BULLETIN

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Mathematical Instruction

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Bulletin of the International Commission on Mathematical Instruction

No. 55 December 2004

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About ICMI

Background The *International Commission on Mathematical Instruction*, ICMI, is a commission of the *International Mathematical Union* (IMU), an international non-governmental and non-profit making scientific organisation with the purpose of promoting international cooperation in mathematics.

Established at the Fourth International Congress of Mathematicians held in Rome in 1908 with the initial mandate of analysing the similarities and differences in the secondary school teaching of mathematics among various countries, ICMI has expanded its objectives and activities considerably over the years. The Commission aims at offering researchers, practitioners, curriculum designers, decision makers and others interested in mathematical education, a forum for promoting reflection, collaboration, exchange and dissemination of ideas and information on all aspects of the theory and practice of contemporary mathematical education as seen from an international perspective. ICMI thus takes initiatives in inaugurating appropriate programmes designed to further the sound development of mathematical education at all levels, and to secure public appreciation of its importance. The Commission is also charged with the conduct of the activities of IMU bearing on mathematical or scientific education. In the pursuit of its objectives, the Commission cooperates with various groups, regional or thematic, which may be formed within or outside its own structure.

As a scientific union, IMU is a member organisation of the *International Council for Science* (ICSU). This implies that ICMI, through IMU, is to abide to the ICSU statutes, one of which establishes the principle of non-discrimination. This principle affirms the right and freedom of scientists to associate in international scientific activities regardless of citizenship, religion, political stance, ethnic origin, sex, and suchlike. Apart from observing general IMU and ICSU rules and principles, ICMI works with a large degree of autonomy.

Structure Members of ICMI are not individuals but countries, namely those countries that are members of IMU and other countries specifically co-opted to the Commission. Each member of ICMI appoints a Representative and may create a Sub-Commission for ICMI to maintain liaison with the Commission in all matters pertinent to its affairs. ICMI currently has 82 members.

The Commission is administered by the *Executive Committee of ICMI*, elected by the General Assembly of IMU and responsible for conducting the business of the Commission in accordance with its Terms of Reference and subject to the direction and review of the members. The *General Assembly of ICMI* consists of the members of the Executive Committee and the Representatives to ICMI. The General Assembly convenes every four years in conjunction with the International Congress on Mathematical Education.

ICMI Activities A major event in the life of the international mathematics education community, the quadrennial *International Congress on Mathematical Education*, ICME, is held under the auspices of ICMI and typically gathers more than three thousand participants from all over the world. The ICMI Executive Committee is responsible for the selection of a site for an ICME as well as for the appointment of International Programme Committee, in charge of the scientific content of the

congress. The practical and financial organisation of an ICME is the independent responsibility of a Local (or National) Organising Committee, under the observation of general ICMI principles.

Apart from the ICME congresses, the Commission organises or supports various activities, such as the *ICMI Study Programme*, in which each Study, built around an international seminar, aims at investigating issues or topics of particular significance in contemporary mathematics education and is directed towards the preparation of a published volume intended to promote and assist discussion and action at the international, national, regional or institutional level; the *ICMI Regional Conferences*, supported by ICMI morally and sometimes financially in order to facilitate the organisation of regional meetings on mathematics education, especially in less affluent parts of the world; or the *ICMI Solidarity Project*, aiming at increasing the commitment and involvement of mathematics educators around the world in order to help the furtherance of mathematics education in those parts of the world where there is a need for it that justifies international assistance and where the economic and socio-political contexts do not permit adequate and autonomous development.

The above-mentioned activities are of a more or less regular nature. In addition to those, ICMI involves itself in other activities on an *ad hoc* basis. For instance, ICMI has recently reinitiated contacts with UNESCO and established collaboration with ICSU Committee on Capacity Building in Science. Also ICMI is involved in planning the education components on the programme of the International Congresses of Mathematicians, the ICMs.

ICMI Affiliated Study Groups The Commission may approve the affiliation to ICMI of Study Groups, focussing on a specific field of interest and study in mathematics education consistent with the aims of the Commission. The current Study Groups affiliated to ICMI are the *International Study Group on the Relations between the History and Pedagogy of Mathematics* (HPM), the *International Group for the Psychology of Mathematics Education* (PME), the *International Organization of Women and Mathematics Education* (IOWME), the *World Federation of National Mathematics Competitions* (WFNMC) and the *International Study Group for Mathematical Modelling and Applications* (ICTMA).

Information and Communication The official organ of ICMI since its inception is the international journal *L'Enseignement Mathématique*, founded in 1899. The homepage of the journal can be found at the address http://www.unige.ch/math/EnsMath/. Under the editorship of the Secretary-General, ICMI publishes the *ICMI Bulletin*, appearing twice a year. The Bulletin is accessible on the internet at the address http://www.mathunion.org/ICMI/, where more information about ICMI can also be found.

Support to ICMI The principal source of ICMI's finances is the support it receives from the IMU. Every year ICMI thus has to file a financial report for the endorsement of IMU, as well as a scientific report on its activities. Quadrennial reports are presented to the General Assemblies of both IMU and ICMI.

But one of the greatest strengths of ICMI is the time contributed freely by the hundreds of mathematicians and mathematics educators committed to the objectives of the Commission.

The Members of ICMI

All countries members of the International Mathematical Union, the mother organisation of ICMI, are *de facto* members of ICMI. But it is also possible for a country not a member of IMU to become a member of ICMI. (Information on this matter can be obtained from the Secretary-General of ICMI.)

There are currently 82 member countries of ICMI, 66 of which are also members of IMU. In the following list, (*) indicates a member of ICMI that is not a member of IMU.

A Argentina
Armenia
Australia
Austria
B Bangladesh (*)
Belgium
Bosnia and Herzegovina
Botswana (*)
Brazil
Brunei Darussalam (*)
Bulgaria
C Cameroon
Canada
Chile
China
Costa Rica (*)
Croatia
Cuba
Czech Republic
D Denmark
E Egypt
Estonia
F Finland
France
G Georgia
Germany
Ghana (*)
Greece
H Hong Kong
Hungary
I Iceland
India
Indonesia (*)
Iran
Ireland
Israel
Italy
Ivory Coast
J Japan
K Kazakhstan
Democratic Republic of Korea
Republic of Korea
Kuwait (*)
L Latvia
Lithuania
Luxembourg (*)
M Malawi (*)
Malaysia (*)
Mexico
Mozambique (*)
N Netherlands
New Zealand
Nigeria
Norway
P Pakistan (*)
Peru
Philippines
Poland
Portugal
R Romania
Russia
S Saudi Arabia
Senegal (*)
Serbia and Montenegro
Singapore
Slovakia
Slovenia
South Africa
Spain
Swaziland (*)
Sweden
Switzerland
T Thailand (*)
Tunisia
Turkey
U Ukraine
United Kingdom
United States of America
Uruguay
V Venezuela
Vietnam
Z Zambia (*)

The International Commission on Mathematical Instruction

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Legend: IMU stands for the *International Mathematical Union*. ICMI is a commission of IMU.

ICME-9 Proceedings:
A Revised Version of the CD to be Issued

The book of Proceedings of ICME-9 was on display in a mock-up version during ICME-10 and has appeared slightly after this congress. The reference of the book is:

> Hiroshi Fujita, Yoshihiko Hashimoto, Bernard R. Hodgson, Peng Yee Lee, Stephen Lerman and Toshio Sawada, editors, *Proceedings of the Ninth International Congress on Mathematical Education*. Kluwer Academic Publishers, 2004. ISBN 1-4020-8093-X (Hardcover), 1-4020-7902-8 (Softcover) or 1-4020-7910-9 (E-book).

The book is accompanied by a CD. However a problem occurred in the production of the CD. It is stated in the Preface of the book (p. xii) that "the CD part of these Proceedings contains, in addition to files for the whole content of the book part, vivid scenes of the ceremonies and the IRT, full texts of regular lectures if available, and some scientific animation etc." As it turns out the "whole content of the book part" is absent from the accompanying CD, as are the "full texts of the regular lectures if available".

The Executive Committee of ICMI and the Japanese organizers of ICME-9 deeply regret this situation, which caused frustration to many ICME-9 participants and especially to the regular lecturers. However I am pleased to inform the ICMI community that the congress organizers have decided to issue a revised and complete version of the CD that will be sent to all ICME-9 participants. Details about the revised CD will soon be announced.

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A New Cover for the *ICMI Bulletin*

This issue of the *ICMI Bulletin* is the first one integrating on its cover the recently adopted ICMI logo. The new cover of the *Bulletin* was designed at the *Studio École* of the School of visual arts of Université Laval (Québec).

The Editor

Presidential Address at the Opening Ceremony of ICME-10

Hyman Bass

Minister Toernaes,
Dean Stubkjaer,
Mayor Aagard-Svendsen,
Chairmen Niss and Blomhoej,
Dr. Stedhøy,
Guests and participants of the Tenth International Congress on Mathematical Education.

As President of the International Commission on Mathematical Instruction, it is my honor and pleasure to welcome you all to this auspicious congress, and to express our collective appreciation of the hard work, imagination, and gracious hospitality of our Nordic hosts.

About the ICME and mathematics education

This Congress vividly reminds me of the complexity of mathematics education, and of how hard it is to globally comprehend.

This contrasts with mathematics, as a discipline. Mathematics has a universal character. Mathematicians throughout the world have a largely shared sense of the nature of their discipline, its central problems, its methods, and of the nature, genesis, and warrants of mathematical knowledge. Mathematicians worldwide know each other, and speak a common technical language.

Mathematics education, in contrast, is not simply a discipline, a body of knowledge, a field of scholarly research. It is *partly* that — things one *knows*. But, much more than that, and perhaps more importantly, it comprises things that people *do*, a field, or rather a constellation of fields, of *practice*. Who are the professionals that populate this enterprise? They are, first and foremost, teachers of mathematics, at all levels, from kindergarten through university levels. And they are teacher educators, a diverse community of which many mathematicians are (often unconsciously) members, as well as teacher leaders and professional developers. They are mathematicians, curriculum developers, assessment specialists, school administrators, district and state level supervisors and policy makers. And overlain on all of this are educational researchers who study all aspects of this loosely organized system.

This character of mathematics education was not always so. For most of history, few of the professions I have mentioned, except for teaching, existed. The evolution toward this vast enterprise, that we now inhabit — and here assemble — was long and gradual. It was marked by certain transforming events such as the invention of the printing press, the industrial revolution, the emergence of science as a foundation for security and commerce, the digital revolution, and the spread

of democratization. These have had certain consistent and cumulative effects on education, and on mathematics education in particular:

- Higher leverage resources for the conservation and transmission of knowledge.
- The need for acquisition of more, and more sophisticated knowledge.
- The need to provide such knowledge to growing numbers of people.
- The challenges of diversities: Of resources and expertise needed for the educational enterprise; of cultural and social contexts; of institutional and curricular organization; of learners and learning styles; of appropriate pedagogical methods; and of the formation of education professionals.

The core of contemporary mathematics education remains what Deborah Ball and David Cohen have called the "instructional triangle," the interactive dance of the teacher, the students, and the mathematics, in a classroom setting. Scholarly work on mathematics instruction has progressed from an early focus on the mathematical ideas, and how best to render them in the school curriculum, then to a close cognitive study of learners and how they process and assimilate new mathematical ideas, and now increasingly to teaching, a complex and multidimensional phenomenon for which effective methods of research are only now being developed.

The size and diversity of this Congress mirrors that of the mathematics education enterprise itself. An added special feature, and benefit, of this Congress is its *international character*. Mathematics education is culturally situated, and takes different forms in different societies. Here you will be able to learn about, and from, those differences. Here, in one environment, you will meet and communicate with co-professionals with whom you rarely have occasion to interact, be they from another continent, or from your home institution. It is a unique event, perhaps at times bewildering, but I hope also edifying, and even inspiring.

A tribute to Miguel de Guzmán and Igor Sharygin

There are many dedicated individuals in the ICMI family who carry forward the work and organization that make these Congresses, and the other work of ICMI possible. We have sadly this year lost two important members of that family.

Miguel de Guzmán, my predecessor as President of ICMI, passed away suddenly and prematurely on April 14, 2004. He was a distinguished harmonic analyst, and an intellectual and spiritual leader of the current blossoming of mathematics and mathematics education in Spain. Among Miguel's important contributions to ICMI is the creation of the Solidarity Project, whose aim is outreach to help improve mathematics education in developing countries. He was a man of broad culture, deep compassion, and an inspiring communicator and teacher. His passing is a sad loss for our Spanish colleagues, and for the many communities of mathematics and mathematics education worldwide.

Igor Sharygin, a name perhaps less familiar to you, was a member of the last ICMI Executive Committee. I report with the sadness of all who had the good fortune to know him that Igor passed away on March 12, 2004. Igor was a high school teacher who exemplified the highest Russian traditions of problem-based mathematics education. His love and deep understanding of geometry is evident in his writings. And Igor was culturally a mathematician, who typically used the word

"beautiful" in describing both mathematics and mathematicians. We fondly remember his personal warmth and generosity, and his passion for life and ideas.

The ICMI Awards

There are many important new developments in the ICMI world since the last Congress in Japan. To conclude these welcoming remarks, I wish to speak of one of them, the inauguration of two new ICMI awards — the *Felix Klein Medal* for lifetime achievement in mathematics education research, and the *Hans Freudenthal Medal*, for a major program of research on mathematics education during the past 10 years. Michèle Artigue will shortly chair the presentation of these awards.

When I arrived in the ICMI environment, the possible establishment of ICMI awards was one of the first issues I encountered. This question had already had a long and inconclusive history. The ICMI Executive Committee in 1999 appointed a committee of distinguished and respected leaders in the field, chaired by Jeremy Kilpatrick, to study the question and make a recommendation to the ICMI EC. The medals to be awarded today inaugurate a design that follows the essential principles recommended by the Kilpatrick Committee. Suffice it here to share some of the views, partly personal, that shaped this action.

Opposition to giving awards was based on concerns for things like elitism, potential or perceived bias, superabundance of qualified candidates and consequent disappointment of deserving individuals, lack of sufficiently objective and consensual criteria for selection, immunity of the selection process from undue external pressure, etc. All of these are serious concerns, to which substantial attention was given in the design of the award process.

Of the many kinds of important contributions to mathematics education worthy of recognition, we chose, for now, to focus on *mathematics education research*, since this is a domain where norms of evaluation are most developed, and now most demanded. Indeed, we felt that the awards themselves, and the quality controls on the selection process, could help contribute, through such public recognition of exemplary work, to the evolution and better articulation of broadly accepted norms in the field. The Award Selection Committee consisted of an international group of six distinguished scholars in the field. Its membership, except for its publicly known chair, Michèle Artigue, remains confidential until expiration of their terms.

These awards honor extraordinary work of individual scholars, and, in so doing they are meant to encourage the efforts of others in the field. But they have broader purposes as well. As I just indicated, they offer a process for developing, over time, a publicly sanctioned definition of quality in a field that has often struggled to find one. The absence of such awards was, in some minds, and in the outside world, a confession of the lack of possibility of such a consensual definition. To less generous critics of mathematics education, it signalled an absence of work worthy of high recognition. When we are now asked to cite exemplary mathematics education research, we should be able to point, with conviction and pride, to those recognized with the award of these medals. A further salutary effect of the awards, an effect already witnessed, is that they will help breach some of the provincial boundaries in mathematics education scholarship, wherein much important work is known

only within national or regional boundaries. The works of today's and future medallists will more quickly gain the wide international audience that they deserve.

Opening of the Congress
It is now my privilege and joyful duty, on behalf of the International Commission on Mathematical Instruction, to declare officially open this Tenth International Congress on Mathematical Education.

For my first act within the Congress, it gives me great pleasure to introduce Professor Michèle Artigue, Chair of the Award Selection Committee, for the ceremony of presentation of the Felix Klein and Hans Freudenthal medals.

Hyman Bass, President of ICMI
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ICME-11 in México: A Progress Report

The Executive Committee of ICMI is pleased to announce its decision, made at its meeting held in July 2004 on the occasion of ICME-10, to appoint Professor Marcela Santillán, Rectora at the Universidad Pedagógica Nacional in México, as the Chair of the International Programme Committee for ICME-11. Prof. Santillán can be reached by e-mail at her address m.santillan@ajusco.upn.mx.

The full composition of the IPC will be announced in the next issue of the *ICMI Bulletin*.

On the other hand, the Mexican organizers have announced that Professor Carlos Signoret, Head of the Department of Mathematics at the Universidad Autónoma Metropolitana — Iztapalapa in México, will act as chair of the Local Organizing Committee for ICME-11. His e-mail address is casi@xanum.uam.mx.

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A Call for Bids for ICME-12 (2012)

Bernard R. Hodgson

ICME-10 is just a few months behind us, and the next International Congress on Mathematical Education is still more than three years away. Still it is already time to initiate the process leading to the following ICME, the twelfth in this series of quadrennial meetings. The ICMI Executive Committee is thus launching to all its member countries an official call to submit bids to host ICME-12 in 2012.

As the task of organizing an international congress of the size of an ICME becomes increasingly immense, complicated and demanding — and involves for example the reservation of accommodation and other facilities many years ahead —, it is hoped that a formal decision about the site of ICME-12 could be made before the end of 2007. We are thus proposing the following schedule:

- preliminary declaration of intention of presenting a bid to act as host for ICME-12 should be received by the Secretary-General of ICMI by **November 1, 2005**;
- firm bids should reach the Secretary-General by **November 1, 2006** (in 12 copies).

I would like to say a few words about possible ingredients that can be found in a bid to host an ICME. The main task in preparing such a bid is to provide conviction for the ICMI Executive Committee that the candidate country is in a favorable position of accomplishing this non-trivial task. The document submitted should thus address aspects such as the following.

- ***Inviting bodies***
  The bid should define the set of inviting bodies, i.e. those who submit the bid. In most cases this set consists of a coalition of bodies (like learned societies, associations, academies, universities, official national or provincial authorities). This aspect is to ensure that the invitation has sufficiently broad support in the proposed host country and that all major parties concerned with mathematics education stand behind the bid. Also of importance is the actual involvement of the local mathematics education community so as to create a nice ambiance around and during the meeting.

- ***Scientific infrastructure***
  The document should present the scientific infrastructure in the bidding country that will be supporting the congress. This is to demonstrate the presence of a sufficiently large group of mathematics educators in the country to provide national backup of the scientific program. In particular, the document should clarify whether there is a substantial core of educators in the country with experience in international meetings.

- ***Venues***
  The bid should indicate possible venues within the country (city and institutions in which the congress would take place), describing their advantages and disadvantages in relative terms.

This includes a presentation of the technical congress facilities (in particular the availability of rooms of various types and sizes, among others for the plenary sessions, or usual standards such as air conditioning or presentation equipment), transportation to the site as well as on-site, and the variety of local accommodation facilities, ranging from inexpensive student residence type accommodation to high-class international hotels. Eventually, the bid should address other local concerns, such as the security of participants.

- ***Logistic infrastructure***
  The document submitted should outline the logistic infrastructure of the congress in order to demonstrate that a sufficiently advanced, varied and capable organization system is — or can be put — in place to deal with all matters pertinent to the local organization of a multi-faceted and complex congress of about 4000 participants.

- ***Financial infrastructure***
  The bid should describe the financial infrastructure of the congress, indicating the size of the funds that are expected to be available to the congress, and listing the organizations, institutions, and bodies in the bidding country that are ready — or may be expected — to support the congress financially in terms of money, services, equipment or manpower. The bid should also address the specific issue of possible help to participants from non-affluent countries, as well as the expected level of registration fees for congress participants.

The above is not meant to be an exhaustive check-list of matters to be considered one after the other in preparing a bid, but it gives the flavor of the natural questions the decision makers, namely the Executive Committee of ICMI, will be considering, in addition to other issues such as the broad geographical distribution of the ICME congresses.

The best general guidance in preparing a bid may be found in the following summary: the document has to have two properties, namely,

(a) an existence proof (or at least a good sketch of one) that the inviting consortium can actually manage all aspects of the Congress;
(b) features that make the Executive Committee of ICMI think that the present bid is not only feasible, but also better than other potential bids.

Of course, as the quality of a bid is a multi-faceted concept, there is freedom to balance weaker points in a potential bid with stronger ones.

Any country interested in making a bid is strongly encouraged to do so. Potential bidders may wish to keep in mind the precedent created with ICME-10, namely an invitation presented on behalf of a group of countries that have agreed to support and concretely collaborate in the organization of the congress in a particular country.

The Secretary-General will be happy to reply to requests for further information on these matters.

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The 2005 ICMI Awards — A Call for Proposals

Michèle Artigue

The Executive Committee of the International Commission on Mathematical Instruction (ICMI) has recently created two awards in mathematics education research :

- the ***Hans Freudenthal Award***, for a major program of research on mathematics education,
- the ***Felix Klein Award***, for lifelong achievement in mathematics education research,

and an ICMI Awards Committee of six persons has been appointed for selecting the awardees.

The first recipients of these two awards, Professor Guy Brousseau for the Felix Klein Award and Professor Celia Hoyles for the Hans Freudenthal Award, formally received these at the opening ceremonies of ICME-10 in Copenhagen in July 2004.

The ICMI Awards Committee is now entering a new selection process and the two next awardees will be known by the end of 2005. As has been the case for the first process, the ICMI Awards Committee is open to suggestions coming from the mathematics educational community and would like to have this call for proposals widely distributed.

As in the first selection process, proposals have to be accompanied by a synthetic presentation of the proposed person and of the reasons for this proposition. They have also to include the names and coordinates of two or three persons whom the Awards Committee can contact for more information. All suggestions must be sent by ordinary mail or by e-mail to the Chair of the Awards Committee **by the end of July 2005**.

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The ICMI Medals:
A Tangible Token of the ICMI Awards

Bernard R. Hodgson

The ICMI Awards in mathematics education research were presented for the first time during the Opening Session of ICME-10. The official announcement of the 2003 ICMI Awards, accompanied by citations describing the contribution of each recipient, had been issued three months earlier — the citations for the awards conferred on Guy Brousseau and Celia Hoyles were published in the *ICMI Bulletin* No. 54 (June 2004), pp. 8-11.

As a tangible sign of recognition, each awardee received at the ICME-10 ceremony a certificate and a medal. The two certificates, signed by the President and the Secretary-General of ICMI, read as follows:

> *The first Felix Klein Medal of the Internal Commission on Mathematical Instruction (ICMI) is awarded to Professor Guy Brousseau. This distinction recognises the essential contribution Guy Brousseau has given to the development of mathematics education as a scientific field of research, through his theoretical and experimental work over four decades, and to the sustained effort he has made throughout his professional life to apply the fruits of his research to the mathematics education of both students and teachers.*
>
> *The first Hans Freudenthal Medal of the International Commission on Mathematical Instruction (ICMI) is awarded to Professor Celia Hoyles. This distinction recognises the outstanding contribution that Celia Hoyles has made to research in the domain of technology and mathematics education, both in terms of theoretical advances and through the development and piloting of national and international projects in this field, aimed at improving through technology the mathematics education of the general population, from young children to adults in the workplace.*

The certificates were designed by students from the Studio École of the School of visual arts of Université Laval and can be seen on the ICMI website.

The design and production of the Felix Klein and of the Hans Freudenthal medals was done at École Boulle in Paris, a renowned French school of art and design. Founded in 1886, École Boulle is named after a famous cabinet-maker of king Louis the 14th, André-Charles Boulle, after whom is also named a well-known curved chest of drawers. The ICMI medals, produced as a project in a course for students completing their degree at École Boulle, were conceived and made by Thomas Soufflard. The technique used by the student is that of modelled engraving, where a hollowed or relief motif is

obtained by cast, strike, or ornamentation. The engraving was made by hand and the medals were stroke-pressed a few weeks before ICME-10 at the Monnaie de Paris, using a special 600-ton press.

On one face of the medals are shown the past two Presidents of ICMI, Felix Klein (1849–1925) and Hans Freudenthal (1905–1990), whose names were given to the awards. (See the *ICMI Bulletin* No. 51, December 2002, pp. 14-15, for brief information on these two eminent scholars.)

On the reverse side appears the logo of ICMI, surrounded by the name of the Commission, written in French and in the form of a circle, *Commission internationale de l'enseignement mathématique*.

This is a testimony to the intensive use of French in the early years of ICMI, as is reflected, for instance, in the issues from that period of the journal *L'Enseignement Mathématique*, the official organ of ICMI since its inception.

(The Editor is indebted to Leif Kragh, who provided the photographs of the medals.)

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About the ICMI Logo

Bernard R. Hodgson

The establishment of the ICMI Awards in mathematics education research reinforced the need of adopting a logo to serve as the visual identification of the Commission and to appear on the medals presented to the awardees. Moreover the presentation of the first awards at ICME-10 imposed an inescapable deadline for adopting a logo. The choice was finalized by the ICMI Executive Committee at its meeting held in Dortmund in February 2004, after a long process of consultation and selection among proposals submitted.

International Commission on
Mathematical Instruction

The logo of ICMI is the result of students' work. It was designed by Anick Légaré and Priscilla Lavoie, two students from the *Studio École* of the School of visual arts of Université Laval, in Québec. More than 35 proposals of logos were received, in response to a call made already in 2000 at ICME-9 and repeated in the *ICMI Bulletin*. These proposals, representing a remarkable richness of visions and creativity, mainly originated from three groups located in Denmark, France and Canada. The concepts on which the various proposed logos rest were very different one from the other, and it was not an easy exercise for the members of the Executive Committee to come to a conclusion. Among the criteria used in the final decision were the simplicity and the efficiency of the design, as well as its flexibility.

The two designers claim to have been inspired by three fundamental ingredients connected to ICMI: *mathematics*, *education* and the *international* perspective. Moreover, ICMI offering a forum for

meetings and exchanges among mathematics educators from all over the world, communication appeared to them as a major value supported by the work of the Commission.

The designers describe the visual identification adopted for ICMI as follows. After experimenting with various basic geometrical shapes (triangles, squares, rectangles, pentagons, hexagons), they selected the square, a very simple geometrical object and one of the very first shapes met by a child. The square refers here to the world of education and its structure is intended to convey stability, solidity and support.

This square has been opened up by other geometrical shapes representing the acronym of the Commission: I, C, M, I. These forms introduce rhythm and movement and also suggest creativity, an essential ingredient of mathematics. The openings bored by the letters in the border of the figure reinforce the dynamics of the whole picture and suggest outreach commitment. The letters create a network of lines evoking communication and transfer of information.

The letters are built from simple shapes, straight lines and circles, and recall basic symbols used in mathematics, while bringing to mind some kind of symmetry. The curved ends of the letters introduce suppleness as well as harmony to the whole. The acronym 'ICMI' has been integrated into the logo so as to facilitate recognition and create a lasting image. The signature, giving the full name of the Commission, uses a font (*Optima*) with a high legibility and whose lines are in harmony with the logo itself.

As regards the choice of colours, the colour blue is traditionally associated with the world of education and suggests learning and knowledge. The colour white used for the letters brings in some freshness, while the grey colour of the signature, more neutral, refers to communication and technology.

The simplicity of the logo, concluded the designers, makes it easy to recognize and easy to use in various settings, and will help it stand the test of time.

One could be tempted to add that the geometrical shapes defined within the square by the four letters may be reminiscent "locally" of the pieces of a jigsaw puzzle, thus introducing another dimension of education where games and challenges come into play — as well as evoking children, many of whom are so fond of puzzles.

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Inaugurating a New Election Procedure for ICMI

Hyman Bass and Bernard R. Hodgson

The International Mathematical Union (IMU) and the International Commission on Mathematical Instruction (ICMI), which is a sub-commission of IMU, have somewhat parallel organization and structure. Each has countries as members, each is administered by an Executive Committee (EC), including its officers, and each has a General Assembly (GA), consisting of representatives of the member countries, and which meets at the quadrennial international congresses (ICM's for IMU, ICME's for ICMI). This parallelism ceases when we come to governance. The governing body of both IMU and of ICMI has, till now, been the GA of IMU. In particular, this meant that the EC of ICMI, including the officers of ICMI, were elected by the GA of IMU, from a slate of nominees constructed by the IMU EC. In short, ICMI was governed and elected by units of IMU.

