From Lyon (1969) to Shanghai (2020), the International Congresses on Mathematical Education (ICME)

…as critical opportunities for crossing experiences of mathematics teaching and learning all over the world

Binyan Xu, ECNU, Shanghai, China - Takeshi Miyakawa, Joetsu University of Education, Japan - Luc Trouche, ENS de Lyon, France - 20th June 2018, ENS de Lyon

14th International Congress on Mathematical Education

July 12 to 19, 2020 Shanghai, China

Outlines

1) A short survey of ICME history, from Lyon 1969 and beyond

2) ICME experiences

3) Towards ICME-14, in ECNU Shanghai 2020

4) Current collaborative projects

A short survey of ICME history

1899, Foundation of the journal "L'enseignement mathématique
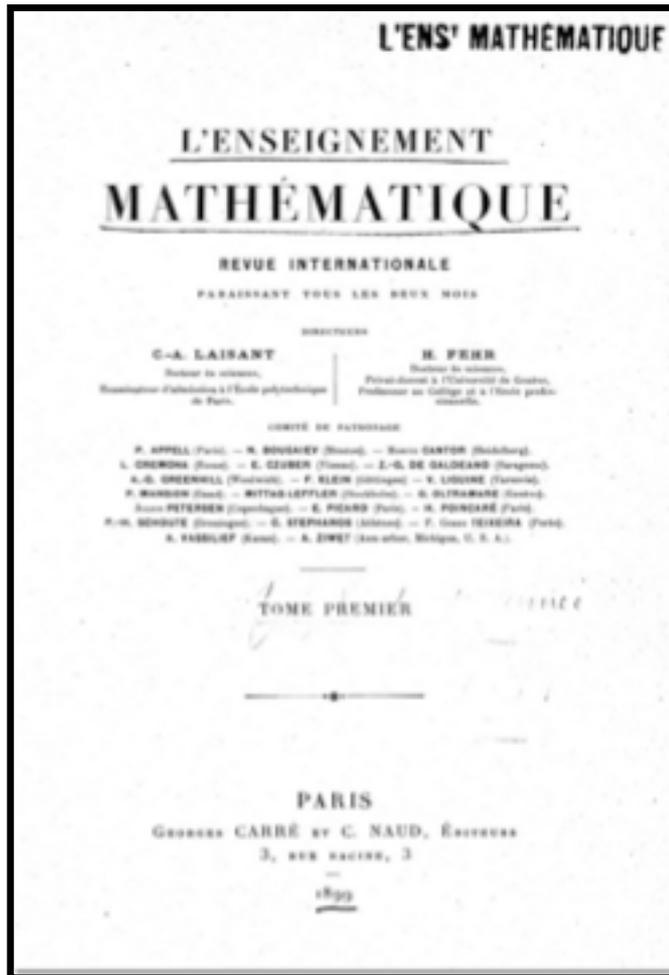
The journal was founded in 1899 by Henri Fehr (Geneva) and Charles-Ange Laisant (Paris).

The objectives:

« associating the world of teaching to the huge movement of scientific solidarity emerging at the end of the XIXe century »

« Comparing the way of teaching mathematics in different countries »

Fehr was editor-in-chief until his death in 1954.

Online versions:
http://www.unige.ch/math/EnsMath/EM_en/

A short survey of ICME history

1908, the birth of ICMI, some reasons of this birth

Regarding the French reform of 1902, the commission for designing the curricula in sciences was chaired by a mathematician (Gaston Darboux). Poincare´, Borel and Hadamard made lectures in the ' Musée pédagogique' for supporting its implementation

The International Commission on Mathematical Instruction (ICMI) was established at the Fourth International Congress of Mathematicians held in Rome in 1908. It was initiated to support a widespread interest among mathematicians in school education. The Rome Congress adopted a resolution, submitted on the initiative of the American mathematician, teacher, educator and historian of mathematics, David Eugene Smith (1860-1944), creating ICMI with the initial mandate of making a comparative study on the methods and plans of teaching mathematics at secondary schools.

https://www.mathunion.org/icmi/organization/historical-sketch-icmi

A short survey of ICME history

1908, the birth of ICMI, its link to l'Enseignement mathématique

The idea of such an international commission had in fact been formulated by Smith himself three years earlier in the international journal L'Enseignement Mathématique, in his response to a survey proposed by the Editors on the "conditions to be satisfied by a complete — theoretical and practical — teaching of mathematics in higher institutions".

The initial ICMI mandate, an international comparative study, ultimately became a massive six-year project producing 187 volumes, containing 310 reports from eighteen countries.

The founding President of ICMI was the German mathematician Felix Klein (1849-1925). From the very beginning of ICMI, *L'EM* was adopted as its official organ, which is still the case today.

A short survey of ICME history

1967, towards the Modern Math reform

Later ICMI presidents include such eminent mathematicians as Jacques Hadamard (from 1932 to the War),

After interruptions of activity around the two World Wars, ICMI was reconstituted in 1952. It was a time when the international mathematical community was being reorganized and ICMI then became an official commission of the International Mathematical Union (IMU). Successive presidents were Marshall H. Stone (1959-1962), then Lichnerowicz (1963-1966).

In 1967 the French government created the *Lichnerowicz Commission* made up of 18 teachers of mathematics. The commission recommended a curriculum based on set theory and logic with an early introduction to mathematical structures ("math modern reform")

A short survey of ICME history

1969, the birth of ICME

Hans Freudenthal, chairing ICMI from 1967 to 1970, had a view of mathematics, seen not primarily as a body of knowledge, but as a human activity, a view on mathematics education, seen essentially as a development from the concrete to the general, and a view on research on mathematics education to be developed as a new field, not restricted to a statistical or psychological point of view.

