The International Commission on Mathematical Instruction

ICMI

Bulletin No. 51

December 2002

Editor:
Bernard R. Hodgson
Département de mathématiques et de statistique
Université Laval
Québec G1K 7P4 CANADA

Table of Contents

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 which 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 81 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) and the *World Federation of National Mathematics Competitions* (WFNMC).

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.

A Note to the Reader

The Editor regrets that the publication of the *ICMI Bulletin* has recently met with considerable delays. The previous issue of the *Bulletin*, No. 50, was dated June 2001 while the present one, No. 51, is dated December 2002.

It is the Editor's aim to resume a more regular schedule of publication from now on, with two issues of the *Bulletin* published annually, as has been the case for the last two decades.

ICMI Study Volumes

Individuals may purchase the ICMI Study Volumes published by Kluwer Academic Publishers at a discount of 60% for the hardback and a discount of 25% for the paperback.

More information on this discount is available from the Secretary-General of ICMI
bhodgson@mat.ulaval.ca
or from the publisher
irene.vandenreydt@wkap.nl

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

For information on the ICMI Study Volumes CONSULT KLUWER WEBSITE
http://www.wkap.nl/prod/s/NISS

The International Commission on Mathematical Instruction

ICMI Executive Committee 1999 – 2002

President: **Hyman BASS**
2413 School of Education, 610 E. University
University of Michigan
Ann Arbor, MI 48109-1259 USA
hybass@umich.edu

Vice-Presidents: **Néstor AGUILERA**
Universidad Nacional del Litoral
PEMA / INTEC, Guemes 3450
3000 Santa Fe, ARGENTINA
aguilera@ceride.gov.ar

Michèle ARTIGUE
IREM, Case 7018
Université de Paris VII
2 place Jussieu
75251 Paris - Cedex 05, FRANCE
artigue@ufrp7.math.jussieu.fr

Secretary-General: **Bernard R. HODGSON**
Département de mathématiques et de statistique
Université Laval
Québec G1K 7P4 CANADA
bhodgson@mat.ulaval.ca

Members at Large: **Gilah LEDER**
Institute for Advanced Study
La Trobe University
Bundoora, Victoria 3086 AUSTRALIA
g.leder@latrobe.edu.au

Yukihiko NAMIKAWA
Graduate School of Mathematics
Nagoya University
Nagoya, 464-8602, JAPAN
namikawa@math.nagoya-u.ac.jp

Igor F. SHARYGIN
Moscow Centre for Continuous Mathematical Education (MCCME)
Bolshoy Vlasievskiy per., d. 11
121 002 Moscow, RUSSIA
sharygin@mccme.ru

Jian-Pan WANG
East China Normal University
3663 Zhongshan Road N.
Shanghai 200062 CHINA
jpwang@ecnu.edu.cn

***Ex officio* members:**

Miguel de GUZMÁN (Past President)
Facultad de Ciencias Matemáticas
Universidad Complutense
28040 Madrid, SPAIN
mdeguzman@bitmailer.net

Jacob PALIS Jr. (President of IMU)
IMPA
Estrada Dona Castorina, 110
22460-320 Rio de Janeiro, RJ, BRAZIL
imu@impa.br

Phillip GRIFFITHS (Secretary of IMU)
Institute for Advanced Study
Olden Lane
Princeton, NJ 08540-0631 USA
pg@ias.edu

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

A Word of Thanks to the 1999–2002 ICMI Executive Committee

Hyman Bass

ICMI has benefited for four years (1999-2002) from the fine services of its Executive Committee, consisting, beside myself and the three *ex officio* members, of Néstor Aguilera (Argentina), Michèle Artigue (France), Bernard Hodgson (Canada), Gilah Leder (Australia), Yukihiko Namikawa (Japan), Igor Sharygin (Russia), and Jian Pan Wang (China). On behalf of the ICMI community, I write to express our gratitude for their generous efforts. Particular thanks are due to Michèle Artigue and Jian Pan Wang, who graciously hosted meetings of the ICMI EC in Paris (1999 and 2002) and Shanghai (2001).

Areas of work and progress of this ICMI EC include:

- ICME-9 in Japan, which was a great scientific success.
- Launching the auspicious plans for ICME-10, in Copenhagen.
- Framing the bidding for ICME-11, whose venue is soon to be decided.
- Continuing the program of ICMI Studies, with Studies 12 (Algebra), 13 ("East/West"), 14 (Applications & Modelling), 15 (Teacher Education), and 16 (Challenging Mathematics) in various stages of development.
- Inauguration of the first ICMI Prizes, the Felix Klein Award and the Hans Freudenthal Award.
- Initiation of renewed ties with ICSU (through participation in its recent capacity building conference in Rio) and with UNESCO.
- Improvement in relations with the IMU and concomitant changes in the Terms of Reference that govern these relationships.

I have personally relied on the diverse expertise, wisdom, friendship, and generosity of each of the EC members during these eventful four years. I must give special mention to Bernard Hodgson, Secretary-General of ICMI, who is the very heartbeat of ICMI, and who continues the illustrious traditions of recent Secretaries (now General) of ICMI. These are all busy and richly talented people who have contributed much to the advancement of mathematics education. ICMI owes them all a debt of gratitude, and I personally want to express my own appreciation for all that they have done, and for the privilege of working with them.

Hyman Bass, President of ICMI
hybass@umich.edu

A New Executive Committee of ICMI

Bernard R. Hodgson

According to the Terms of Reference of ICMI, the election of the Executive Committee of the Commission is the responsibility of the General Assembly of IMU. During the last General Assembly held in Shanghai in August 2002, the following people were elected to form the next Executive Committee of ICMI:

President:	Hyman Bass	(USA)
Vice-Presidents:	Jill Adler	(South Africa)
	Michèle Artigue	(France)
Secretary-General:	Bernard R. Hodgson	(Canada)
Members-at-Large:	Carmen Batanero	(Spain)
	Nikolai Dolbilin	(Russia)
	Maria Falk de Losada	(Colombia)
	Peter L. Galbraith	(Australia)
	Petar S. Kenderov	(Bulgaria)
	Frederick Koon-shing Leung	(Hong Kong)

In addition, the President of IMU, John Ball (UK), and the Secretary of IMU, Phillip Griffiths (USA), are *ex officio* members of the ICMI EC.

The term of this Committee is from January 1st, 2003, to December 31st, 2006.

Due to a tie in the voting for Members-at-Large, the President of IMU proposed, and the General Assembly of IMU approved, that six Members-at-Large should be declared elected — which respects the number of EC members according to the new Terms of Reference of ICMI, as these Terms allow for the cooptation of up to two additional Members-at-Large.

Biographical information about the members of this new ICMI Executive Committee will appear in a forthcoming issue of the ICMI Bulletin.

The outgoing Executive Committee wishes the incoming EC all the best of luck and progress in its work for mathematics education.

Bernard R. Hodgson
Secretary-General of ICMI
bhodgson@mat.ulaval.ca

New Terms of Reference for ICMI

Bernard R. Hodgson

As a Commission of the International Mathematical Union, ICMI formally depends upon the Union and its General Assembly. The Terms of Reference of ICMI are thus established by IMU. The Terms of Reference of the Commission had been last amended in 1986, so they were in great need of being updated. Consequently the Executive Committee of ICMI started in 2001, in collaboration with the ICMI Representatives, reflection on modifications to be brought to the Terms. This has resulted in a project of new Terms of Reference for ICMI which was then discussed with the IMU Executive Committee. At the IMU EC meeting held in Paris on April 12-13, 2002, at which the President and Secretary-General of ICMI were invited, a revised version of ICMI Terms of Reference was adopted by the IMU EC. You will find these new Terms below. (The "old" Terms of Reference of ICMI appear in the *ICMI Bulletin* No. 47 (December 1999), pp. 35-36.) The main amendments to the Terms of Reference of ICMI are as follows:

- the composition of the Commission has been clarified: as is the case for IMU, members of ICMI are countries, not individuals;
- the notion of "General Assembly of ICMI" has been introduced in the Terms, to which the ICMI Executive Committee should present a quadrennial report;
- the notion of "ICMI Representatives" has been made more precise;
- the number of members of the ICMI Executive Committee has been increased and the possibility of co-optation of additional EC members has been introduced;
- the notion of ICMI Affiliated Study Groups has been formally introduced.