Under the impulse of pressures from the IMU GA and beyond, this process of election and governance is poised to be dramatically changed, pending approval of new proposed procedures and structures at the 2006 IMU GA to be held in Spain, in Santiago de Compostela, prior to the ICM-Madrid. For ICMI, the essential features of the proposed new election procedures are the following:

1. An **ICMI Nominating Committee** (NC) will propose a slate of candidates for the officers and other EC members of ICMI. This NC will be formed according to a carefully crafted process that assures that it is largely independent of the incumbent EC's of both IMU and ICMI, and that it includes members who are knowledgeable about the culture and functioning of ICMI. The details can be found in the Appendix below.

2. The election of officers and other EC members of ICMI will be **at and by the GA of ICMI** (not IMU) at the ICME (not the ICM).

This new process awaits approval by the IMU GA in Santiago de Compostela. In the meantime, the proposed new model for the ICMI NC has already been implemented, and is currently functioning, but necessarily in an advisory role for the moment. Its chair is Professor Mogens Niss of Roskilde University, Denmark, a former Secretary-General of ICMI. The Presidents of IMU and of ICMI are automatic members of the ICMI NC.

Since the terms of ICMI EC members are for four years (between congresses), and the ICME's are two years out of phase with the ICM's, it was necessary to design a transition phase for moving from the current system to the new one. This transition process is likewise described in the Appendix below. In particular, a new ICMI EC will be elected by the IMU GA in 2006, but the next such election will be at and by the ICMI GA at ICME-11 in Monterrey, in 2008. To accommodate this transition, the terms of the next two ICMI EC's will be for three years instead of four. Assuming that this new process is approved in Santiago de Compostela, it will be fully functioning in steady state at ICME-12, in 2012.

We now offer a brief history of the genesis of these important changes, together with references to the corresponding changes in the Terms of Reference of ICMI. New Terms of Reference for ICMI were adopted by the EC of IMU at its meeting of April 2002. These Terms were published in the *ICMI Bulletin* No. 51 (December 2002), pp. 8-12.

The Procedure for the Election of the EC of ICMI was then slightly amended, but only with very minor adjustments — compare the procedure appearing in the above reference with the previous version, *ICMI Bulletin* No. 47 (December 1999) p. 36. This procedure was the one used for the election of the current (2003-2006) ICMI EC, which took place during the IMU GA held in Shanghai, China, in August 2002, just prior to the ICM-Beijing. During that same IMU GA, the delegates passed the following **Resolution 8**:

> *The General Assembly of IMU expects the Executive Committee to develop a proposed mechanism to involve members from the National Committees for Mathematics, not on the Executive Committee, to assist in the selection of slates. This proposal should be put forth to the 2006 General Assembly.*

The spirit of this resolution was to address the way of selecting the slates of candidates for the election to the various EC's inside the Union (IMU, ICMI and other commissions of the IMU). Up to then, these slates were selected by the EC of IMU. In the case of ICMI, the rules concerning the slate of candidates for the ICMI EC read previously as follows (see *ICMI Bulletin* No. 51 (December 2002), p. 10):

> *The existing Executive Committee of ICMI shall request proposals for the membership of the EC of ICMI from the Representatives to ICMI.*
>
> *The EC of IMU shall request proposals for the membership of the EC of ICMI from the Committees for Mathematics, who shall consult the Representatives to ICMI for suggestions. The EC of IMU will conduct extensive consultations with the existing EC of ICMI before proposing a slate to the Nominating Committee.*

(The Nominating Committee mentioned here is the one described in the Procedure for the Election of the Executive Committee of IMU — see *ICMI Bulletin* No. 47 (December 1999) p. 33.)

It was to comply with Resolution 8 that the EC's of IMU and ICMI have drafted a new model for the selection process of the slate of candidates to the EC of ICMI. The model was discussed between the two EC's early in 2004 and finalised during the meeting of the ICMI Executive Committee held just prior to ICME-10 — this allowed for an announcement of these decisions to be made at the GA of ICMI held during ICME-10 in Copenhagen.

It should be noted about the proposed procedure that, while the actual election will be in the hands of the ICMI GA, any future amendments to this procedure will still be under the jurisdiction of the GA of IMU.

Comments on this new election procedure for the ICMI Executive Committee should be forwarded to us as soon as possible, and at least four months prior to the GA of IMU to be held in connection with the ICM 2006 in Spain.

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Appendix

International Mathematical Union: Nominating Committee / Election Model for the International Commission on Mathematical Instruction

The International Commission on Mathematical Instruction (ICMI) Nominating Committee will be formed with the purpose of presenting the slate of nominations for the ICMI Executive Committee to the Adhering Organizations, in preparation for the ICMI elections by the ICMI General Assembly. The Nominating Committee shall consist of seven people, each with full voting rights. None of its members shall be eligible for nomination for the ICMI EC. The ICMI Nominating Committee will be formed as follows.

1) Chair of the Nominating Committee

The Chair of the ICMI Nominating Committee shall be chosen by the President of the ICMI in consultation with the President of the IMU and must not be a current member of the IMU EC or the ICMI EC, or be working in the country of either president.

2) President of ICMI, or his/her nominee

The current President of the ICMI, or a nominee of the President, in the year that the ICMI Nominating Committee is formed, shall be a member of the ICMI Nominating Committee.

3) President of IMU, or his/her nominee

The current President of the IMU, or a nominee of the President, in the year that the ICMI Nominating Committee is formed, shall be a member of the ICMI Nominating Committee.

The above three members shall constitute the "**core members**" of the ICMI Nominating Committee.

4) **One person chosen by the IMU EC**

The current IMU EC, in the year that the ICMI Nominating Committee is formed, will choose one person to be a member of the ICMI Nominating Committee. This person should, ideally, be one who is knowledgeable regarding ICMI matters and must not be a member of the ICMI EC in the year that the Nominating Committee is formed.

5) **Two persons chosen at random from nominees of ICMI/IMU members**

The ICMI EC will administer a *random selection* of two members of the Nominating Committee from a pool of nominees submitted by the ICMI members in good standing.[(1)] These nominees shall be persons who are not current members of the ICMI Executive Committee, who are willing to serve, and who do not work in the same country as any of the nominees in categories 1-4 above. Each ICMI member in good standing will be entitled to at most one nomination for the nominating committee. The call for such nominations should be sent by the ICMI EC to the Adhering Organizations and the member representatives to ICMI, by 1 September in the year ICME-2 (that is, two years prior to the International Congress on Mathematical Education).[(2)] Nominations, submitted to the ICMI EC, should be received by 1 December of the same year.

6) **One person, experienced with the work of ICMI, chosen by the core members of the ICMI Nominating Committee**

One further member will be chosen by the core members of the ICMI Nominating Committee. This person should, ideally, be a former member of the ICMI Executive Committee or, if such a person is not unavailable, have significant experience of ICMI affairs.

In the overall selection of Nominating Committee members, due consideration should be given to balance with regard to representation of region, culture, gender, and sub-fields, and to expertise for the programmatic agenda of the ICMI.

Duties of the Nominating Committee

A nomination slate will be formed for the election of the Executive Committee of the International Commission on Mathematical Instruction (ICMI EC). The slate shall consist of a unique candidate for each of the four ICMI officers (President, Secretary-General, and two Vice-Presidents), plus at least seven nominees for the remaining five members of the ICMI EC to be elected. This slate will be communicated by the Nominating Committee Chair to the current ICMI EC and to the Adhering

Organizations, in preparation for the ICMI elections by the ICMI General Assembly. Only members of ICMI in good standing[(1)] will be eligible to vote, and each such member will have one vote.

Notes:
(1) "Good standing" is defined by two requirements of the ICMI member: 1. Being current in dues payments; and 2. Having clearly identified a member representative who, in turn, has established effective contact with the ICMI Secretary General.
(2) The letter of solicitation of nominees for the Nominating Committee from the ICMI members in good standing should contain some explanation of the functioning of the Nominating Committee, and of the desired qualifications of members of the Nominating Committee.

Transition Process

1. Following approval of the new nomination and election model by the IMU EC, ICMI will immediately initiate the process of formation of an ICMI Nominating Committee, for the construction of a slate for the election of the ICMI EC in 2006. That slate shall be communicated to the EC's of both ICMI and IMU. The existing Statutes of IMU remain in force at this time, so that the slate shall have the status of advice to the IMU EC.

2. The election of the ICMI EC shall then take place at, and by, the General Assembly of IMU, at ICM Madrid in 2006. The Nominating Committee Chair, and one other designated member of the Nominating Committee shall attend the IMU GA to be available to explain the slate, and to answer questions about it that may arise. If the General Assembly of IMU approves the new election procedures, the terms of the ICMI EC at this election will be for three years, 1 January, 2007 – 31 December, 2009.

3. The next election of the ICMI EC will be done at, and by, the ICMI General Assembly at ICME-11, in Monterrey, Mexico, July 2008. This election will be conducted according to the above model, with the exception that the elected EC will assume office only on 1 January, 2010, and for a term of only three years, ending 31 December, 2012.

The subsequent ICMI EC election will occur at, and by, the ICMI General Assembly at ICME-12, in 2012, fully according to the above model. The ICMI EC elected on that, and future occasions will serve four year terms, beginning 1 January of the year following the election.

The International Commission on Mathematical Instruction What? Why? For Whom?

Hyman Bass and Bernard R. Hodgson

Note from the Editor

On the occasion of ICME-10, the President and Secretary-General of ICMI were invited by the Editor of the *Notices of the American Mathematical Society* to prepare a paper providing basic information about the Commission — its aims, history, activities, etc. —, keeping in mind the usual readership of the *Notices*. The article

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http://www.ams.org/notices/

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Mathematics is an international — even universal — discipline, and this aspect finds institutional expression every four years in the International Congress of Mathematicians (ICM), where a world community of mathematicians assembles to report progress on shared problems and with a common technical language. But these things, which we now take for granted, were not always so. The "international movement" in mathematics took hold only at the end of the nineteenth century, the first congress being the 1897 ICM in Zürich. The body that now provides the international infrastructure for mathematics — for example, sponsoring the ICM's — is the International Mathematical Union (IMU),[(1)] an international nongovernmental and nonprofit scientific organization with the purpose of promoting international cooperation in mathematics. The members of the IMU are not individuals but countries, and the adhering (membership) entity in each member country is typically its Academy of Sciences or a professional organization of mathematicians. The IMU is known to mathematicians mainly indirectly through the publicly visible expressions of its work, like the ICM's and the awarding of the Fields Medals.

Our focus here is the International Commission on Mathematical Instruction (ICMI), the *mathematics education* counterpart to the IMU.

A Brief Bio of the ICMI

The International Commission on Mathematical Instruction[(2)] was founded at the fourth ICM held in Rome in 1908.[(3)] It was initiated to support a then 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 an international commission with the initial mandate of making "a comparative study on the methods and plans of teaching mathematics at secondary schools" (quoted in [5, p. 13]). The idea of such an international commission had in fact been formulated by Smith himself three years earlier in the newly established journal *L'Enseignement Mathématique* (L'EM) 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" [2].

The birth of the ICMI was not modest. The great German mathematician Felix Klein (1849–1925), for whom mathematics education was a deep and career-long interest, became its founding president, while the first secretary-general was Henri Fehr (1870–1954) from Switzerland, one of the co-founders of L'EM.(4) The initial ICMI mandate, an international comparative study, ultimately became a massive six-year project producing 187 volumes containing 310 reports from 18 countries [5, p. 14]. Later ICMI presidents — thus far always research mathematicians — include such figures as Jacques Hadamard (from 1932 to the war), Marshall H. Stone (1959–62), André Lichnerowicz (1963–66), Hans Freudenthal (1967–70), Hassler Whitney (1979–82), Jean-Pierre Kahane (1983–90), and Miguel de Guzmán (1991–98).(5) So the interest and productive engagement of serious research mathematicians with school mathematics education, even at the international level, has a long and substantial, albeit uneven, history.

A small but significant place for mathematics education was reserved at the ICM's, in a section initially called "Teaching and History of Mathematics". It was in this section at the 1900 ICM in Paris that David Hilbert gave the talk "Mathematical problems" that shaped much of twentieth-century mathematics. As the history of mathematics later acquired a section of its own, the name changed to "Teaching and Popularization of Mathematics" and most recently to "Mathematics Education and Popularization of Mathematics", reflecting the broader nature of the field.

Over time, as the mission of general education expanded (more advanced knowledge, for more people), the needs and complexity of mathematics education grew as well, leading to the development in due course of corresponding communities of both practicing professionals and scholars. The small venue afforded by the one section of the ICM's became inadequate for the communication of problems and ideas in this expanded domain. This led ICMI president Hans Freudenthal to organize the first International Congress on Mathematical Education (ICME) in Lyon in 1969. These ICME's have since evolved into quadrennial congresses in years divisible by four,(6) the next one to be ICME-10 in Copenhagen, July 4–11, 2004, where we expect some 3,500 participants, including a significant number of mathematicians. (More on ICME-10 below.)

Connecting Mathematics and Mathematics Education

Mathematics education and *mathematics*, though obviously linked, are fundamentally different as domains of practice and scholarship. Their main historical intersection has been the induction and advanced mathematical preparation of mathematical researchers and scientists, a small but now growing fraction of the population served by school education, and this primarily at postsecondary levels. While most mathematicians teach, mathematics education treats teaching much more seriously

as a professional practice, requiring dedicated training and certification. Theories of learning and of assessment play much more prominent roles, as does curriculum analysis. And these have become as well multidisciplinary domains of mathematics education research, using a variety of methods, many of them unfamiliar to most mathematicians.

So how are mathematics and mathematics education, as domains of knowledge and as communities of practice, now linked, and what could be the most natural and productive kinds of connections? The ICMI represents one historical, and still evolving, response to those questions at the international level. First of all, the ICMI, now formally constituted as a commission of the IMU (see the next section), is thus structurally tied to mathematics. In fact, nominally and in terms of governance, the ICMI is subordinate to mathematics. (Recall, for example, where the presidents of the ICMI have come from.) This is, on the one hand, a unique and potentially invaluable resource. Elsewhere in mathematics education — for example, in the fields of practice and in the institutional arrangements within universities — mathematics and mathematics education exist in different worlds that rarely communicate with each other and most often not well when they do. Yet history teaches us that there is a tradition of healthy interest and engagement of (some) mathematicians in mathematics education, and current experience indicates strongly that mathematicians have vital things to contribute, in multidisciplinary settings, to mathematics education, a potential not always sufficiently appreciated by mathematics educators. On the other hand, mathematicians sometimes lack a sufficient knowledge and/or appreciation of the complex nature of the problems in mathematics education, and they often tend to see issues of mathematical integrity and rigor of the curriculum as the beginning and end of the story. (See the *Notices* article by Tony Ralston [6] for an insightful recent commentary on this cross-boundary behavior.) This kind of stance and disposition presents problems when it infects positions of authority and policy setting in mathematics education. In particular, this exposes a latent danger in the inherited governance arrangements of the ICMI, completely under IMU control. Many in the ICMI community argue for greater ICMI autonomy, yet still within the IMU environment.

ICMI vice president Bent Christiansen argued in 1982 that (see [5, p. 260]) the ICMI should *not* decide what are proper or relevant solutions to problems in mathematics education, but should provide a structure under which interaction and exchange of views could be facilitated. It should provide the type of leadership and structure responsive to the needs and interests of the growing mathematics education community and do so under the auspices of the IMU. He also revoiced the frequently expressed need of a permanent secretariat for the ICMI.

Jean-Pierre Kahane, in his 1990 Farewell Message as president of the ICMI, gave the reasons for the ICMI being a commission of the IMU, in terms of

> …the intimate link between mathematics and its teaching. In no other living science is the part of *mise en forme*, *transposition didactique*, so important at a research level. In no other science, however, is the distance between the taught and the new so large. In no other science has teaching and learning such social importance. In no other science is there such an old tradition of scientists committed to educational questions ([4, p. 6]; see also [5, p. 262]).

The Structure of the ICMI Today

Structurally the ICMI now exists as a member of the IMU family. After interruptions of activity around the two world wars, the ICMI was reconstituted in 1952, at a time when the international mathematical community was being reorganized, as an official commission of the International Mathematical Union.[7] This still defines the formal position of the ICMI today. Thus, the Terms of Reference of the ICMI are established by the General Assembly of the IMU, which is also responsible for the election of the Executive Committee, the administrative leadership of the ICMI. Furthermore, the vast majority of the funding of the ICMI comes from the IMU. Once these election and budget matters are settled, the ICMI works with a large degree of autonomy.

As is the case for the IMU, members of the ICMI are not individuals, but countries — namely, those countries which are members of the IMU and other countries specifically coopted to the commission. There are currently eighty-one members of the ICMI, sixty-five of which are also members of the IMU. Each member of the ICMI appoints a representative and may create a subcommission for the ICMI. Such a subcommission serves the dual purpose of (a) providing an organized local (national) forum for dealing with issues of mathematics education and for exchange of information, and (b) offering a link between the local and international mathematics education communities. There are currently fourteen such subcommissions.

The ICMI's organizational outreach includes five permanent so-called Affiliated Study Groups, each focusing on a specific field of interest and study in mathematics education consistent with the aims of the commission. The Affiliated Study Groups are neither appointed by the ICMI nor operate on behalf or under the control of the ICMI. They are thus independent of the ICMI for their work, also in terms of finances, but they collaborate with the ICMI on specific activities, such as the ICMI Studies or components of the program of the ICME's. They present reports on their activities to the General Assembly of the ICMI. The current ICMI Affiliated Study Groups, with their year of affiliation, are:

- HPM — *The International Study Group on the Relations between the History and Pedagogy of Mathematics* (1976),
- PME — *The International Group for the Psychology of Mathematics Education* (1976),
- IOWME — *The International Organization of Women and Mathematics Education* (1987),
- WFNMC — *The World Federation of National Mathematics Competitions* (1994), and
- ICTMA — *The International Study Group for Mathematical Modelling and Applications* (2003).

According to its Terms of Reference, the commission is "charged with the conduct of the activities of IMU, bearing on mathematical or scientific education and [takes] the initiative in inaugurating appropriate programs designed to further the sound development of mathematical education at all levels, and to secure public appreciation of its importance." This is clearly reflected in the objectives and activities of the ICMI, which have considerably expanded over the years.

Activities of the ICMI

The ICMI's objective today could be globally described as offering researchers, practitioners, curriculum designers, decision makers, and others interested in mathematical education a forum for promoting reflection, collaboration, exchange and dissemination of ideas, and information on all

aspects of the theory and practice of contemporary mathematical education, as seen from an international perspective. How does the commission achieve such aims? We now discuss some of its current major activities and programs.

The ICMI's primary responsibility is to plan for the ICME's, which entails choosing from among host country bids, appointing an international program committee to form the scientific program and select presenters, and overseeing progress of the congress preparations. But the practical and financial organization of an ICME is the independent responsibility of a local (national) organizing committee. This parallels to a large degree what the IMU does for the ICM's. However, the format of an ICME differs interestingly from that of an ICM in that it tends to be much more interactive, involving working groups and study groups that have structured meetings throughout the congress and that may well produce published reports for the congress proceedings.

ICME-10 in Copenhagen in July 2004 (see the next section) will also feature the first awarding of two medals in mathematics education research, recently inaugurated by the ICMI. The Felix Klein Medal for lifetime achievement will be awarded to Guy Brousseau from France. The Hans Freudenthal Medal for a major program of research will be awarded to Celia Hoyles of the UK. Information about these awards and citations of the work of the laureates can be found on the ICMI website, http://www.mathunion.org/ICMI/.[(8)]

A second major ICMI program is the series of ICMI Studies, a most successful set of activities launched in the mid-1980s. Each study focuses on a topic or issue of prominent current interest in mathematics education. Its International Program Committee (appointed by the ICMI) first drafts a "discussion document" that articulates the theme and purpose in great detail. This is widely disseminated to solicit papers from the field. From these submissions, invitations are issued to about eighty participants in an international conference, the results of which are synthesized into a research volume presenting a state-of-the-art expert report on the study theme. This process typically stretches over a period of about three years per study. These studies have acquired a growing importance and influence on the field. Here is a chronological list of past and current studies and their conference sites.

1. *The Influence of Computers and Informatics on Mathematics and Its Teaching* (Strasbourg, France, 1985)
2. *School Mathematics in the 1990s* (Kuwait, 1986)
3. *Mathematics as a Service Subject* (Udine, Italy, 1987)
4. *Mathematics and Cognition* (book prepared by PME, an Affiliated Study Group of ICMI)
5. *The Popularization of Mathematics* (Leeds, UK, 1989)
6. *Assessment in Mathematics Education* (Calonge, Spain, 1991)
7. *Gender and Mathematics Education* (Höör, Sweden, 1993)
8. *What Is Research in Mathematics Education and What Are Its Results?* (College Park, USA, 1994)
9. *Perspectives on the Teaching of Geometry for the 21st Century* (Catania, Italy, 1995)
10. *The Role of the History of Mathematics in the Teaching and Learning of Mathematics* (Luminy, France, 1998)
11. *The Teaching and Learning of Mathematics at University Level* (Singapore, 1998)

12. *The Future of the Teaching and Learning of Algebra* (Melbourne, Australia, 2001)
13. *Mathematics Education in Different Cultural Traditions: A Comparative Study of East-Asia and the West* (Hong Kong, 2002)
14. *Applications and Modelling in Mathematics Education* (Dortmund, Germany, February 2004)
15. *The Professional Education and Development of Teachers of Mathematics* (Águas de Lindóia, Brazil, May 2005)
16. *Challenging Mathematics in and beyond the Classroom* (Trondheim, Norway, June 2006)
17. *Technology in Mathematics Education* (2006)

The themes of these studies illustrate some of the many domains of mathematics education in which mathematicians, among other expert professionals, have crucial knowledge and expertise to contribute.

The study volumes for the first five studies were published by Cambridge University Press. Since Study 6, the study volumes appear in the New ICMI Study Series (NISS) published by Kluwer Academic Publishers[(9)] under the general editorship of the president and secretary-general of the ICMI.

Another component of ICMI activities comprises the so-called ICMI Regional Conferences. Despite the international nature of its position and role, the ICMI from time to time lends its name to a variety of regional conferences on mathematics education, primarily in less affluent parts of the world. A number of ICMI Regional Conferences have thus been held over the years. These meetings are supported morally by the ICMI and sometimes with modest financial contributions as well. Recent and forthcoming ICMI Regional Conferences include:

- SEACME-8 — *8th South East Asian Conference on Mathematical Education* (Quezon City, Philippines, 1999)
- *All-Russian Conference on Mathematical Education* (Dubna, Russia, 2000)
- ICMI-EARCOME-2 — *Second ICMI East Asia Regional Conference on Mathematics Education* (Singapore, 2002)
- XI-IACME — *11th Inter-American Conference on Mathematics Education* (Blumenau, Brazil, 2003)
- EMF 2003 — Espace mathématique francophone 2003 (Tozeur, Tunisia, 2003)
- ICMI-EARCOME-3 — *Third ICMI East Asia Regional Conference on Mathematics Education* (Shanghai, China, 2005)
- EMF 2006 — *Espace mathématique francophone 2006* (Sherbrooke, Canada, 2006)

In addition to the above activities of a regular nature, the ICMI takes other initiatives on an ad hoc basis. For instance, the ICMI is currently collaborating with UNESCO on an international exhibition on the theme "Why Mathematics?" aimed particularly at young people, their parents, and their teachers. This exhibition will be launched at the 4th European Congress of Mathematics in Stockholm in June 2004. It will then be shown at ICME-10 in Copenhagen and will later travel to various places.

A major aim of the commission is to support the development of mathematics education in less-affluent regions of the world. To this end, the ICMI initiated in the 1990s a Solidarity Program in Mathematics Education based on a twofold approach.

The first component of this program is the ICMI Solidarity Fund, established by the ICMI in 1992 at the suggestion of its president, Miguel de Guzmán. The overall objective of the Solidarity Fund is to increase, in a variety of ways, the commitment and involvement of mathematics educators around the world in order to help the progress of mathematics education in those parts of the world where there is a need for it that justifies international assistance and where the economic and sociopolitical contexts do not permit adequate and autonomous development. This initiative thus aims to foster solidarity in mathematics education between well-defined quarters in developed and less-developed countries. Particular emphasis is placed on projects that enable the activation of a self-sustainable infrastructure within mathematics education in the region, country, or province at issue. Central to this program of international assistance was the establishment of a fund to provide financial support for the approved projects. The Solidarity Fund is based on voluntary donations from individuals and organizations and is kept separate from the ICMI's general funds.

The second component of the ICMI Solidarity Program aims at having a balanced representation from all over the world among the presenters and the general participants in activities such as the ICMI Studies or the ICME's. In support of this goal, the ICMI has implemented, starting with ICME-8 in 1996, a general policy of forming for each ICME an ICME Solidarity Fund established by setting aside 10 percent of the registration fees in order to provide grants to congress delegates from nonaffluent countries. At each of the recent ICME's, some 100 to 150 participants from economically challenged regions of the world have thus been given financial support to facilitate their presence at the congress.

In the same spirit, efforts are made by the organizers of each ICMI Study to find financial resources so as to facilitate the participation in the Study Conference of a substantial delegation from nonaffluent countries.

An Invitation to ICME-10

The 10th International Congress on Mathematical Education, ICME-10, will be held in Copenhagen on the campus of the Technical University of Denmark on July 4–11, 2004. A distinctive flavor of ICME-10 is the fact that it is being hosted, not by a single country, but by the ensemble of the Nordic countries — Denmark, Finland, Iceland, Norway, and Sweden. The congress is expected to gather around 3,500 participants, including mathematicians with an interest in education, researchers in mathematics education, and teachers from all over the world. The International Program Committee, chaired by Mogens Niss[10] (Denmark), proposes a structure combining the best from the ICME tradition with a number of innovative elements and features. The program, whose details can be found on the congress website,[11] includes the following events:

- 8 plenary activities, among which are Plenary Lectures by Hyman Bass (USA), Erno Lehtinen (Finland), Andreas Dress (Germany), and Ferdinando Arzarello (Italy); and reports from so-called survey teams that will present the state of the art with respect to themes such as reasoning, professional development of teachers, testing, or technology, with particular

regard to identifying and characterizing important new knowledge, recent developments, new perspectives, and emergent issues;
- 80 regular lectures, covering a wide spectrum of topics, themes, and issues;
- 29 Topic Study Groups, some being organized according to educational levels, others according to content-related issues, and the rest to overarching perspectives and meta-issues;
- 24 Discussion Groups focussing on the examination and discussion of issues that can be dealt with in different ways depending on experiences, values, norms, and judgments;
- a thematic afternoon with 5 parallel miniconferences: *Teachers of mathematics*, *Mathematics education in society and culture*, *Mathematics and mathematics education*, *Technology in mathematics education,* and *Perspectives on research in mathematics education from other disciplines*;
- special sessions of the 5 ICMI Affiliated Study Groups and reports on the 3 most recent ICMI Studies;
- various sets of activities, such as workshops, Sharing Experiences Groups, poster exhibitions, paper presentations, or round-table sessions;
- national presentations from the Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden), Korea, Mexico, Romania, and Russia.

A congress such as ICME-10 provides a unique opportunity to learn about recent developments in mathematics education around the world and to be introduced to innovations and recent research on the teaching and learning of mathematics at all levels, from primary to tertiary education. The scientific program aims to provide food for thought and inspiration for practice to all, from the established mathematics educator to the novice in the field, and to all with an interest in mathematics education. It is structured so as to allow plenty of choice while encouraging exchange and contacts between participants.

In a context where the debate over the state of mathematics education at all levels, from primary school to graduate school, is becoming more intense and vigorous than ever, ICME-10 provides unparalleled access to expert knowledge in the field. ICME-10 can surely play a significant role in facilitating the exchange of ideas and experiments within and between the mathematics and mathematics education communities and contribute to the improvement of mathematics education all around the world.

References

[1] Daniel Coray and Bernard R. Hodgson, Introduction, *One Hundred Years of* L'Enseignement Mathématique*: Moments of Mathematics Education in the Twentieth Century* (Daniel Coray et al., eds.), Monographies de L'Enseignement Mathématique, No. 39, L'Enseignement Mathématique, Geneva, 2003, pp. 9–15.

[2] The Editors, Note de la Rédaction sur les réformes à accomplir dans l'enseignement des mathématiques, *Enseign. Math.* **7** (1905), 382–383.

[3] A. Geoffrey Howson, Seventy-five years of the International Commission on Mathematical Instruction, *Educational Stud. Math.* **15** (1984), 75–93.

[4] Jean-Pierre Kahane, A farewell message from the retiring president of ICMI, *Bull. Internat. Commiss. Math. Instruction* **29** (1990), 3–8.