He drew all the consequences of such a position in creating a journal (Educational studies in Mathematics); a congress: the first ICME (International Congress on mathematical education) was launched in 1969 in Lyon, as a manifestation of independence from IMU; and an Institute: Freudenthal Institute in Utrecht (Bass 2008)

A short survey of ICME history

1969, ICME, APM and IREM in Lyon

A convergence of mathematical evolution (the Bourbaki school), curricular reform (Modern Math), mathematics education as a research field (ICME) and deep social pressure (May 1968 events)

In 1968, at the time of the student demonstrations, Glaymann, mathematician in Lyon, president of the French national mathematics teacher association (APM), received an audience with the Minister of National Education, Edgar Faure and reiterates the APM proposition of creating IREM (Institutes for research on mathematics teaching)

Faure, after one week of reflection, to evaluate the cost of such an operation, proposed to create an IREM in Paris. Glaymann answered him that with the same budget, the APM thinks that three IREMs could be created.

This came to pass, Glaymann was named first director of the IREM at Lyon, and this, just in time, put him in a position to offer to host the first ICME in 1969 proposed by Freudenthal

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A short survey of ICME history

From 1983 to 1986, Jean-Pierre Kahane, a French mathematician, chaired ICMI. In 1985, he launched the *ICMI Studies*.

Each Study focuses on a topic or issue of prominent current interest in mathematics education. Built around an international conference, it is directed towards the preparation of a published volume intended to promote and assist discussion and action at the international, regional or institutional level.

The first one was, in 1985: *The Influence of Computers and Informatics on Mathematics and its Teaching*

The next one (ICMI Study 24): *School Mathematics Curriculum Reforms: Challenges, Changes and Opportunities*

https://www.mathunion.org/icmi/activities/icmi-studies

A short survey of ICME history

2008, centenial of ICMI

A symposium was held in Rome to celebrate the 100th anniversary of this institution. It was addressed to a selected group of participants (150–200 people), under the title:

The First Century of the International Commission on Mathematical Instruction (1908-2008) Reflecting and Shaping the World of Mathematics Education

The programme included plenary sessions, invited short talks, and working groups. Most plenary lectures had a speaker and a reactor. Each working group had two leaders and up to 30 participants

For example, the WG « The role of resources and technology in mathematics education » (Maschietto & Trouche 2010)

http://www.unige.ch/math/EnsMath/Rome2008/

ICME EXPERIENCES

ICME-10 in Copenhagen

Long trip

- Programme
  - ✓ 8 days, from 9:00 to 20:00…

- Satellite conferences
  - ✓ PME (International Group for the Psychology of Mathematics Education)
  - ✓ HPM (History and Pedagogy of Mathematics)
  - ✓ etc.

ICME-11 in Monterrey (Mexico)

What for? For whom?

Mathematicians

Researchers on math education

Teacher Educators

Teachers

Cross-cultural setting

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ICME-12 in Seoul (South Korea)
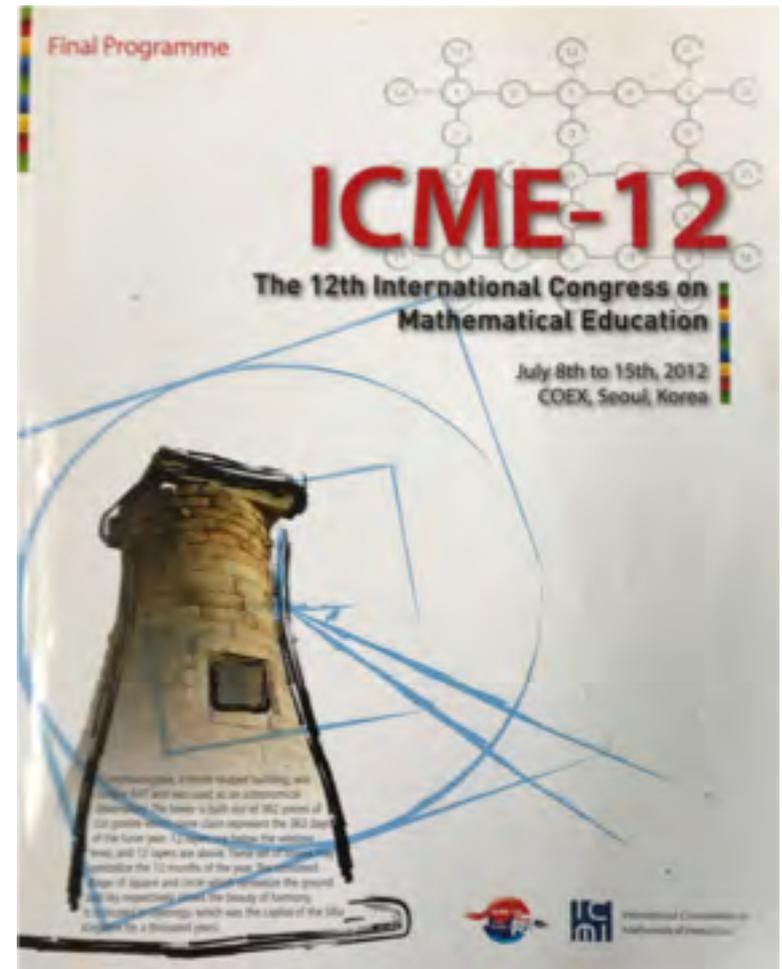
ICMI and Japan

- ICME Participations
  - ✓ Lyon (1969): 5/650; Exeter (1972): 40/1400; Karlsruhe (1976): 80/2000; etc.