It should be noted that ICMI already had a General Assembly as well as Affiliated Study Groups, but those were not mentioned in the previous Terms — and Representatives were previously called "delegates". Here is some background information as regards the co-optation procedure introduced in these new Terms. In response to criticisms expressed in the past about the role of the General Assembly of IMU, the IMU Executive Committee has decided to leave room for "real decisions" by the GA. In the case of elections of the ECs of IMU and its commissions, the IMU GA did not wish to be presented "short" slates by the IMU EC, with only as many candidates as positions to be filled. The solution adopted by the IMU EC for the 2002 election was to have more candidates than positions for the non-officer members. In order to protect the various equilibria the outgoing Executive Committee of ICMI tries to achieve, when identifying a list of candidates to be proposed to the IMU EC for the election of a new ICMI EC, we have negotiated with IMU this co-optation option. Although this may result in some ICMI ECs having a substantial number of members, it was felt this was an acceptable solution to help meeting the various representation parameters ICMI aim at satisfying. The new Terms thus reflect the election procedure as implemented in 2002.

A formal text such as the following Terms of Reference is far from conveying the true essence of an organisation like ICMI. Still it is an important document to which one needs to refer as regards basic aspects of the life of ICMI. The readers are thus encouraged to react to these new Terms and send comments or suggestions for their future improvements to their ICMI Representative or to the Secretary-General.

International Commission on Mathematical Instruction (ICMI) Terms of Reference (2002)

(Adopted by the Executive Committee of the International Mathematical Union at its meeting held at Institut Henri-Poincaré in Paris on April 12-13, 2002)

1. The members of the International Commission on Mathematical Instruction (ICMI) consist of
   (a) those countries which are members of the International Mathematical Union (IMU), and
   (b) other countries which are co-opted, as specified in (7) below.
   The term "country" is to be understood as described in the Statutes of IMU.

2. The General Assembly of the Commission consists of
   (a) the members of the Executive Committee, as specified in (3) below, and
   (b) one Representative from each member country of ICMI, as specified in (5) below.
   The General Assembly of ICMI shall normally meet once in every 4 years, during the International Congress on Mathematical Education.

3. The Executive Committee of the Commission consists of the following members. Elected by *IMU:* Nine members, including the four officers, namely, the President, two Vice-Presidents, and the Secretary-General. *Ex-officio members:* The outgoing President of ICMI, the President and the Secretary of IMU. *Co-opted members:* In order to provide for missing coverage or representation, the ICMI Executive Committee may co-opt up to two additional members.

4. In all other respects the Commission shall make its own decisions as to its internal organization and rules of procedure.

5. Appointment of the Representative to ICMI is the responsibility of the Adhering Organization of IMU, for those countries which are members of IMU, and of the Adhering Organization of ICMI, for those countries co-opted under item (7) below. Any Adhering Organization wishing to support or encourage the work of the Commission may create, or recognize, in agreement with its Committee for Mathematics in the case of a member country of IMU, a Sub-Commission for ICMI to maintain liaison with the Commission in all matters pertinent to its affairs. The Representative to ICMI, as mentioned in (2) above, should be a member of the said Sub-Commission, if created.

6. The Commission shall be charged with the conduct of the activities of IMU, bearing on mathematical or scientific education and shall take the initiative in inaugurating appropriate programmes designed to further the sound development of mathematical education at all levels, and to secure public appreciation of its importance. In the pursuit of this objective, the Commission shall cooperate, to the extent it considers desirable**,** with effective regional groups which may be formed spontaneously, within, or outside, its own structure.

7. The Commission may, with the approval of the Executive Committee of IMU, co-opt as members of ICMI countries that are not members of IMU, on an individual basis.

8. 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. These Affiliated Study Groups are independent of ICMI, financially and otherwise, but they shall produce quadrennial reports to be presented at the General Assembly of ICMI. The Commission will cooperate, to the extent possible, with the work of the Study Groups, for example by regularly publishing information on their activities in the ICMI Bulletin.

9. The budget of the Commission shall be submitted to the Executive Committee of IMU and the General Assembly of IMU, for approval, at such times as may be determined by agreement between the Commission and the Executive Committee of IMU.

10. The Commission shall file an annual report of its activities with the Executive Committee of IMU, and shall file a quadrennial report at each regular meeting of the General Assembly of IMU.

11. At each regular meeting of the General Assembly of ICMI, the Commission shall file a quadrennial report of its financial situation and of its activities.

Procedures for the Election of the Executive Committee of ICMI

The rules for the election of the Executive Committee of ICMI are similar to those for the election of the Executive Committee of IMU with the same Nominating Committee.

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 Executive Committee of ICMI before proposing slates to the Nominating Committee.

No person can be a candidate for more than one office.

Notes from the Editor:

1-) About history

The reader interested in the evolution of the Terms of Reference of ICMI over the years will find various versions of these Terms in the following issues of the *ICMI Bulletin*:

- Terms adopted by the Executive Committee of IMU in 1960: *ICMI Bulletin* 5 (April 1975) pp. 5-6.
- Terms adopted by the General Assembly of IMU in 1982: *ICMI Bulletin* 13 (Feb. 1983) p. 5.
- Terms adopted by the General Assembly of IMU in 1986: *ICMI Bulletin* 47 (Dec. 1999) pp. 35-36.

2-) About the use of the term "country":

In the first Term of Reference of ICMI, one finds the statement that "The term 'country' is to be understood as described in the Statutes of IMU." For the interested reader, Statute 4 of the IMU reads:

> *The term "country" is to be understood as including diplomatic protectorates and any territory in which independent scientific activity in mathematics has been developed, and in general shall be construed as to secure the broadest and most effective participation of mathematicians in the scientific work of the Union.*

3-**) About the Procedures for the election of the Executive Committee:**

The rules for the election of the Executive Committee of ICMI are described as being "similar to those for the election of the Executive Committee of IMU with the same Nominating Committee". The IMU rules, which were updated in 1999, will be found below (taken from the *IMU Bulletin* No. 48, June 2002, p. 8). These amended rules were applied for the 2002 election of the ICMI Executive Committee appointed for the years 2003-2006.

1. Not less than a year before the meeting of the GA, the EC shall request proposals for the membership of the EC from the National Committees for Mathematics, to be considered before the spring EC meeting prior to the Assembly. The candidate's CV and a brief description of activities should accompany the suggestions, as should assurance of the candidate's willingness to serve if elected.

2. The EC shall then form its own slate. The slate should be mailed to the National Committees at least four months before the GA, together with background on the candidates, their fields and countries/geographic areas.

3. After the slate drawn by the EC is known, the National Committees can make further proposals of names specifically for the offices of President, Secretary, Vice-President, and Members-at-Large. These proposals shall reach the Secretary not less than two months before the GA. The same information as in (1) and (2) concerning the nominees, including their willingness to serve if elected, should be provided.

4. The Secretary will send to the National Committees a list of all names proposed, as well as candidates' CV's, before the GA. The National Committees are asked to cooperate in having their delegates to the GA fully informed.