[5] Olli Lehto, *Mathematics without Borders: A History of the International Mathematical Union*, Springer-Verlag, New York, 1998.
[6] Anthony Ralston, Research mathematicians and mathematics education: A critique, *Notices Amer. Math. Soc.* **51** (2004), 403–411.

Notes:
(1) http://www.mathunion.org/.
(2) Historical information about the ICMI can be found in the ICMI 75th-anniversary paper [3] by Howson as well as in Lehto's recent book [5] on the history of the International Mathematical Union.
(3) So we are close to the first centenary of the ICMI, to be celebrated in Italy in 2008.
(4) An initial aim of the "international journal" (to use its own description) *L'Enseignement Mathématique*, launched in 1899, was "to associate the world of teaching to the 'great movement of scientific solidarity' which was emerging at the end of the 19th century" [1, p. 11]. From the very beginning of the ICMI, L'EM was adopted as its official organ, which is still the case today. The other current channels of communication of the commission are the ICMI Bulletin, published twice a year, and the ICMI website, http://www.mathunion.org/ICMI/.
(5) It is with great sadness that we report the untimely passing of Miguel de Guzmán on April 14, 2004. Information about his life and work can be found at http://www.xena.ad/lcf/fev2002/guzman.htm.
(6) The successive ICME's, from ICME-2 in 1972 to ICME-9 in 2000, were held respectively in Exeter (UK), Karlsruhe (Germany), Berkeley (USA), Adelaide (Australia), Budapest (Hungary), Québec (Canada), Sevilla (Spain), and Tokyo/Makuhari (Japan). The ICMI has recently accepted the invitation received from México to host the 11th ICME in 2008.
(7) Through the IMU, the ICMI thus belongs to the International Council for Science (ICSU). This implies that the ICMI is to abide by ICSU statutes, one of which establishes the principle of nondiscrimination and free circulation of scientists. Lehto's book [5] vividly testifies to the importance of this rule in the life of both the IMU and the ICMI.
(8) An announcement about the ICMI medals appears in "Mathematics People" in this issue [June/July 2004] of the *Notices*.
(9) http://www.wkap.nl/prod/s/NISS.
(10) mn@mmf.ruc.dk.
(11) http://www.ICME-10.dk/.

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The Sixteenth ICMI Study:
Challenging Mathematics in and beyond the Classroom

Discussion Document

Contents

From time to time ICMI (International Commission on Mathematical Instruction) mounts studies to investigate in depth and detail particular fields of interest in mathematics education. This paper is the Discussion Document of the forthcoming ICMI Study 16, *Challenging Mathematics in and beyond the Classroom*.

1. Introduction

Mathematics is engaging, useful, and creative. What can we do to make it accessible to more people?

Recent attempts to develop students' mathematical creativity include the use of investigations, problems, reflective logs, and a host of other devices. These can be seen as ways to attract students with material that challenges the mind.

Initiatives taken around the globe have varied in quality and have met with different degrees of success. New technologies have enabled us to refine our efforts and restructure our goals. It is time to assess what has been done, study conditions for success and determine some approaches for the future.

Accordingly, ICMI has embarked on its 16th Study, to examine challenging mathematics in and beyond the classroom, and is planning a Conference to be held in Trondheim, Norway, from 27 June

to 03 July 2006 at which an invited group of mathematicians and mathematics educators, drawn from around the world, will analyze this issue in detail and produce a report.

This document will suggest specific issues and invite those who might contribute to the discussion to submit a paper, so that the International Programme Committee can select those attending the Conference.

Finally, using the contributions to this Conference, a book (the Study Volume) will be produced. This book will reflect the state of the art in providing mathematics challenges in and beyond the classroom and suggest directions for future developments in research and practice.

The authors of this Discussion Document are the members of the International Programme Committee (IPC) for this ICMI Study. The committee comprises 13 people from different countries, listed at the end of this document. The structure of this Discussion Document is as follows. In section 2 we define and discuss fundamental terms used in the Study. In section 3 we look at the current context, list examples of current practice, observe changes in recent years and identify problems. In section 4 we pose a number of critical questions leading to the results of the Study. In section 5 we call for contributions and outline the process of the Study.

2. Description

(a) Challenge

What is a mathematical challenge? While this may be the topic of discussions during the Study Conference itself, we offer some preliminary thoughts to provide background to debate.

One answer is that a challenge occurs when people are faced with a problem whose resolution is not apparent and for which there seems to be no standard method of solution. So they are required to engage in some kind of reflection and analysis of the situation, possibly putting together diverse factors. Those meeting challenges have to take the initiative and respond to unforeseen eventualities with flexibility and imagination.

Note that the word 'challenge' denotes a relationship between a question or situation and an individual or a group. Finding the dimensions of a rectangle of given perimeter with greatest area is not a challenge for one familiar with the algorithms of the calculus, or with certain inequalities. But it is a challenge for a student who has come upon such a situation for the first time. A challenge has to be calibrated so that the audience is initially puzzled by it but has the resources to see it through. The analysis of a challenging situation may not necessarily be difficult, but it must be interesting and engaging.

We have some evidence that the process of bringing structure to a challenge situation can lead one to develop new, more powerful solution methods. One may or may not succeed in meeting a challenge, but the very process of grappling with its difficulties can result in fuller understanding. The

presentation of mathematical challenges may provide the opportunity to experience independent discovery, through which one can acquire new insights and a sense of personal power. Thus, teaching through challenges can increase the level of the student's understanding of and engagement with mathematics.

We do note that there are several terms used to sometimes describe similar things, but which really have quite distinct meanings. These terms include the expressions 'challenge', 'problem solving' and 'enrichment'. We have discussed the term 'challenge' above. Problem solving would appear to refer to methodology, but problem solving is often associated with a challenging situation. Enrichment would be the process of extending one's mathematical experience beyond the curriculum. This might or might not happen in a challenging context.

(b) How do we provide challenges?

Mathematics can challenge students both inside and outside the classroom. Learning takes place in many contexts. Mathematical circles, clubs, contests, exhibits, recreational materials, or simply conversations with peers, can offer opportunities for students to meet challenging situations. It is our responsibility to provide these situations to students, so that they are exposed to challenges both in the classroom and beyond.

In this endeavour, the role of the teacher is critical. It is the teacher who is faced with the difficult task of keeping alive in the classroom the spontaneity and creativity students may exhibit outside the classroom.

We note that many teachers do not select problems for lessons on their own, but just follow what is given in a textbook. In this context the role of good textbooks and books of problems is very important. To provide challenge one needs not only to include challenging problems, but also, which is often more helpful, to construct small groups of problems, leading a student from very simple and basic facts and examples to deeper and challenging ones. By careful selecting problems and organising the structure of textbooks the authors can very much help teachers in providing challenge. It can happen that a student with a good book may develop an interest in the subject even without any help from a teacher.

The support of the general public is likewise critical. Since children are products of their entire social environment, they need the support of the adults around them in acquiring an understanding and appreciation of mathematics. And, in supporting the new generation, the engagement of citizens in mathematics will open new opportunities for their own personal growth and the public good.

It is important for us to challenge students of every level of motivation, background or ability. Highly motivated students need challenges so that they don't turn their active minds away from mathematics and towards endeavours they find more appealing. Mathematical challenges can serve to attract students who come to school with less motivation, and such students learn from challenging material more than they can learn from the mastery of algorithms or routine methods.

It is particularly important, albeit difficult, to provide challenges for students who struggle to learn mathematics. It is all too easy for students with learning difficulties to content themselves with competence at, or mastery of, algorithmic mathematics, and not attempt to think more deeply about mathematics. However, some practitioners have found that even the learning of routine material is improved when taking place in a challenging environment.

Particularly valuable are situations that can be used to challenge all students, regardless of their background, or motivational level.

The process of providing students with challenging situations itself presents challenges for educators. Some of these challenges are mathematical. Teachers must have a wide and deep knowledge of the mathematics they teach, in order to support students who are working on non-standard material. Other challenges to the teacher are pedagogical. In expanding the kinds of experiences students have, teachers must likewise expand their knowledge of student learning, and their ability to interpret what students say. It is the responsibility of the mathematics and mathematics education community to support teachers in these aspects of their growth.

(c) Where are challenges found?

- Challenge situations provide an opportunity to do mathematics, and to think mathematically. Some are similar to the activities of professional mathematicians. These include:
  - Solving non-routine problems
  - Posing problems
  - Working on problems without achieving a complete solution
  - Individual investigations
  - Collaborative investigations in teams
  - Projects
  - Historical investigations
  - Organizing whole-class discussions searching ways to solve a problem, a puzzle or a sophism.

  Other challenges are less like formal mathematics. These attract in a different way, leading into mathematics from other contexts. Some of these are:
  - Games
  - Puzzles
  - Construction of models
  - Manipulation of hands-on devices

- Still other challenges connect mathematics with other fields. Some examples are:
  - Mathematics and other sciences
  - Mathematics and the humanities
  - Mathematics and the arts
  - Real-world problems

- Challenges can be found in a variety of venues and vehicles, including:
  - Classrooms
  - Competitions
  - Mathematics clubs, circles or houses
  - Independent study
  - Expository lectures
  - Books
  - Papers
  - Journals
  - Web sites
  - Science centres
  - Exhibits
  - Festivals, such as mathematics days
  - Mathematics camps

3. Current Context

(a) Practices and examples

There are many ways that students are currently being challenged. These challenges occur both within and outside of school and include students as well as general members of the public. They can also be classified in several categories such as competitions, problem solving, exhibitions, publications, and what may be roughly called 'mathematics assemblies'. Below we refer to some particular cases where challenge is organised. To illustrate this we have used examples which are familiar to members of the International Programme Committee.

COMPETITIONS

Exclusive and inclusive competitions

There are many well known competitions such as the *International Mathematical Olympiad (IMO)* and *Le Kangourou des Mathématiques*. The former involves small groups of students from many countries (an example of an exclusive competition) while the latter involves thousands of students in France and Europe (an example of an inclusive competition). Details of these and many other competitions can be found on their web sites as well as in the World Federation of National Mathematics Competition's journal *Mathematics Competitions*.

The word 'competitions' may initially conjure up an image of rivalry between individual students with 'winners' and 'losers'. While this may be so in certain situations it is not always the case. Even in the IMO, where medals and prestige are at stake, there is more cooperation than rivalry outside the competition room. In all competitions, though, students work 'against the problem' as much as they work 'against each other' and there are situations where completing the questions is the main aim rather than 'winning'. And there are competitions where the students have to compose questions for

other students to solve rather than having the questions imposed by the competition organizers. Below we give examples of two competitions that are different in some way from the traditional competition where students are essentially submitted to an examination.

An exclusive competition of interactive style

The competition *Euromath* is a European cup of mathematics. Each team is composed of 7 people: students from primary school to university and one adult. The six best teams are chosen to participate in the final competition by the results of their work on logical games. In the final, these teams work in front of spectators. To win, a team needs to be quick and to have good mathematical knowledge but the most important thing is 'l'esprit d'équipe'.

Another model of an inclusive competition

KappAbel is a Nordic competition for 14 year olds in which whole classes participate as a group. The first two rounds consist of problems distributed on the Internet and downloaded by the teacher. Within a 90 minute time limit, the class discusses the problems and decides how to answer each problem. The third round is divided into two parts: a class project with a given theme (that ends with a report, a presentation and an exhibition), and a problem solving session run as a relay where two boys and two girls represent the class. Recent themes have been Mathematics and local handicraft traditions (2000), Mathematics in games and play (2001), Mathematics and sports (2002), Mathematics and technology (2003) and Mathematics and music (2004). The three best teams from the third round meet on the following day for the final, which is a problem solving session with the teams that did not make it to the final as audience.

References

A web site for IMO: olympiads.win.tue.nl/imo/
Web site for Le Kangarou: www.mathkang.org/
Mathematics Competitions reference: via WFNMC site www.amt.edu.au/wfnmc.html

CLASSROOM USE OF CHALLENGE

Problem solving

The words 'problem solving' have been used to cover a variety of experiences but by the words here we mean allowing students to work on closed questions that they are not immediately able to solve. Hence they need to apply their mathematical content knowledge as well as ingenuity, intuition and a range of metacognitive skills in order to obtain an answer.

Problem solving is often used in classrooms as a one-off exercise that may or may not be connected to the main mathematical curriculum. It can be seen as a 'filler' that many students enjoy but it is not always viewed as central to the mathematics classroom.

Investigations and projects may be extended problem solving exercises where students look into more difficult problems over more than one period of class time. They frequently involve a written report.

Teachers who use problems to develop students' ideas, knowledge and understanding of curriculum material can be considered as taking a 'problem solving approach' to the topic. This approach can reflect the creative nature of mathematics and give students some feel for the way that mathematics is developed by research mathematicians. Examples of both problem solving lessons and lessons which take a problem solving approach can be found on the web site www.nzmaths.co.nz.

Challenge in traditional education: An example

A traditional method in Japanese elementary school is to solve a problem through full-class discussion. With a skilful teacher, the children can learn more than the curriculum intends. For example, suppose that they are given the problem of dividing 4/5 by 2/3. One student might observe that 6 is the least common multiple of 2 and 3, and write

$$\begin{aligned}(4/5)/(2/3) &= (4 \times (6/2))/(5 \times (6/3)) \\ &= (4 \times 3)/(5 \times 2) \\ &= 12/10.\end{aligned}$$

The children can come to realise that this method is equivalent to the standard algorithm and can be used with other choices of fractions. From the teacher's point of view, this dynamic is unpredictable, and so the teacher requires deep mathematical understanding and sure skills in order to handle the situation. But when the approach succeeds, the children deepen their mathematical experience.

EXHIBITIONS

Exhibitions, in the sense of gathering material together for people to view or interact with, are becoming increasingly common. These are generally outside of the classroom and may be aimed as much at the general public as they are at students. They can also take place in a variety of settings from schools to museums to shopping malls to the open air. We mention several examples of these.

The idea of a science centre is to present scientific phenomena in a hands-on way. This means that the visitors are challenged by a real experiment and then try to understand it. Some science centres have mathematical experiments, but there are also science centres devoted exclusively to mathematics, for instance the Mathematikum in Germany or Giardino di Archimede in Italy. These permanent centres, best visited with a guide, attract tens and hundreds of thousands of visitors per year.

There are also annual exhibitions, varying in content from year to year. An example of this which attracts tens of thousands of visitors per day is *Le Salon de la culture et des jeux mathématiques* in Paris. Further, there are also occasional exhibitions, such as the international exhibition *Experiencing Mathematics* sponsored by UNESCO and ICMI jointly with other bodies. This exhibition was

launched in 2004 at the 10th International Congress on Mathematical Education and is expected to travel to various countries in the coming years.

Exhibitions can have a special theme, such as the one at the University of Modena and Reggio Emilia featuring mathematical machines. These machines are copies of historical instruments that include curve drawing devices, instruments for perspective drawing and instruments for solving problems.

Instruments for museums, laboratories or mathematics centres may be very expensive. For classroom use small cheaper kits may be available with information about possible classroom use.

References

Mathematikum: www.mathematikum.de
Giardino di Archimede: www.math.unifi.it/archimede/.
Le Salon de la culture et des jeux mathématiques: www.cijm.org
Experiencing Mathematics: www.mathex.org/MathExpo/
Mathematical machines: www.mmlab.unimo.it.

PUBLICATIONS, INCLUDING INTERNET

Publications cover at least books, journals, web sites, CDs, games and software. They are generally accessible to a wide audience.

School mathematics journals

There are many examples around the world of journals designed to stimulate student interest in mathematics. These journals contain historical articles, articles exposing issues with current research, such as the four colour theorem and Fermat's Last Theorem, and Problem corners, where new problems are posed, other current problems from Olympiads are discussed and students may submit their own solutions. Examples of such journals in the Eastern Bloc, where the traditions are older, are *Kömal* (Hungary) and *Kvant* (Russia). In the West outstanding examples are *Crux Mathematicorum* (Canada), *Mathematics Magazine* and *Mathematics Spectrum* (UK).

Books

There are many publications which enrich and challenge the student's interest in mathematics. In the English language the Mathematical Association of America has a massive catalogue and the Australian Mathematics Trust has a significant number of publications. In Russian there is also a very rich resource, traditionally published through Mir. In the French language the *Kangourou* and other publishers have a prodigious catalogue, as does the Chiu Chang Mathematics Education Foundation in the Chinese language. This refers to just a few major languages. It is expected to be impossible to try to list individual references in this Study. We expect it will be difficult enough to identify the major publishers.

Internet

There are a number of examples in which people can join a classroom by internet. The 'e-classroom' conducted by Noriko Arai is a virtual classroom in which everybody interested in mathematics can join by registration. The classroom is run and supervised by a few mathematicians called moderators. Usually one of them gives a problem such as 'characterise a fraction which is a finite decimal'. Then, discussions start. A student gives a vague idea to solve the problem, a partial answer or a question, and other students give comments on it or improve former ideas. Moderators encourage the discussions, giving hints if necessary. Usually the discussions end with complete answer. Sometimes a new problem arises from discussions. Otherwise, another problem will be given by a moderator.

N. Arai developed software so that only students of the classroom can have access to the discussions. In this environment a shy child or an elder person who is not so strong in mathematics may feel more comfortable in joining discussions.

"MATHEMATICS ASSEMBLIES"

These activities are aimed at groups of people who generally assemble together in one place to be educated by an expert or group of experts. We have in mind here such things as mathematics clubs, mathematics days, summer schools, master classes, mathematics camps, mathematics festivals, and so on. Five specific examples are given below that refer to mathematics days, research classes, and industry classes.

School mathematics days

There are many examples around the world of mathematics days in which teams of students from various schools in a district come together. During the day they will participate in various individual and team events in an enjoyable atmosphere, and there may be expository lectures.

Mathematics clubs

The world has many examples of mathematics clubs (or circles as they are sometimes known) of students who meet at regular intervals in their town to solve new problems. Often these clubs use a correspondence competition such as the *International Mathematics Tournament of Towns* as a focus for their activity. These clubs are usually coordinated by local academics, research students or teachers who do so in a voluntary capacity. (See www.amt.edu.au/imtot.html)

Mathematics houses

In Iran, a team of teachers and university staff have established what are called *Mathematics Houses* throughout the country. The Houses are meant to provide opportunities for students and teachers at all levels to experience team work by being involved in a deeper understanding of mathematics through the use of information technology and independent studies. Team competitions, e-competitions, using mathematics in the real world, studies on the history of mathematics, the connections between

mathematics and other subjects such as art and science, general expository lectures, exhibitions, workshops, summer camps and annual festivals are some of the non-classic mathematical activities of these Houses. (See www.mathhouse.org)

Research classes

In Germany for many years the prize for the winners of a mathematical competition is an invitation to a 'Modellierungswoche'. In this, groups of eight students together with two teachers work on a real application problem posed by local industry. Many of the problems are optimisation problems. The solution normally requires modelling, mathematical analysis and making a computer program. (See zfm.mathematik.tu-darmstadt.de/)

As another example, in *Math.en.jeans* each team works in collaboration with a university researcher who has proposed a problem, ideally connected to his/her research, on which the students work for a long period (often up to a full school year). (See www.mjc-andre.org/pages/amej/)

(b) Trends

It seems that, with few exceptions, the overall trends are positive. For example, there are many new competitions that cater for a wider range of students than the more traditional Olympiad-style competition and include younger children than before. Many competitions now involve groups of students rather than just individuals.

In recent years too, problem solving has been added to the curricula of a number of countries. However, without some professional development for teachers, it may not appear in the actual curriculum delivered in class.

In the same vein, there appears to be an increasing number of mathematical exhibitions. For a while, mathematical exhibits generally appeared in science centres but now there are more exhibitions devoted solely to mathematics. And, instead of being held in museum-like settings, mathematics exhibitions exist that are portable or appear in such unusual settings as shopping centres, subways, and the open air.

As for publications, there recently seems to have been an increasing number of books and films of a mathematical nature for the general public. Some of these, such as *Fermat's Last Theorem* and *A Beautiful Mind*, have been extremely successful. On the book side though, there may be a trend away from classical problem books to books that discuss mathematical topics and are meant to be read rather than worked on. These books may attempt to convey deep and complicated mathematics but they do so by creating an impression rather than going into great details.

In recent years the Moscow Centre for Continuous Mathematical Education has published a series of books *The library of mathematical education*. These are small books (20-30 pages) written by professional mathematicians and addressed to interested high school students. They include popular

explanations of various areas of mathematics, challenging problems for students and history. The small size of the volumes, good illustrations, and popular style of writing attract a lot of readers.

It appears that magazines and newspapers are currently carrying more mathematics, both with stories about contemporary mathematics and with problems or puzzles.

Mathematics can be found in many sites on the internet. These sites range from discussions of specific topics to problem sites, to the history of mathematics, to teacher professional development, to games (including sites that claim to read your mind), to emergency rooms where you can ask for mathematical help. There are even more and varied sites that all help to make mathematics more accessible, if not popular.

(c) Problems identified

The difficulties that these contexts produce fall into two categories: development and applications. In the former category most new initiatives depend on a small number of people for their success. This makes them fragile. It seems often easier to find money to begin new projects than to find continuing support for them.

By applications we mean applications in schools. It is not clear that much of the new material available is being used successfully by great numbers of teachers in the regular classroom. This may be for a variety of reasons. First, teachers are frequently plagued with time constraints as more material, especially involving new subjects outside of mathematics, enters the school curriculum. These subjects reduce the time available for mathematics. Second, especially in senior secondary school, high stakes examinations force teachers into teaching for the examination rather than developing mathematical ideas. And third, teachers may lack the confidence to deal with the new material that was not part of their undergraduate training. They may also be uncomfortable with the more open pedagogy required for challenging situations which are, by their nature, less structured than the traditional pedagogy.

4. Questions Arising

One goal for the Study Conference will be to get a good picture of what is the state of the art. Here are some examples of issues that may be considered in the context of this Study.

Impact of teaching and learning in the classroom:

- How do challenges contribute to the learning process?
- How can challenges be used in the classroom?
- How much challenge is provided in current curricula?
- What further opportunities to challenge would enhance teaching and learning in the regular classroom?
- How can teachers be made aware of the existence of the different types of challenges?

- How can we ensure that these challenges are compatible with the mandated syllabus?
- How can time constraints in the classroom be handled?
- How can challenges be evaluated?
- How can students be evaluated in challenges?
- How can the effectiveness of using challenging materials be supported by the grading system?
- What sorts of challenges are appropriate for remedial and struggling students?
- What are the implications for teacher training of challenges which are in the classroom?
- What are the implications for teacher training for challenges which exist outside of the classroom?
- What background do students need to handle challenge material and how can this be introduced into the classroom? This includes familiarity with mathematical notation and conventions, ability to reason and draw conclusions, ability to observe and classify and skill at communication.
- How can 'beyond classroom activities' like competitions, exhibitions, clubs, maths fairs, etc., influence the classroom activities and learning in such a way that all students in the class are challenged and motivated?
- How can teachers, parents and students be made aware that these kinds of activities and challenges also will strengthen the learning and understanding of basic concepts and skills in mathematics?
- Can experience with competitions, maths fairs, etc., be part of teacher training and in service teacher education? And will this help to engage teachers in 'beyond classroom activities' or implement these kinds of activities in classroom practice?
- How can textbooks be written so that challenging activities is the philosophy and leading idea behind the textbook, and not only fragmental parts of the content of the book?
- How can technology be used by teachers and students to create challenging environments?

Beyond classroom activities

- What is the effect on the visitors of exhibitions, festivals, etc., where they have only a short meeting with mathematical challenges? How can parents, teachers, students and others be helped to go deeper into the mathematics beyond these short meetings?
- How can one make visible the mathematics behind everyday technological devices, and how can this be put into a context that is accessible and mathematically challenging for different groups of people?

Research

- What research has been done to evaluate the role of challenge?
- What can research into the use of challenge tell us about the teaching and learning of mathematics?
- What questions require further research?

More general questions

- How can the mathematics and mathematics education community be involved in this kind of challenging activity that goes beyond their own research interests?
- Are there some branches of mathematics that are more suitable for producing challenging problems and situations?
- How can different designs of challenging activities, in particular competitions, attract different groups of people (the very able students, gender, cultural differences, different achievement, etc.)?
- What can be done to identify, stimulate and encourage the mathematically talented students?

5. Call for Contributions

The work of this Study will take place in two parts. The first consists of a Conference to take place in Trondheim, Norway, from 27 June to 03 July 2006. The Conference will be a working one. Every participant will be expected to be active. Participation is by invitation only, based on a submitted contribution. Among the attendees, it is planned to represent a diversity of expertise, experience, nationality and philosophy. Such attendance should be drawn broadly from the mathematics and mathematics education community. It is hoped that the Conference will attract not only long term workers in the field but also newcomers with interesting and refreshing ideas or promising work in progress. In the past, ICMI Study Conferences have included about 80 participants.

The IPC hereby invites individuals or groups to submit contributions on specific questions, problems or issues related to the theme of the Study for consideration by the Committee. Those who would like to participate should prepare (a) a one-page listing of their current position and contact information, as well as of their past and present publications and activities pertinent to the theme of the Study; (b) a paper of 6-10 pages addressing matters raised in this document or other issues related to the theme of the Study. Proposals for research that is on its way, or still to be carried out, are also welcome. Research questions should be carefully stated and a sketch of the outcome — actual or hoped for — should be presented, if possible with reference to earlier and related studies.

These documents should be submitted no later than August 31, 2005, to both co-chairs of the Study either by post, by facsimile or (preferably) by e-mail. All such documents will be regarded as input to the planning of the Study Conference and will assist the IPC in issuing invitations no later than January 31, 2006. All submissions must be in English, the language of the Conference.

The contributions of those invited to the Conference will be made available to other participants beforehand as preparation material. Participants should not expect to present their papers orally at the Conference, as the IPC may decide to organize it in other ways that facilitate the Study's effectiveness and productivity.

Unfortunately an invitation to participate in the Conference does not imply financial support from the organizers, and participants should finance their own attendance at the Conference. Funds are being

sought to provide partial support to enable participants from non-affluent countries to attend the Conference, but the number of such grants will be limited.

The second part of the Study is a publication which will appear in the (New) ICMI Study Series (NISS). This Study Volume will be based on selected contributions submitted as well as on the outcomes of the Conference. The exact format of the Study Volume has not yet been decided but it is expected to be an edited coherent book which it is hoped will be a standard reference in the field for some time.

International Programme Committee

Co-chairs:

Edward J. Barbeau, University of Toronto, CANADA
Peter J. Taylor, University of Canberra, AUSTRALIA

Chair, Local Organising Committee

Ingvill M. Stedøy, Norwegian University of Science and Technology, Trondheim, NORWAY

Mariolina Bartolini Bussi, University di Modena et Reggio Emilia, ITALY
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Patricia Fauring, Buenos Aires, ARGENTINA
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Vladimir Protasov, Moscow State University, RUSSIA
Ali Rejali, Isfahan University of Technology, IRAN
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Kenji Ueno, Kyoto University, JAPAN
Bernard R. Hodgson (*ex officio*), Secretary-General of ICMI, Université Laval, Québec, CANADA

Advisors from ICMI Executive Committee

Maria Falk de Losada, University Antonio Nariño, Bogota, COLOMBIA
Petar Kenderov, Academy of Sciences, Sofia, BULGARIA

Inquiries

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The official website for the Study is

http://www.amt.edu.au/icmis16.html

Editors of journals, magazines and newsletters are encouraged to publish this Discussion Document.

A New ICMI Study Volume Available

The Study volume resulting from the twelfth ICMI Study has recently appeared as volume 8 of the New ICMI Study Series (NISS):

Kaye Stacey, Helen Chick and Margaret Kendal, *The Future of the Teaching and Learning of Algebra. The 12th ICMI Study*. Kluwer Academic Publishers, 2004. (NISS 8)

Individuals purchasing the book for personal use are entitled to the usual "ICMI discount" of 60% on the hardbound price and 25% on the softcover price.

Note: As a result of the recent merger of Kluwer Academic Publishers with Springer, the NISS volumes now appear under the Springer label and can be purchased via the Springer website

http://www.springeronline.com

A Report from PME

Joop van Dormolen

At the last Annual General Meeting of the International Group for the Psychology of Mathematics Education (PME), held on 17 July 2004 in Bergen, Norway, Chris Breen, South Africa (cb@humanities.uct.ac.za), was elected as President for the period until July 2007.