- ICMI President
  - ✓ 1975-1978: Shokichi Iyanaga

- ICME-9
  - ✓ Tokyo (Makuhari) in 2000

- IMU President
  - ✓ 2015-2018: Shigefumi Mori (Fields medallist)
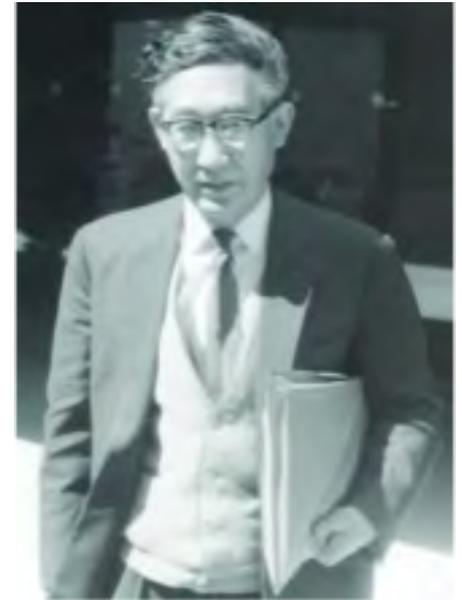
ICME-13 in Hamburg (Germany)
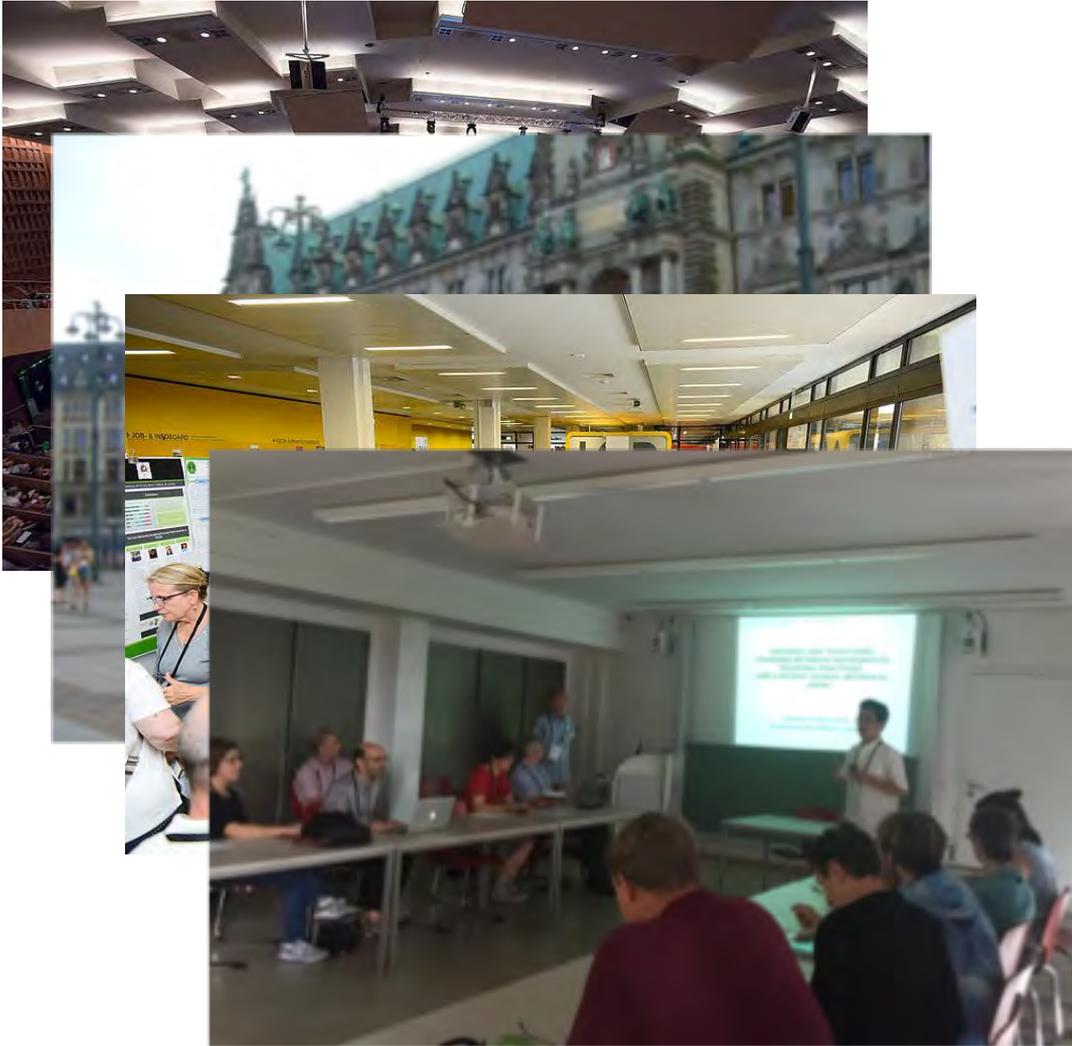
