in education, arts, sciences and culture; and OEEC was established to help administer the Marshall Plan, by allocating United States financial aid and implementing economic programs for the reconstruction of Europe after World War II. The history of ICMI in these years is intertwined with that of these new bodies, from which it draws support, collaboration and new ideas.

Mathematical research developed according to new paradigms, and computers opened new research perspectives. Phenomena such as progressive decolonization

⁴ In 1961 OEEC was superseded by the Organisation for Economic Co-operation and Development (OECD).

and the independence of some countries led people to consider the problems of education – obviously also the mathematical one – in those countries.

Many changes were also taking place in the field of mathematics education. Gradually, school was becoming “for all”, that is, an institution that involved all citizens. In the United States, the 1950s were marked by important projects, among them in 1951 the University of Illinois Committee in School Mathematics Project (UICSM), headed by Max Beberman, and in 1958 the School Mathematics Study Group (SMSG), directed by Edward G. Begle and financed by the National Science Foundation.

In Europe the Commission Internationale pour l’Étude et l’Amélioration de l’Enseignement des Mathématiques (CIEAEM) was the new arena where mathematicians, psychologists, philosophers and schoolteachers discussed mathematics education, focusing their attention on the student and the process of teaching and learning. CIEAEM was not a structured body, but rather a fluid think tank producing innovative ideas that shaped the environment of mathematics education in the following years.

These new ways of looking at mathematics education showed that international inquiries and comparison of the curricula of the various countries, which were the core of the agenda of the old Commission, were outdated, and fostered expansion of the scope of ICMI.

Consequently, also the role of subcommissions changed. In the first phase of the history of ICMI, Klein was fundamental in directing the activities of the Commission, but these appeared to be the result of an international network made up of the various national subcommissions, see (Karp, 2019; Schubring 2022a). After the rebirth of ICMI in 1952, the national subcommissions continued to exist, but Commission’s changing objectives gradually resized their role. In the following years we find evidence of this fact. Still in 1976 ICMI General Assembly agreed that a greater effort should be made to activate national subcommissions (*ICMI Bulletin* (1976, 8, p. 19)

In the decades we are considering the role of ICMI presidents has been central. Except for Albert Châtelet who, despite being a very politically committed mathematician in his own country and active in the field of mathematics education, took no major initiatives during his presidency, all the others presidents—Behnke, Stone, Lichnerowicz and Freudenthal—have pursued very specific objectives for ICMI by influencing its activities.

When Freudenthal assumed the presidency in 1967, he wrote to Secretary André Delessert:

In the future I will seek your help to communicate with CIEM. On the other hand, with regard to the internal communication of the office, it seems to me better that its members consider each other as equals and that each

communicates with all the others without any formality.⁵ (H. Freudenthal to A. Delessert, Utrecht 22.3.1967, *Fondo Delessert*, Serie V, u. a. 347).

Freudenthal's request was an acknowledgment that his predecessors had heavily placed the action of ICMI on them, and expressed a desire for change.

The early years of ICMI after the reconstitution

At the time of the rebirth of ICMI new social, economic, political, technological and scientific contexts called for new approaches in the field of mathematics education. Furthermore, the new position of ICMI as a subcommission of IMU required precise Terms of Reference to define the relationships between the two entities. The new president Châtelet (1952–1954)⁶ was not up to the task. He took little interest in ICMI. In the private correspondence between the officers of both ICMI and IMU there are frequent references to his lack of collaboration with the EC of IMU and with the then secretary of the ICMI Behnke. Here are a few passages from the correspondence:

Since four month I never heard a word from Châtelet and I am now nervous; Since Châtelet does not answer to my 3 last letters, I cannot do nothing in this moment; Six weeks are passed since I have written this letter, but Châtelet did not answer till today. And with my preceding letters it was the same. (H. Behnke to E. Bompiani, Munster 7 July 1953; Munster 31 July 1953; Munster 11 September 1953, *LA* 14A, 1952–1954).