For the year 2004/2005 the Officers of the International Committee are:

Vice President	Peter Gates, UK (peter.gates@nottingham.ac.uk)
Treasurer	Markku Hannula, Finland (markku.hannula@zpg.fi)
Secretary	Ron Tzur, USA (lihi@nc.rr.com)

The next PME conference (PME29) will be held in Melbourne, Australia from 10 to 15 July 2005. The Chair of the Organizing Committee is Helen Chick (h.chick@unimelb.edu.au). For information visit the PME29 home page http://staff.edfac.unimelb.edu.au/~chick/PME29/.

The home page of PME can be visited at http://igpme.org.

The Executive Secretary of PME is:

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ICMI Affiliated Study Groups Websites

The homepages of the five ICMI Affiliated Study Groups are located at the following addresses:

HPM:	http://www.mathedu-jp.org/hpm/index.htm
ICTMA:	http://www.infj.ulst.ac.uk/ictma/
IOWME:	http://www.stanford.edu/~joboaler/iowme/index.html
PME:	http://igpme.org/
WFNMC:	http://www.amt.edu.au/wfnmc.html

A Report from HPM

Constantinos Tzanakis

There were several activities of the International Study Group on the Relations between the History and Pedagogy of Mathematics (HPM) during ICME-10 in Copenhagen, Denmark, last July, as well as, an ICME-10 Satellite Meeting of the HPM Group, that took place just after ICME-10 in Uppsala, Sweden.

A. Activities of the HPM Group at ICME-10, Copenhagen, July 4-11, 2004

During ICME-10, there were two Topic Study Groups devoted to the HPM perspective in Mathematics Education (TSG 17 and TSG 29). There was also the ASG (Affiliated Study Group) Meeting of the HPM Group. Finally, a session of Poster Round Tables, one Workshop, one Sharing Experience Group (SGA) and three Regular Lectures were devoted to themes pertaining to the HPM perspective. Below, more details are given on these activities.

1. Topic Study Group 17: *The role of the history of mathematics in mathematics education*

(This section is based on the report by M-K. Siu and C. Tzanakis, included in the *HPM Newsletter* no 57, November 2004, pp.13-16.)

The aim of TSG17 was to provide a forum for participants to share their teaching ideas and classroom experience in connection with the history of mathematics, in the spirit of the 10th ICMI Study on the role of the history of mathematics in the learning and teaching of mathematics (that led to the ICMI Study Volume *History in Mathematics Education: The ICMI Study*, J. Fauvel & J. van Maanen (eds), Kluwer 2000, NISS 6), and to learn about work that has been done since then. The four sessions in this group focused on integrating the history of mathematics in the teaching of mathematics, in an effort to make clearer the meaning of a historical dimension in mathematics education and deepen the understanding of its various aspects. The Organizing Team was A. Elidrissi (Morocco), S. Kaijser (Sweden), L. Radford (Canada), M-K. Siu (China, co-chair) and C. Tzanakis (Greece, co-chair).

The final programme consisted of 13 presentations: 5 invited talks, 4 oral presentations and 4 paper-by-distribution contributions. Each presentation was followed by discussion among participants. In the last session an extra half-hour was devoted to a general discussion and a summary of the main points raised during the four sessions. Relevant material on the presentations has been made available on the TSG 17 webpage in the form of extended abstracts, full texts, related papers, or links to other web sites. Prospective participants were able to download material of interest to them and study it in advance. However, hard copies of material on some presentations were also available on spot. At least 64 people from 22 countries participated in this group. All material will remain available at http://www.icme-10.dk (go to *Programme*, then to *Topic Study Groups* and then follow the link to TSG17). This web site of ICME-10 will be kept online till the next ICME in 2008. In addition, work is under progress to collect full texts of these presentations as papers to be refereed. Accepted papers

will appear in a forthcoming special issue of the *Mediterranean Journal of Research in Mathematics Education* published by the Cyprus Mathematical Society.

Invited talks:
C-I. Fung (China): *How history fuels teaching for mathematising: Some personal reflections*
F. Furinghetti, (Italy): *History and mathematics education: A look around the world with particular reference to Italy*
M. Helfgott, (USA): *Two examples from the natural sciences and their relationship to the history and pedagogy of mathematics*
J. van Maanen, (The Netherlands): *History in mathematics education: FAQ and facts*
G. Waldegg, (Mexico): *Problem solving, collaborative learning and history of mathematics*
Oral presentations:
G.T. Bagni, (Italy): *Prime numbers are infinitely many: Four proofs from history to mathematics education*
M. Barabash & R. Guberman-Glebov, (Israel), *Seminar and graduate project in the history of mathematics as a source of cultural and intercultural enrichment of the academic teacher education program*
D. Taimina, (USA): *History of mathematics and mechanics in digital Reuleaux kinematic mechanism collection*
J. Tattersall, & S. L. McMurran, (USA): *Using the* Educational Times *in the classroom*
Papers by distribution:
R.J. Charette, (USA): *Integrating the history of mathematics in the teaching of mathematics*
A.R. Garciadiego, (Mexico), *Elucidating through history: The case of a well-ordered set*
C. Tzanakis, (Greece): *"The ontogenetic development parallels the historical development" To what extent is this claim true, or false? Remarks and results from some case studies*
O. Yevdokimov, (Ukraine): *Using material from the history of mathematics in learning by discovery*

Further details on the activities in this group, can be found in the HPM Newsletter no 57, pp.13-16, also available from the HPM web site http://www.mathedu-jp.org/hpm/index.htm.

2. Topic Study Group 29: *The History of the Teaching and Learning of Mathematics*
(This section is based on the report by G. Schubring, included in the *HPM Newsletter* no 57, November 2004, p.16.)

As a part of ICME-10, the first specialized Symposium on the history of mathematics education took place as TSG 29. The Organizing Team was, H. Gispert (France), H-C. Hansen (Denmark), H. Khuzwayo (South Africa), G. Schubring (Germany, co-chair) and Y. Sekiguchi (Japan, co-chair). The main goal of the Symposium was to create a net of international communication between researchers in this field, and to establish a discussion between the various national histories and their approaches. The TSG 29 focussed on three dimensions which dominate current research in various countries: transmission of reform movements and modernisations of the syllabi for mathematics in primary and secondary schools, the different aspects of the teaching practice (textbooks, teaching methods, teacher training), and the cultural, political, and social functions of mathematics instruction.

The oral contributions presented in the four working sessions were the following:
K. Bjarnadóttir (Iceland), *From Isolation and Stagnation to 'Modern' Mathematics — A Reform or Confusion?*
E. Donoghue (USA), *The Education of Mathematics Teachers in the United States: David Eugene Smith, An Early Twentieth Century Pioneer*
T. Fujita (Japan), *The Role of Intuition in Geometry Education: Learning from the Teaching Practice in the early 20th Century*
L. Giacardi (Italy), *From Euclid as Textbook to the Gentile Reform: Problems, Methods, and Debates in Mathematics Teaching in Italy 1867 to 1923*
A. Karp (Russia), *"Universal Responsiveness" or "Splendid Isolation"? Episodes in the History of Mathematics Education in Russia*
N. Kastanis & I. Kastanis (Greece), *Transmissions of Mathematics into Greek Education, 1800-1840: From Individual Choices to Institutional Frames*
G. Schubring (Germany), *The State of the Art*
H. J. Smid (The Netherlands), *Between the Market and the State: The Emergence of Mathematics Instruction and of its Teachers as a Result of State Initiative and of Pressure by the Market*
S. Yamamoto (Japan), *The Process of Adapting a German Pedagogy for the Modern Mathematics Teaching in Japan*
The paper by M. Abdeljaouad who was unable to attend, *Issues about the status of mathematics teaching in Arab countries — elements of its history and some case studies*, was made accessible on the TSG's website.

A first considerable result of these initiatives is the first *International Bibliography on the History of Teaching and Learning Mathematics*. It is accessible by a link to the TSG on http://www.uni-bielefeld.de/idm/geschichte.html. Another major outcome of this TSG is that a network for research in this area was established. Its news are accessible via the same link. All those interested are invited to subscribe, and to communicate relevant papers, information, and sources.

3. The ASG meetings of HPM in ICME-10
(This section is based on the report by F. Furinghetti, included in the *HPM Newsletter* no 57, November 2004, pp.17-18.)

The three sessions of the ASG meetings of the HPM Group were used for discussing the identity of the group. The points in question were: (a) To make known the origin of the group; which persons contributed to its birth and growing and which was the initial impetus for the formation of this group; (b) To stress once again the basic ideas underlying the activities of the group; (c) To outline, the results of work done in the past four years and the perspectives for the future. There were three talks, each one focusing on one of the three points above.

The first point was illustrated by F. Fasanelli. The full text of her talk is published in the Proceedings of the HPM Satellite Meeting of ICME-10 in Uppsala. This talk gave the opportunity to all participants to remember once again John Fauvel's contribution in this area. It was important for newcomers to have an outline of the history of the group and better understand what does working in this field mean. The second point was illustrated by U. D'Ambrosio, in his talk, "*Diffusion and*

popularization of science and mathematics", which emphasized that the spirit of the HPM group is not only the use of history in the teaching of mathematics, but also (and mainly) the conception of mathematics as a living science, a science with a long history, a vivid present and an as yet unforeseen future, together with the conviction that this conception of mathematics should not only be the core of the teaching of mathematics, but it should also be the image of mathematics spread to the outside world. The third point was addressed by Jan van Maanen, co-editor of the book *History in Mathematics Education: the ICMI Study*, who talked on what has happened after the publication of this group and Victor Katz, who is currently developing an important project on the use of history in mathematics teaching.

Many colleagues have attended the ASG meetings. Some of them were old members and some were newcomers wishing to understand something about the HPM group. During the discussion, some attendants asked about the rules, which regulate the life of HPM. This is a crucial point in the management of activities of any group like HPM. Rules that are too strict are sometimes an obstacle for efficient action. On the other hand, however, the absence of precise rules may be interpreted as indications of an arbitrary and antidemocratic behavior. It was important to raise this question in the final ASG meeting and the discussion, which followed, provided new insights for acting correctly and efficiently.

4. Regular Lectures related to the HPM Group

The following lectures are directly related to themes pertaining to the HPM perspective in mathematics Education:

(a) V. Katz (USA): *Stages in the history of algebra with implications for teaching*

(b) L. Puig (Spain): *History of algebraic ideas and research on educational algebra*

(c) E. Shchepin (Russia): *Teaching the Calculus: Euler versus Weierstrass*

V. Katz discussed the three broad stages in the historical development of algebra and what can be the benefit for teaching of being aware of these stages. L. Puig tried to exploit from current knowledge on the historical development of algebra and of students' learning of algebra, in order to develop appropriate teaching models. Finally, E. Shchepin addressed the important issue of how to relax mathematical rigor (in Weierstrass' sense) in an introductory teaching of calculus and profit from a more Eulerian approach, by following in a broad sense the main steps of the historical development.

5. Workshops and Sharing Experience Groups (SGA)

One workshop and one SGA were devoted to history in mathematics Education.

(a) V. Katz, K.D. Michalowicz (USA): *Historical modules for teaching and learning of secondary mathematics*.

In this interesting workshop, the organizers presented their project sponsored by NSF and the MAA of USA, aiming at revealing the rationale for using material from the history of mathematics, to teach various mathematical topics. As a result of this project, the organizers presented a more than 1300 pages huge resource material for several historical modules, available in CD-form. A most distinctive feature of these modules is that both their structure and content form an almost complete course in secondary education mathematics, inspired from and based on the history of mathematics. Further details on this resource material, can be found in the *HPM Newsletter* no 57, pp.6-9, also available from the HPM web site http://www.mathedu-jp.org/hpm/index.htm.

(b) A. Gazit (Israel): *What should teachers know about the history of mathematics? The knowledge of pre-service elementary school teachers*
This group aimed at discussing the quality and the extent of difference between mathematics and non-mathematics pre-service elementary school teachers in their knowledge of the history of mathematics and addressed the question of what are their attitudes toward teaching this history.

6. Poster Round Table
The following posters were discussed in a Round Table session:
(a) J. Barnett (USA): *Teaching mathematics throughout the millennia: By whom? To whom? For whom?*
(b) K. Clark (USA): *History of mathematics in the secondary and post-secondary classroom*
(c) J.A. Fossa (Brazil): *Teaching fundamental theorems: An example from the history of mathematics*
(d) B. Morey (Brazil): *The interesting, the easy and the relevant in the history of mathematics*

B. The HPM 2004 *History and Pedagogy of Mathematics* Conference (ICME-10 Satellite Meeting and 4th European Summer University on History and Epistemology in Mathematics Education)

This Conference took place at the University of Uppsala in Sweden from 12 to 17 July 2004 and was a joint meeting in two traditions, namely, the I*CME-10 Satellite Meeting of HPM* (which was the 6th principal quadrennial meeting of the HPM Group) and the *4th European Summer University on History and Epistemology in Mathematics Education*.

The HPM meetings form a natural place for exchanging ideas and communicating research results and teaching experience among, historians of mathematics (who wish to inform others about their research), teachers of mathematics (who may wish to gain new ideas on how they can integrate the history of mathematics into their teaching), mathematicians (with a concern on how their discipline emerged and can be taught) and all with an interest in mathematics, its history, and its role at present and in the past. Therefore this conference's sessions were structured along the following *main themes*: The history of mathematics; Integrating history of mathematics into the teaching of mathematics; The role of the history of mathematics in teacher's training; The common history of mathematics, science and technology; Mathematics and different cultures; The philosophy of mathematics.

The program was structured as follows. There were six plenary sessions, including 6 invited lectures (one per day) and 2 panel discussions; parallel sessions consisting of 9 workshops (from one to two hours, depending on the workshop) and 55 paper presentations (in 3 parallel sessions). With some exceptions, for each contribution there is a full text in the *Proceedings* (edited by F. Furinghetti, S. Kaisjer and A. Vretblad), which were prepared in advance and were distributed to the participants upon their registration at the Conference. It should be stressed that the *Proceedings* includes a very informative 23-pages history of the HPM Group, written by F. Fasanelli and presented during the ASG meeting of the HPM Group at ICME-10 (the original version of the text was co-authored by the late J. Fauvel and has appeared earlier in the HPM web page). An additional short note by E. Barbin

outlines the history of the *European Summer Universities on History and Epistemology in Mathematics Education.*

The Conference was attended by at least 112 participants, from 32 different countries of all continents and gave wonderful opportunities for lively discussions and exchange of ideas among participants in the beautiful city of Uppsala and its surroundings. Many thanks should go to the Local Organizing Committee and especially S. Kaisjer, Z. Kristófi and S. Rodhe, for their intensive efforts to organize a high quality scientific event. In addition to the motivating scientific atmosphere, participants had the opportunity to experience a warm hospitality of the Organizing Committee and the local authorities. More detailed information on the Conference activities and a review of its Proceedings will be available, hopefully in the next issue of the HPM Newsletter.

Some additional comments

As the new chair of the HPM Group for the period 2004-2008, I would like to comment briefly on my view of this Study Group. The HPM group is a group of people with overlapping scientific interests and with a common objective to contribute to humanizing Mathematics, revealing its cultural and multidimensional nature and improving Mathematics Education through the didactical implications of the historical development of Mathematics. This point of view has been stressed on several occasions, like for instance, during the discussion in the last ASG session of the HPM Group at ICME-10 in Copenhagen.

Therefore, as the new Chair of HPM I will try to act as a kind of motive force for coordinating initiatives, collaborating on the realization of suggestions and collecting relevant information. To this end, I have in mind

- to collaborate closely with the former Chairs of the group and all members of the Advisory Board, so that I have a better overview of activities in progress, or ideas and initiatives to be realized in practice.
- to assist the regular publication and continuous enrichment of the *HPM Newsletter* and the constant improvement and updating of the HPM website. Both the Newsletter and the website can be important tools for making easier the contact among the members of the group and for increasing its visibility.
- to actively support magazines, or journals related to the HPM perspective and encourage, or motivate the publication of special issues of other journals devoted to themes that emphasize the historical dimension in Mathematics Education.
- to collaborate in the organization of local, or international activities (meetings, conferences, colloquia etc) that will provide the opportunity to bring together people, who are interested in integrating history into Mathematics Education. Such activities will hopefully stimulate new collaborations and foster further initiatives that will bring closer, mathematicians, historians of Mathematics and mathematics educators, who are eager to contribute to the improvement of Mathematics Education around the world.

For that purpose, the HPM Advisory Board has been enlarged to have a sufficiently good geographic representation, as well as, a balanced representation of the three dimensions of HPM (History, Pedagogy, Mathematics).

HPM Advisory Board for 2004-2008

Abraham Arcavi, Weizmann Institute of Science, Israel
Evelyne Barbin, IREM-Centre François Viète, Université de Nantes, France
Ricardo Cantoral, Departamento de Matemática Educativa, Centro de Investigación y de Estudios Avanzados del IPN, México,
Ubiratan d'Ambrosio, Pontificia Universidade, Catolica de São Paulo, Brazil (former chair 1984-1988)
Abdellah Elidrissi, École Normal Supérieure, Morocco
Florence Fasanelli, American Association for the Advancement of Science, USA (former chair 1988-1992)
Gail FitzSimons, Monash University, Australia
Fulvia Furinghetti, Department of Mathematics, Universita di Genova, Italy (former chair 2000-2004)
Wann-Sheng Horng, National Taiwan Normal University, Taiwan
Masami Isoda, Graduate School of Comprehensive Human Science, University of Tsukuba, Japan (Webmaster)
Sten Kaijser, Department of Mathematics, University of Uppsala, Sweden
Nikos Kastanis, Department of Mathematics, University of Thessaloniki, Greece (Newsletter co-editor)
Victor Katz, Department of Mathematics, University of the District of Columbia, USA
Manfred Kronfellner, Institut für Algebra & Computermathematik, Technische Universität Wien, Austria
Karen Dee Michalowicz, The Langley School, VA, and Graduate School, Mathematics Education, George Mason University, VA, USA
Luis Radford, École des Sciences de l'Éducation, Laurentian University, Canada
Gert Schubring, Institut für Didaktik der Mathematik, Universität Bielefeld, Germany,
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Bjorn Smestad, Faculty of Education, Oslo University College, Norway (Newsletter co-editor)
Robert Stein, Education and Human Resources, National Science Foundation, USA
Constantinos Tzanakis, Department of Education University of Crete, Greece (chair)
Jan van Maanen, Department of Mathematics, University of Groningen, The Netherlands (former chair 1996-2000)
Chris Weeks, Downeycroft, Virginstow Beaworthy, UK (Newsletter co-editor)

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A Report from IOWME

Hilary Povey

The International Organisation of Women and Mathematics Education (IOWME) meets once every 4 years as part of the ICME conference. In between the conferences it is run by two officers, a convener and a newsletter editor. It functions as a network of people working on issues around gender and mathematics and has National Coordinators across the world.

Hilary Povey, Convener
Hilary Povey is a reader in mathematics education at Sheffield Hallam University where she teaches mathematics to initial teacher education students. She previously taught mathematics in secondary schools for a number of years and has also worked as an advisory teacher. At one time, Hilary directed the SMILE mathematics project and has retained an engagement with mathematics curriculum development throughout her career. In both her teaching and research she is committed to addressing social justice issues, both those associated with gender and more widely.
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Postal address: 58A Mathematics Education Centre, Faculty of Development and Society, Sheffield Hallam University, Collegiate Crescent Campus, Sheffield S10 2BP, England

Heather Mendick, Newsletter Editor
After doing a degree in mathematics Heather worked as a mathematics teacher in England for 7 years. She worked mostly with students after the end of compulsory schooling (so 16-years-old and over). After this she went back to university and studied Gender Studies. About a year ago Heather finished her PhD looking at how young people in England come to choose mathematics and the role of gender in this. For the last year she has been working at Lancaster University in the UK. She has just finished there and is currently looking for something to do next. Meanwhile she is working on a book about gender and mathematics based on her PhD and teaching part-time.
E-mail address: heathermendick@yahoo.co.uk
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Conference report
The following papers were presented at ICME-10:
Anna Rogers, University of South Australia, *Towards gender equity in education: how early childhood research can inform the greater mathematical community*
Coleen Vale, Victoria University, Helen Forgasz, Monash University and Marj Horne, Australian Catholic University, *Showcasing recent Australian research in gender and mathematics*
Sabita D'Souza, University of Technology, Sydney, Australia, *Gender Imbalance in engineering mathematics courses: can we increase female representation be introducing collaborative learning methods?*
Corinne Angier and Hilary Povey, Sheffield Hallam University, UK, *'I can do it, but it'll be a battle': finding her place as an undergraduate mathematician*

Barbro Grevholm, Agder University College, Sweden, *Increasing women's participation in mathematics: the role of networking*

Reflections on the conference and initial thoughts for Mexico

There was a really good discussion at the conference about the way the IOWME sessions had been organised. In terms of working within ICME there were questions raised about whether our main strategy should be directed at mainstreaming gender into the conference rather than having separate sessions. Many felt these should be parallel aims and were enthusiastic about the higher than normal proportion of women among the plenary speakers, regular lecturers, and chairs of the discussion groups and the topic study groups.

There was a general dissatisfaction about the way that the first two IOWME sessions had been scheduled against the discussion groups and some discussion about the role of the IOWME sessions as compared with that of Topic Study Group 26 on Gender and Mathematics.

In terms of the IOWME sessions themselves the balance between research and practice was explored, as was the shift in focus from participation to quality of participation. Relating to this, questions were raised as to whether we should be encouraging girls into mathematics given the current 'masculine' subject cultures.

Some people felt that the call for papers for the IOWME sessions sounded "elitist and exclusive" because of the way that papers were to be selected on the basis of peer review. Parallel sessions would solve this by enabling more papers to be presented. This raised the question of why do the sessions have to be structured around papers? There was a discussion of whether the organisers had got the right balance between papers and discussion given the fact that IOWME only meets at ICME and performs an important function as a support group for those working on gender and mathematics.

In terms of working for Mexico:

- We will stress the need for dedicated space for the affiliated groups at ICME in Mexico: individual members and the new coordinator and newsletter editor will protest about the scheduling of the IOWME sessions against the discussion groups
- Given the financial difficulties that many coordinators have in getting to ICME, IOWME should have an active role in nominating people for financial assistance to attend ICME-11. Someone from IOWME should sit on the ICME-11 Grant Committee.
- In future we need flat rooms — not lecture theatres — for the sessions to facilitate a different kind of interaction.
- IOWME sessions should be jointly planned with any of the discussion or topic study groups focused on gender and mathematics and links made between them in the programme.

Issues about communication

There were also discussions at ICME-10 about the ways that IOWME members communicate with each other. Given that we only meet once every four years at ICME and that most people cannot get to these conferences, other forms of communication are really vital. Communication is also important because there is a challenge for IOWME to stay together across all the differences between countries,

North and South, rich and poor. In terms of gender and mathematics, some countries are just beginning feminist research and interventions while others are caught in the throws of a backlash against feminism.

With this is mind, it is worrying that people reported the problem of newsletters not getting out to individual members. Changing e-mail addresses obviously add another difficulty to maintaining communication. People stressed that national coordinators need to be proactive. It was suggested that the newsletter editor collect membership lists from individual coordinators and e-mail the newsletter directly to members. The exclusiveness of e-mail was noted. Hilary is currently negotiating with her university about the IOWME website.

Hilary Povey, IOWME Convener
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Report on an ICMI Regional Conference: EMF 2003 (Tozeur, Tunisia, December 2003)

Hikma Smida

The conference EMF 2003 (*Espace mathématique francophone 2003* — "Francophone Mathematical Space") took place from 19 to 23 December 2003 in Tozeur, in the Southern part of Tunisia. The conference gathered 264 participants from twelve countries (Algeria (8); Belgium (4); Burkina-Faso (1); Canada (14); Spain (1); France (54); Italy (2); Lebanon (3); Morocco (3); Mauritania (3); Switzerland (2); Tunisia (166)), with French as the language of the meeting.

EMF 2003 is the second in a series of symposia taking place every three years in a country where French is used as a language. EMF 2003 was preceded by EM 2000 (Grenoble, France) and will be followed by EMF 2006 (Sherbrooke, Canada). It was officially recognized as a Regional Conference of ICMI, where the "region" was defined not in geographical but rather in linguistic terms, the gathering being based on a common language. EMF 2003 was held under the patronage of the Tunisian Minister for Education and Training and was sponsored by UNESCO. It was organised by the Tunisian Commission on Mathematics Education (CTEM) and the Tunisian Association for the Mathematical Sciences (ATSM), with the cooperation of CFEM (*Commission française pour l'enseignement des mathématiques*), the French Sub-Commission of ICMI.

Created in 2000 by the Tunisian Ministry of Education and Training, the CTEM is a team composed of researchers, teachers and inspectors. Its mission is to carry out, on the request of the Ministry, prospective and comparative studies on mathematics teaching in different educational systems, so to keep up with the innovations that may lead to improvements in the teaching of mathematics in Tunisia. Established in 1968 at the initiative of a team of academics, secondary teachers and inspectors, the ATSM is an association concerned by the improvement of Tunisian mathematics teaching, especially in primary and secondary schools. I would like to use this opportunity to pay a particular homage to the late Mr. Sadok Aïdi, one of the main founders of the ATSM and former Tunisian Representative to ICMI, who passed away on January 10, 2004. Mr. Aïdi dedicated his career to the promotion of mathematics and to ensuring that mathematics teaching in Tunisia would be contemporaneous and of high quality. In charge of the ATSM journal, Mr Aïdi has been always careful to spread information and to favour exchanges between specialists of the teaching of mathematics, especially among the francophone community. Several of his former students, actually academics or secondary teachers or inspectors, were present at EMF 2003, thus bearing witness to Mr Aïdi's work, both in the present and in the future.

The Local Committee of EMF 2003, chaired by Hikma Smida, has been sponsored by two Tunisian organisms:

- The National Centre of Pedagogical Innovation and Educational Research (CNIPRE), which is an institution of study and research whose activities concern several domains such as

educational innovation, new technologies, national and international assessment and educational resources.
- The National Pedagogical Centre (CNP), the institution in charge of the publication and diffusion of the officially prescribed textbooks in Tunisia, as well as pedagogical and digital supports for teaching and learning.

The scientific program of EMF 2003 was under the responsibility of an International Scientific Committee chaired by Hedi Daboussi. Nine themes were identified for the conference:

- Mathematics education at the crossroads of many cultures;
- Mathematics for all; popularisation of mathematics;
- History and epistemology of mathematics;
- Current evolution of curricula;
- Institutional transitions: primary/secondary and secondary/tertiary;
- Teacher education and development;
- Tools for teaching and learning;
- The teaching of probability and statistics;
- Mathematics and other disciplines.

EMF 2003 was financially supported by the Tunisian Ministry of Education and Training, the CNIPRE, the CNP, ICMI, as well as by a large number of Tunisian institutions and enterprises.

Several officials and institutional representatives were present at the opening ceremony, chaired by the Governor of Tozeur. The ceremony started with welcome words from Hikma Smida, followed by the greetings of Bechir Kachoukh for the ATSM, Jean-Luc Dorier for the CFEM and Bernard Hodgson for ICMI. Mr Nejib Ayed, director of the CNIPRE and representative of the Tunisian Minister for Education and Training, read a welcome message from the Minister. After these allocutions, the Mayor of Tozeur introduced the participants to the region and its inhabitants, called the Djeridi. With humour and vivacity, the Mayor touched some typically Djeridi traits like witticism, frankness, love of science, poesy and erudition. He also presented some elements of the history of the region. The Mayor ended his speech by the lecture of some extracts from poems of Abou el Kacem Chebbi, the son of Tozeur and one of the greatest Tunisian poets. Then, the Governor of Tozeur welcomed the participants and declared EMF 2003 open.

EMF 2003 included several scientific activities as well as cultural ones. In fact, during the four days, the participants were offered four plenary conferences, sixty-seven communications, two workshops, one round table on teachers education, two public presentations, a conference on astronomy with observation of stars, and also five exhibitions: mathematics and art, books and Tunisian productions, women in mathematics, women in sciences, fractals.