Proceedings
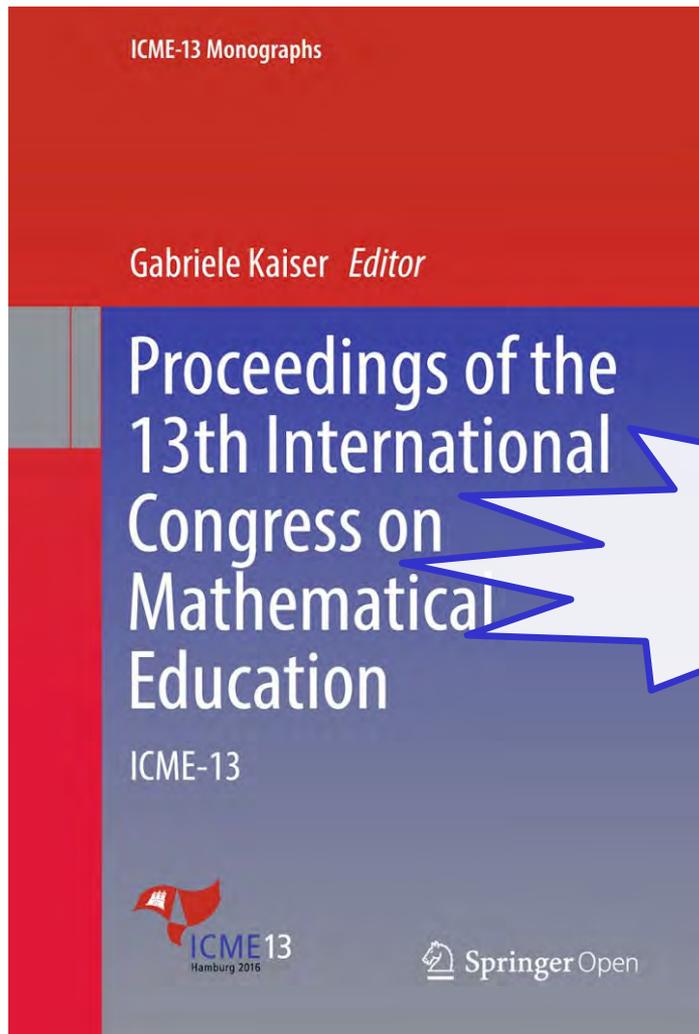
26 titles !!
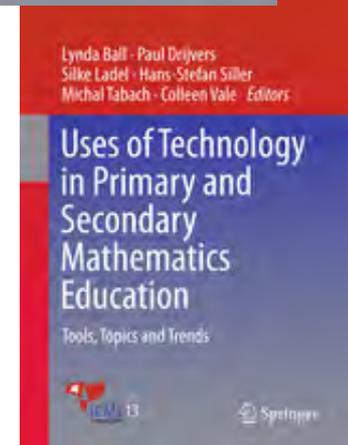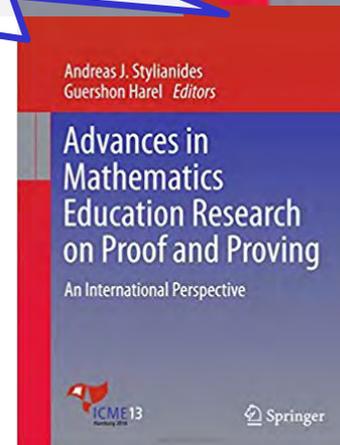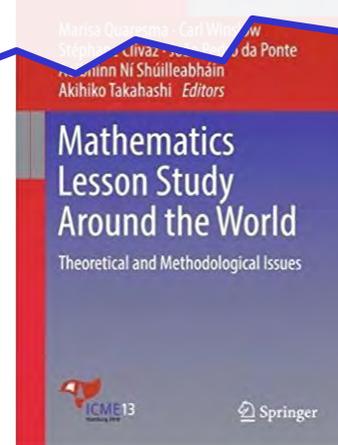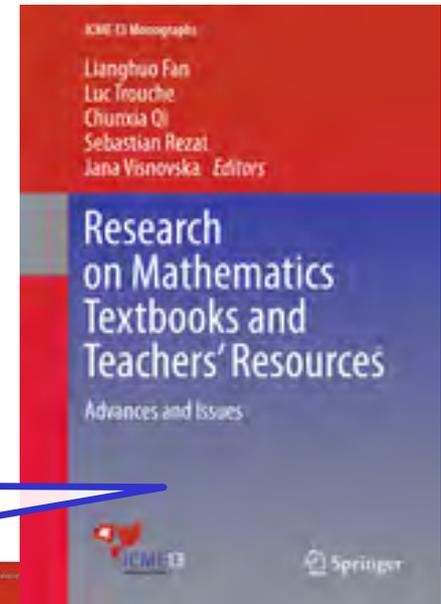
Evolution of proceedings