It will also be necessary to select a president very carefully. I agree that we should get rid of Châtelet (W. Hodge to M. Stone, 31 May 1954, quoted by Lehto 1998, p. 111).

Various factors may have caused Châtelet's inertia: the difficulty of reconstructing ICMI after World War II, too many organizational and institutional commitments in his own country and also the fact that the secretary Behnke made up for his shortcomings.

After the transition period under the presidency of Châtelet we may identify two main lines of action by the four successive presidents. Behnke and Freudenthal worked to clarify the relationship with IMU in order to obtain reasonable autonomy of ICMI, and to make room for new educational issues. The action of Stone and Lichnerowicz was more externally projected, establishing contacts with official institutions and expanding the scope of ICMI.

Behnke,⁷ first as secretary (1952–1954) and then as president of ICMI (1955–1958), intended to recreate the climate of fervor and international collaboration that had characterized Klein's presidency. He was aware of the organization and policy problems he had to face to revitalize the Commission: greater autonomy from IMU, funding, visibility, the problem of finding mathematicians active in

⁵ The original text is *A l'avenir je me servirai bien de votre aide pour communiquer avec CIEM. D'autre part, quant à la communication interne du bureau, il me semble mieux que ses membres se considèrent l'un l'autre comme des égaux et que chacun communique avec l'ensemble des autres sans aucune formalité.*

⁶ See the portrait of Châtelet by Gauthier and Goldstein (2022).

⁷ See the portrait of Behnke by Schubring (2022b).

research who were interested in teaching. In the latter connection, he wrote to Stone:

It is [a] very difficult matter to engage mathematicians, well-known for their research work, into problems of instruction ... because they regard this kind of work of little value. H. Behnke to M. Stone, Oberwolfach, 11 August 1954, *LA* 14A, 1952–1954)

He also underlined the need to organize ICMI congresses:

At the international Congresses of Mathematicians, ICMI plays a relatively small role, since these Congresses are dominated by reports and discussions on matters of research [in mathematics]. It might therefore, be more appropriate for ICMI to hold smaller symposia in the years between Congresses. (H. Behnke, *Memorandum*, *LA* 14A 1958–1960))

Therefore, during his mandate, he tried to make ICMI less dependent on IMU by proposing new Terms of Reference amending those of 1954 (*LA*, 14A 1958–1960), in particular he asked to form regional groups to mitigate the Eurocentric character of ICMI. Behnke's proposals were downsized, and IMU retained control over the Commission. During his presidency new themes of study were taken into consideration, which were resumed in the following years: school for the masses (Piene, 1956); questions on methods (Daltry, 1956); action and perception in the teaching-learning process, teacher-learner relationship, biological and social factors (Kurepa, 1960); and the impact of psychological and pedagogical research (Freudenthal, 1959).

As we showed in (Furinghetti, Giacardi, & Menghini, 2020), when Behnke launched his proposals, the time was not yet ripe for such radical changes.

Broadening the field of action and objectives of ICMI: Stone and Lichnerowicz

*Marshall H. Stone (1959–1962)*⁸

Stone, who after the presidency of IMU, held the position of vice-president of ICMI (1955–1958) and then that of president (1959–1962), was very active on the international front, especially thanks to his contacts with UNESCO and OEEC, and opened up ICMI to the stimuli of Modern Mathematics. This was the period of decolonization, which led to an increase of the number of the members of the United Nations (UN). The newly independent countries lacked many facilities for their development, including for education. UNESCO, the UN agency responsible for education, had the task of establishing schools, especially primary schools. Stone had the merit of involving UNESCO in the ICMI activities beyond primary level. In November 1952 he wrote to Châtelet:

I hope that eventually we shall be able to persuade UNESCO to be interested in secondary education and even in university education so far as it affects the under-developed areas. (M. Stone to A. Châtelet, Chicago, 3 November 1952, *LA* 14A 1952–1954)

⁸ See the portrait of Stone by Kilpatrick (2022).