5. On the first day of the meeting, the General Assembly shall appoint a Nominating Committee (NC) consisting of:
   (i) the President of IMU (chairman),
   (ii) all Past Presidents who are present (ex-officio),
   (iii) eight further delegates.

   Election to the NC shall be from names either proposed by the President or proposed and seconded from the floor, and shall be by show of hands unless the meeting decides otherwise.

6. The NC shall propose a slate drawn from the slate of the EC and the names in (1) and (3) and shall make it known to the meeting. No person shall be a candidate for more than one office.

7. Further nominations can be made from the floor after the slate of the NC has been declared, provided that they are drawn from names previously offered by the National Committees as in items (1) and (3) , signed by at least ten delegates, and convey the same information as in (2) and (3) above.

8. The General Assembly shall then elect the new President, Vice-President, Secretary, and Members-at-Large by written ballots from the EC and NC slates as well as the list of nominations from the floor (unless a candidate withdraws), but no others. A vote shall be invalid if more names are marked in any category than the number of places to be filled (i.e., one each for President and Secretary, two for Vice-Presidents and five for Members-at-Large). A candidate for President or Secretary may be elected only if unopposed or if he or she obtains a majority of the votes cast. If the first ballot is indecisive, there shall be a second ballot. In the ballots for the Vice-Presidents and Members-at-Large, the two or five candidates respectively who obtain the largest numbers of votes shall be elected. In the event of a tie, the President shall decide.

   Note: Statute (9) provides (inter alia) that: "each delegation shall be free to cast the votes to which it is entitled either as a unit or divided in such a manner as it may determine."

Bernard R. Hodgson
Secretary-General of ICMI
bhodgson@mat.ulaval.ca

A General Change in Nomenclature

Hyman Bass

As reported elsewhere in this issue of the *ICMI Bulletin*, the Executive Committee of the International Mathematical Union has approved, at its meting held in Paris in April 2002, new Terms of Reference for ICMI. Among these modifications is a change in nomenclature regarding one of the officers of the Executive Committee of the Commission: The position of "Secretary" is now designated by the term "Secretary-General". This note is intended to explain the rationale for this change, which may not be apparent.

This change of title aims, above all, to reflect and support the work and responsibilities of the position, for which the title aids in negotiations with other international bodies. But it can also be seen as a return to the historic origins of ICMI. During the first few decades of the Commission, dating from its inception in 1908 to the Second World War, the officers of the Executive Committee were designated as "President", "Vice-Presidents" and "Secretary-General". In point of fact, the Secretary-General of ICMI during all those years was Henri Fehr, from Switzerland. (The list of the members of the various ICMI Executive Committees can be found in the *ICMI Bulletin* No. 48, June 2000, pp. 46-51.)

When, in 1952, ICMI was reestablished as a Commission of the newly created International Mathematical Union, this position was given the title "Secretary", in parallel with the nomenclature of the IMU itself. In a certain way this can be seen as a historical accident, according to the account given by Olli Lehto, past Secretary of IMU, in his book *Mathematics Without Borders: A History of the International Mathematical Union* (Springer, 1998).

The foundation of a "new" IMU, after the Second World War, was triggered by an ad hoc committee under the leadership of the US mathematician Marshall H. Stone. Stone was responsible in particular for preparing a Draft of the Statutes and By-Laws for the future Union, where he used the expression "Secretary-General". Lehto reports as follows on why the title was finally changed to "Secretary":

> "The British suggested that 'Secretary-General' of the original text be changed to 'General Secretary'. To achieve a compromise pleasing to all, the word 'General' was dropped. That is why the Union has a Secretary." (p. 80)

Moving finally past this linguistic sensitivity, ICMI now again has a Secretary-General, as is the case for the vast majority of Scientific Unions who are members of ICSU.

Hyman Bass, President of ICMI
hybass@umich.edu

The ICMI Awards to Bear the Names of Two Eminent Scholars

Bernard R. Hodgson

The decision of the Executive Committee of the International Commission on Mathematical Instruction to establish two awards recognising exceptional contributions in mathematics education research was announced in the *ICMI Bulletin* No. 50, June 2001, p. 18. However at that time it was too soon to make public the hypotheses considered to name these awards, as the contacts needed to ensure the support of all interested parties had not yet been finalised.

The ICMI EC is now pleased to officially announce that the two ICMI awards in mathematics education research will be bear the names of two highly distinguished and eminent scholars, both of whom have exerted a major influence on the evolution of mathematics education and have played a major role in the life of ICMI: Hans Freudenthal and Felix Klein.

One of the ICMI awards is given for a major program of research on mathematics education during the past ten years and it is named after Hans Freudenthal (1905–1990). Born in Germany, Freudenthal moved in 1930 to Amsterdam, after having obtained his doctorate, where he became assistant to L.E.J. Brouwer. In 1946 he was appointed in Utrecht to a chair in pure and applied mathematics and the principles of mathematics. He made substantial contributions to topology, geometry and the theory of Lie groups, but his professional interests became gradually more centred about issues of mathematics education. He is the founder of the theoretical approach towards the learning and teaching of mathematics known as "Realistic Mathematics Education". Freudenthal launched in 1971 the IOWO, a research institute on mathematics education which, after his death, was renamed the *Freudenthal Institute*. Freudenthal served on the ICMI Executive Committee from 1963 to 1974, and was ICMI President from 1967 to 1970. He prompted the establishment of the ICME congresses, devoted solely to mathematics education — in contrast to mathematics education as a component inside the International Congresses of Mathematicians —, the first one having been organised at his initiative during his ICMI presidency (Lyon, France, 1969). He also launched in 1968, and for many years edited, the famous international journal *Educational Studies in Mathematics*, a standard reference in the field nowadays and a journal much closer to the on-going development in mathematics education research that ICMI official organ, *L'Enseignement Mathématique*.

The second ICMI award recognises lifelong achievement in mathematics education research. It is named after Felix Klein (1849–1925), one of the most important mathematicians of the late 19th and early 20th centuries. Klein's name is attached today to many major contributions to mathematics, especially in function theory and non-euclidean geometry. He is especially famous for his work on the connections between geometry and group theory, as expressed in the so-called *Erlanger Programm* (1872). Klein played a key role in having Göttingen recognised as a major research centre in mathematics and under his editorship the *Mathematische Annalen* became one of the most prestigious research journals in mathematics. He also directed the publication of the *Enzyklopädie des*

Mathematischen Wissenschaften. Slightly before the turn of the century Klein became interested in the teaching of mathematics at school level. He gave summer courses for teachers in which he intended to make accessible to secondary school teachers some of the most recent mathematical developments of his time. This eventually led him to promote the idea of presenting "elementary mathematics from an advanced standpoint", to use his own expression, with the aim in particular of providing teachers with a comprehensive view of basic mathematics. In 1908 Klein was appointed, at the Fourth International Congress of Mathematicians, as President of a committee with the mandate to constitute an International Commission to organise a comparative Study on the methods and plans of mathematics teaching in secondary schools. This International Commission eventually developed a much wider scope of interest and became the ICMI as we know it today, with Klein acting as its President until 1920.

Both the *Hans Freudenthal Medal* and the *Felix Klein Medal* will be given for the first time during the opening ceremony of the ICME-10 congress, to be held in Copenhagen in July 2004.

Bernard R. Hodgson
Secretary-General of ICMI
bhodgson@mat.ulaval.ca

The ICMI Awards — A Call for Proposals

Michèle Artigue

The Executive Committee of the International Commission on Mathematical Instruction has decided, at its annual meeting held in Japan in 2000, to create two awards in mathematics education research :

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

These awards will consist of a certificate and a medal, and they will be accompanied by a citation. They should have a character similar to that of a university honorary degree, and they shall be given in each odd numbered year. At each ICME, the medals and certificates of the awards given since the

previous ICME will be presented at the Opening Ceremony. Further, the awardees will be invited to present special lectures at the ICME.