10th International Congress on Mathematical Education

PROCEEDINGS

ICME 10 2004

July 4-11 2004
Copenhagen, Denmark

Materials from ICME-11 Mexico
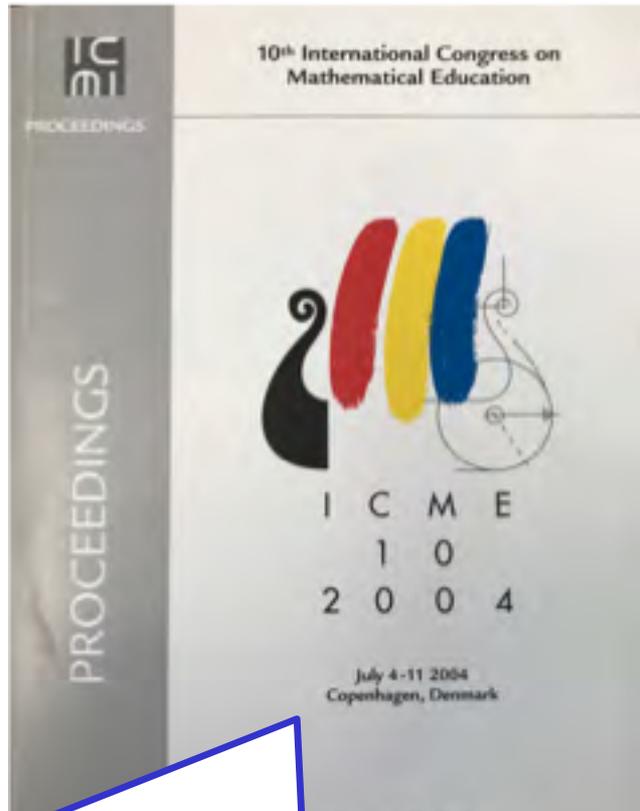
ICME-10: Relatively longer papers for plenary activities and short reports from TSG, DG, etc.

ICME-12 in Seoul (South Korea)

Sung Je Cho
Editor

The Proceedings of the 12th International Congress on Mathematical Education

Intellectual and Attitudinal Challenges

Springer Open

Sung Je Cho
Editor

Selected Regular Lectures from the 12th International Congress on Mathematical Education

Springer
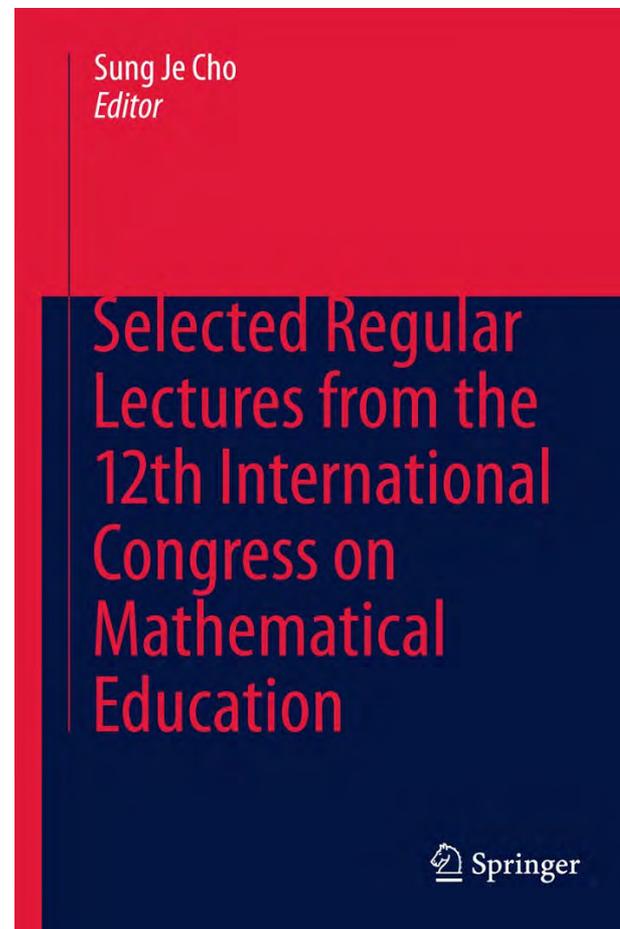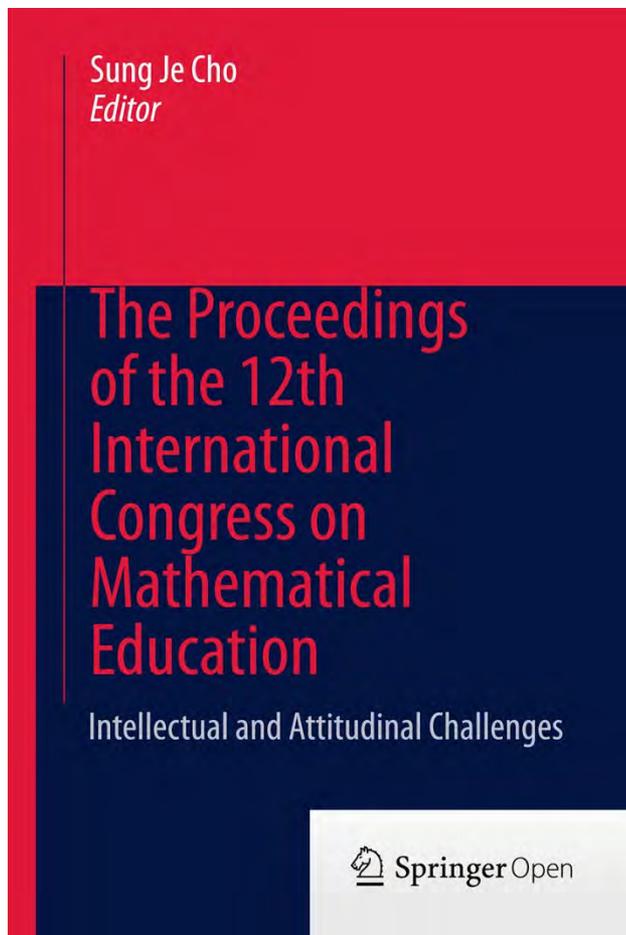
Towards ICME-14, in Shanghai, 2020

Towards ICME-14, in Shanghai, 2020

- Basic data of ICME 14, 2020, Shanghai

- Retrospect of bidding for ICME 14

- First IPC meeting

- Topic Study Groups at ICME 14

- Discussion Group / Workshop / National Presentation and others

- Cultural and social activities in Shanghai

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Basic data of ICME 14, 2020, Shanghai