The four plenary conferences treated different topics touching upon the themes of the symposium. In her conference "The teaching of mathematics in Tunisia: genesis and destiny", Hikma Smida presented a survey on the principles and the orientations that underlay the curricular evolution of the Tunisian mathematics teaching in primary and secondary school, from 1958 to 2002, identifying also different parameters that may lead to an optimal realization of curricular innovations. In a joint

conference entitled "Preparation to the teaching of mathematics and development of professional competencies: articulation between mathematical, didactical and practical preparation", Nadine Bednarz and Marie-Jeanne Perrin presented a survey on the initial education of teachers in Québec and in France. After having described the institutional context and the general orientation of teacher education in both settings, the speakers presented the results of a research on teachers practices as well as on initial teacher training. In his conference "From Kairouan to Saragossa: seven centuries of mathematics in the Western Mediterranean", Ahmed Djebbar spoke of the mathematical tradition of Andalusia and Maghreb expressed in Arabic language, stressing its possible extensions to Europe. Finally, in a conference entitled "The macabre constant", André Antibi described, through examples, the lag between pupil's and teacher's motivations and pointed out a collusion between selection and assessment, specifying some tracks to remedy it.

The communications covered all the themes of the symposium. However, their distribution among the themes was unequal. Indeed, the themes tools of the teaching (10), teaching of probabilities and statistics (10), mathematics and other disciplines (9), institutional transitions (7) were those that counted the largest number of contributions. The two workshops concerned the use of information and communication technologies in mathematics teaching. The public presentations have also concerned ICT. In the first of these, Régis Goiffon presented two mutualisation tools of educational resource and explained their use. In the other, Abderrazak Berrezigue introduced some of the pedagogical resources proposed on line by the e-learning Tunisian school and explained their use. The round table on teacher education, led by Nadine Bednarz, attracted a large number of participants. The discussions enhanced the important differences between the countries as regards the various systems for the preparation of teachers.

EMF 2003 was a remarkable symposium in several aspects. From a scientific point of view, it provided a space of information in which 264 researchers, teachers and specialists could inquire about the most recent research related to mathematics teaching, as well as about teaching experiences, different teaching and training systems and new teaching tools. EMF 2003 was also a space of communication, offering participants from different countries an opportunity to discuss and exchange ideas or points of view on several questions related to mathematics teaching. The discussions and debates took place quite frankly and in a total respect of orientations and culture of each country, so that the specificities and the differences between the cultural contexts have been an important source of wealthy debates. EMF 2003 was as well a space of projects, offering a basis for concerted actions in terms both of exchanges of experiences and information, or cooperation in research. All the more since some fundamental problems in mathematics teaching are global by nature and their resolution requires international collaboration and solidarity.

At the regional level, EMF 2003 encouraged an important involvement of North African participants. Twenty-two researchers, most of them working in collaboration with teams from France or Québec present at the symposium, have presented their works. Describing and analyzing the situation in their countries, comparing between different situations, considering perspectives, they contributed to develop research on mathematics teaching as well as to promote international collaboration and communication. Messengers of their countries but also hyphens between countries, they played a large part in intensifying the cohesion among participants. Furthermore, EMF 2003 was also a space

of encounter where young North African participants could establish acquaintance and envisage future projects.

On the national level, one should greet the strong implication of the Tunisian secondary school teachers. Conscious of their responsibility as determining actors in the improvement of mathematics teaching, conscious also of the heavy task that is incumbent upon them, 130 teachers were present in EMF 2003, coming from several regions of Tunisia. EMF 2003 offered them the opportunity to exchange points of view, to inquire, to inform, to share their experiences and to establish contacts with their colleagues from other countries. Their keen sense of hospitality and their cordial presence gave to the symposium a happy tonality that lasted until the end. EMF 2003 was also a space of meeting where Tunisian secondary school teachers, researchers in didactics, inspectors, and academics could discuss and confront their points of view around common preoccupations related to mathematics teaching and learning.

But EMF 2003 was also a cultural space. Indeed, EMF 2003 offered the opportunity to its participants to discover the region of El Djerid (the country of palms), a fascinating region where desert and oasis alternate so magically — a paradox whose secret lies in the water sources that run in the oasis through channels (seguia), according to a system established by Ibn Shabbat, a scientist himself native of the region. El Djerid is a region situated in the Southwest of Tunisia and edged by a sea of salt called Chott El Djerid (the saline lake of El Djerid). According to Greek mythology, it is Chott El Djerid, the Tritonis Lake, which Jason and his Argonauts had crossed in their quest for the Golden Fleece. An Arabic legend tells that the Chott was a sea haunted by sea monsters, the faraouns, that devoured anyone crossing it. Until the day a hero, called Skander thoul Karneine, cast a spell over them covering the seat with a white shroud. The participants could also visit the mountain oasis Chebika, Midas and Tamarza. Formerly called Ad Speculum and Ad Turres, Tamarza and Chebika were Roman military outposts, Tamerza becoming an episcopal office in the Byzantine era.

Everyone going to El Djerid is impressed by the dazzlingly beautiful of the sky by night. For this reason, an astronomic night was proposed to the EMF 20003 participants. Supported by the Tunis Science City, the astronomic night began with a conference titled “Astronomy and mathematics” and presented by Mr Chebbi, followed by a demonstration in a portable planetarium. There, the participants could observe the sky of Tozeur studded with stars whose brightness is so intense that one stays fascinated.

During all four days of the symposium, EMF 2003 has been surrounded by a very particular atmosphere. If I had to describe this atmosphere in only one word, I would say: *emotion.* Emotion when Tozeur the magical city, called Thusurus by Ptolemy and called Bled El Hadhr (the city of civilization) with the Islamic conquest, opened us its arms with its institutions, its officials and its inhabitants, confirming the millennial tradition of the Arabian hospitality. Emotion when Ahmed Djebbar reminded the North Africans participants that they are heirs to a memory and a civilization that have consecrated science. Emotion at the view of Chebika, the village perched on a mountainside. A marvellous scenery of beautiful gorges surrounded by red rocks, and of buildings made of stone and clay dominating a deep ravine and overhanging an oasis through which flow water sources. Emotion at the view of the old brick village of Tamarza, barricaded behind a mountain chain

and hanging from the sides of a gigantic canyon. A grandiose landscape of colours and lines where sky, mountain and desert seem to merge on the horizon, the whole flooded by a thrilling light tinted with various colours. Emotion in the closing ceremony, when ICMI Vice-President Michèle Artigue, pointing out how much Tunisians love their country and paying homage to their warm reception, described EMF 2003 as an encounter of hearts.

The gala dinner, organized and supported in part by Dar Cherait, has been one of the most intense moments of EMF 2003. The dinner took place in a palm grove illuminated all around by palm-fires. Welcomed by a folkloric orchestra and horse riders wearing the traditional burnous, the participants were installed in tents, put up for the occasion in the palm grove. On a large dance space set up in the centre of the palm grove, musicians have sung and danced Tunisian popular legends, telling the daring exploits of heroes defending their region or saving their ladies. Mentioning another dimension of the Tunisian popular tradition, the musicians staged dervish dances, going into trance and taking the participants onto the dance floor. All night long, participants have danced and sung in a climate of happiness and feast. A marvellous spectacle of one community united in a formidable symbiosis, and driven by a powerful desire to make sure that all goes well. The party ended at the dawn, leaving an ineffable memory in the mind of each participant.

EMF 2003 was an incontestable success, certainly generated by the powerful will of all to make a memorable achievement of this manifestation. Didn't Abou el Kacem Chebbi, the poet of Tozeur, say

> "When I strike for a goal, I let hope carry me on and I forget to be careful
> I don't avoid the craggy roads and I'm not afraid of falling in a burning fire
> One who doesn't like to climb mountains will live eternally at the bottom of ravines."

I would like to thank for their contribution all the participants of EMF 2003, on my behalf and on behalf of my colleagues of the Local Committee of EMF 2003 (Mehdi Abdeljaouad, Abdennebi Achour, Taoufik Charrada, Béchir Kachoukh, Leila Lassoued). Most of them had travelled thousands of kilometres for attending EMF 2003, I thank them deeply. I also would like to thank the Tunisian Minister for Education and Training, the regional authorities of Tozeur, the Tunisian Ambassador in France and professors Jean-Pierre Kahane, Bernard Hodgson and Michèle Artigue for their support and their help. And I am grateful to the CNIPRE, the CNP, ICMI, the CFEM and the Tunisian institutions and enterprises for their sponsoring.

Note: The website of EMF 2003 is accessible at http://www.edunet.tn/emf2003/.

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In Memoriam — A Note from the Editor

The mathematics and mathematics education community is mourning the passing in 2004 of four outstanding colleagues who brought major contributions to our field over the last decades. In addition to their influence both at the local and international levels, all were closely connected to ICMI as an institution. As a matter of fact, three of them were members of its Executive Committee. In the following pages, the reader will find homage to the memory of

- Sadok Aïdi (1927–2004)
- Igor F. Sharygin (1937–2004), member of the 1999-2002 ICMI Executive Committee
- Hans-Georg Steiner (1928–2004), Vice-President of ICMI on the 1975-78 Executive Committee
- Jacobus van Lint (1932–2004), member of the ICMI Executive Committees from 1987 to 1994.

I am grateful to all the colleagues who kindly accepted to participate in these commemorations, especially to Leïla Lassoued-Aïdi, mathematician and daughter of Sadok Aïdi, and Georgii Sharygin, mathematician and son of Igor Sharygin.

A brief autobiographical note prepared by Igor Sharygin when he became a member of the ICMI EC has appeared in the *ICMI Bulletin* No. 47 (December 1999), pp. 6-7.

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In Memoriam
Sadok Aïdi (1927–2004)

Sadok Aïdi died in Salammbô (Tunisia) on January 10, 2004, at the age of 77 years. His health condition had gradually deteriorated during the previous years, following an Alzheimer type disease. For thirty years, and from the independence of the country, he had substantially contributed to the development of mathematical education in Tunisia.

He had been associated to activities of ICMI. In 1970 he was an observer at the ICMI meeting held in Nice in parallel to the International Congress of Mathematicians. Thereafter he was appointed as the Tunisian Representative to ICMI, a position he held until his death. He took part in the congresses

ICME-1 in Lyon (France, 1969), ICME-2 in Exeter (U.K, 1972) and ICME-3 in Karlsruhe (Germany, 1976). He also participated to the seminar of Echternach (Luxembourg, 1973).

Born on January 10, 1927 in Sfax, Sadok Aïdi taught mathematics at the secondary school of Alaoui (Tunis), and later at the Carthage secondary school. He was in turn vice-headmaster of the technical school of Tunis and headmaster of the Khaznadar secondary school of Bardo (Tunis), before becoming inspector of mathematics, and then general inspector. Later on, he became deputy-director charged with the scientific programs at the programs department of the National Ministry of Education. He was among the founders, gathered by M.S. Baouendi in January 1968, of the Tunisian mathematical association ATSM (Association Tunisienne des Sciences Mathématiques). He was a member of the Executive Committee of this association from 1968 to 1978, holding the positions of Treasurer, then Secretary-General, in charge of the bulletin and in 1975, for one year only, President ("He did not like honours", said his friend Mohamed Fayala). But he was finally appointed Honorary President!

It was during his presidency that the General Assembly of the association decided to initiate the "national days" of the ATSM and to organize a national competition of mathematics for the pupils of the 6th level of secondary education (last year before the baccalaureate). However, his main contribution within ATSM was the heavy load of publishing the bulletin, called *Bulletin de liaisons et d'échanges* (currently *Miftah Al Hissab*). The publication of this journal started already at the time of the inception of the association in 1968, and obviously widely reported on the debate around the reform of the "new maths". One finds in the bulletin some of the works of the GEEM (Groupes d'Études sur l'Enseignement des Mathématiques) and Sadok Aïdi fed it from his own works and reflections, proposing problems "for long winter nights". For each issue of the bulletin, he chose a quotation which he put forward, such as for example the following one due to Freudenthal: "It is not possible to learn mathematics, it is necessary to do mathematics."

Sadok Aïdi was also active at the international level: in addition to his contribution within ICMI, he had been correspondent of the French Association des Professeurs de Mathématiques (APM) and also member of CIEAEM (Commission internationale pour l'étude et l'amélioration de l'enseignement des mathématiques). From 1970 to 1983 he participated to most annual meetings of CIEAEM and was a member of its Executive Committee and involved in the organization of its meetings from 1975 to 1983. The 25th meeting of CIEAEM took place in Tunis on the topic "Why mathematics in education". It had been organized, according to Angelo Bertoletti, "in a masterly way". Claude Gaulin, in a postcard addressed to Aïdi after the meeting, wrote: "Bravo for the work that you and the Tunisians achieved for CIEAEM! Through it the Commission receives a new and important spur."

It is very difficult to outline in few lines the dimension of a personality. In addition to his professional occupations, Sadok Aïdi invested himself a lot in the social and cultural activities of his city. He was my father, and I discovered on the occasion of this commemoration some aspects of his work. His physician, Professor Abdelaziz Annabi, who always called him "Master", said to me when I informed him of the death of my father: "He left children, he left pupils, he lives through them."

I have invited a few people who knew Sadok Aïdi well and accompanied him at various stages of his mathematical career to contribute some personal reflections on the occasion of this commemoration. These texts are presented in what follows.

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Sadok Aïdi left marks of influence everywhere, having contributed to the education of generations of teachers, the creation and the development of the journal of the ATSM, essential in guiding the first steps of teachers when reform (how many times!) of the programs in certain experimental classes was at stake. Sadok was part of a movement that could contribute to build the country because he had faith that one could change things through the force of conviction and work.

Mohamed Bouguila, General Inspector (retired)
Tunis, TUNISIA

Teaching in general in Tunisia, and teaching of mathematics in particular, owes much to Sadok Aïdi, he was there for any innovation. The journal of the ATSM, it was Sadok, from the collection of articles to the distribution. The first national days of mathematics, it was Sadok: preparation, organization, contributions and summaries of communications. The introduction of informatics in secondary schools, it was Sadok who had the idea, with a small group of teachers and people in charge — already in 1976! His comments and input during the meetings of the working groups for the reform of mathematical programs were listened to and appreciated. I keep of him the memory of a man sincere in his relations, while intransigent on principles.

Mohamed Fayala, General Inspector
Secondary private school Fayala
Sousse, TUNISIA

To a man who made me love mathematics,
To a man to nobody similar in his love for his profession and his pupils, in his devotion and his sacrifice,
To a man who gave me everything, inculcating in me method and contact,
To a man whom I deeply regret,
I dedicate these simple words, which express only imperfectly what I keep in my memory of this professor who became a myth for me.
Dear Professor, I keep on reminding your invaluable advices. Thousands of Thanks!

Ezzeddine Ben Jabeur
Pupil at the Carthage secondary school in 1965-1966
Professor of Mathematics, Secondary school Azaiz Khouja
Kélibia, TUNISIA

My wife and I have of Sadok Aïdi the memory of the excellent man, with a great kindness, whom we met at the Alaoui secondary school. We were his colleagues, my wife, Madeleine, teaching French and me, like Aïdi, mathematics; we thus had common pupils so avid of knowledge, for my part since 1951 until in 1961 and for my wife more briefly. On the occasion of a maritime crossing we appreciated the smiling phlegm of Sadok in the face of customs officers fussy about a carpet. It is thus to say how much we estimated all the beautiful humanity of Sadok Aïdi.

Rene Forté, Professor of mathematics (retired)
Toulouse, FRANCE

I got acquainted with Mr Sadok Aïdi for the first time in the early seventies, through the articles he had been publishing in the revue of the ATSM. His papers shed light on the path to follow for teachers and reflected the qualities of a great educator. My first meeting with the late one took place in 1981 when I participated to the work of the commission of the programs. Mr Sadok was an active and influential member of this commission and it is thanks to his relevant ideas and his clear-sighted directives that the commission's work led to new well conceived programs. I remember that Mr Sadok, who read much and was a subscriber of many foreign revues, handed out to us at the beginning of each meeting of the commission copies of the articles and the research tasks that he had read and that were in connection with the agenda. Finally I have closely known Mr Sadok when I was preparing the competitive examination of inspectors. He helped me substantially by providing me, from his own library, all the documents I asked for. And if I do forget, I would never forget the advice he gave me, at the time of my first taking office as an inspector: "Don't say all you observed and don't write all you said." For all those who knew him, Mr Sadok Aïdi was an example to follow.

Ali Rahmouni, Inspector of Mathematics
Tunis, TUNISIA

The telephone rang in my office. It was by the end of June 1978. I then had, since two years, the position of vice headmaster at the secondary school of Korba. It was the voice of Mr Sadok Aïdi, sub-director at the programs department of the Ministry of Education, announcing me the approval of the ministry for my appointing as a head within the programs department. This was my first contact with Mr Sadok. My relation with him as a direct senior in rank lasted until the end of 1986, date of his retirement. I had thereafter the honour of succeeding him as the head of the sub-department of programs for the scientific, economic and technical disciplines of secondary school education. Professionally, I learned essential qualities from Mr Sadok, such as rigour, the necessity of adopting a clear and progressive procedure in any action to be carried out, as well as the obligation of the follow-up. It is by his intermediary that I made acquaintance with eminent pedagogues and academics of current times, particularly those from scientific and technical disciplines all over the country and with whom I thereafter weaved excellent relations of work and friendship. Mr Sadok was a man devoted to his work while remaining strongly attached to mathematics, his favourite discipline. Moreover, he developed openings on informatics, a field in full rise. Humble by nature, he did not like to speak about his own person, while being proud of his children's success in their studies. Our personal relations went through an ascending trajectory, allowing a progressive and irreversible consolidation. May God the almighty grant him his infinite mercy and receive him in his eternal paradise!

Mahmoud Ouanes
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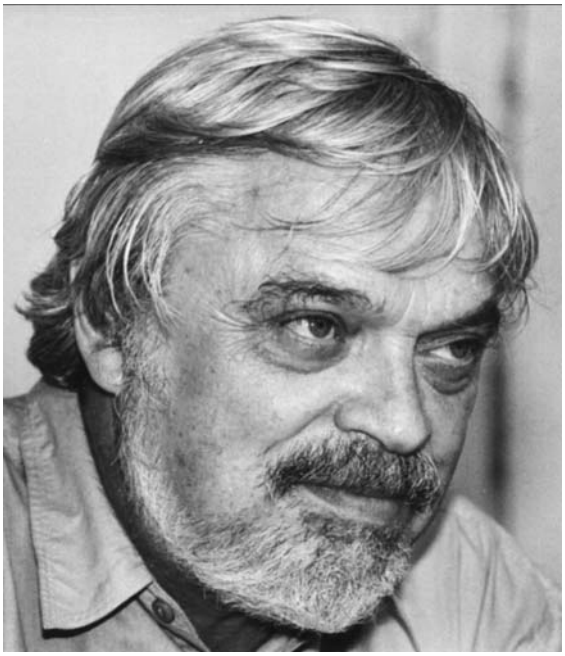
In Memoriam
Igor F. Sharygin (1937–2004)

Igor Fedorovich Sharygin was born in 1937 in Moscow, USSR. When he was a 5th-grade student, his teacher, to whom he was grateful till the end of his life, inspired him to study Mathematics at an advanced level. He became an active member of the students' Mathematical club at Moscow State Lomonosov University. He graduated from school in 1954 with silver medal and entered the Mathematics and Mechanics Department of MSU. In 1959 he completed the programme of undergraduate studies at MSU with honours and continued his studies at the post-graduate level. His scientific adviser was N.S. Bakhvalov. In 1962 he finished post-graduate studies and in 1965 defended his thesis, entitled "The lower bounds in the theory of integration and approximations on certain functional classes" — some results of his thesis have not been improved until now.



Until 1972 he worked at MSU (in the Departments of Mathematics and Mechanics and of Applied Mathematics and Cybernetics). He had to leave MSU due to a political scandal, when he signed a letter in favour of the dissident mathematician and poet Esenin-Volpin. After this and until 1985 he taught mathematics in various institutes in Moscow. At the same time he was an active author of the famous *Kvant* magazine, the journal of elementary Mathematics for school children founded by Kolmogorov. He also took part in the Olympiad movement: he helped prepare Soviet teams for the International Math Olympiads and suggested several problems for the Soviet and International Olympiads. His interests were centred around elementary Geometry.

In 1981 his first book, *Problems in Plane Geometry* was published as a supplement to *Kvant*. Soon after this, in 1983, its sequel *Problems in Solid Geometry* appeared. These books quickly became very popular and were translated into several languages. In 1984 he became editor-in-chief of the Problems Section of the journal *Mathematics in School*. In 1985 he became a senior researcher in the Moscow Institute of Educational Systems and Methods. At the same time he continued writing various books in elementary Mathematics for secondary and high schools. He also taught elementary Mathematics in school, and was scientific adviser of post-graduate students. During the years 1989-1999 his books *Solving Problems in Mathematics* (vol.1-2), *Visual Geometry*, *Mathematical Medley*, *Textbook in Geometry (7-9 grades, Plane Geometry)*, *Textbook in Geometry (10-11 grades, Solid Geometry)* and many others were published.

In 1998 he became the Russian representative to ICMI and was later elected a member of the ICMI Executive Committee for the period 1999-2002. Till the very end of his life he continued writing books and struggling for Mathematics education in Russia.

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Igor Sharygin — an outstanding specialist in education, scientist, pedagogue, and the person who promoted and popularized science — passed away on the 12th of March, 2004.

During all his life he advocated the necessity of improving and developing mathematical education which he considered one of the major instruments of personal creativity — and hence of the revival of his country.

Igor Sharyguin had a *sacred love* for Geometry. He wrote: "Geometry is a phenomenon of the human culture. … Geometry, as well as mathematics in general, helps in moral and ethical education of children. … Geometry develops mathematical intuition, introduces a person to independent mathematical creativity. … Geometry is a point of minimum for the distance between school mathematics and the mathematics of high level."

Igor Sharyguin was among the brightest mathematical "composers" — inventors of new mathematical problems — of our time. Due to his efforts, Geometry was enriched by numerous excellent school problems; he wrote many wonderful textbooks and popular books on mathematics. Among his own works, Geometry for young people is the most helpful and "ecologically pure" product for the intellectual development of a person.

Igor Sharyguin was a man of many interests. He took an active interest in philosophy, poetry, history, which were reflected in his books and works.

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Igor Fedorovich Sharygin was a member of a mathematical circle which I run for high school pupils. The circle produced a lot of known mathematicians. Igor was distinguished among other participants by a large modesty coefficient: the ratio of someone's real mathematical abilities to his opinion about them.

Later he became my graduate student and after that the first postgraduate student. At that time a wide circle of applied problems has been requiring calculating high-dimensional integrals, in particular, from functions with singularities. For functions with high-order smoothness, algorithms of calculating the high-dimensional integrals have been developed mainly for the case when the integration domain is periodic and represents the unit cube. Igor Sharygin has shown that these methods can be applied for low-order smoothness and with no assumption of the periodicity.

However the main godsend in his work was a simple and universal method suggested by him of removal of the singularities and reducing integrals over the unit cube to integrals over the same cube from periodic functions. The problem was old and the solution method was found on surface, but nobody before Igor had been able to find it. This method has become the classical method for computing integrals of functions with singularities and entered textbooks. When I speak about this method in my lecture course "Numerical methods" in Moscow University, I am proudly adding that this method was found by my student, known to you from school — I. F. Sharygin.

Later, during 10 years Igor Sharygin had been teaching at the computational mathematics chair of Moscow University. As result of some casual circumstances he has left this position. This fact made him upset very much but it turned out great success for all us. Mathematical community, Russian and international, has acquired in his person the greatest, after Hadamard and Kiselev, school geometer of the XXth century.

In his youth Igor Sharygin was trying to avoid any work if it was not immediately linked to Mathematics. However when in his fifties, he became an active social man. In the beginning he was a convinced adherent of the so-called reformers, but later he had harshly been disappointed by them. He published many papers directed against the policy conducted by the reformers for globalization of education and all society's life that consisted in a dull imitation of American samples. Igor Sharygin had been considering teaching Mathematics, especially Geometry, as one of the most important elements of upbringing human culture, assisting every single person to develop his conscious look at natural and life phenomena and exclude manipulating his consciousness.

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A Wink of the Eye from Igor Sharygin

Bernard R. Hodgson

The professional achievements of Igor F. Sharygin, in particular his remarkable books on problem solving and geometry, are a clear testimony to his exceptional wit and imagination. I would like to mention a small piece of evidence of this characteristic of Igor, which should bring back great memories to all the colleagues who belonged with him to the 1999-2002 ICMI Executive Committee.

Verbal communication with Igor was not facilitated by the fact that his oral fluency in English was not as high as he would have wished. Consequently he developed many alternative ways of providing his input to the work of the Executive, especially through written communication. We all remember the small *exposés* he would make, going to the blackboard during our working sessions and presenting enthusiastically in a written form and pictures his views on the topic being discussed. And the word "beautiful" came so often in the brief oral comments he would then make.

His enthusiasm never faded away, and he came to the last meeting of the EC, held in July 2002, with a nice surprise for all of us on the Committee, a direct inspiration of his lively and witty mind. He had found on the web photographs of all of us. He brought these to a Moscow street artist, Victor Schmokhin, and discussed with him the composition of a drawing intended to serve as a homage and a memory to this Executive Committee. Each member of the EC was associated with a national icon representing his of her country internationally. The result is the following picture, where Igor's smile and sparkling eyes — as well as his Russian origins — as so well represented. The original of this drawing, dated July 10, 2002, is posted in the office of ICMI Vice-President Michèle Artigue, who was hosting this ICMI EC meeting in Paris.

The reader will probably have no difficulty in identifying the members of this Executive Committee: Néstor Aguilera (Argentina), Michèle Artigue (France), Hyman Bass (USA), Bernard R. Hodgson

(Canada), Gilah Leder (Australia), Yukihiko Namikawa (Japan), Igor F. Sharygin (Russia) and Jian Pan Wang (China).

I would like to conclude by quoting from the comments made by ICMI President Hyman Bass during his Presidential Talk at the opening session of ICME-10:

"Igor was a high school teacher who exemplified the highest Russian traditions of problem-based mathematics education. His love and deep understanding of geometry is evident in his writings. And Igor was culturally a mathematician, who typically used the word "beautiful" in describing both mathematics and mathematicians. We fondly remember his personal warmth and generosity, and his passion for life and ideas."

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In Memoriam
Hans-Georg Steiner (1928–2004)

Hans Georg Steiner — a life for mathematics education has come to an end

Rolf Biehler, Rudolf Sträßer and Andrea Peter-Koop

It is our sad duty to inform the international mathematics education community of the passing of Hans-Georg Steiner on December 14, 2004. He died after a long illness at the age of 76. Our scientific community has lost a widely known and greatly respected scientist, an inspiring and gracious colleague and a precious friend.

Many of us will remember Hans-Georg Steiner as a colleague, who continuously fostered ties between people as well as networks across countries and disciplines. His engagement for the development of mathematics education nationally and internationally was extraordinary — especially his contributions to the fields of theory, history and philosophy of mathematics education.

He was well known for his work as one of the three founding directors of the IDM (Institute for Didactics of Mathematics) in Bielefeld, Germany, and as the chairman of the International Programme Committee of ICME-3 in Karlsruhe, Germany, 1976.

Those who knew him well and worked with him are thankful for his many sparks of inspiration, advice and academic stimulus. We all owe him very much and trust that his ideas and achievements will remain alive in our community.

We extend our deepest sympathy to his beloved wife Erika and their three children and grandchildren.

On behalf of his scholars and former colleagues,

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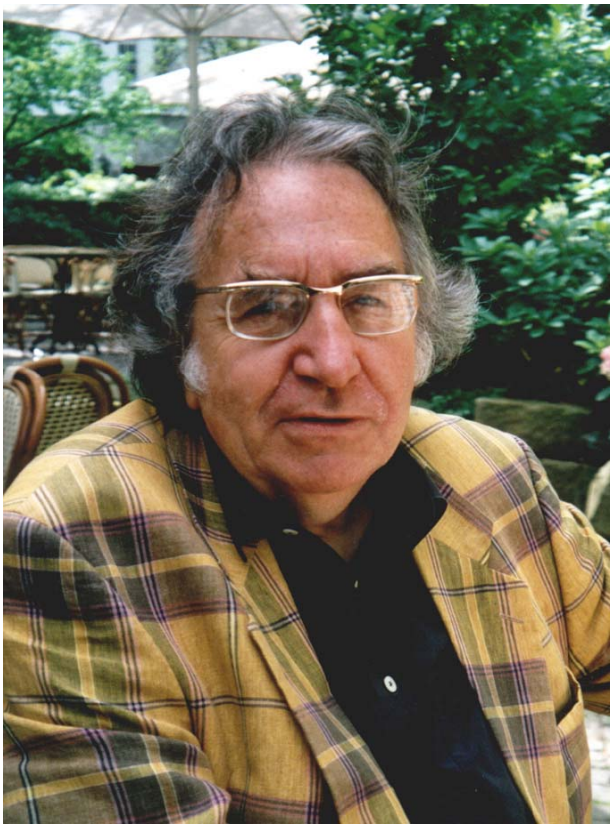
Hans-Georg Steiner (21.11.1928 – 14.12.2004) — A life for mathematics education

Gert Schubring

With Hans-Georg Steiner one of the pioneers of the modern development of mathematics education[(1)] and its establishment as a scientific discipline has passed away.