In 1956 Stone represented ICMI at the “Conference on Mathematical Instruction in South Asia”, organized with the support of IMU and UNESCO in Bombay at the Tata Institute of Fundamental Research with the purpose “to discuss, with special reference to South Asia, the problems of mathematical education at all levels, and to formulate plans for its sound development”. (*Internationale Mathematische Nachrichten*, 47/48, 1956, p. 9) The address by Stone dealt with some crucial problems of mathematical instruction (Stone, 1957) focusing in particular on university teaching in the USA, but also considering mathematics education problems from the top down, and making suggestions for curricula.

In the summer of 1961, UNESCO drew up a draft contract with IMU to study the relationships between university teaching of mathematics and physics. On this occasion, there were disagreements between Stone and IMU because he had not been consulted in advance and because plans had been made to appoint an IMU subcommittee to discuss collaboration with UNESCO. Stone wrote to the secretary of the Union Beno Eckmann:

I thought that I.C.M.I. was designated as I.M.U.'s organ for handling all matters in the field of mathematical education ... Furthermore, the setting up of two bodies under I.M.U. designed to deal, even in cooperation, as independent agents respectively restricted to the secondary field and the university field is more likely than not to destroy I.C.M.I. (M. Stone to B. Eckmann, Chicago, 17 February 1961, *IA* 14A 1961–1966)

Finally, he agreed that a Special Committee on the Teaching of Science (SCOTS) should study the details of the contract, but it “ought to go out of existence once the UNESCO contract had been successfully negotiated” (M. Stone to B. Eckmann, Chicago, 22 July 1961, *IA* 14A 1961–1966). Stone was appointed chairman of this Committee.

Collaboration with UNESCO was fruitful for the life of ICMI and for the development of mathematics education as an autonomous discipline because it was a booster for the organization of important international conferences that broadened the scope of ICMI, such as the “Inter-American Conference on Mathematical Education” (IACME, Bogotá 1961). Other meetings were organized thanks to collaboration with OEEC or with local mathematical bodies: the most famous was the seminar at the *Centre Culturel de Royaumont* in 1959, on the new thinking in mathematics and mathematics education, and implementation of reform, see (Schubring, 2014). In his introductory address Stone, chair of the seminar, outlined a new policy in mathematics education. He formulated a veritable “program of research in the teaching of mathematics” (study and experimentation), expressing his hopes for creation of *ad hoc* institutes for research, and promotion in the universities of research projects regarding the teaching of mathematics (Stone, 1961, pp. 28–29)

ICMI was well represented by the guest speakers Edward G. Begle (a future Executive Committee member) and Edwin A. Maxwell (past Executive Committee member and future ICMI secretary) and by the delegates Otto Frostman (Executive Committee member), Kay Piene (past Executive Committee member).

In the aftermath of the Royaumont seminar many topics discussed there were taken up in various subsequent meetings: in 1960 in Aarhus, Zagreb-Dubrovnik, Belgrade, in 1961 in Lausanne and in Bologna, see (Furinghetti & Menghini, 2023).

Concerning the relationships with IMU, Stone defended the role of ICMI, and the Terms of Reference of 1960, even though they only accepted a small part of Behnke's proposals, represent a small step towards a greater independence of ICMI, with the possibility of co-opting representative of non-IMU countries and of cooperating with regional groups, but IMU retained its control over the Commission, see (Giacardi, 2022b).

*André Lichnerowicz (1963–1966)*⁹

In the final report of his mandate “Report for the period 1959–1962” Stone presented the guidelines for the future ICMI, and in particular stressed the importance of getting more funds to carry out more ambitious projects; of responding to the growing “demand for an international bibliographical informational service in the field of education”; and of extending ICMI's activity to new areas, such as Africa (*L'Enseignement Mathématique*, s. 2, 9, 1963, p. 111).