When: July 12 to 19, 2020, Shanghai, China

Where:
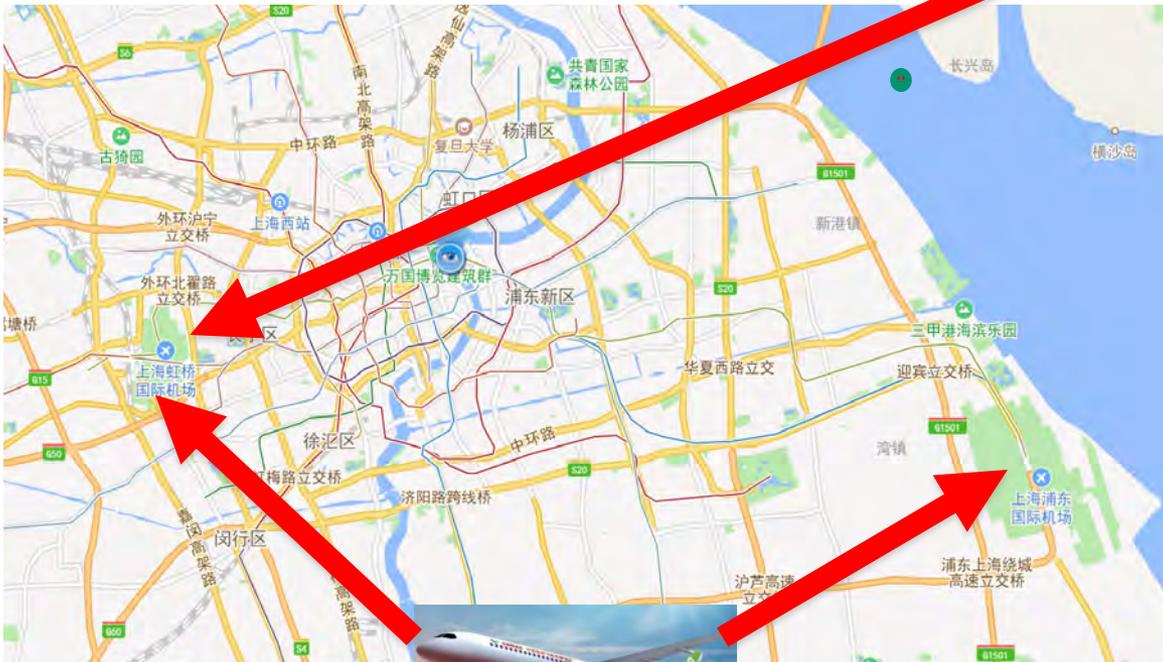
Basic data of ICME 14, 2020, Shanghai

Website ICME-14: www.icme14.org

Please visit the official ICME-14 website for further information. In the near future you will find a lot of useful information about the important aspects of the upcoming congress.

Retrospect of bidding for ICME 14

- **East China Normal University plays the main role in the bidding**

The official bidding body is Chinese Mathematical Society (CMS). Authorized by CMS, East China Normal University (ECNU) undertakes the bidding, and also pays the main role in the preparing and hosting ICME 14.

East China Normal University is one of the most prestigious universities in China.

Retrospect of bidding for ICME 14

- **The mathematics education team of ECNU**

ECNU takes the lead in the development of teacher education in China, and has a tradition of laying great emphasis on the practice and research in mathematics education.

The biggest team of mathematics educators in the university in China (8+6+X）:

- From the School of Mathematics Science: 5 full professors +4 associate professors + young potential researchers

- From the School of Education: 3 full professors + 2 associate professors + young potential researchers

Retrospect of bidding for ICME 14

- **The mathematics education team of ECNU**

ECNU boast an active team of young and middle aged mathematical educators, not only deeply involved in the international mathematics education community, but also outstanding in the research and teaching practices in the field.

There are intensive collaboration with international researchers or research groups, for example, IFE (Lucs group), University of Haifa, University of Delaware, University of Hamburg

Retrospect of bidding for ICME 14

- **The mathematics education team of ECNU**

The mathematics education team of ECNU has a great influence both at home and abroad.

Prof. Dianzhou Zhang, Jianpan Wang, Binyan Xu from ECNU ever served and is serving as ICMI EC members.

The mathematical educators in ECNU have played active roles in last few ICME, The team successfully host the Third ICMI East Asia Regional Conference on Mathematical Education (EARCOME 3) in 2005.

The team has also successfully organized the ICM 2002 Satellite Conference on Mathematical Education in Lhasa, China,

The team led the national presentation in ICME 11 in Mexico.

Retrospect of bidding for ICME 14

- **Why ICME 14 in Shanghai**

Shanghai is the engine for the economic and social development of China and a window of China's open-door policy. Since mid-19th century, Shanghai has been an important city featuring frequent exchanges between eastern and western culture.

History: As early as in the 16th century A.D., from Shanghai came a knowledgeable scientist Guangqi Xu (als known as Kwangke Seu) who, together with Metteo Recci, translated the first six books of Euclid's Elements into Chinese.

Retrospect of bidding for ICME 14

- **Why ICME 14 in Shanghai**

Nowadays: Shanghai is an important base for mathematics research and education in China.