The first recipients of the Freudenthal and Klein awards will be known by the end of the year 2003. These awards will be formally presented at the opening ceremony of ICME-10 in Copenhagen.

An Award Committee (AC) of six persons shall select the awardees. Members of the AC are appointed by the President of ICMI, after consultation with the Executive Committee and with other scholars in the field. The terms of appointment are for eight years and non-renewable, with three of the members being replaced each four years, at the time of the ICME's. One of the three continuing members shall then also be named as committee chair. To initiate the process, a committee of six has been appointed in 2002, three of them with eight-year terms, the other three with four-year terms. Exceptionally, the first chair of the Award Committee has been chosen among the current ICMI Executive Committee but, in the future, current members of the ICMI EC should not be selected for membership in the Award Committee.

Michèle Artigue, *professeur* at the Université de Paris 7 in France, and one of the Vice-Presidents of ICMI, has accepted the task of chairing the first Award Committee, with a term of four years. The active members of the AC, except for its chair, shall not be made known. Only at the time when the terms of committee members expire shall their names be made public.

The AC, once appointed, is completely autonomous. Its work and records are kept internal and confidential, except for the obvious process of soliciting advice and information from the professional community, which should be done by the committee chair. The committee has full authority to select the awardees. Its decision is final. Once made, that decision is to be reported, in confidence, to the ICMI-EC, via the President of ICMI.

The AC is open to suggestions as regards future awardees. All such suggestions, which have to be carefully supported, must be sent by ordinary mail to the chair of the Committee, by the end of June 2003.

Michèle Artigue, Chair of the ICMI Awards Committee
IREM, Université Paris 7
Case 7018, 2 place Jussieu,
75251 Paris Cedex 05 France
artigue@ufrp7.math.jussieu.fr

ICME-10, Copenhagen 2004 — An Update

Hans Christian Hansen

Progressing as planned

The planning of the next International Congress on Mathematical Education, ICME-10 in Copenhagen July 2004, is well in progress. The International Programme Committee, chaired by Mogens Niss, has found and decided on a structure for the scientific programme — combining the best from the ICME tradition with new elements. You may go directly to the website

http://www.ICME-10.dk/

for the first announcement and all the up to date information on the programme. Here you can also order the second announcement that will be ready by late (Danish) Summer 2003. And in fact we would like you to — in order to get a picture of the general interest at this stage.

About 25 persons are working in the Local Organizing Committee — chaired by Morten Blomhøj — with the actual planning of the congress. We are progressing well and will certainly be ready in time to welcome you all to the nice venue offered us by the Technical University of Denmark.

A third committee, the Nordic Contact Committee, has been established to involve all the Nordic countries in the planning. So we believe we have a powerful organisational structure behind this important congress.

If you want practical information, information on Copenhagen/venue, social events you'll find it all on the congress website.

Tradition and innovation

The main part of the scientific programme consists of best elements from former ICMEs, but the IPC has added a number of new ideas in the structure. So here are the main parts of the programme at ICME-10:

- 8 Plenary activities. Besides lectures this includes reports from some of Survey Teams that will give a survey of the state-of -the art with respect to a certain theme.
- Many regular lectures covering a wide spectrum on topics, themes and issues.
- 29 Topic Study Groups, each organized by prominent experts of the specific field. 8 of these are organized according to educational levels, 13 according to content related issues and the rest to overarching perspectives and meta-issues.
- 24 Discussion Groups with genuine interactive discussion and no oral presentations.
- A thematic afternoon with five parallel mini-conferences: 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.
- Workshops and Sharing Experiences Groups, ranging from new approaches to teaching and new math. topics to obstacles to innovation and PhD students sharing approaches.

- Posters — and time slots for presentations of these. The IPC is considering the possibility of grouping posters and schedule particular Round Table sessions for such groups.
- National presentations. At the present time presentations are confirmed from all the Nordic countries, Rumania and Russia.
- Presentations of papers. However not all the papers accepted by the organizers can be accommodated in the oral programme. So the idea of Presentation by Distribution, which was invented for ICME-9, will also be adopted for ICME-10

For detailed information go to www.ICME-10.dk.

Hans Christian Hansen, Denmark ICMI Representative
hch@dcn.auc.dk

Affiliated Study Groups Websites

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

HPM:	http://www.mathedu-jp.org/hpm/index.htm
PME:	http://igpme.org/
IOWME:	http://www.stanford.edu/~joboaler/iowme/index.html
WFNMC:	http://www.amt.canberra.edu.au/wfnmc.html

On ICSU Principle of Non-Discrimination

Bernard R. Hodgson

Through its mother organisation, the International Mathematical Union, ICMI belongs to the ICSU family, IMU being one of the scientific union members of the International Council for Science. It is often mentioned that as a consequence, ICMI is to abide to the ICSU statutes, one of which establishes the principle of non-discrimination.

It may be of interest to those belonging to ICMI circles to have more precise information on how this principle is actually presented in ICSU documents. You will find below a statement issued by ICSU pertaining to non-discrimination as well as the text of some of ICSU Statutes, especially Statute 5 affirming the principle of universality of science which entails freedom in the conduct of science. This information appears in the *ICSU Year Book 2002*, pp. 7-8 and 21-23. It is also available on the ICSU website

http://www.icsu.org/

ICSU Statement on Freedom in the Conduct of Science

Approved by the Executive Board and General Committee of ICSU, Lisbon, October 1989. Revised by the Executive Board, Rabat, October 1994. Further revised by the General Committee at its meeting in Chiang Mai, Thailand, October 1995.

The International Council for Science (ICSU) is the oldest existing non-governmental body committed to international scientific cooperation for the benefit of humanity. Created in 1931 when its predecessor, the International Research Council, was dissolved because of discrimination against scientists from certain countries, ICSU has consistently and vigorously pursued a policy of non-discrimination. ICSU maintains that discrimination hinders the free communication and exchange of ideas and information among scientists and thereby impedes scientific progress, which is dependent on their collective efforts.

ICSU's Members are 26 International Scientific Unions and 98 national academies of science or research councils. Together these organizations set up international mechanisms to carry out scientific programmes of an interdisciplinary nature which are concerned with issues such as protection of the environment, research in Antarctic regions or space research. An important factor in the success of these activities is that they are carried out under the aegis of such a respected independent and international scientific body as ICSU. Each of the International Scientific Unions, the National Scientific members, ICSU interdisciplinary bodies, and Scientific Associates — the organizations

comprising the ICSU family — strictly adheres to the basic principles of the Council's Statutes when involved in activities carried out within the scope of ICSU's concern.

One of the basic principles in these Statutes is that of the universality of science (see Statute 5), which affirms the right and freedom of scientists to associate in international scientific activity without regard to such factors as citizenship, religion, creed, political stance, ethnic origin, race, colour, language, age or sex. Such rights are embodied in a variety of articles in the International Bill of Human Rights (*).

ICSU seeks to protect and promote awareness of the rights and fundamental freedoms of scientists in their scientific pursuits. ICSU has a well-established non-political tradition which is central to its character and operations, and it does not permit any of its activities to be disturbed by statements or actions of a political nature.

As the intrinsic nature of science is universal, its success depends on cooperation, interaction and exchange, often beyond national boundaries. Therefore, ICSU strongly supports the principle that scientists must have free access to each other and to scientific data and information. It is only through such access that international scientific cooperation flourishes and science thus progresses.