Traditionally, in the German Empire the preparation of teachers for teaching mathematics — the starting off point for reflection on the topic and of didactics — occurred in two separate systems that failed to communicate with each other. On one side were the *Pädagogische Akademien*, the *Pädagogische Hochschulen* and the *Lehrerbildungsanstalten* with their purely practical orientation for the elementary (primary) schools, and on the other the universities that concentrated exclusively on specialized scientific subject matter for the secondary schools. Even though, as a result of Felix Klein's efforts at the beginning of the 20th century, there had been *Habilitationen* (qualifications to lecture in universities) in "didactics of the mathematical sciences", the didactical component of teacher education remained mostly restricted to some teaching assignments by experienced school teachers. During the post-WWI Weimar Republic, Friedrich Drenckhahn at Rostock became the first to stress the need for a didactics of mathematics in the realm of the "*Methodik*" for instruction in arithmetic ("*Rechnen*") and geometry ("*Raumlehre*"). Nevertheless, this situation persisted unchanged in the Federal Republic for a long time after WWII.

Moreover, not only were these two systems mutually distinct, but there was also barely any communication with educators outside Germany. Thus, whereas thoughts on "*Methodik*" were completely concentrated upon the regional catchment area of its lecturers at the respective teacher training institution, for the university domain there was access and participation in the international communication established for the first time thanks to the foundation in 1908 of IMUK/CIEM (*Internationale mathematische Unterrichtskommission / Commission internationale de l'enseignement mathématique*). IMUK was, however, dissolved in 1920, and even when revived in 1928 was not very active.

In 1952, CIEM was re-established as ICMI and began to create stronger — although initially still limited — international cooperation, thanks, amongst others, to the initiative of Heinrich Behnke, from 1952 to 1966 a member of the *ICMI Executive Committee*, its President from 1955 to 1958, and later its Vice-President. Within Germany, Behnke had succeeded in establishing in 1951 at Münster — the traditional home of high quality mathematics teacher education — the first "seminar for didactics of mathematics" at a German university.[(2)] Münster thus constituted the nucleus for the definite emergence of a didactics of mathematics. In fact, it was in Münster and in its didactical

seminar that Steiner studied and was professionally formed. The international guests invited to Münster by Behnke, such as Howard Fehr and James Lighthill, brought Steiner quickly into contact with international developments.

In 1960 Hans-Georg Steiner undertook his first visit to the USA where he established contacts within the rapidly developing curriculum reform-movement. On his second visit, he assumed teaching responsibilities at Teachers College Columbia University, an institution with a long-standing tradition within mathematics education. Soon afterwards, he became a member of the CSMP (Comprehensive School Mathematics Project) in Carbondale/Illinois. There he demonstrated his ability — a quality that would later become so decisive — to recruit persons for work on reform and development, and to engage them on cooperative tasks. At the same time, he became acquainted with educational structures in which elementary and secondary schools were not separated from each other socially and conceptually. Indeed, the curriculum work of CSMP also involved elementary schools.

After his return from the USA, Steiner founded in 1968 the *Zentrum für Didaktik der Mathematik* in Karlsruhe. Together with the annual federal conferences on didactics of mathematics that began in 1967, the *Zentrum* provided a decisive means for bringing together the separate traditions of *Volksschul-Methodiker* and *Gymnasialdidaktiker*.[(3)] Later, in 1969, Steiner founded, based on the *Zentrum*, the *Zentralblatt für Didaktik der Mathematik* (ZDM), the first truly international journal on the didactics of mathematics to be established in Germany. The journal was formed with two main purposes in mind — to propagate research and to review international publications — key means for forging the scientific development of the new discipline. This probably constitutes the most salient achievement of Steiner both for the German and also for the international community.

In 1970 Steiner was appointed professor for didactics of mathematics at the *Pädagogische Hochschule* Bayreuth and was thus able to apply there his concepts in teacher education. Among other projects, he was involved in a teaching project for the elementary schools, "Modern Mathematics in the first and second school years". This did not aim to teach set theory, but rather to develop mathematical thinking with numbers and calculations. For the teacher trainee students, accompanying lectures offered reflections on practice and theory.

Eventually, in 1973 he was appointed as one of the three foundation professors at the IDM — the *Institut für Didaktik der Mathematik* at the University of Bielefeld, together with Michael Otte and Heinrich Bauersfeld, and developed there a comprehensive activity in which he was able, in particular, to further the program in which he had been engaged so far — namely, establishing a scientific didactics with internationalisation as an essential element of this process. In the structure of the IDM based on the division of labour between three main groups, Steiner led the group that concentrated upon curriculum development in the upper secondary grades. As in other aspects of the work of the IDM, this group was interdisciplinary and included mathematicians, didacticians of mathematics, sociologists and psychologists. Major projects that were undertaken included the reorganization of the upper grades of the *Gymnasien*, vocational education, statistics and the social role of mathematics. Following the introduction of pocket calculators and computers in the classrooms, the group's researches and developments involving the new media and technologies were both innovative and original.

The foundations laid by Steiner at the IDM for the development of mathematics didactics as a scientific discipline were by no means unaffected by structural problems. In 1969 the Volkswagen Foundation made it known that it wished to provide funds for the establishment of an institute for didactics of mathematics. At the time Freiburg University made a bid to host such an institute. However, after being awarded the grant, disagreements arose about how such an institute with five full professorships should be integrated into the university structure. As a result, then, of characteristic intra-university conflicts, Freiburg returned the grant. In 1972, the newly established university of Bielefeld, with its reform-minded profile in which unusual institutions were integrable, was granted the funds. At Bielefeld, the mathematics department solved the integration problem in such a way that no teaching loads in teacher training were assigned to the members of the new institute. The IDM was thus instituted as a central scientific unit, with teaching tasks only in in-service training and in postgraduate education. However, this response, which reinforced IDM's position as a research institute, still did not fit comfortably into the university structure at Bielefeld and increasingly gave rise to animosity from other departments. The university management, which apparently still saw didactics of mathematics mainly as an elementarisation of the subject, responded by beginning "to use" the staff of the IDM as a reservoir for equipping new faculties. Only international storms of protest in 1991/92 made the Rectorate, which by then wished to dissolve IDM, conscious of what a significant profile element of the university IDM was. It was particularly to be deplored that the university management was entitled to decide the fate of an internationally respected and nationally active institute according only to its own, local criteria. The reestablishment of IDM as an institution on the so-called "blue list" — special institutions co-financed by the Federal Government and the Länder — had proved not to be realizable. The paradox that the interdisciplinary IDM was reduced by the same Rectorate, which propagates interdisciplinarity as the university *leitbild*, to an institution exclusively oriented towards one single discipline, had fortunately not to be experienced consciously by Steiner.

The third International Congress on Mathematical Education (ICME-3, Karlsruhe, 1976) became an effective landmark in the process of the national and international disciplinary stabilization of the didactics of mathematics, following its predecessors in Lyon (1969) and Exeter (1972). Steiner, from 1975 to 1978 Vice-President of ICMI and Chair of the Program Committee, succeeded in bringing together there the different, hitherto also institutionally separated strands and to engage them in lasting cooperation. An excellent means for realizing this was the new organization of the congress. This was built around thirteen sections which investigated central issues of mathematics instruction, and which benefited from the careful preparation of the teams which were composed internationally and had worked together well before the congress. Steiner also succeeded, by means of the extensive integration of various competencies, to diminish the initial obvious tensions between the Bielefeld institute and the didacticians of mathematics working elsewhere in the Federal Republic.

Besides his work on research and development at the IDM, it was always a central concern for Steiner to give conceptual stimulation and to help spread new ideas by organizing national and international colloquia and conferences. This stimulating function is certainly one of his most important contributions towards the development of the didactics of mathematics, in particular for the Federal Republic. The series of these influential conferences first began in 1974 with the Regional ICMI-

IDM Conference on the Teaching of Geometry. Of the other conferences, one should name the ICMI Symposium of 1978, The Education of Mathematics Teachers, and the larger conference of 1979: Comparative Studies of Mathematics Curricula — Change and Stability.

Steiner also gave innovative suggestions via smaller-scale working conferences, such as a series of colloquia devoted to the relation of educational history and history of mathematics. Other valuable forms for the exchange of ideas were the numerous bilateral conferences organized by him: for example, the German-Italian and the German-French symposia on recent developments in the didactics of mathematics.

The conference series which proved in the long term to be probably the most important for the development of research was the series of symposia on *TME: Theories of Mathematics Education* established by him in 1985. TME had originated from his conviction that — thanks to the achieved scientific level — the further major task lay in the advancement of theoretical approaches. At ICME-10 in Copenhagen, many participants still spoke to me about TME and told me how essential their participation in TME conferences had been for their scientific development.

Finally, Steiner merits particular respect for having organized two conferences with participants drawn from the old Federal Republic and the GDR immediately after the "Wende" in the GDR and to have thus once again initiated communication and cooperation.

Unfortunately, it was not granted to Steiner after having become professor emeritus in 1993 to continue and to conclude his numerous projects, because, increasingly, a protracted serious illness impaired his working possibilities.

Notes:
(1) In Germany — as in France and Italy — "*Didaktik*" means the scientific investigation of teaching and learning processes. However, in the Anglo-Saxon world "didactics" often has negative connotations and "mathematics education" is preferred. Since not all meanings of the German terms would be thus translated, we shall maintain the use of *didactics* to express the German meaning.
(2) *Seminare* were traditional forms in German universities for specialised studies in given disciplines and for closer contact with the professors.
(3) The Volksschule, Realschule and Gymnasium are the components of the tripartite system of secondary education still to be found in most regions of Germany.

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Hans-Georg Steiner: some personal reminiscences

A. Geoffrey Howson

Hans-Georg Steiner was a towering figure — both literally and metaphorically — within mathematics education in the 1960s, 70s and 80s. A protégé of Heinrich Behnke, an ICMI stalwart of the early post-WW2 years, he soon became involved in ICMI affairs and in the work of UNESCO, which at that time leaned heavily on ICMI for advice on mathematics education matters. It was natural, then, that he should have been invited to be one of the plenary speakers at ICM-1 (Lyon), and to lead a working group, that on the initial training of secondary school teachers, at ICME-2 (Exeter). ICME-3 (Karlsruhe), however, is the ICME that will always be identified with Steiner, for he was the mastermind behind the programme and, indeed, the organisation of the congress. It was a meeting that very much reflected his particular interests, methods and leanings. By the time of the Karlsruhe congress, Steiner had also been elected a Vice-President of ICMI (1975-78). Later, he was to serve on the Programme Committee for ICME-4 (Berkeley).

Although attending ICME-1, I did not hear Steiner's lecture, for that was on the closing morning of the congress and I had already begun my long train journey home. Again, although we were both members of the Programme Committee for ICME-2, we never met at that time. In those days ICMI did not appoint the Programme Committee and could not provide finance for its overseas members to attend its meetings. As a result, the only overseas member who ever attended the Committee's meetings was Hans Freudenthal, the past President of ICMI — others made their views known through correspondence. It was, then, in November 1974, at a conference in Tokyo arranged by the Japanese Society for Mathematics Education, that we first met.

Before then, Steiner had been but a name to me. Strangely, my first real encounter with his influence was on an aid visit to Egypt in the 1960s that closely followed one by Steiner. He had given a talk on geometry for schools that had in fact caused his audience much difficulty and, as a result, much dismay. The reason being that few teachers and many university lecturers lacked that grasp of mathematics that Steiner possessed and, it must be added, that Hans-Georg did not always take into account the background of his audiences and their ability to comprehend the richness of his lectures at the rate at which he delivered them. What was clear, when I was given a printed version of his Cairo talk, was Steiner's great grasp of the field and how much I had to learn from him. Some other work of his on introducing the notion of working with axioms, taking voting systems as a model, was referred to in a book that Brian Griffiths and I had published earlier in 1974.

Our meeting in Tokyo led to an invitation to me to pay the first of many visits, in Spring 1975, to the newly-established *Institut für Didaktik der Mathematik* in Bielefeld. The IDM should have been a lasting memorial to Steiner and his vision, but alas it has recently fallen on hard economic times and is now but a shadow of its former self. There, Steiner attracted staff of outstanding quality and intellect. In a way, IDM served to emphasise the different approaches of Klein and Freudenthal to which I referred in my talk at ICME-10. Steiner drew upon the heritage of Klein — whom, it will be recalled, Freudenthal accused of often [hovering] "too high above school mathematics to be able to influence it". As a result, IDM and Freudenthal's IOWO (and later what became the Freudenthal Institute) had

different aims and approaches. In many countries, particularly the Anglophone ones, it was Freudenthal's institute that had the greater influence — the more theoretically inclined IDM received less attention. Yet, I found my many visits to IDM, including a spell as visiting professor there, of enormous value and inspiration. The atmosphere of learning and thinking, with its accompanying magnificent library, had no equal. Perhaps, not surprisingly, though, Steiner's work was appreciated more in central Europe than in, say, England, and it was a university in the old Czechoslovakia that awarded him what to my knowledge was the first honorary doctorate for work in the field of mathematics education. Steiner's work at IDM is, however, described more fully by one of his colleagues, Gert Schubring, in the preceding paper of this homage to him.

The Karlsruhe ICME was an outstanding achievement of Steiner's. The plenary talks which included ones not only from the past ICMI President, Sir James Lighthill — one of the leading applied mathematicians of the 20th century — but also from Michael Atiyah and Peter Hilton, emphasised the importance that Steiner placed on a knowledge of mathematics as the foundation for mathematics education and mathematics educators. At a sub-plenary level the congress was built around thirteen discussion groups covering what Steiner and his committee saw as the main areas of mathematics education. With the aid of UNESCO funding, the leaders of the groups were brought together for a week the previous December in order better to plan their sessions and the Programme Committee for the congress nominated a consultative committee for each group to assist the group leader in his or her task (whatever merits the Karlsruhe congress had, promoting women in mathematics education was not one of them and I can recall only Madam Krygowska being asked to play a significant role). Here I can recall Steiner coming to my aid and backing my judgement against that of his committee. I had been much impressed on my visits to Bielefeld by one research student and asked that she should be added to the committee set up to advise me. Putting a research student without a PhD (and a woman at that) onto such a committee appalled Steiner's ICME colleagues and it was only his strong support that allowed me to have Christine Keitel as one of my named helpers.

Steiner continued to mount seminars, at Bielefeld and elsewhere, throughout the 70s and 80s and these provided much intellectual sustenance to those invited to them. Unfortunately, he had serious health problems in the 1980s and these appeared to restrict his activities to some extent. To some he was regarded as formal and cold. But although this might be the initial impression he gave, for he often seemed to set up a protective cocoon around him, once one broke through that cocoon one encountered a different person with a vast variety of interests, some of which belied his somewhat austere reputation, and a good sense of humour. He had a wide interest in the arts and I shall always preserve memories associated with him. Amongst others there was the pleasure I gained speaking with him on music and opera and of listening to him play the piano, the joint visit we paid to one of the first exhibitions of Chinese art after the reopening of China to the west (*Kunstsschaetze aus China*, Berlin, 1981), and the manner in which his guidance prompted my wife and me to take frequent holidays in the various German Laender and to enjoy the scenery, architecture and culture to be found in them.

I am certain that all who came to know Hans-Georg well will treasure similar memories of him. He helped to enrich our lives and our professional careers in so many ways. On visiting ICME-10 (Copenhagen) I was disappointed not to meet Hans-Georg and Erika again there. I was even more

shocked to learn from a German colleague that he had been stricken with Alzheimer's disease — a terrible fate for anyone. A few months later I heard with sorrow of his death. Mathematics education and our lives were enriched by his life. Now we can be grateful for that and extend our great sympathy to his wife, Erika, and their family whose loss is even greater.

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In Memoriam
Jacobus H. van Lint (1932–2004)

An Appreciation of Jacobus H. (Jack) van Lint (1932 – 2004)

Henry O. Pollak

In the early 1960's, shortly after I became head of mathematical research at Bell Laboratories, I was invited to visit the Technological University at Eindhoven and the Philips Gloelampen Laboratories in the Netherlands. I was told of this wonderful young mathematician Jack van Lint, and Chris Bouwkamp, who divided his time between the two institutions, promised to introduce us. Bouwkamp said: "You will want to hire him. But promise me you won't keep him." Jack did make several long visits to Bell Labs, and I will always keep him in my heart as an outstanding example of a complete mathematician, and as my friend over the last 40 years.

J. H. van Lint was born in Bandoeng on Java in 1932. He and his family escaped to Australia after Japan entered World War 2, they came to Chicago later during the war, and moved to the Netherlands after the war ended. He did much of his doctoral work at Göttingen, and received his degree with Prof. van der Blij at Utrecht. Jack came to the University at Eindhoven in 1959, where he was professor of mathematics, Dean of the Department of Mathematics and Computer Science, and from 1991-1994, Rector Magnificus of the University. He retired officially, but by no means totally, in 1997.

Jack is my image of a man who did everything that one could imagine asking of a mathematician. He was both an academician and an industrial mathematician, with his regular consulting at Philips and his frequent visits to Bell Labs. He seemed to like all of the mathematical sciences, with special fondness for number theory, all aspects of discrete mathematics, and analysis. He took particularly to algebraic coding theory, for example to his work on block designs and quadratic residue codes, and he is perhaps most famous for his success in classifying all possible perfect codes. But he couldn't resist a good problem no matter what the field might turn out to be. For example, in his first few weeks at Bell Labs he proved a particular property of Euclidean minimal spanning trees which had been worrying us, and later he and I tackled an asymmetric game with unusual problems of resource allocation. All in all, he is the author or co-author of 12 books and 177 published papers.

His contributions to education were as varied as his work in mathematics. He was the Reporter for the Section on Mathematics Education at the University Level at ICME-3 in Karlsruhe, and gave an address at ICME-4 in Berkeley on areas of mathematics of newly emerging importance for school education. He was a member of the Executive Committee of ICMI from 1987 to 1994. Of his numerous and long-term education activities in Eindhoven, I remember the particular enthusiasm he had for a rather unusual piece of educational research in 1969. He did a thorough and most interesting experiment comparing a classical "essay-type" calculus test with a similar multiple choice test — with the result that requests for an "objective" test in calculus were not repeated. (A part of the report on this experiment was published in *Educational Studies in Mathematics* 6 (1975), pp. 259-271.) At the other end of university mathematics education, 15 Ph.D. students at Eindhoven received their doctorates under Prof. van Lint.

Jack van Lint's instinct was always to think about the larger picture, the total system, in all his undertakings. Thus he was especially effective in the relations of the University with the "outside world", not only global undertakings but especially smaller and medium-sized companies in the region. He was a football player in his younger years, an active swimmer and hiker throughout his life, and did much to improve the sport facilities at the University. The broad impact of his career was recognized by his membership in the Netherlands Academy of Arts and Sciences (1972), by honorary degrees from Bucarest, Bergen, and Gent, and an honorary professorship at Xian. He was made a Knight in the Order of the Lion of the Netherlands in 1993.

Jack particularly loved the outdoors, both the Alps and the western part of the United States. He combined several extended visits to Cal Tech with camper tours which he and his family took, especially to the National Parks in Utah. He and I also shared a major hobby of philately and postal history, where he specialized in the Netherlands and its former colonies. But above all, he loved life and lived every aspect of it to the fullest. His marriage to Betty, and his children and grandchildren, brought him a lifetime of joy and fulfillment. We all miss him a great deal.

Acknowledgement:
I gratefully acknowledge the assistance of Betty van Lint, and of H.C.A. van Tilborg and Harry Roumen at the Technological University of Eindhoven, in the preparation of this remembrance. Any misunderstandings and mistakes are solely my responsibility.

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Contribution to the Jack van Lint Obituary

Mogens Niss

I had known Jack van Lint from some of his publications in mathematics and mathematics education long before I met him personally for the first time. This happened when we were both appointed members of the Executive Committee (EC) of ICMI in 1987. Jack was appointed to the EC in his capacity as the representative of the International Mathematical Union (IMU) on the then existing Committee on the Teaching of Science (CTS) of the International Council for Science (ICSU). We remained in contact long since we both left the Executive Committee, he in 1995, I in 1999.

Jack's approach to the work in he ICMI EC was one that integrated mathematics and mathematics education with science and technology and society at large. He was particularly keen to establish links between mathematics and its teaching and learning and other scientific communities. Jack's intellectual and personal style was open-minded, frank and direct, and discussion and debates were close to his heart. Some may have been tempted to mistake his directness, frankness, and non-adherence to the gospel of diplomacy for a tendency to be bullying. I have experienced him upsetting various audiences by his propensity to being outspoken and calling what he saw as a spade a spade. However, Jack was in fact a very considerate and compassionate man who greatly cared for others and who went a long way to help people who needed — and deserved — it.

Jack had a very well developed sense of "savoir vivre" in what appears to have been all aspects of life. I have shared many a meal and many a drink with him and other friends and colleagues. He always greatly influenced the conversation, both as regards its themes and the points being made. His reservoir of pithy examples and anecdotes to illustrate his points seemed unlimited. The enthusiasm with which he described his hiking experiences in the mountains or visits to stamp dealers bore witness of a man with serious passions that complemented those he nurtured for mathematics and it's teaching and, of course, his family. Despite his 72 years Jack van Lint died far too young. Those of

us who were fortunate enough to have known him will miss him. Instead of seeking his comments to the way the world is going we now have to imagine what they would have been.

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In Memory of Jack van Lint

Jean-Pierre Kahane

Jack van Lint has been a member of the ICMI Executive Committee during eight years, first, elected by the General Assembly of the International Mathematical Union (IMU), then, *ex officio*, as representative of the Committee on the Teaching of Science of the International Council for Science (ICSU-CTS). At this time, around 1990, this ICSU-CTS paid a great attention to mathematics, and ICMI had a close relation with it.

Jack took part in many International Congresses of Mathematicians (ICMs), and on Mathematical education (ICMEs). However I really met and appreciated him only while we were preparing the first ICMI study on the influence of computers and informatics on mathematics and its teaching. He had a very important part in the preliminary discussion document, and everything in the final report concerning discrete mathematics is essentially due to him, while everything else wears his touch. He immediately impressed me by his frankness, his clarity, and his expertise on all scientific aspects of informatics relevant to mathematics teaching. Discussing with him made it clear that mathematics teaching should be enriched and renewed by notions coming from informatics.

At the Warsaw ICM of 1983 he was not included in the part of the program prepared by ICMI, but he presented an invited lecture as a mathematician expert in his field, and his report on finite geometries was a remarkable exposition on partial geometries of type (K,R,T) — each line has K points, each point belongs to R lines, and there are exactly T lines joining a given point to a point belonging to a given line. His role and efficiency in ICMs, ICMEs and the first ICMI study made him a very natural candidate for the ICMI Executive Committee in 1986, and since then the ICMI EC took advantage of his contribution in many ways.

His contribution to the Québec ICME in 1992 deserves to be read again and again. Jack stood up for the teaching of discrete mathematics, but he was completely opposed to the scattering encountered in many courses of that type. He showed how the underlying structure could make this teaching in no

way inferior to the teaching of analysis from a conceptual point of view. Still now this paper is one of the best possible references for someone who wants to build a course on discrete mathematics. (See "What is discrete mathematics and how should we teach it?" In: D.F. Robitaille, D.H. Wheeler and C. Kieran, eds., *Selected Lectures from the 7th International Congress on Mathematical Education*, Presses de l'Université Laval, 1994, pp. 263-270.)

I remember him at the Höör meeting in 1993, in Sweden, before the ICMI Study on Gender and Mathematics Education. There was a special session early in the morning, well prepared by the organizers in order to emphasize that there was a problem in the gender composition of the ICMI Executive Committee. All members of the EC who were present at Höör were invited to sit on the platform, all men, in front of an audience of women. The lesson was clear, and the ICMI EC was renewed later with a fair participation of women. During the session the situation of the men on the platform was really uncomfortable, but Jack did not care and faced the provocation in a provocative way, without any intention to be approved, as a kind of intellectual sport, and I was forced to admire how good he was as a fighter. I immediately thought that this quality had something to do with the high responsibilities he already had as Rector Magnificus of his University.

In all activities of his he was able to join competence, rigor, frankness, and a high conception of the role of mathematics in science and of science in society. I was shocked when I was informed of his death, for I felt for him more than professional esteem, a deep and hearty respect. His passing is an immense loss for mathematics and its teaching, and for the whole of science in its relation with human beings.

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Erratum

In the "Summary of ICMI Accounts 2000-2004", appearing on p. 52 of the June 2004 issue of the *ICMI Bulletin* (No. 54), the total balance of ICMI in US dollars, as of January 1st, 2002, should read 134 015,36 USD, instead of 134 105,36 USD.

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Experiencing Mathematics
An International Exhibition Supported by UNESCO and ICMI

The idea of a travelling exhibition on mathematics intended for the general public emerged in the sequel to the Word Mathematical Year 2000. UNESCO played an essential role in bringing this project to fruition and ICMI has accepted to support the exhibition, both financially — a grant of 10 000 USD was provided by ICMI, in addition to a grant of 1000 USD from the IMU — as well as by helping its circulation in connection with ICMI-related activities. ICMI is represented in this project by Vice-President Michèle Artigue.

The exhibition *Experiencing Mathematics* (formerly called "Why Mathematics?") is aimed particularly at young people, their parents and their teachers. But it is hoped that the ideas brought forth by the exhibition will interest all those who want to learn more about Science in general and Mathematics in particular. The exhibition is designed so to be shown in a room of about 200 to 400 square meters and consists of posters, brochures and hands-on exhibits. All the proposed items are easily transportable and can be adapted to local situations.

The exhibition was officially launched during the 10th International Congress on Mathematical Education held in Copenhagen in July 2004, and was later shown during a congress of a French association of mathematics teachers (APMEP), in October 2004 in Orléans. But its first appearance accessible to the public at large, and in particular to pupils and students, was in December 2004 in Paris. It was then on display at the Maison des Métallos, in partnership with the Mairie of the Cité de Paris, from December 9 to 31.

ICMI was represented at the official opening of the exhibition in Paris by Vice-President Artigue as well as by the Secretary-General. UNESCO was represented by Minella Alarcon, Programme Specialist responsible for physics and mathematics in UNESCO Division of Basic and Engineering Sciences (Natural Sciences Sector). The following two texts are the welcome speech of Minella Alarcon and Michèle Artigue during this opening session. I have also added excerpts from a text (*Who needs maths at a time like this?*) found on the website of the Division of Basic and Engineering Sciences and providing information on the exhibition.

More information on the exhibition *Experiencing Mathematics* can be found on the website
http://www.mathex.org/MathExpo/

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Message on behalf of UNESCO, Natural Sciences Sector, on the occasion of the opening of the International Mathematics Exhibition *Experiencing Mathematics* in Paris (December 9, 2004)

Minella Alarcon

I am very pleased to speak with you today on the occasion of the opening of the UNESCO International Mathematics Exhibition *Experiencing Mathematics* here in Paris. I would like to express our sincere appreciation to Paris Mayor Delanoe, Paris Deputy Mayor Auffray and 11th District Mayor Sarre for hosting and making this ceremony possible. This occasion demonstrates UNESCO's commitment to the development of Mathematics. UNESCO has had a long history of cooperation with French mathematicians through our support of the activities of the International Centre for Pure and Applied Mathematics (CIMPA).

As well, I would like to acknowledge the support and assistance of our different partners in this project, without whom this Exhibition would not have been possible, notably the International Commission on Mathematical Instruction (ICMI) of the International Mathematical Union, Centre-Science de la Région Centre, Tokai University of Japan, the Ateneo de Manila University, the Committee for the World Mathematical Year 2000, Région Centre, the European Mathematical Society, the French Mathematical Society, and the Society of Applied and Industrial Mathematics.