Data from Shanghai Statistical Yearbook 2013:

Institutions	Students
67 Higher learning	506,600
761 primary schools	760.400
871 middle schools	736,100
29 special education schools	1600

Retrospect of bidding for ICME 14

- **Why ICME 14 in Shanghai**

In recent years, the outstanding performance of Shanghai students in PISA tests has attracted worldwide attention. Shanghai experiences of mathematics education was summarized.

It included mainly:
- the continuity of principles of curriculum reform which combine students' development autonomy and teachers' guidance role;

- the open culture of mathematics classroom teaching, "教无定法"(teaching with various or flexible approaches);

- collective teachers' community

Retrospect of bidding for ICME 14

- **Preparation started in June 2013…**

- **May, 2015, field defense in East China Normal University**

Retrospect of bidding for ICME 14

- **June 6, 2015, announcement by ICMI**

Retrospect of bidding for ICME 14

- **July 2016, to sign the agreement with ICMI EC in Hamburg**

Retrospect of bidding for ICME 14

- **July 2016, Welcome speech at the closing of ICME 13 in Hamburg**

First IPC meeting in Shanghai

	Name	University & Country	Remark
Chair	Jianpan Wang	East China Normal University, China	ICME-14 Congress Chair
Members	Jill Adler	University of the Witwatersrand, South Africa	Ex-officio member, ICMI President
	Abraham Arcavi	Weizmann Institute of Science, Israel	Ex-officio member, ICMI Secretary General
	Jiansheng Bao	East China Normal University, China	ICME-14 LOC Co-chair
	Daniel Chazan	University of Maryland, USA	
	Faïza Chellougui	University of Carthage, Tunisia	
	Marta Civil	University of Arizona, USA	
	Alicia Dickenstein	Universidad de Buenos Aires, Argentina	IMU Vice-President
	Yufeng Guo	Beijing Normal University, China	
	Anjum Halai	Aga Khan University, Pakistan/Tanzania	
	Gabriele Kaiser	University of Hamburg, Germany	ICME-13 Convenor & IPC Chair
	Caroline Lajoie	Université du Québec à Montréal, Canada	
	Celi Espasandin Lopes	Universidade Cruzeiro do Sul, Brazil	
	Tomas Lowrie	University of Canberra, Australia	
	Maria Alessandra Mariotti	Università di Siena, Italy	
	Takeshi Miyakawa	Joetsu University of Education, Japan	
	Frode Rønning	Norwegian University of Science and Technology, Norway	
	Ewa Swoboda	Rzeszów University, Poland	
	Luc Trouche	École Normale Supérieure de Lyon, France	
	Catherine Vistro-Yu	Ateneo de Manila University, Philippines	
	Binyan Xu	East China Normal University, China	ICME-14 LOC Co-chair
	Ivan Yashchenko	Moscow Center for Continuous Math Education, Russia	

First IPC meeting in Shanghai

The First IPC Meeting for ICME-14
September 10 - 17, 2017 Shanghai, China

First IPC meeting in Shanghai

Function of IPC
- To determine the overall structure of ICME 14
- To nominate plenary lecturers
- To propose the themes and teams of plenary panels
- To nominate invited lecturers
- To propose themes and teams of survey teams

All these activities will give an overview of the state-of-the-art within mathematics education worldwide, and in addition will provide the participants with insights into present and future major trends in mathematics education.

- To propose Topic study groups

Topic Study Groups will enable the conference participants to actively participate via their own contributions.

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Topic Study Groups at ICME 14

A Topic Study Group (TSG) is designed to gather a group of congress participants who are interested in a particular topic in mathematics education. Topic Study Groups will therefore promote the discussion of a variety of perspectives on the theme of the Group.

No.	Topic
1	Mathematics education at preschool level
2	Mathematics education at tertiary level
3	Mathematics education for gifted students
4	Mathematics education for students with special needs
5	Teaching and learning of number and arithmetic
6	Teaching and learning of algebra at primary level
7	Teaching and learning of algebra at secondary level
8	Teaching and learning of geometry at primary level
9	Teaching and learning of geometry at secondary level
10	Teaching and learning of measurement
11	Teaching and learning of probability
12	Teaching and learning of statistics
13	Teaching and learning of calculus
14	Teaching and learning of programming and algorithms
15	Teaching and learning of discrete mathematics

Topic Study Groups at ICME 14

16	Reasoning, argumentation and proof in mathematics education
17	Problem posing and solving in mathematics education
18	Students' identity, motivation and attitudes towards mathematics and its study
19	Mathematical literacy, numeracy and competency in mathematics education
20	Learning and cognition in mathematics (including learning science)
21	Neuro science and mathematics education/Cognitive Science
22	Mathematical applications and modelling in mathematics education
23	Visualization in the teaching and learning of mathematics
24	The role and the use of technology in the teaching and learning of mathematics at primary level
25	The role and the use of technology in the teaching and learning of mathematics at lower secondary level
26	The role and the use of technology in the teaching and learning of mathematics at upper secondary level
27	The role of the history of mathematics in mathematics education
28	Preservice mathematical teacher education at primary level
29	Preservice mathematical teacher education at secondary level
30	In-service mathematical teacher education and mathematical teacher professional development at primary level
31	In-service mathematical teacher education and mathematical teacher professional development at secondary level