On these grounds, ICSU works to resolve such cases as do, nevertheless, arise from time to time when such open access is denied or restricted and in cases primarily involving members of the ICSU family. In most cases, private consultations involving members of the ICSU family have been successful. Where private consultations have failed, ICSU has publicized acts of discrimination against scientists and taken steps to prevent their repetition, including, if necessary, such measures as encouraging members of the ICSU family to decline invitations to hold or attend meetings in the country concerned.

On the basis of its firm and unwavering commitment to the principle of the universality of science, ICSU reaffirms its opposition to any actions which weaken or undermine this principle.

(*) *The International Bill of Human Rights includes three documents: the Universal Declaration of Human Rights (1948), the International Covenant on Civil and Political Rights, and the International Covenant on Economic, Social and Cultural Rights (1966).*

Excerpts from ICSU Statutes

I. Denomination and Domicile

1. ICSU: The International Council for Science, hereinafter called "ICSU", is an international non-governmental and non-profit making scientific organization.

2. The International Council of Scientific Unions (ICSU) was created, following the dissolution of the International Research Council, in Brussels in 1931 where it had its first legal domicile. The name of the Council was changed to ICSU: The International Council for Science at an Extraordinary General Assembly in 1998, but the acronym ICSU has been maintained. The present legal domicile of ICSU is in Paris, France, where its Secretariat is located.

II. Objectives

3. The principal objectives of ICSU are:
   a) to encourage and promote international scientific and technological activity for the benefit and well-being of humanity;
   b) to facilitate coordination of the international scientific activities of its Scientific Union Members (see Statute 7) and of its National (*) Scientific Members (see Statute 8);
   c) to stimulate, design, coordinate or participate in the implementation of international interdisciplinary scientific programmes;
   d) to act as a consultative body on scientific issues that have an international dimension;
   e) to encourage the strengthening of human and physical scientific resources worldwide with particular emphasis on the developing world;
   f) to promote the public understanding of science;
   g) to engage in any related activities.

(*) *The term "National" as used in these Statutes and Rules of Procedure has no connotation other than denoting a Member admitted under the provisions of Statute 8.*

4. In order to further the attainment of these objectives ICSU may, whenever appropriate:
   a) enter, through the intermediary of the national adhering organizations, into relations with the governments of their respective countries in order to promote scientific research in these countries;
   b cooperate with the United Nations and its agencies, and with other international intergovernmental or non-governmental organizations;
   c) provide, through suitable channels, information to interested parties and the public at large about progress in science and technology and its impact on society;
   d) undertake actions to strengthen the well-being and effectiveness of science and scientists;
   e) establish and promote programmes either within the ICSU family or in partnership with others.

5. In pursuing its objectives in respect of the rights and responsibilities of scientist, ICSU, as an international non-governmental body, shall observe and actively uphold the principle of the universality of science. This principle entails freedom of association and expression, access to data and information, and freedom of communication and movement in connection with international scientific activities, without any discrimination on the basis of such factors as citizenship, religion, creed, political stance, ethnic origin, race, colour, language, age or sex. ICSU shall recognize and respect the independence of the internal science policies of its National Scientific Members. ICSU shall not permit any of its activities to be disturbed by statements or actions of a political nature.

III. Membership

6. Each Member has the obligation to support the objectives of ICSU, uphold the principle of the universality of science, and meet its financial obligations as appropriate. Members shall normally adhere to ICSU in one of two categories:
   a) Scientific Union Members, or
   b) National Scientific Members.

7. A scientific Union Member shall be an international (*) non-governmental organization devoted to the promotion of activities in a particular area of science and shall have been in existence for at least 6 years.

(*) *In these Statutes and Rules of Procedure, international bodies are taken to mean those bodies to which appropriate organizations in all countries of the world are eligible to adhere.*

8. A National Scientific Member shall be a scientific academy, research council, scientific institution or association of such institutions. Institutions effectively representing the range of scientific activities in a definite territory may be accepted as National Scientific Members, provided they can be listed under a name that will avoid any misunderstanding about the territory represented, and have been in existence in some form for at least 4 years.

9. The scientists of more than one nation may form a scientific body (academy, research council, etc.) for application as a National Scientific Member. No organization of scientists may adhere through more than one national membership.

10. Exceptionally, any other grouping of institutions acceptable to ICSU may be admitted to membership in category a) or b) on a case by case basis.

Bernard R. Hodgson
Secretary-General of ICMI
bhodgson@mat.ulaval.ca

The Fourteenth ICMI Study on Applications and Modelling in Mathematics Education

Discussion Document

***(Note of the Editor:** Because of the delay in the publication of this issue of the ICMI Bulletin, the Discussion Document for this Study was printed separately and distributed to the mailing list of the ICMI Bulletin early in 2003, so to accommodate the deadline of June 15, 2003, for the submission of contributions.)*

This paper is the *Discussion Document* for a forthcoming ICMI Study on *Applications and Modelling in Mathematics Education*. As will be well known, from time to time ICMI (the International Commission on Mathematical Instruction) mounts specific studies in order to investigate, both in depth and in detail, particular fields of interest in mathematics education. The purpose of this Discussion Document is to raise some important issues related to the theory and practice of teaching and learning mathematical modelling and applications, and in particular to stimulate reactions and contributions to these issues and to the topic of applications and modelling as a whole (see chapter **4**). Based on these reactions and contributions, a limited number (approximately 75) of participants will be invited to a conference (the *Study Conference*), which is to take place in February 2004 in Dortmund (Germany). Finally, using the contributions to this conference, a book will be produced (the *Study Volume*) whose content will reflect the state-of-the-art in the topic of applications and modelling in mathematics education and suggest directions for future developments in research and practice.

The authors of this Discussion Document are the members of the *International Programme Committee* for this ICMI Study. The committee consists of 14 people from 12 countries, listed at the end of chapter **4**. The structure of the Document is as follows. In chapter **1**, we identify some reasons why it seems appropriate to hold a study on applications and modelling. Chapter **2** sets a conceptual framework for the theme of this Study, and chapter **3** contains a selection of important issues, challenges and questions related to this theme. In chapter **4** we describe possible modes and ways of reacting to the Discussion Document, and in the final chapter **5** we provide a short bibliography relevant to the theme of this Study.

1. Rationale for the Study

Among the themes that have been central to mathematics education during the last 30 years are relations between mathematics and the real world (or better, according to Pollak, 1979, the "rest of the world"). In section 2.1., we shall deal with terminology in more detail but, for the moment, we use the

term "*applications and modelling*" to denote any relations whatsoever between the real world and mathematics.

That applications and modelling has been an important theme in mathematics education can be seen from the wealth of *literature* on the topic, as well as from material generated from a multitude of national and international *conferences*. Let us mention, in particular, firstly the ICMEs (the *International Congresses on Mathematical Education*) with their regular working or topic groups and lectures on applications and modelling, and secondly the series of ICTMAs (the *International Conferences on the Teaching of Mathematical Modelling and Applications*) which have been held biennially since 1983. Their Proceedings and Survey Lectures (see the bibliography in chapter **5**) indicate the state-of-the-art at the relevant time and contain many examples, studies, conceptual contributions and resources addressing the relation between the real world and mathematics, for all levels and all institutions of the educational system. In *curricula and textbooks* we find many more relations to real world phenomena and problems than, say, ten or twenty years ago. While applications and modelling also play a more important role in most countries' *classrooms* than in the past, there still exists a substantial gap between the ideals of educational debate and innovative curricula, on the one hand, and everyday teaching practice on the other hand. In particular, genuine modelling activities are still rather rare in mathematics lessons.