The new president of ICMI, Lichnerowicz, accepted Stone's suggestions. He was a mathematician well known for his contributions in differential geometry, but he had specific interests in mathematics education: he was one of the founding members of the CIEAEM and since 1955 had participated in the work of training teachers in Modern Mathematics in France. From 1966 to 1973 he would chair the so-called *Commission Lichnerowicz*, responsible for the renovation of mathematics education at primary and secondary levels in France. ICMI president from 1963 to 1966, he managed to enter into special contracts directly between UNESCO and ICMI for the preparation of a report on mathematics teaching at the university level in eight countries (*LA 14A*, 1961–1966; *L'Enseignement Mathématique*, s. 2, 10, 1964, p. 296; 12, 1966: 136) and the publication of the series of volumes *New Trends in Mathematics Teaching*.

The first volume of this series appeared in 1967. In the preface Lichnerowicz wrote:

What we might call “the traditional mathematical disciplines” have been transformed into a unitary discipline of mathematics, ..., modern mathematics has made an effort to dominate them [structures] ... Modern mathematics teaching calls for all the teaching talent and skill of the teachers and it is encouraging to see that since 1945 there have been individual pioneers or centres all over the world “on the job”. The aim of “New Trends” is to provide a link between all those who are, or who would wish to be, concerned in a task as essential as it is absorbing. (UNESCO, 1967, p. 17)

In fact, the volume gathered papers on problems related to the teaching of mathematics presented at various meetings as well as original articles; it also included lists of symposia on mathematics teaching, and of journals related to this

⁹ See the portrait of Lichnerowicz by Gispert (2022).

subject, and a list of centers where the problems concerning mathematics education were studied. This volume can rightly be considered the expression of a community, that of mathematics educators, which was gradually assuming an identity and transforming mathematics education into a new scientific discipline.

On the political side, Lichnerowicz was engaged in establishing collaboration with the USSR and Africa. Significantly, upon being elected president, he tried to have the Russian mathematician Andrei Kolmogoroff as one of the vice-presidents, but Kolmogoroff refused (G. de Rham to K. Chandrasekharan, Lausanne, 18.5.1963, *Fonds de Rham*, 5113–403), and the choice fell on the Polish mathematician Stefan Straszewicz. During the meeting in Paris (1964, February 14 and 15) the ICMI Executive Committee resolved to propose to the Organizing Committee of the next ICM in Moscow a plenary lecture held by a Russian mathematician on the teaching of numerical analysis at the university (*L'Enseignement Mathématique*, s. 2, 10, p. 295). Concerning Africa, Lichnerowicz managed to organize with the Senegalese national commission a small symposium (1965, January 13–16) on “L’Enseignement des mathématiques dans ses rapports avec celui des autres sciences,” in connection with the main conference held in Dakar from 14 to 22 January 1965 (*L'Enseignement Mathématique*, s. 2, 12, 1966, pp. 131–132).

When Lichnerowicz became president of ICMI in 1963, Freudenthal joined the Executive Committee and began to be more involved. This was the first step towards the future changes in ICMI policy. In 1964 he chaired the international colloquium on “Modern curricula in secondary mathematical education” held in Utrecht, which, with the next one, also held in Utrecht in 1967, on “How to teach mathematics so as to be useful” gives us a glimpse of Freudenthal’s future lines of action.

The weaknesses of the new ICMI identified by the various presidents up to Freudenthal

At the Symposium celebrating ICMI’s first centenary, we illustrated how from 1970 onwards one can speak of ICMI’s Renaissance, see (Furinghetti, Menghini, Giacardi, & Arzarello, 2008). The presidents of the 1950s and the 1960s (Behnke, Stone, Lichnerowicz) paved the way, but definitely Freudenthal’s initiatives—the journal *Educational Studies in Mathematics* and the International Congress on Mathematical Education (ICME)—were the trigger that changed ICMI and fostered the development of mathematics education as a research discipline.

The innovations introduced by Freudenthal¹⁰ were certainly made possible by his strong personality, but also by his ability and that of his predecessors to grasp the weaknesses of ICMI from the point of view of its structure and work program.

First of all, the old Commission was born and developed within the community of mathematicians and depended for its mandate on the four-year International

¹⁰ See the portrait of Freudenthal by Schubring (2022c).