This project was conceptualised and designed to promote public appreciation of the importance of Mathematics in daily life. The exhibition targets the youth between the ages of 10 and 18, as well as their parents and teachers. As you will see here, the exhibition is being presented in English and French, and features posters, manipulative models and interactive devices illustrating various themes. Its maiden voyage took it to Copenhagen (Denmark) last July on the occasion of the 10th International Congress of Mathematical Education (ICME-10). Many other countries have expressed interest in hosting or reproducing the exhibition. Next year, the exhibition will travel to South Africa and will tour the countries in Southern Africa.

In the meantime, the exhibition will be here in Paris at Maison des Métallos from tomorrow for the month of December. I invite you to bring your children and friends and wish you an enjoyable time experiencing Mathematics.

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A Welcome from ICMI

Michèle Artigue

It is in my capacity as ICMI Vice-President that I am welcoming you today to the official opening of the mathematical exhibition *Experiencing Mathematics*, hosted in this Maison des Métallos by the Mairie de Paris.

For the International Commission on Mathematical Instruction, a project such as the one fostered by this exhibition is of particular importance. Mathematics tends to be perceived in our culture as something unreachable, restricted to the "happy few". While it is part of our daily technologically-aided tasks, it still is invisible. And while it is one of the most achieved human constructions, it is often experienced as being cold and inhuman.

An exhibition such as this one, it is hoped, will help to change these perceptions. One does not need to be a mathematician to admire the beauty of the posters surrounding us and the human activity they encompass, to understand the multiplicity of the links between mathematics and society, to appreciate handling the objects on display, to take up the challenges proposed.

All this would be enough by itself. But what seems to me to be the most interesting point of this project is that it goes much beyond that. This is a travelling and evolutional exhibition — an exhibition that aims at being a vector of communication between cultures, a vector of pedagogical dynamization.

Even if this was not a deliberate choice, the fact that this exhibition is taking place here, in a neighbourhood marked by cultural *métissage*, in a building marked by labour history, instead of the magnificent showrooms of the City Hall or other prestigious institutions, definitely takes a major symbolic value.

Which is also true of the pedagogical scheme linked to the current event. This plan of action has a double component: first, mornings dedicated to class visits, where pupils and teachers will have the opportunity of being guided by Jean Brette, until recently mathematics supervisor at the Palais de la Découverte; and secondly, a competition allowing the exhibition to survive beyond the short three weeks of its live presentation. This competition, sponsored by the IREM of the Université Paris 7, is supported by the educational authorities of Paris, Créteil and Versailles, as well as by the Académie des Sciences and by the APMEP, the French national association of mathematics schoolteachers. It is open to all primary and secondary school pupils from the region of Ile de France. These pupils are invited to enrich the exhibition with their own creations, posters, games, objects and real or virtual manipulations. Thanks to the financial support just approved by the regional authorities, I can announce today that the works selected by the jury will be reproduced by the Centre Sciences d'Orléans and thence become an integral part of the exhibition. It is rather unusual for students to have the opportunity of seeing their mathematical production exhibited on such a large scale. We hope that by next May the jury will be submerged under such proposals. We also hope that through

these productions, many students will have experienced a new relationship to mathematics, a new relationship as well to their teachers, and that they will get mutually enriched through the projects.

But, as previously mentioned, Paris is only a first step for this exhibition. It will then be travelling to other countries and we hope, thanks in particular to the international website attached to it, that it will play, between teachers and pupils of different cultures, the role of channel of communication and mathematical exchanges that we are all eager to see implemented. For ICMI, it is of the outmost importance that this role can be played within developing countries. A first project is in the planning process and a copy of the exhibition should be travelling throughout the southern part of Africa during 18 months, starting from South Africa where it be shown next June. As this journey progresses, the exhibition will undoubtedly be enriched with new manipulations and new objects, as the mathematics culture, as any other culture, is not one but many.

On behalf of ICMI, I would like to thank warmly all those who made this adventure possible, and also those who will contribute over the next three weeks, as well as throughout the schoolyear, so that this first experience becomes a model for the development of the project. I wish a long and rich life to the exhibition *Experiencing Mathematics*.

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Who needs maths at a time like this?

(Excerpts from a text posted on the website of UNESCO Division of Basic and Engineering Sciences — October 22, 2004)

In order to show that mathematics is not only indispensable to daily life but can also be fun, a team led by UNESCO has designed a travelling exhibition entitled *Experiencing Mathematics*, which began its world tour July 2004.

Mathematics is central to daily life in the XXIst century but how many people realize, each time they use a telephone or credit card, listen to a compact disk, drive a car or board a plane, that it is mathematics that makes these apparatus work? Similarly, when people invest in the stock market, check the weather report or admire a work of art, are they conscious of an association between these actions and mathematics? Adults have been heard to proclaim, with a certain degree of pride, that they don't understand mathematics. The mathematical support systems of objects and processes that are part and parcel of our daily lives are simply 'invisible' to the person in the street.

(…)

In keeping with its interest in promoting international co-operation in mathematics, UNESCO is proposing an international mathematics exhibition that will travel to various cities around the world. The project is being implemented by a working group led by UNESCO and bringing together mathematicians from universities, research institutions and science centres. Countries everywhere are being encouraged to sign up for the exhibition.

Realized by the Centre-Sciences in Orléans (France), *Experiencing Mathematics* targets children and youth between the ages of 10 and 18, but also their parents and teachers. It features posters, and interactive devices in nine tables. These are organized around various themes, including shapes in nature; tilings and symmetries; filling spaces; graphs and connections; secret codes and cryptography. Some of the manipulative models illustrate the Pythagorean Theorem, the square drill, the differential gear, the cradle pinball device, tricycle with square wheels, a tree that plays music, the chaotic clock, and the Galton cradle.

Initially, the touring exhibition is being presented in English and French. Its maiden presentation took place in Copenhagen (Denmark) on 4-11 July, on the occasion of the 10th International Congress on Mathematics Education (ICME-10). The exhibition is now travelling to France for a formal launch in December and month-long run at the Maison des Métallos in Paris, in co-operation with the Paris municipality. Among the many countries that have expressed interest in hosting or reproducing the exhibition are Abu Dhabi, the United States, Canada, Italy, Finland, Mexico, Zambia, Russia, Ecuador, Ghana, and South Africa.

Making the plans and designs of exhibition items accessible on the Internet is welcomed by those from developing countries where reproduction can be done at a lower cost. Moreover, other host countries can add objects and models that, while remaining true to the mathematical themes, would be more representative of their own cultures. By strengthening international collaboration and inviting financial and technical support, funds can be raised for countries keen to host the exhibition but unable to cover all costs themselves.

The exhibition draws its inspiration from two successful French and Japanese initiatives in recent years. The first was a Mathematical Art Exhibition during the 9th International Congress on Mathematical Education (ICME-9) in 2000. Prof. Jin Akiyama, Deputy-Director of the Research Institute of Educational Development at Tokai University (Japan), had this to say about the event. "This exhibit celebrates the beauty and the power of mathematics through artistic objects that demonstrate mathematical concepts and formulas, and through models and devices that offer the audience opportunities to experiment, to discover, to gain fresh insights into mathematical truths… We hope the exhibit will bring the audience a sense of wonder and a new appreciation for mathematics." Akiyama quotes mathematician G.H. Hardy, "A mathematician, like a painter or a poet, is a maker of patterns… The mathematician's patterns, like the painter's or poet's, must be beautiful; the ideas, like the colours of the words, must fit together in a harmonious way. Beauty is the first test: there is no permanent place in the world for ugly mathematics."

The second was one of several activities marking World Mathematical Year in 2000. Led by Prof. Mireille Chaleyat-Maurel, the French Committee for the Year designed and developed a series of posters that were displayed in the underground transport stations of Paris. In 2002, the group was awarded the d'Alembert Prize by the French Mathematical Society for drawing public attention to the evolution of mathematics and for showing its connection to contemporary concerns.

The exhibition has been made possible mainly through technical and financial support from the International Commission on Mathematical Instruction, the International Mathematical Union, the European Mathematical Society, Tokai University of Japan, Japanese Ministry of Education, Université René Descartes and Université Pierre et Marie Curie of France, and the Ateneo de Manila University.

Applications for future exhibition venues are to be reviewed by the UNESCO-led project working group. Contact Prof. Mireille Chaleyat-Maurel (mcm@ccr.jussieu.fr) or, at UNESCO, Minella Alarcon (m.alarcon@unesco.org).

ICMI and the ICMI Bulletin on the World Wide Web and on e-Mail

Information about ICMI, including the most recent issues of the ICMI Bulletin (starting with issue No. 39, December 1995), is available on the ICMI website, which is part of the site of the International Mathematical Union, hosted at the Konrad-Zuse-Zentrum für Informationstechnik Berlin in Germany. This website can be accessed at the address

http://www.mathunion.org/ICMI/

Direct access to the ICMI Bulletin on the internet, through the IMU master site, is obtained at

http://www.mathunion.org/ICMI/bulletin/

The ICMI Bulletin can also be obtained electronically directly from the Secretary-General as a PDF or Word file.

For further information, please contact Bernard R. Hodgson at bhodgson@mat.ulaval.ca.

The First Africa Regional Conference of ICMI — Announcement of an ICMI Regional Conference Johannesburg

The First Africa Regional Conference of ICMI will be held at the University of the Witwatersrand (Education Campus) in Johannesburg, South Africa, on June 22-25, 2005. The theme of the congress is *Mathematics Teaching and Teacher Education in Changing Times.* This conference has officially been recognised by the Executive Committee of the Commission as an ICMI Regional Conference.

The First Africa Regional Congress of ICMI has the following purposes:

- Stimulate regional collaboration and activity
- Promote regional and global contributions and interactions
- Highlight issues pertinent to mathematics education in developing countries
- Share and showcase activities in and across countries in the region

The congress aims as gathering mathematics teachers, mathematics educators, teacher educators, mathematics curriculum developers, mathematicians, and anyone involved in or interested in mathematics education.

The theme of the congress will be addressed under four strands:

1) Teacher Education (primary and secondary; initial and in-service)
2) Information and Communication Technology (ICT) and Resources for teaching and learning
3) Indigenous Knowledge Systems (IKS), Ethnomathematics and the Curriculum
4) Teaching and Learning Mathematics (primary, secondary and tertiary)

(Strand 4 is intentionally broad to include pedagogical issues of mathematics teaching, learning and assessment. Participants from across the region are invited to share and raise issues pertinent to their context. This helps us to meet the third purpose above.)

The congress will include the following activities to meet its purposes in line with the strands. The plenary and symposia are designed to provoke debate in strands 1, 2 and 3. The parallel presentations and workshops are more general and across all strands. The national presentations and regional meeting are more specifically geared to generating and supporting ongoing activity, collaboration and interaction in the region.

Plenary panels

There will be two plenary panels each with three invited speakers and a chairperson who will co-ordinate the panel and plan for it to be an engaging congress activity.

- PANEL 1: Perspectives on mathematics teacher education
  Panel: Chris Breen, South Africa (Chair); Hyman Bass, USA; Choshi Kasanda, Namibia; Mamoshibudi Mabale, South Africa.

- PANEL 2: Perspectives on ICT and Resources for teaching and learning
  Panel: Renuka Vithal, South Africa (Chair); Michèle Artigue, France; George Ekol, Uganda; Cyril Julie, South Africa.

Symposia

Three symposia that support the key purposes of the Congress and fit key strands have been identified and organisations invited to prepare and present these.

(i) IKS — organised by Southern African Ethnomathematics Study Group (SAEmSG)
(ii) Teachers' views on mathematics teacher education: different contexts and different levels — organised by the Association for Mathematics Education of South Africa (AMESA)
(iii) Secondary-Tertiary interface — organised by the South African Mathematics Society (SAMS)

Parallel Presentations

These will be of two forms: (i) long papers and (ii) short papers. Long paper presentations should be reports on research studies or major development projects. Time allocated to each paper will be 30 minutes presentation and 15 minutes discussion. Short papers could cover research in process, aspects of teaching and learning, issues of curriculum, or innovative ideas. Time allocated to each paper will be 20 minutes presentation and 10 minutes discussion.

Parallel Workshops

The workshops are intended to provide for interactive and/or hands-on activity, and so opportunities for delegates to work together on various areas of practice. Workshops could cover aspects of practice at all levels including research. These can be either 1 or 1.5 hours long.

National presentations

Focus for the national presentations is mathematics teacher education. National Presentations will be planned to include the following issues from each participating country:

(i) recruitment and retention of mathematics teachers,
(ii) curriculum for primary and secondary mathematics teachers,
(iii) the mathematics that is taught to mathematics teachers,
(iv) the role of mathematicians in teacher education, and
(v) other pressing issues regarding mathematics teacher education.

Regional Meeting

The meeting will include (i) summaries of national presentations, (ii) discussions of collaboration among countries, and (iii) discussions of regional participation in the global arena of mathematics and mathematics education.

Exhibitions

We plan to have exhibitions and other displays by associations and organisations involved in mathematics and mathematics education from the various nations in the region.

A book of abstracts will be printed for the Congress and available on the Congress website together with the Program by 1 June 2005. We intend to produce proceedings from the Congress that have as a key part, the National presentations on Teacher Education in all countries. These proceedings can then be a useful resource with which to understand and pursue collaboration in mathematics teacher education across the region.

Further information on the ICMI Africa Regional congress can be found on the congress webpage
http://www.wits.ac.za/ICMI

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EARCOME 3 — Update on an ICMI Regional Conference

The Third East Asia Regional Conference on Mathematics Education (ICMI-EARCOME 3) will be held on August 7-12, 2005, in China. This conference has officially been recognised as an ICMI Regional Conference. Three teacher education institutes — East China Normal University in Shanghai, Nanjing Normal University in Nanjing and Hangzhou Teachers College in Hangzhou — are the co-organizers of EARCOME 3.

EARCOME is a series of international conferences, usually designated as ICMI Regional Conferences, hosted in East Asian countries. The participants from countries around the world will attend it, though it is titled East Asia regional conference. So it is really a worldwide international event for researchers, mathematics educators, school teachers, policy makers, textbook editors and other scholars to share their knowledge among each others.

The theme of EARCOME 3 is *Foundations and Creativity: The Strengths and Weaknesses of Mathematics Education in East Asia*. East Asian countries have distinctive traditions in mathematics education. Students from East Asian countries often top the list in international assessments of mathematics education and mathematics competitions. Research and practical teaching in this region are developing rapidly with its booming economy and fast social advance. EARCOME 3 will provide a forum for global scholars and teachers to present research findings, to exchange ideas, to communicate and discuss common issues. It is believed that further international exchange on such a meaningful theme, not only among East Asian countries, but also between the East and the West, will truly benefit both eastern and western mathematics education development.
The conference theme will be mainly explored through, though not restricted to, the following areas at primary, secondary and tertiary level:

- Curriculum
- Teaching
- Learning
- Assessment
- Teacher education

The main components of the scientific programme of EARCOME 3 are as follows.

Plenary Lectures
The speakers and titles of the Plenary Lectures are:

- Jeremy Kilpatrick (USA): The Many Faces of the School Mathematics Curriculum.
- Frederick Leung (Hong Kong): In the Books There Are Golden Houses: Mathematics Assessment in East Asia.
- Kyungmee Park (Korea): Mathematics Teacher Education in East Asian Countries — the Strengths and Weaknesses.
- Christine Keitel (Germany): Searching for Commonalities and Differences in Teaching Mathematics in Different Cultures and Systems.
- Shiqi Li & Jun Li (China): The Gains and Losses in China's Students Learning Mathematics.

Regular Lectures
There are eight Regular Lectures, some of which are:

- Finding Culture in the Classroom: Lessons from Mathematics Classrooms in Melbourne, Hong Kong, San Diego, Tokyo and Shanghai;
- Successful High-Level Problem Solving in the Philippines
- Some Impacts on Integrating Technology into Mathematics Education
- Building Foundations & Developing Creativity: An Analysis of Singapore Mathematics Textbooks
- Promoting Mathematics Teacher Professional Development through a School Based Collaborative Culture: Strength and Weakness of the Malaysian and Shanghai Experience
- Subject-Matter Knowledge Associated with the Equality Sign

Symposiums
There will be four Symposiums, entitled: Creativity; Culture and Tradition of Teaching and Learning; Technology and Teaching; and Problem Solving and Teaching.

Topic Study groups
The six Topic Study Groups are: Primary Curriculum; Primary Teaching and Learning; Secondary Curriculum; Secondary Teaching and Learning; Teacher Education; and Assessment

Other components of the programme are:

Interview: "Old Stars" from some East Asian countries are interviewed to exchange points of view about practical teaching and learning, cultural traditions and developing trends of mathematics education in East Asia.

Workshops: Two workshops — Algebra Teaching and Learning, Probability and Statistics Teaching and Learning — will be arranged. All participants are welcome, though the workshops are mainly for local school teachers with Chinese interpreters.

Poster and Exhibition

You are all warmly welcome to China to attend the Conference! For details, please have a look at the conference website:

www.math.ecnu.edu.cn/earcome3

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A Note on Copyright

The International Association for Statistical Education (IASE) and its Activities

Carmen Batanero and Chris Wild

1. Introduction

IASE, the International Association for Statistical Education, essentially functions as the international umbrella organization for statistics education. It has very strong connections with education groups in national statistical associations and societies. It seeks to improve statistics education at all levels from elementary (primary) school through to the training of professionals, and to increase the uptake of statistics education world wide. IASE fosters international cooperation, and stimulates discussion and research. It disseminates ideas, strategies, research findings, materials and information using publications, international conferences, and increasingly, its website accessible at the address http://www.stat.auckland.ac.nz/~iase/.

IASE is formally constituted as the education section of the International Statistical Institute (ISI). It may be joined independently, however, by anyone who wishes to participate in IASE's activities, wishes to be a part of an international community of statistics educators, wishes to share experiences with and learn from the experiences of other statistics educators around the world, or simply wishes to support those working to achieve IASE's goals. The membership is largely made up of teachers, lecturers and professors of statistics, applied and government statisticians and education researchers.

Interest in how better to train professionals and users of statistics has been a crucial concern of the International Statistical Institute (ISI) since its foundation in 1885 (more information about ISI is available from http://www.cbs.nl/isi/). This interest was given official visibility with the setting up in 1948 of the ISI Education Committee — specifically charged with promoting statistical education in collaboration with the UNESCO and other international institutions (Vere-Jones, 1995). The responsibilities of the Committee of Education included the development of programs in statistics to train technicians and university lecturers in developing countries and the setting up of International Centres for Statistical Education (those in Calcutta and Beirut were outstanding examples) to meet the training needs of the respective geographical environment. Special subcommittees were devoted to encourage the introduction of statistics in schools, women's role in statistics, and the promotion of conferences on statistical education.

This Committee functioned until 1991 when, as a result of the efforts of its members, the International Association for Statistics Education (IASE) was created as a new Section of the ISI. The purpose of IASE, according to its statutes is "to promote the understanding and advancement of statistical education and related subjects and to foster the development of effective and efficient educational services through international contacts among individuals and organisations, including statistical educators and educational institutions."

2. IASE Conferences

One of the major priorities of the IASE and the ISI Statistical Education Committee has been the organization of international conferences to give isolated statistics educations the opportunity to meet and share their experiences. The major worldwide conference in statistics education is the International Conference on Teaching Statistics (ICOTS), which has been held every four years since 1982 in different geographical areas, and where all aspects of statistics education from elementary school level to the training of statistical professionals are discussed. At ICOTS-6 (Cape Town, South Africa, 2002; http://icots6.haifa.ac.il/icots6.html), more than 300 papers were presented by approximately 470 participants. The Seventh International Conference on Teaching Statistics (ICOTS-7), with the theme *Working Cooperatively in Statistics Education*, will be hosted by the Brazilian Statistical Association (ABE) in Salvador (Bahia), Brazil, July 2-7, 2006 (http://www.maths.otago.ac.nz/icots7).

Round Table Conferences to promote research in specific problems related to statistics education have been also organised since 1968 by the ISI and more recently by IASE and held close to ICME conferences (1996, Granada, Spain, Role of Technology in Teaching and Learning Statistics; 2000, Tokyo, Training Researchers in the Use of Statistics; 2004, Lund, Sweden, Curricular Development in Statistics Education).

Since 1995 IASE has organised specific Invited Paper Sessions in the ISI Biennial Sessions. More recently IASE has also held full satellite conferences adjacent to ISI (2001 Korea: Satellite Conference on Statistical Literacy; 2003 Berlin: Satellite Conference on Statistics Education and the Internet; 2005 Sydney: Satellite Conference on Statistics Education and the Communication of Statistics). IASE also collaborates with many different institutions to organise statistics education conferences or statistics education groups in mathematics education, education or statistics conferences (e.g. ICME, PME, CERME, and conferences of national statistical societies in different countries).

3. Publications and Internet Resources

A main concern of IASE is providing statistics educators with information and resources that help them developing statistical understanding, skills and literacy around the world. The proceedings of the ICOTS, Round Tables and other Conferences have been distributed from the ISI office and more recently through the Publications page of IASE website (http://www.stat.auckland.ac.nz/~iase/). This website was recently re-designed and is currently the main international statistics education web server with a variety and most complete set of links to publications, conferences, resources and news.

In January 2002, IASE founded the *Statistics Education Research Journal*. It is now a joint publication of IASE and ISI. It is a twice-yearly free refereed electronic publication and its eighth issue was released in November 2004. The journal's aims include the encouragement of research activity in statistics education, the advancement of knowledge about students' attitudes, conceptions, and difficulties in learning probability and statistics, and the improvement of the teaching of statistics at all educational levels. Other publications include IASE Review (annual review of IASE activities), and IASE component of ISI Newsletter. Hipótesis Alternativa is a related regional publication. IASE

has begun to build on its Publications webpage what we intend to become a comprehensive archive of doctoral dissertations in Statistics.

The International Statistical Literacy Project (ISLP), an IASE project coordinated by Carol Joyce Blumberg (cblumberg@winona.edu) is making resources that are useful for the development of statistical literacy at all levels from Primary/Elementary School through Adult Learners available on the web. There are also ISLP webpages aimed at those in government and for journalists and the rest of the mass media and a webpage devoted to useful datasets (for more information see http://course1.winona.edu/cblumberg/islphome.htm).

4. The Future of IASE

With about 500 members from 61 different countries a distinctive feature of IASE is its vitality, which is evident in its varied activities, organised and carried out by enthusiastic volunteers around the world who seldom meet apart from annual conferences. This work is also supported by the IASE National Correspondents who facilitate communications between IASE and statistics educators around the world. Most of the work is done virtually and, despite this, there is a very strong feeling of community. Indeed, probably the most rewarding aspect of IASE membership is participating in an international community of people who believe in the value of statistics education and wish to advance it. We hope this brief account encourages others to join IASE and help advance its aims.

Reference

Vere-Jones, D. (1995). The coming of age of statistical education. *International Statistical Review*, 63(1), 3-23.

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Two Books from ICTMA

The International Study Group for Mathematical Modelling and Applications (ICTMA) is since 2003 one of ICMI five Affiliated Study Groups. The Group aims at promoting Applications and Modelling (A&M) in all areas of mathematics education — primary and secondary schools, colleges and universities. ICTMA holds biennial conferences where all aspects of A&M are considered. Each of those conferences results in a publication consisting of edited papers from the conference and a limited number of commissioned papers.

The last two volumes published under ICTMA have recently appeared.

From ICTMA-10 (2001)

> Ye Q, Blum W, Houston SK and Jiang Q, editors, *Mathematical Modelling in Education and Culture: ICTMA 10*, Horwood Publishing, Chichester, 2003, 330 pp. [ISBN: 1-904275-05-2]

From the Preface:
The 10th International Conference on the Teaching of Mathematical Modelling and Applications (ICTMA-10) was held in Beijing, in July/August 2001. This was the first time that the conference had been held in an Eastern country, and it was a timely move. As well as the political and cultural changes evident in China over the last number of years, there are also the beginnings of important changes to the mathematics curricula in both schools and universities. The influence of two decades of the mathematical modelling movement in the West was beginning to be felt, and both teachers and academics were eager to meet their Western counterparts and to share with them their excitement at these developments.

This volume contains a collection of 25 of the contributions to ICTMA-10, and a high percentage of these are by Chinese authors who describe their developing work. The rest of the contributions are by authors resident in "the West", including Australia, and these papers describe ongoing developments in curriculum design and teaching methods. However they also concentrate on research into the learning of modelling, and this research is giving the community greater insights into the ways in which students develop as modellers. These insights will inform pedagogy, making it more effective and efficient.

From ICTMA-11 (2003)

> Lamon S, Parker W and Houston K, editors, 2003, *Mathematical Modelling: A Way of Life: ICTMA 11*, Horwood Publishing, Chichester, 2003, 267 pp. [ISBN: 1-904275-03-6]

University teachers and practitioners of mathematical modelling often speak of mathematical modelling as a "way of life", using this phrase as referring to habits of mind and to dependence on the power of mathematics to describe, explain, predict, and control real phenomena. This book aims to encourage teachers to provide opportunities for students to model a variety of real phenomena appropriately matched to students' mathematical backgrounds and interests from early stages of mathematical education. Many university students have difficulty studying mathematical modelling because of their beliefs about what it means to do mathematics. Habits, misconceptions, and mindsets present obstacles to the acceptance of a "models-and-modelling perspective" at this stage of mathematics education. Without prior experience in building, interpreting and applying mathematical models, many students may never come to view and regard modelling as a "way of life."

AMUCHMA Newsletter on the History of Mathematics in Africa

AMUCHMA, the African Mathematical Union Commission on the History of Mathematics in Africa, announces that the issue 29 of the *AMUCHMA Newsletter on the History of Mathematics in Africa* is now available, like all the earlier issues, available on the web page:

http://www.math.buffalo.edu/mad/AMU/amuchma_online.html

An electronic version of the Newsletter can be obtained, as an attachment, from Paulus Gerdes at pgerdes@virconn.com.

The AMUCHMA Newsletter is published in various languages. It is available free of charge upon request, as follows:

For the English and Portuguese versions, send requests to

Paulus Gerdes
Chairman of AMUCHMA
Centro de Investigação Etnomatemática
C.P. 915, Maputo, Mozambique
Fax: 258-1-49 45 04
e-mail: pgerdes@virconn.com

For the French and Arabic versions, send requests to:

Ahmed Djebbar
Secretary of AMUCHMA
G.H.D.S.O., Bt. 307
Université Paris-Sud
91405 Orsay Cedex, France
Fax: 33-1-47 01 59 17
e-mail: Ahmed.Djebbar@wanadoo.fr

A Call from AMUCHMA

In the context of the historiography of mathematics in Africa, we are currently collecting data on Doctorates in the Mathematical Sciences, Mathematics Education and History of Mathematics obtained by Africans. The following gives examples of an entry:

NIGERIA
Aderemi Oluyomi KUKU (b. 20.03.1941) (Male)
1971 (Ph.D.) *On the Whitehead group of p-adic integral group-rings of finite p-groups*, University of Ibadan (Ibadan, Nigeria); Advisor: Hyman Bass.

TOGO
Pascal Kossivi ADJAMAGBO (b. 1956) (Male)
1981 (doctorat 3ième cycle) *Déterminant non-communicatif et systèmes differentiels* [*Skew determinant and differential systems*], Université de Paris 6, Paris, France; Advisor: Jean Vaillant
1991 (doctorat d'état) *Fondements de la théorie des déterminants sur un domaine de Ore* [*Fundaments of the theory of determinants on an Ore domain*], Université de Paris 6, Paris, France; Advisor: Jean Vaillant

Readers are invited to send in the same format their own data and, if they have, the data of any other mathematician (in particular the earliest mathematician) in their country.

Paulus Gerdes, Chairman AMUCHMA
C.P. 915, Maputo
MOZAMBIQUE
pgerdes@virconn.com

Note:
(from AMUCHMA website http://www.math.buffalo.edu/mad/AMU/amuchma_online.html)

AMUCHMA (the Commission on the History of Mathematics in Africa of the African Mathematical Union), formed in 1986, has the following objectives:

a. to improve communication among those interested in the history of mathematics in Africa;
b. to promote active cooperation between historians, mathematicians, archaeologists, ethnographers, sociologists, etc., doing research in, or related to, the history of mathematics in Africa;
c. to promote research in the history of mathematics in Africa, and the publication of its results, in order to contribute to the demystification of the still-dominant Eurocentric bias in the historiography of mathematics;
d. to cooperate with any and all organizations pursuing similar objectives.