Altogether, during the last few decades there has been a lot of work in mathematics education which centres on applications and modelling. Many activities have had a primary focus on *practice*, e.g. construction and trial of mathematical modelling examples for teaching and examinations, writing of application-oriented textbooks, implementation of applications and modelling in existing curricula or development of innovative, modelling-oriented curricula. Several of these activities contain *research* components as well if (as according to Niss, 2001) we consider research as "the posing of genuine, non-rhetorical questions … to which no satisfactory answers are known as yet … and … the undertaking of non-trivial investigations of a systematic, reflective and 'methodologically conscious' nature" in order to obtain answers to those questions. In this sense, there are specific applications and modelling research activities, such as: clarification of relevant concepts; investigation of competencies and identification of difficulties and strategies activated by students when dealing with application problems; observation and analysis of teaching, and study of learning and communication processes in modelling-oriented lessons; evaluation of alternative approaches used to assess performance in applications and modelling. In particular during the last few years the number of genuine research contributions has increased as can be seen in recent ICTMA Proceedings.

That applications and modelling has been – and still is – a central theme in mathematics education is not surprising at all. Nearly all questions and problems in mathematics education, that is questions and problems concerning human learning and teaching of mathematics, affect and are affected by relations between mathematics and the real world. For instance, one essential answer (of course not the only one) to the question as to *why* all human beings ought to learn mathematics is that it provides a means for understanding the world around us, for coping with everyday problems, or for preparing for future professions. When dealing with the question of *how* individuals acquire mathematical knowledge, we cannot get past the role of relations to reality, especially the relevance of situated learning (including the problem of the dependence on specific contexts). The general question as to what, after all, "*mathematics*" is, as a part of our culture and as a social phenomenon, of how mathematics has

emerged and developed, points also to "applications" of mathematics in other disciplines, in nature and society. Today mathematical models and modelling have invaded a great variety of disciplines, leaving only a few fields where mathematical models do not play some role. This has been substantially supported and accelerated by the availability of powerful *electronic tools*, such as calculators and computers with their enormous communication capabilities.

In the current OECD (Organisation for Economic Co-operation and Development) Study PISA (Programme for International Student Assessment), relations between the real world and mathematics are particularly topical. What is being tested in PISA is "*mathematical literacy*", that is (see the PISA mathematics framework in OECD, 1999) "an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgements and to engage in mathematics, in ways that meet the needs of that individual's life as a constructive, concerned, and reflective citizen." That means the emphasis in PISA is "on mathematical knowledge put into functional use in a multitude of different situations and contexts". Therefore, mathematising real situations as well as interpreting, reflecting and validating mathematical results in "reality" are essential processes when solving literacy-oriented problems. Following the 2001 publication of results of the first PISA cycle (from 2000), an intense discussion has started, in several countries, about aims and design of mathematics instruction in schools, and especially about the role of mathematical modelling, applications of mathematics and relations to the real world.

In mounting this Study on "Applications and Modelling in Mathematics Education", ICMI takes into account the above-mentioned reasons for the importance of relations between mathematics and the real world as well as the contemporary state of the educational debate, of research and development in this field. This does not, of course, mean that we already know all answers to the essential questions in this area and that it is merely a matter of putting together these answers in the Study. Rather, it is an important aim of the Study to identify shortcomings and to stimulate further research and development activities. Nevertheless, it is time to map out the state-of-the-art in theory and practice, in research and development of applications and modelling in mathematics education, and to document these in this Study.

Documenting the state-of-the-art in a field and identifying deficiencies and needed research requires a *structuring framework*. This is particularly important in an area which is as complex and difficult to survey as the teaching and learning of mathematical modelling and applications. As we have seen, this topic not only deals with most of the essential aspects of the teaching and learning of mathematics at large, but it also touches upon a wide variety of versions of the real world outside mathematics that one seeks to model. Perceived in that way, the topic of applications and modelling may appear to encompass all of mathematics education plus a lot more. It is evident, therefore, that we have to find a way to conceptualise the topic so as to reduce complexity to a meaningful and tractable level. In the following chapter **2** we offer our conceptualisation of the topic: in section 2.1 we clarify some of the basic concepts and notions of the field, and in section 2.2 we suggest a structure for the field. This serves as a basis for identifying important challenges and questions in chapter **3**, the core of this Discussion Document.

2. Framework for the Study

2.1. Concepts and Notions

Here we shall give, in a rather pragmatic way, some working definitions that will be useful for the following sections. This is not the place for a deeper epistemological analysis of these concepts. Rather, this can be done in the Study itself.

By *real world* we mean everything that has to do with nature, society or culture, including everyday life as well as school and university subjects or scientific and scholarly disciplines different from mathematics. For a description of the complex *interplay between the real world and mathematics* we use one of the well-known simple models developed for that purpose (see Blum/Niss, 1991, and the literature quoted there). The starting point is normally a certain *situation* in the real world. Simplifying it, structuring it and making it more precise – according to the problem solver's knowledge and interests – leads to the formulation of a *problem* and to a *real model* of the situation. Here we use the term problem in a broad sense, encompassing not only practical problems but also problems of a more intellectual nature aiming at describing, explaining, understanding or even designing parts of the world. If appropriate, real data are collected in order to provide more information on the situation at one's disposal. If possible and adequate, this real model – still a part of the real world in our sense – is *mathematised*, that is the objects, data, relations and conditions involved in it are translated into mathematics, resulting in a *mathematical model* of the original situation. Now mathematical methods come into play, and are used to derive *mathematical results*. These have to be re-translated into the real world, which is *interprete*d in relation to the original situation. At the same time the problem solver *validates* the model by checking whether the problem solution obtained by interpreting the mathematical results is appropriate and reasonable for his or her purposes. If need be (and more often than not this is the case in "really real" problem solving processes), the whole process has to be repeated with a modified or a totally different model. At the end, the obtained solution of the original real world problem is stated and communicated.

The process leading from a problem situation to a mathematical model is called *mathematical modelling*. However, it has become common to use that notion also for the entire process consisting of structuring, mathematising, working mathematically and interpreting/validating (perhaps several times round the loop) as just described.

Sometimes the given problem situation is already pre-structured or is nothing more than a "dressing up" of a purely mathematical problem in the words of a segment of the real world. This is often the case with classical school *word problems*. In this case mathematising means merely "undressing" the problem, and the modelling process only consists of this undressing, the use of mathematics and a simple interpretation.

Using mathematics to solve real world problems is often called *applying* mathematics, and a real world situation, which can be tackled by means of mathematics, is called an *application* of mathematics. Sometimes the notion of "applying" is used for any kind of linking of the real world and mathematics.

During the last decade the term "*applications and modelling*" has been increasingly used to denote all kinds of relationships whatsoever between the real world and mathematics. The term "modelling", on the one hand, focuses on the direction reality $\rightarrow$ mathematics and, on the other hand and more generally, emphasises the processes involved. The term "application", on the one hand, focuses on the opposite direction mathematics $\rightarrow$ reality and, on the other hand and more generally, emphasises the objects involved — in particular those parts of the real world which are accessible to a mathematical treatment and to which corresponding mathematical models exist. In this comprehensive sense we understand the term "applications and modelling" as used in the title of this Study.

2.2. Structure of the Topic Applications and Modelling in Mathematics Education

Let us begin by addressing what one may refer to as "the reality" of applications and modelling in mathematical education. We think of this reality as being constituted essentially by two dimensions: The significant "*domains*" within which mathematical applications and modelling are manifested, on the one hand, and the educational *levels* within which applications and modelling may be taught and learnt, on the other hand.