Congresses of Mathematicians, but it was otherwise free to choose its members and decide which projects to implement. The new ICMI as a subcommission of IMU depended on the latter both for the choice of members of the Executive Committee and for funding. The lack of precise Terms of Reference to regulate the relations between the two bodies produced friction that arose mainly from the ICMI's desire to obtain greater independence from IMU.

As mentioned above, Behnke had already identified some shortcomings of ICMI: the problematic relationship with the community of mathematicians; the difficulty of finding mathematicians active in research who were interested in teaching; the difficulty of being visible at the international congresses of mathematicians; the importance of involving secondary teachers; the need for ICMI congresses; and the fact that “sub-commissions suffer from being ruled by university professors, for their influence is predominant through the national adhering organizations” (Behnke, 1955).

Stone underlined the need to expand the field of action of ICMI both geographically and culturally and to get more funds for “a satisfactory execution of its program of scientific meetings and publication” (*L'Enseignement Mathématique*, s. 2, 9, 1963, p. 109).

Other structural defects were identified by Freudenthal: lack of a permanent ICMI office, difficulties in relations between president and secretary (for example between Châtelet and Behnke, Freudenthal and Delessert); few contacts between old and new Executive Committees; the fact that the presidents until then had been chosen from among university professors “of considerable scientific weight”¹¹ (H. Freudenthal to H. Cartan, June 29, 1970 *Fonds de Rham*, 5113–403).

Furthermore, the Commission's old agenda, which placed emphasis mainly on curricular issues and organizational aspects of mathematics teaching in the various countries, was now outdated. The new demands of society, the new trends in mathematical research and technology required a renewal of the subjects to be studied, of tools and of methods.

As for the cultural aspects related to mathematics education, Freudenthal proposed new research topics: mathematization; motivation; comparative evaluation of the contents of mathematics courses; criteria of success; the connection between mathematics and other disciplines; the development of mathematical activity in pupils; research methodology; and evaluation of the results of research in mathematics education. Closely connected with this evolution of the sector, Freudenthal emphasized the need for a suitable journal, since the official organ *L'Enseignement Mathématique* was no longer an “educational” journal, and the need to hold ICMI congresses that were independent of the ICMs.

No less important is Freudenthal's view of the qualities a president had to possess: “familiarity with questions relative to secondary or primary teaching over many years; a thorough awareness of the international situation and of the

¹¹ The original text is *de poids scientifique pas trop léger*.

international sphere of those who are concerned with teaching; a taste for initiative and action”.¹² (H. Freudenthal to H. Cartan, Utrecht, June 29, 1970 *Fonds de Rham*, 5113-403, also in IMU Archive: SF1 / Ser 6.5)

ICMI and mathematics education as a research discipline

The 1960s and the 1970s, which are the object of our analysis, could rightly be called the “roaring years” for mathematics education due to the spurs of concomitant events in politics, technology, research and society, see (Furinghetti & Giacardi, 2022b).

Anna Zofia Krygowska, who in 1958 was appointed to a professorship in the Methods of Teaching Mathematics Department, within the Faculty of Mathematics and Physics in Cracow, pointed out that the changes needed to tackle the problems of mathematics education required new professional figures based on mixed competences, able to develop frontier research in collaboration with mathematicians, psychologists, mathematics educators and mathematics teachers, see (Krygowska, 1968). In this concern the creation of university chairs in mathematical education was advocated by important figures such as Alexander Wittenberg, Freudenthal, and Krygowska.

In 1969 Begle’s speech at the first ICME made it clear that new methods had to be employed in research:

I see little hope for any further substantial improvements in mathematics education until we turn mathematics education into an experimental science ... We need to start with extensive, careful, empirical observations of mathematics teaching and mathematics learning. Any regularities noted in these observations will lead to the formulation of hypotheses. These hypotheses can then be checked against further observations, and refined and sharpened, and so on. To slight either the empirical observations or the theory building would be folly. They must be intertwined at all times. (Begle, 1969, p. 242).

What has been ICMI’s role in the new way of looking at mathematics education? In our opinion, as Kilpatrick (2008) claims, ICMI has been both a mirror of that development and a stimulus for new directions.