Topic Study Groups at ICME 14

32	Knowledge in/for teaching mathematics at primary level
33	Knowledge in/for teaching mathematics at secondary level
34	Affect, beliefs, and identity of mathematics teachers
35	Knowledge and practice of mathematics teacher educator
36	Research on classroom practice at primary level
37	Research on classroom practice at secondary level
38	Task design and analysis
39	Language and communication in the mathematics classroom
40	Research and development on mathematics curriculum
41	Research and development on textbooks and resources for learning and teaching mathematics
42	Research and development in assessment in mathematics education
43	Research and development in testing (national and international) in mathematics education
44	Mathematics and interdisciplinary education
45	Mathematics for non-specialist/mathematics as a service subject at tertiary level
46	Mathematical competitions and other challenging activities
47	Mathematics education in a multilingual environment
48	Mathematics education in a multicultural environment
49	Distance learning, e-learning, and blended learning of mathematics

Topic Study Groups at ICME 14

50	Mathematics education in and for work; continuous mathematics education including adult education
51	Mathematics education for ethnic minorities
52	Ethno-mathematics
53	Equity in mathematics education
54	Social and political dimensions of mathematics education
55	The history of the teaching and the learning of mathematics
56	Philosophy of mathematics and mathematics education
57	Diversity of theories in mathematics education
58	Empirical methods and methodologies in mathematics education
59	Mathematics and creativity
60	Semiotics in mathematics education
61	International education cooperation
62	Popularization of mathematics

Discussion Group / Workshop / National Presentation and others

- Discussion groups are designed to gather congress participants who are interested in discussing, in a genuinely interactive way, certain challenging, controversial or emerging issues and dilemmas of interest to an international or regional audience.

- Workshops aim for an even deeper interaction with a specific topic emphasizing activities of the participants

- A National Presentation is an activity during which representatives of a given country will make a presentation on the state and trends in mathematics education in that country.

Cultural and social activities in Shanghai

Shanghai French Concession, since the end of 19th century, ended in 1943.
Shanghai Wu Kang Building (I.S.S Normandie Apartment, constructed since 1924), Xuhui district, Huai Hai Zhong Road

Cultural and social activities in Shanghai

Shanghai Xuhui district, Hengshan Road (at that time in Shanghai French Concession)

Cultural and social activities in Shanghai

Fuxing Garden (at that time called French Garden)

Typical Shanghai visiting

Zhu Jia Jiao, Water village, more than 2000 years old

Welcome to ICME 14
July 12-19, 2020

Welcome to Shanghai, China

Current collaborative projects

In the frame of the PRoSFER and JoRISS programs, ECNU -ENS de Lyon collaboration

2014-2015 The C2SE project (French-Chinese laboratory for comparing curricula in science education) http://joriss.ens-lyon.fr/education-science-c2se--186013.kjsp?RH=JORISS-PROJECTS&RF=1365416327206
2015-2016 The CORE-M project (Collective and Resources for teaching Mathematics)

2016-2017 The MaTRiTT project (Mathematics teachers' resources in a Time of Transitions) http://ife.ens-lyon.fr/ife/recherche/groupes-de-travail/matritt-joriss

Chongyang WANG

Binyan XU

Luc TROUCHE

Jiansheng BAO

Luxizi ZHANG

Fangchun ZHU

Sophie Soury-Lavergne

Jana TRGALOVA

Mingyu SHAO

Chongyang WANG's work pays particular interests on the **expertise** in **teachers' documentation work**, and mathematics teacher professional development **in collective resource work**. In her PhD study, two groups of math teachers from lower secondary schools (one in China and one in France) were followed. She hopes to explore the components of documentation expertise and the mechanism for its development, through the contrasting case studies.

Fangchun ZHU focus on the **instrumental orchestration** for mathematics teachers in **dynamic geometry environment**. In the research, he pays attention to one of the special resources: mathematics task with dynamic geometry and analyze the different roles of dynamic geometry in teachers' didacitcal process. By contrasting french and chinese cases, he wants to analyze the different in the orchestration of different mathematics tasks.

Luxizi ZHANG is studying variations in teaching mathematics through the lens of resources. Comparing the similarities and differences of the variation in Chinese mathematics teaching with that of French. The variation can be the variation of teachers themselves (teachers' documentation work) and the variation of the exercises on the basis of "BIANSHIJIAOXUE" (Bao et al., 2003; Gu et al., 2004) , theory of variation (Marton, 2015), didactic variables (Brousseau 1986), and changes of registers (Duval, 2006).

Mingyu SHAO is adopting the comparative analysis and the design research methodology, the research will be devoted to describe how (under which condition and by what means) the digital learning environment can promote the learning of analytical geometry concept——in particular, what is the relationship between the development of student thinking level along the hypothetical learning trajectory and the development of student individual instrumental genesis of dynamic geometry software ?Theoretical Basis: the notion of hypothetical learning trajectory (Simon, 1995; Clement & Sarama, 2004), instrumental approach (Verillon & Rabardel, 1995) and instrumental genesis (Gueudet & Trouche, 2009).
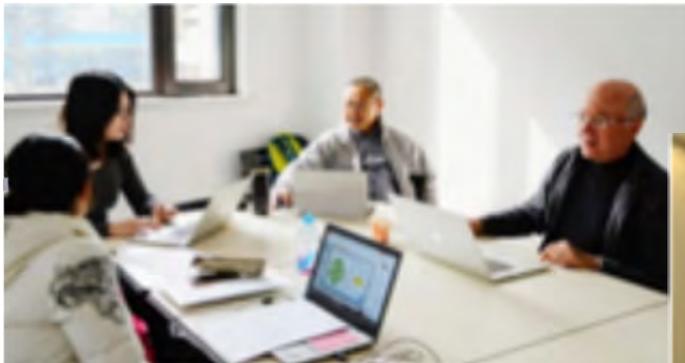
Wish all of you
a complete success

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