Its main activities are as follows: the publication of a newsletter; the setting up of a documentation centre; the organization of lectures on the history of mathematics at national, regional, continental and international congresses and conferences.

Ramanujan Prize for Young Mathematicians from Developing Countries

The Abdus Salam International Centre for Theoretical Physics (ICTP), located in Trieste, Italy, is pleased to announce the creation of the *Ramanujan Prize for young mathematicians from developing countries*. The Prize is funded by the Niels Henrik Abel Memorial Fund.

The Prize will be awarded annually to a researcher from a developing country less than 45 years old (on December 31 of the year for which the award is given), who has conducted outstanding research in a developing country. Researchers working in any branch of the mathematical sciences are eligible. The Prize carries a $10 000 cash award and travel and subsistence allowance to visit ICTP for a meeting where the Prize winner will be required to deliver a lecture. The Prize will usually be awarded to one person, but may be shared equally among recipients who have contributed to the same body of work.

The Prize will be awarded by ICTP through a selection committee of five eminent mathematicians appointed in conjunction with the International Mathematical Union (IMU). The first winner will be announced in 2005. The deadline for receipt of nominations is July 31, 2005.

The members of the Selection Committee for the Ramanujan Prize are Le Dung Trang (ICTP, Chairman), Bernt Øksendal (University of Oslo), Jacob Palis (IMPA, Brazil), Peter Sarnak (Princeton University) and S.R. Srinivasa Varadhan (Courant Institute).

More information on the Ramanujan Prize can be found on the websites of IMU (http://www.mathunion.org/) or ICTP (http://www.ictp.it/).

ICMI Study Volumes

Readers are reminded that
individuals may purchase the ICMI Study Volumes
published by Springer
at a discount of 60% for the hardback and
a discount of 25% for the paperback.

It is understood that the books ordered are
for personal use only.

For information contact the Secretary-General of ICMI
bhodgson@mat.ulaval.ca

or visit the New ICMI Study Series page on Springer website
http://www.springeronline.com/sgw/cda/frontpage/
0,11855,4-40414-69-33111341-0,00.html
(Ref: 246029)

Conferences on Technology in Mathematics Education

Bernhard A. Kutzler (Austria) is managing a website about various aspects of the relationship between technology and mathematics education. In particular information about conferences with an emphasis on the use of technology in mathematics education can be found at the address

http://www.kutzler.com

under the heading "Events".

ICMI Activities on the Web

For up-dated information about coming ICMI activities and ICMI related activities, please consult the following sites:

- **Study 15** (May 2005) http://www-personal.umich.edu/~dball/icmistudy15.html
- **First Africa ICMI Regional Conference** (June 2005) http://www.wits.ac.za/ICMI
- **ICTMA-12** (July 2005) www.city.ac.uk/conted/reseach/ictma12/index.htm
- **PME-29** (July 2005) http://staff.edfac.unimelb.edu.au/~chick/PME29/
- **EARCOME 3** (August 2005) http://euler.math.ecnu.edu.cn/earcome3/
- **EMF 2006** (May 2006) http://emf2006.educ.usherbrooke.ca/
- **Study 16** (June 2006) http://www.amt.edu.au/icmis16.html
- **ICM 2006** (August 2006) http://www.icm2006.org
- **ICTMA-13** (July 2007) http://www.ku.edu.np/Ictma13.htm

ICMI on the Web

The ICMI website, which is part of the site of the International Mathematical Union, is hosted at the Konrad-Zuse-Zentrum für Informationstechnik Berlin in Germany. This website can be accessed at the address

http://www.mathunion.org/ICMI/

Readers are encouraged to visit the site and provide the Secretary-General with comments and suggestions for its improvement.

Interested readers should also note the address for the homepage of IMU (International Mathematical Union):

http://www.mathunion.org/

as well as the homepage of ICSU (International Council for Science), to which ICMI belongs through IMU:

http://www.icsu.org/

Future Conferences

(Prepared with the collaboration of Carmen Batanero)

ATCM 2004, December 2004, Singapore

The Ninth Asian Technology Conference in Mathematics (ACTM 2004) is devoted to the theme *Technology in Mathematics: Engaging Learners, Empowering Teachers and Enabling Research*. It is hosted by the National Institute of Education, Nanyang Technological University, Singapore, and the Advanced Technology Council in Mathematics and will take place on December 13-17, 2004.

More information can be obtained from the Chair of the International Programme Committee, Wei-Chi YANG (wyang@radford.edu) or from the ATCM Local Organising Committee (atcm2004@nie.edu.sg), or by visiting the conference website

http://www.atcminc.com/mConferences/ATCM04/

EPISTEME – 1, December 2004, India

An international conference to review research on Science, Technology and Mathematics Education is to be held at the International Centre Dona Paula, Goa, India, on December 13-17, 2004. The conference will survey the global progress of research in this field and will aim at identifying promising directions for future work.

For more information contact the Convener from Jayashree Ramadas (episteme@hbcse.tifr.res.in) or visit the conference homepage

http://www.hbcse.tifr.res.in/episteme

4th Mediterranean Conference on Mathematics Education, January, 2005, Italy

The Fourth Mediterranean Conference on Mathematics Education, with international participation, follows a successful series of three such conferences since 1997 and is to be held in Palermo, Italy, on January 28-30, 2005. The themes of interest are: Mathematics in the Modern World; Mathematics and Didactics; Mathematics and Society; Mathematics and Talent; Mathematics and Sciences; Mathematics and Technology; Mathematics and Motivation; Mathematics and Statistics; and History of Mathematics

More information can be obtained from cms@cms.org.cy or by visiting the web page

http://math.unipa.it/~grim/mediterranean_05.htm

CERME-4, February 2005, Spain

The Fourth Congress of the European Society for Research in Mathematics Education (ERME) will be held in Sant Feliu de Guíxols, Girona, Spain, from 17 to 21 February, 2005. The conference will focus mainly on work in Thematic Groups in a style similar to that developed in previous conferences. CERME-4 will also include plenary activities and poster presentations. The Congress is preceded by the II YERME Meeting (Young European Researchers in Mathematics Education), that takes place on 16-17 February.

Further information can be received from the President of ERME: Paolo Boero (boero@dima.unige.it), the Chair of the CERME4 Programme Committee: Barbara Jaworski (barbara.jaworski@hia.no), or the Chair of the CERME4 Organising Committee, Marianna Bosch (mbosch@fundemi.com). Web site:

http://cerme4.crm.es/.

IASE Satellite Conference, April 2005, Australia

This conference, focused on Statistics Education and the Communication of Statistics, is jointly organised by the IASE (the International Association for Statistical Education) and the Victorian Branch of the Statistical Society of Australia and will be held on 4-5 April, 2005, immediately preceding the International Statistical Institute Session in Sydney, Australia.

The approach will be non-technical, suitable for both a specialist and non-specialist audience who would like to learn how to better communicate the statistical ideas which occur in their everyday and working lives. This meeting is intended to be of interest to a wide cross section of society including teachers, educational administrators, researchers in statistical education and in probabilistic reasoning and others who want to gain a better grasp of how to communicate statistics in general and who would like to broaden their knowledge of statistics applications. It should also be of interest to people concerned with interpreting sociological, economical, political, scientific or educational reports, predicting sports results, by policy makers, journalists, health professionals and others from the general population.

More information from the joint chair of the Programme Committee, Brian Phillips (bphillips@swin.edu.au) or on the webpage

http://www.stat.auckland.ac.nz/~iase/conferences.php?show=iase2005

ICMI Study 15: "*The Professional Education and Development of Teachers of Mathematics*", May 2005, Brazil

The ICMI Studies are working conferences dealing with specific themes in mathematics education, meaning that a substantial amount of the time is dedicated to discussions, although paper and other presentations also take place. The focus of the 15th ICMI Study is the professional education and

development of mathematics teachers around the world. The premise of this Study is that the education and continued development of teachers is key to students' opportunities to learn mathematics. The curriculum of mathematics teacher preparation varies around the world, both because of different cultures and educational environments, and because assumptions about teachers' learning vary. Countries differ also in the educational, social, economic, geographic, and political problems they face, as well as in the resources available to solve these problems. A study focused on mathematics teacher education practice and policy around the world can provide insights useful to examining and strengthening all systems.

The Study 15 Conference is to be held at Águas de Lindóia, São Paulo, Brazil, on May 15-21, 2005. A Study Volume will be produced, representing and reporting selected activities and results of the Study Conference and its products. This Report will be useful to the mathematics education community, as well as for other researchers, practitioners, and policymakers concerned with the professional education of teachers.

More information from the Study Co-Chairs: Deborah Loewenberg Ball, USA (dball@umich.edu) and Ruhama Even, Israel (ruhama.even@weizmann.ac.il), or by visiting the web page
http://www-personal.umich.edu/~dball/icmistudy15.html

First Africa ICMI Regional Conference, June 2005, South Africa

The First Africa Regional Conference of ICMI will be held at the University of the Witwatersrand (Education Campus) in Johannesburg, South Africa, on June 22-25, 2005. The theme of the congress is *Mathematics Teaching and Teacher Education in Changing Times*. This conference has officially been recognised by the Executive Committee of the Commission as an ICMI Regional Conference. The aims of the conference are: stimulating regional collaboration and activity; promoting regional and global contributions and interactions; highlighting issues pertinent to mathematics education in developing countries; and sharing activities in and across countries in the region.

The theme of the congress will be addressed under four strands: (1) Teacher Education (primary and secondary; initial and in-service). (2) Information and Communication Technology (ICT) and Resources for teaching and learning. (3) Indigenous Knowledge Systems (IKS), Ethnomathematics and the Curriculum. (4) Teaching and Learning Mathematics (primary, secondary and tertiary).

The congress will include two plenary panels, one on mathematics teacher education and the other on ICT and Resources for teaching and learning. There will also be three symposia devoted to the following themes: (i) IKS; (ii) Teachers' views on mathematics teacher education: different contexts and different levels; (iii) Secondary-Tertiary interface. In addition to this the programme will offer parallel presentations, workshops and national presentations. There will also be a regional meeting including discussions of collaboration among countries and discussions of regional participation in the global arena of mathematics and mathematics education. Associations and organisations involved in mathematics and mathematics education from the various nations in the region will also be invited to provide exhibitions and other displays.

Further information on the ICMI Africa Regional congress can be found on the congress webpage
http://www.wits.ac.za/ICMI

Jill Adler (adlerj@educ.wits.ac.za) is the Chair of both the Local Organising and the Scientific Committees. For all administrative queries, please contact Ms Brenda Lacey-Smith (laceyb@functions.wits.ac.za).

SRTL-4, July 2005, New Zealand

The Fourth International Research Forum on Statistical Reasoning, Thinking, and Literacy, will be hosted by the Department of Statistics, The University of Auckland, New Zealand, on July 2–7, 2005. This gathering offers an opportunity for a small, interdisciplinary group of researchers from around the world to meet for a few days to share their work, discuss important issues, and initiate collaborative projects. Having emerged from the three previous forums, the topic and focus of SRTL-4 will be *Reasoning about Distribution*. One outcome of the Forum will be a publication summarizing the work presented, discussions conducted, and issues emerging from this gathering.

Information can be obtained from Maxine Pfannkuch (m.pfannkuch@auckland.ac.nz) or by visiting
http://www.stat.auckland.ac.nz/srtl4/.

ISATT, July 2005, Australia

The bi-annual conference of the International Study Association for Teachers and Teaching (ISATT) is being held for the first time in the southern hemisphere in Australia from 3-6 July 2005. Its theme is "*Challenges for the Profession: Perspectives & Directions for Teachers, Teaching and Teacher Education*".

ISATT comprises a group of teacher educators, teachers, educational research and research students all keen to meet the challenges of teaching in the 21st century. The conference will provide participants with the opportunity to gather and report on their research while allowing ample time to relax and socialise. Post Graduate researches have the chance to meet prior to the main conference in their own research symposium. More information by visiting the web page
http://e-learn.acu.edu.au/isatt2005/.

IFIP WCCE, July 2005, South Africa

IFIP (the International Federation for Information Processing) announces that the 2005 World Conference on Computers in Education (WCCE) will be hosted at the University of Stellenbosch, just outside Cape Town, South Africa from 4 - 7 July 2005. The theme of the conference is "*40 Years of Computers in Education — What works?*"

Further information about WCCE 2005 can be obtained on the web site
http://www.wcce2005.org.za/

"*Mathematical learning from early childhood to adulthood*", July 2005, Belgium

The *Centre de Recherche sur l'Enseignement des Mathématiques* (CREM) organizes, with the collaboration of the Institut de mathématique de l'Université de Mons-Hainaut, an international colloquium on the theme "*Mathematical learning from childhood to adulthood*". The conference will take place on the premises of the University of Mons-Hainaut (Belgium), from July 7 to July 9, 2005. English and French are the languages of the conference.

From early childhood, human beings learn mathematics, either alone or with the help of someone else. Such a long learning period involves many processes, depending on many parameters. Some of these originate in the learner: his or her age, previous knowledge and the civilisation in which he or she lives. Others depend on the domain that is being learned, the reasons why it is learned and its applications. The colloquium aims at confronting research results on such subjects. The emphasis will be on synthetic views, guidelines and a structured view of continuous learning.

Possible further questions to be examined are:
- How do the notions learned at elementary school influence later learning?
- What are the respective roles in the learning process of procedures and concepts? What is the meaning of the expressions "mental representation", "mental object", "mental image" and "mental model" ? How do these mental entities unfold and relate to each other?
- On which basis and following which criteria should one organize mathematical matters to induce a kind of natural learning? How to elaborate guidelines? How to determine necessary passage points?
- What are the respective roles of intuition and rigor? How could the requirements concerning both aspects be modulated?
- What are the respective roles of problem solving and theoretical structuring?
- What is the role of logic?
- What about past attempts to grasp mathematical learning globally, in terms of matters and methods? How did they deal with the above questions? How did these attempts affect school practice?

For more information contact the CREM at crem@sec.cfwb.be or from the website
http://www.profor.be/crem/

MERGA 28, July 2005, Australia

The Mathematics Education Research Group of Australasia Incorporated (MERGA) is an association that aims to promote, share, disseminate, and co-operate on quality research on mathematics education

for all levels particularly in Australasia. It also aims to provide permanent means for sharing of research results and concerns among all members through regular publications and conferences.

On July 7-9, 2005, the MERGA conference will be held in Melbourne to coincide and complement the PME conference that is being hosted by the University of Melbourne. Conference theme is "*Building connections: Theory, research and practice*". MERGA 28 will focus on innovative research and development that links research to teaching that is particular to Australasia.

More information is available from the Conference Chair Colleen Vale (Colleen.Vale@vu.edu.au) or by visiting the web site

http://www.deakin.edu.au/education/numeracy_and_merino/merga/

ICTMA-12, July 2005, United Kingdom

The 12th International Conference on Mathematical Modelling and Applications (ICTMA-12) will take place on July 10-14, 2005, and be hosted at City University, London, UK, by Sir John Cass Business School, the School of Engineering and Mathematical Sciences and the Department of Continuing Education. The academic programme will take place in Sir John Cass Business School, conveniently located in the centre of the City of London.

ICTMA-12's purpose is the research, teaching and practice of mathematical modelling and applications at all levels from primary through to tertiary education. This meeting will have a strong focus on transitions from the real world to the mathematical model. The conference themes will be very attractive to mathematicians, engineers and scientists, modellers in industry, government and finance and teachers and researchers in schools, colleges and universities.

For more information contact the Chair of ICTMA-12, Chris Haines (ictma12@city.ac.uk) or visit

www.city.ac.uk/conted/reseach/ictma12/index.htm

PME 29, July 2005, Australia

The International Group for the Psychology of Mathematics Education came into existence at the Third International Congress on Mathematics Education (ICME3) held in Karlsruhe, Germany in 1976. The PME 29 conference will be held on July 10-15, 2005 in Melbourne, Australia. The conference is hosted by the Department of Science and Mathematics Education, University of Melbourne, and will take place at the University of Melbourne. The conference theme is "*Learners and Learning Environments*".

More information from the Chair of the Programme Committee Helen Chick (h.chick@unimelb.edu.au) or by visiting the web page

http://staff.edfac.unimelb.edu.au/~chick/PME29/

CIBEM V, July 2005, Portugal

The Portuguese Association of Mathematics Teachers is organising the Fifth Ibero American Mathematics Education Conference to be held in Porto, Portugal, July 17- 22, 2005. This is an international conference started from the interest to strength links among the Portuguese, Spanish and Latin American mathematics education communities. Previous conferences were held in Spain, Brazil, Venezuela and Bolivia.

More information can be obtained from Lurdes Serrazina (lurdesserrazina@netcab.pt) or by visiting the web page

http://www.mytwt.net/cibem5/

The conference is preceded by the international meeting "*Mathematics Education: Paths and Crossroads*" to be held at the Faculty of Science, Lisbon University, Portugal, in honour of Paulo Abrantes (1953–2003). The meeting is an undertaking of a group of Portuguese teachers who were his colleagues, friends and companions in the struggle for the renovation of mathematics teaching. The aim is reflecting on Abrantes' strong international work and commitment. More information about this meeting from emce_pa@apm.pt or the web page

http://www.apm.pt/emce_pa/

CIEAEM-57, July 2005, Italy

Researchers in mathematics education and teachers of mathematics are invited to take part in the Conference CIEAEM-57. The Conference will take place in Piazza Armerina (a historical site in the central part of Sicily, Italy) from July 23 to 29, 2005.

The Conference is organized by CIEAEM (Commmission internationale pour l'étude et l'amélioration de l'enseignement des mathématiques). Since its foundation in 1950, the Commission for the Study and Improvement of Mathematics Teaching (CIEAEM) intended to investigate the actual conditions and the possibilities for the development of mathematics education in order to improve the quality of teaching mathematics. The annual conferences, which are the essential means for realizing this goal, are characterized by exchange and discussion of the research work and its realization in practice and by the dialogue between researchers and educators in all domains of practice.

The Chair of the Programme Committee of CIEAEM-57 is Paolo Boero (boero@dima.unige.it). For further details and the pre-registration form, see the web site

http://math.unipa.it/~grim/cieam/conv_cieam_05.htm

ICTMT7, July 2005, United Kingdom

The Seventh International Conference on Technology in Mathematics Teaching is to be held in Bristol, UK, July 26-29, 2005. The overall conference theme is *Visions of Mathematics Education:*

Embedding Technology in Learning. Sub-themes to be considered are: Dynamism, Creative assessment, Theories of tool use, Teachers' professional development, Communities of practice, Design and innovation, and Modelling.

More information from the Co-Chairs: Nick Jones, nick_jones@cabot.ac.uk and Rosamund Sutherland, ros.sutherland@bristol.ac.uk, or by visiting the web page

www.ictmt7.org

ICMI-EARCOME 3, August 2005, China

The East Asia Regional Conferences on Mathematics Education (EARCOME) is a series of international conference, which is usually designated as ICMI regional conference, hosted in East Asian countries. The first and second EARCOME were held in Korea (1998) and Singapore (2002).

Shanghai, Nanjing, and Hangzhou, People's Republic of China will be the host of EARCOME 3 August 7-12, 2005. The participants from countries around the world are welcome since this is an international event for researchers, mathematics educators, school teachers, policy makers and other scholars to share their knowledge among each other. The topic of the EARCOME 3 is "*Foundations and Creativity: The Strengths and Weaknesses of Mathematics Education in East Asia*".

More information from the Conference Secretariat (earcome3@math.ecnu.edu.cn) or by visiting the web page

http://euler.math.ecnu.edu.cn/earcome3/

SEMT '05, August 2005, Czech Republic

The Seventh International Symposium Elementary Mathematics Teaching is to be held in Prague, Czech Republic, on August 21-26, 2005. Prague, the Capital of the Czech Republic, is proud of its long tradition of higher education dating from the middle ages; it is ranked as one of the most attractive cities in Europe. It can offer not only the most unique medieval urban settings but also a rich choice of cultural events and social enjoyment.

We cordially invite you to participate in the seventh bi-annual conference on Elementary Mathematics Teaching, SEMT '05. The programme will be focused on the teaching of mathematics to children within the age-range 5–11 years. The theme of SEMT '05 is "*Understanding the environment of the mathematics classroom*".

More information from Jarmila Novotná (jarmila.novotna@pedf.cuni.cz) or by visiting the website

http://www.pedf.cuni.cz/kmdm/index.htm

CAME 2005, October 2005, USA

The Fourth Symposium on Computer Algebra in Mathematics Education (CAME) will be held October 19-20, 2005 in Roanoke, Virginia, USA. The theme of the symposium is "*Shaping Research and Development of Computer Algebra in Mathematics Education*".

The rationale and goals for CAME Symposia are to serve as a bridge between two communities, the CAS research community and the main mathematics education community. Thus, the 4th CAME Symposium is held in conjunction with the PME-NA-27 conference, to take place on October 20-23 (www.pmena.org/2005).

CAME (http://www.lonklab.ac.uk/came/) was originally founded at ICME-8 in Seville in July 1996. The goals of the organisation are to facilitate the dissemination and exchange of information on research and development in the use of computer algebra in mathematics education; to facilitate access to international expertise in the use of computer algebra in mathematics education; to promote the study of the use of computer algebra in mathematics education. CAME's principle activity is a two-yearly Symposium: the first was in Israel, 1999; the second in the Netherlands, 2001; and the third in Reims, France, June 2003.

More information on CAME 2005 is available at

http://www.lonklab.ac.uk/came/events/CAME4/

DELTA '05, November 2005, Australia

The Fifth Southern Hemisphere Symposium on Undergraduate Mathematics and Statistics Teaching and Learning will be held at World Heritage Fraser Island. Queensland, Australia, on 22-26 November 2005. This conference is the fifth in a growing series of international conferences that cover all aspects of teaching mathematics and statistics at the undergraduate level. This follows previous conferences, including Delta '03 in Queenstown, New Zealand, and Delta '01 in the Kruger Park, South Africa.

Delta '05 themes focus on aspects of undergraduate teaching and learning of mathematics and statistics, including innovative practice; assessment issues; effective use of technology; web delivery and online learning; service teaching; pre-service teacher education; and issues of access, equity, and transition.

For more information visit the conference website

http://www.maths.uq.edu.au/delta05/index.php

Mathematics Education into the 21st Century, November 2005, Malaysia

The Mathematics Education into the 21st Century Project is organising its eight international conference with the title "Reform, Revolution and Paradigm Shifts in Mathematics Education". It will be held in Johor Bharu, Malaysia, on November 25th to December 1st, 2005. This conference follows the first seven Project Conferences held in Egypt (1999), Jordan (2000), Poland (2001), Australia (2001), Italy (2002), Czech Republic (2003) and Poland (2004)

More information about the Project itself can be obtained from its coordinators Fayez Mina or Alan Rogerson (arogerson@vsg.edu.au) or from the website http://math.unipa.it/~grim/21project.htm. Information on the eight conference is accessible at

http://math.unipa.it/~grim/21_malasya_2005.htm

ICEM-3, February 2006, New Zealand

The Third International Conference on Ethnomathematics (ICEM-3) will be held in Auckland, New Zealand, on February 12-16, 2006. The aim of the conference is to bring together researchers in Ethnomathematics from around the world to discuss recent developments and future directions. ICME-3 is hosted by the Department of Mathematics of the University of Auckland.

For further information contact Berlane Martins (martins@math.auckland.ac.nz) or visit

http://www.math.auckland.ac.nz/Events/2006/ICEM-3/

EMF 2006, May 2006, Canada

EMF 2006 ("Espace Mathématique Francophone 2006") will take place in Sherbrooke, Québec, Canada, on May 27-31, 2006. This conference is the third one in a series aiming at promoting reflections and exchanges among the international francophone community on current issues in mathematics education at the primary and secondary levels as well as on teacher education. As its predecessors held in France (2000) and Tunisia (2003), EMF 2006 has officially been recognised as an ICMI Regional Conference by the Executive Committee of ICMI, where the "region" is defined not in geographical but rather in linguistic terms. The theme of the 2006 conference is "*The teaching of mathematics facing the challenges of school and communities*".

EMF 2006 is organised jointly by three Québec associations of mathematics education (Association mathématique du Québec — AMQ, Groupe des responsables en mathématiques au secondaire — GRMS, Groupe des didacticiens et didacticiennes des mathématiques du Québec — GDM). The programme committee is chaired by Nadine Bednarz (descamps-bednarz.nadine@uqam.ca).

More information on the EMF 2006 conference can be obtained on the website

http://emf2006.educ.usherbrooke.ca/

ICOTS-7, July 2006, Brazil

The International Association for Statistical Education (IASE) and the International Statistical Institute (ISI) are organising the Seventh International Conference on Teaching Statistics (ICOTS-7) which will be hosted by the Brazilian Statistical Association (ABE) in Salvador (Bahia), Brazil, July 2-7, 2006. The major aim of ICOTS-7 is to provide the opportunity for people from around the world who are involved in statistics education to exchange ideas and experiences, to discuss the latest developments in teaching statistics and to expand their network of statistical educators. The conference theme, "*Working Cooperatively in Statistics Education*", emphases the idea of cooperation, which is natural and beneficial for those involved in the different aspects of statistics education at all levels.

Information can be obtained for the Chair of the International Programme Committee, Carmen Batanero (batanero@ugr.es) and from the Chair of the Local Organising Committee, Pedro Alberto Morettin (pam@ime.usp.br), or by visiting the congress homepage

http://www.maths.otago.ac.nz/icots7

ICMI 16 Study: "*Challenging Mathematics in and beyond the Classroom*", June 2006, Norway

Recent attempts to develop students' mathematical creativity include the use of investigations, problems, reflective logs, and a host of other devices. These can be seen as ways to attract students with material that challenges the mind. Initiatives taken around the globe have varied in quality and have met with different degrees of success. New technologies have enabled us to refine our efforts and restructure our goals. It is time to assess what has been done, study conditions for success and determine some approaches for the future.

Accordingly, ICMI has embarked, on its 16th Study, to examine challenging mathematics in and beyond the classroom, and is planning a Conference to be held in Trondheim, Norway, from 27 June to 03 July 2006. The Conference will be a working one and every participant will be expected to be active. Participation is by invitation only, based on a submitted contribution. Among the attendees, it is planned to represent a diversity of expertise, experience, nationality and philosophy. Such attendance should be drawn broadly from the mathematics and mathematics education community. It is hoped that the Conference will attract not only long term workers in the field but also newcomers with interesting and refreshing ideas or promising work in progress. In the past, ICMI Study Conferences have included about 80 participants.

More information can be obtained from the Co-Chairs, Edward J. Barbeau, Canada (barbeau@math.toronto.edu) and Peter J. Taylor, Australia (pjt@olympiad.org) or by visiting the Study web page

http://www.amt.edu.au/icmis16.html

ICM 2006, August 2006, Spain

The next International Congress of Mathematicians (ICM), held under the auspices of the International Mathematical Union (IMU), will take place in Madrid, Spain, on August 22-30, 2006. As with the last ICMs, one of the sections of the scientific program will be devoted to the theme "*Mathematics Education and Popularization of Mathematics*".

Information can be obtained from Manuel de León, President of the Local Organizing Committee of ICM 2006 (icm2006@unicongress.com), or by visiting the website

http://www.icm2006.org

ICTMA-13, July 2007, Nepal

The 13th International Conference on the Teaching of Mathematical Modelling and Applications will be held on 23 – 27 July 2007 in the premises of Kathmandu University, Dhulikhel, Nepal.

For more information contact the Chair, of the Local Organizing Committee, Bhadra Man Tuladhar (dean_sci@ku.edu.np) or visit the conference site

http://www.ku.edu.np/Ictma13.htm

ESU-5, July 2007, Czech Republic

Continuing the tradition of organizing the European Summer University (ESU) on the History and Epistemology in Mathematics Education every three years, the 5th Summer University (ESU-5) will take place at Charles University in Prague in July 2007

The ESU aims, not only to stress the use of history and epistemology in the teaching and learning of mathematics, in the sense of a technical tool for instruction, but also to reveal that mathematics should be conceived as a living science, a science with a long history, a vivid present and an as yet unforeseen future. This conception of mathematics should not only be the core of the teaching of mathematics, but it should also be the image of mathematics spread to the outside world.

Details on the program of ESU-5 will be announced later but those interested can obtain further information from Constantinos Tzanakis (tzanakis@edc.uoc.gr), chair of HPM (ICMI Affiliated Study Group) or by visiting the conference website

http://web.pedf.cuni.cz/kmdm/esu5/

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