The shifting of ICMI to a new paradigm for facing the problems of mathematics education was not out of the blue. In the decades taken into consideration, as we have seen, various movements in Europe and in the USA flourished in the field of mathematics education (CIEAEM, UICSM, SMSG).

In particular the connections—personal relationships, participation in the same meetings—between ICMI and CIEAEM served as a stimulus to introduce new topics of discussion in the ICMI agenda, due also to the fact that some members of ICMI Executive Committee, such as Freudenthal, Lichnerowicz, Evert Beth, Gilbert Walusinski and André Revuz, were also part of the CIEAEM. Moreover,

¹² The original text is *état de préoccupations plus que superficielles et continues depuis des années avec les questions de l’enseignement secondaire ou même primaire; familiarité avec la situation internationale et le milieu international de ceux qui s’intéressent à l’enseignement mathématique; goût d’initiative et d’activité.*

the collaboration with OEEC and UNESCO—with special contracts and organization of meetings—thanks to presidents Stone and Lichnerowicz favored not only the broadening of the scope of the ICMI to new countries, but also the creation of a common ground of documentation and information, on which the emerging community of researchers in mathematics education could develop: the series *New Trends in mathematics education*.

ICMI grasped the *Zeitgeist* and its contribution to the development of the discipline of mathematics education did not consist so much in sporadic, albeit significant participation in the quadrennial ICMs, but rather in the political action of exploiting relations with international bodies that enabled the promotion of important initiatives, meetings and publications as we mentioned earlier.

There is no doubt that Freudenthal played a significant role in the renewal process of ICMI. In his actions he enjoyed the support of the most important scholars in mathematics education, including Maurice Glaymann, Krygowska, Revuz and Willy Servais. Since 1955, when he officially joined ICMI as a delegate appointed by the Dutch committee, he had emphasized that ICMI had to deal with strictly scientific questions rather than questions of school organization, stimulating a discussion within ICMI that brought out new themes to be studied, see (*L'Enseignement Mathématique*, s. 2, 1, 1955, p. 200). During the ICM in Edinburgh 1958 he said that: “mathematical teaching theory can be furthered by mathematical teachers who are able mathematicians and able educators.” (Freudenthal, 1959, p. 139). In this statement there are two important points—the ‘mathematical teaching theory’ and the ‘teacher mathematician-educator’—which are symptomatic of the evolution that was taking place in mathematics education.

In January 1967 Freudenthal attended the UNESCO Colloquium in Lausanne on “Coordination of instruction of Mathematics and Physics” and with Krigowska, Servais and others signed an important document which underlined that “the reformation of mathematics teaching had to be considered a permanent process” and that it was urgent to establish an international organism for information on the teaching of mathematics” (Propositions on the teaching of Mathematics, Lausanne 1967, LA 14B 1967–1974, *Educational Studies in Mathematics*, 1969, p. 244).

The decisive step towards the development of this field of research is marked by two initiatives carried out with determination by Freudenthal at the cost of strong friction with IMU: the journal *Educational Studies in Mathematics* an international journal devoted to research in mathematics education, and the ICMEs and ICMI congresses independent of the ICMs. This fact is epitomized by Point 5 of the resolutions expressed at ICME-1 (The Editorial Board ..., 1969, p. 284), which reads:

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 or Research Institutes, with appropriate academic qualifications available.

Freudenthal also explained the reasons for renovation: although small congresses dedicated to well-defined topics could be useful, it was important to go beyond the circle of specialists and reach the teachers, and thus large congresses were necessary. He also stressed that it was essential that all the national subcommissions work and collaborate, and for this it was indispensable to choose people who were genuinely interested in mathematics education.

With his bursting initiatives Freudenthal gave support to mathematics education as a new research discipline distinct from mathematics, see (Howson, 1985). He paved a trail that marked developments in various directions. The ICME conferences became a reference point for the community of mathematics educators, see (Menghini, 2022), and ICMI became an incubator of initiatives for solidarity and the fostering of the development of mathematics education in less affluent parts of the world, see (Hodgson, 2009).

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