More specifically, in the first dimension we discern three different *domains*, each forming some sort of a continuum. The first domain consists of the very *notions of applications and modelling*, i.e. what we mean by an application of mathematics, and by mathematical modelling; what the most important components of applications and modelling are, in terms of concepts and processes; what the epistemological characteristics of applications and modelling are, vis-à-vis mathematics as a discipline and vis-à-vis other disciplines and areas of practice; who uses mathematics, and for what purposes, and with what sorts of outcomes; what is modelling competency, etc. The second domain is that of the *classroom*. We use this term as a broad indicator of the location of teaching and learning activities pertaining to applications and modelling. Of course, this includes the classroom in a literal sense, but it also includes the student doing his or her homework, individually or in groups, and the teacher's planning of teaching activities or looking at students' products, written or other, and so forth. The third and final domain is the *system* domain. The word system, here, refers to the whole institutional, political, structural, organisational, administrative, financial, social, and physical environment that exerts an influence on the teaching and learning of applications and modelling. It appears that we have chosen not to consider individuals, in particular students and teachers, as constituting separate domains. This does not imply, however, that individuals are not part of our conceptualisation. The individual student is a member of the classroom, as defined above, when engaging in learning activities in applications and modelling. The individual teacher can also be regarded as a member of the applications and modelling classroom, namely when he or she is engaged in teaching, supervising, advising or assessing students. From another perspective, however, the teacher is also a member of the system. This happens when he or she speaks or acts on behalf of the system (typically in the form of his or her institution) in matters concerning selection, placement, and examination of the individual student, or invokes rules, procedures or other boundary conditions in decisions on, say, curricular matters.

The *second* dimension is constituted by the educational *levels* at which applications and modelling are taught and learnt. We have decided to adopt a relatively crude division of levels, both in order to avoid excessive detail in the discussion and in order to obtain a division, which is compatible with the state of affairs in most, maybe all, countries in the world. The levels adopted are the *primary*, the *secondary*, the *tertiary* levels, and the level of *teacher education*. Here we do not primarily refer to age levels but to intrinsic levels of the learners' knowledge and competencies. It goes without saying that a much more fine-grained division might have been an alternative. Nevertheless, at least the present one does allow for the consideration of applications and modelling at all educational levels, albeit possibly within larger clusters of rather diverse kinds of education.

We might, of course, design a more subtle structure and regard, for instance, the system as an independent dimension. However, for our purposes it is quite appropriate to represent the "*reality*" of applications and modelling in mathematics education by the Cartesian product of those two dimensions, the domains and the levels. If we do so then a major point in this framework is to identify and consider a number of *crucial issues* concerning that "reality space". An issue addresses a segment of reality, which can be represented as a certain subset of the reality space. That subset consists of those objects, phenomena or situations - drawn from combinations of applications and modelling domains and educational levels - that the issue concerns. To illustrate the point, let us give but one *example* of such an issue:

Issue 0:
One of the underlying reasons for attributing a prominent position to applications and modelling in the teaching and learning of mathematics is that it is assumed desirable for students to be able to engage, outside of the mathematics classroom, in applications and modelling concerning areas and contexts that are new to them. In other words, it is assumed that applications and modelling competency developed in and for some types of areas and contexts can be transferred to other such types having different properties and characteristics. However, many research studies suggest that for some categories of students this transfer is rather limited in scope and range.

To what extent is applications and modelling competency transferable across areas and contexts? What teaching/learning experiences are needed or suitable to foster such transferability?

As it stands here, this issue concerns the classroom domain and (at least) the primary, secondary, and tertiary levels. This means that the issue addresses the "rectangle" constituted by the entire classroom domain and the first three educational levels. If for some reason the focus were to be limited to address, say, the secondary level, then of course the rectangle would be reduced accordingly.

In this Discussion Document, a number of issues have been identified as particularly significant to the present study. Readers are invited to comment on these issues or to suggest further issues to be considered in the Study. Each of the issues addresses its own segment of reality, but of course those segments may intersect. The reality space and the issues addressing it may be mapped as in figure 1:

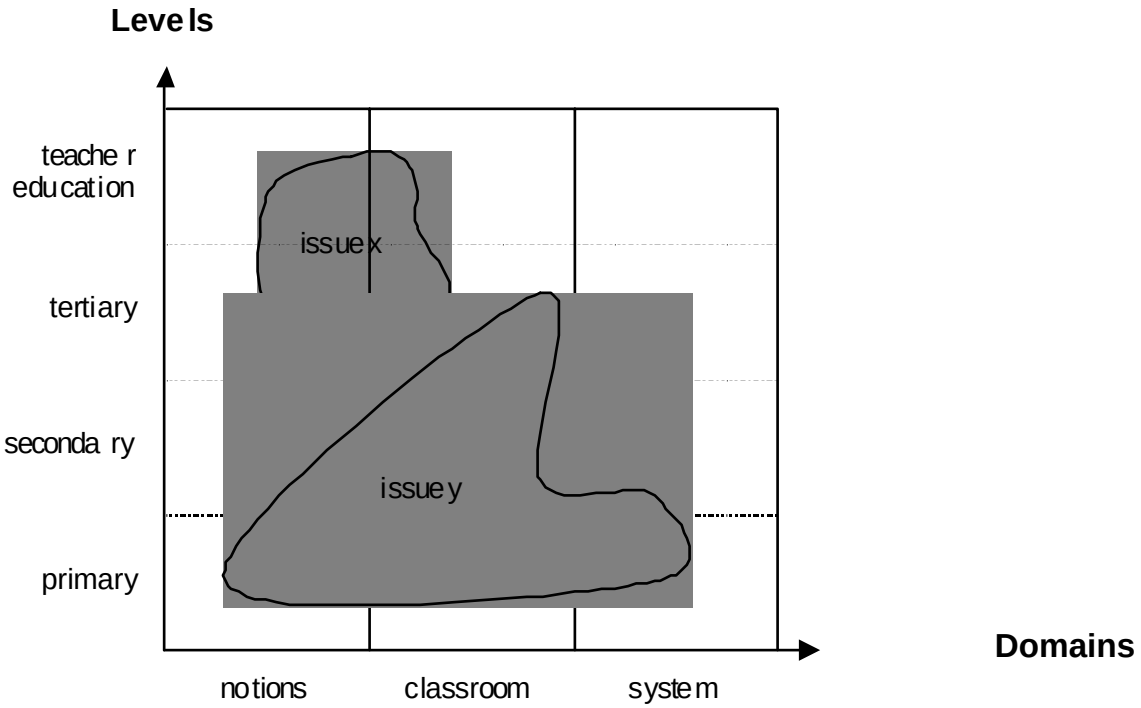

Figure 1: The "reality" of applications and modelling

The reader may have noticed that the formulation of the issue given above as an example consists of two parts. Firstly, a background part outlining a challenge, i.e. a dilemma or a problem which may be of a political, practical, or intellectual nature. For short let us call this part the *challenge* part of the issue. The second part consists of particular *questions* that serve the purpose of pinpointing some crucial aspects of the challenge that deserve to be dealt with in the Study. When the Study has been completed, a substantial portion of it will consist of analyses of a number of significant issues.

From the point of view of this Study, an issue concerning applications and modelling in mathematics education may be viewed and approached — depending on its nature — from a variety of different *perspectives*, each indicating the category of answers sought. The most basic of these perspectives is that of *doing*, i.e. actual teaching and learning practice as enacted and carried out in the classroom (in the sense defined above). Here, the focus is on what does (or should) take place in existing everyday classrooms at given educational levels. Another perspective is the *development and design* of curricula, teaching and learning materials or activities, and so forth. Here, the focus is on establishing short or long term plans and conditions for future teaching and learning. A third perspective is that of *research*, which focuses on the generation of answers to research questions as yet unanswered, while a fourth and final perspective is that of *policy* for which the focus is on the instruments, strategies and policies that are or ought to be adopted in order to place matters pertaining to applications and modelling on the agenda of practice or research in some desired way. Accordingly, a given issue may be addressed from one or some (perhaps all) of these four perspectives. To avoid a possible misinterpretation let us stress that the order in which we have presented these four perspectives does

not imply a hierarchy. It appears that each of these perspectives can be perceived as representing a particular professional role: The role of *teacher* or *student*, the role of *curriculum developer*, the role of *researcher*, and the role of *lobbyist* or *decision maker*. An individual can assume all of these roles, but usually not at the same time.

In the above-mentioned example, the issue may be approached from the perspective of 'doing', provided the interest and emphasis is on the actual construction of learning environments and the carrying through of specific teaching activities meant to underpin transferability of application and modelling competencies cultivated within certain areas and contexts to other such areas or contexts. The 'development and design' perspective is adopted if the emphasis is on finding or devising ways to orchestrate teaching and learning activities that are hoped to generate improved transferability. If, on the other hand, the emphasis is on getting to know and understand the nature and extent of transferability of such competencies between areas and contexts, or the effect of an implemented design, then the 'research' perspective is being invoked. Finally, the 'policy' perspective is on the agenda if the focus is on pleading or lobbying for, say, making room and time in the curriculum for activities that are seen as necessary or desirable for allowing students to gain multi-faceted and rich first-hand experiences with a large variety of applications and modelling activities drawn from different areas, contexts, and situations.

We may depict, metaphorically, the different perspectives by a quadri-focal looking glass, in which each of the four segments represents a characteristic focus and a corresponding focal length, both defined by the perspective; see figure 2:

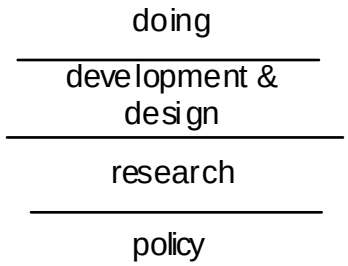

Figure 2: Perspectives on "reality"

So far, we have described the nature of the reality and the issues which are going to be considered in this ICMI Study, and the perspectives through which they can be addressed. One final component in

our attempt to structure the Study remains to be identified: the *recording* of the deliberations and investigations that are going to be conducted in the Study. This Study will be conducted by employing the four perspectives to look at the reality and the issues, and the outcomes of analysing the reality and the issues. Reflecting upon these from various perspectives will provide the substance for what will be recorded in the resulting ICMI Study Volume. Accordingly, that Volume will consist of sections in which the "reality" is described in detail, together with the issues eventually identified, sections in which the different segments of the looking glass are polished, and sections in which conclusions concerning the issues raised and dealt with by means of the four perspectives are presented and discussed.

3. Examples of important issues

In this chapter a number of selected *issues* — consisting of *challenges* and *questions* — are raised. Although certain inherent features have grouped them, there is much overlap between them and different groupings are certainly possible. They are intended as a guide to the kinds of issues that the present Study intends to address. Readers are invited to come up with additional relevant issues.

3.1. Epistemology

Issue 1:
There are a number of different elements and characterisations of modelling and applications; some of these are posing and solving open-ended questions, creating, refining and validating models, mathematising situations, designing and conducting simulations, solving word problems and engaging in applied problem solving. All of these link the field of mathematics and the world. If the goal of knowledge is to assist us to ensure the sustainability of health, education and environmental well-being and improve its quality, then individuals must engage in applications and modelling to do so.

What is the description/representation of the components within applications and modelling relevant to this issue? How is the relationship between applications and modelling and mathematics including its domains, concepts, representations, skills, methods and forms of evidence best described? What is the relationship between applications and modelling and the world we live in?

Examples of specific questions that could be addressed here are:
- What are the process components of modelling? What is meant by or involved in each?
- How does our knowledge of applications and modelling accumulate, evolve and change over time?
- What parts of mathematics, if any, are less likely to be represented in applications and modelling?
- What parts of applications and modelling, if any, are less likely to be represented in mathematics?
- What is the meaning and role of abstraction, formalisation and generalisation in applications and modelling?
- What is the meaning and role of proof and proving in applications and modelling? Are there common features of proving and modelling?
- What are the various meanings of "authenticity" in modelling?

– How much extra-mathematical context must be familiar and understood to undertake applications and modelling?
– What is generalisability and transfer when working across contexts?

3.2. Application Problems

There exists a wealth of applications and modelling problems and materials for use in mathematics classrooms at various educational levels. These materials range from mere "dressed up" mathematical problems to "really real", authentic problem situations.

Issue 2:
An important aspect in the research and practices of applications and modelling is the notion and role of authenticity of the problems and situations dealt with in applications and modelling activities.

What does research have to tell us about the significance of authenticity to students' acquisition and development of modelling competency?

Examples of specific questions:
– What authentic applications and modelling materials are available worldwide?
– Taking account of teaching objectives and students' personal situations (experience, competence), how can teachers set up authentic applications and modelling tasks?
– How does the authenticity of problems and materials affect on students' ability to transfer acquired knowledge and competencies to other contexts and situations?

3.3. Modelling Abilities and Competencies

With the teaching and learning of mathematical modelling and applications, a great variety of goals and expectations are combined.

Issue 3a:
One of the most important goals is for students to acquire modelling ability and competency.

How can modelling ability and modelling competency be characterised, and how can it be developed over time?

Examples of specific questions:
– Are modelling ability and modelling competency different concepts?
– Can specific subskills and subcompetencies of "modelling competency" be identified?
– How can modelling ability be distinguished from general problem solving abilities?
– Are there identifiable stages in the development of modelling ability?
– What are the characteristic differences between expert modellers and novice modellers? What are characteristic features of the activity of students who have little experience of modelling?
– What is the role of pure mathematics in developing modelling ability?

– What are common features, and what are differences between students' individual ability and interactive ability in applications and modelling?

An especially important problem is the context dependence of acquired competencies. This holds for modelling competency as well. See **Issue 0** in section 2.2!

The development of applications and modelling abilities and competencies is of particular relevance for teachers.

Issue 3b:
It appears rare that mathematics teacher education programmes include orientations to modelling, and the use of the modelling process in mathematics courses.

How can modelling in teacher pre-service and in-service education courses be promoted?

Examples of specific questions:
– What is essential in a teacher education programme to ensure that prospective teachers will acquire modelling competencies and be able to teach applications and modelling in their professional future?
– Considering both the limited mathematics background of primary school student teachers and the limited time available for mathematics in their education, how can they experience real, non-trivial modelling situations?
– Which training strategies can help teachers develop security with respect to using applications and modelling in their teaching?

3.4. Beliefs, Attitudes, and Emotions

Beliefs, attitudes and emotions play important roles in the development of critical and creative senses in mathematics.

Issue 4:
Modelling aims, among other things, at providing students with a better apprehension of mathematical concepts, teaching them to formulate and to solve specific situation-problems, awaking their critical and creative senses, and shaping their attitude towards mathematics and their picture of it.

To what extent does applications and modelling have the potential to provide an environment to support both students and teachers in their development of appropriate beliefs about and attitudes towards mathematics?

Examples of specific questions:
- Taking into account available research on the role of beliefs, attitudes and emotions in learning applications and modelling, what are the implications of this research for changing teaching practice and classroom cultures with respect to applications and modelling?
- Can modelling effectively contribute towards promoting views of mathematics that extend beyond transmissive techniques to its role as a tool for structuring other areas of knowledge?
- What strategies are feasible for in-service teacher education that will address the fear experienced by some teachers when faced with applications and modelling?

3.5. Curriculum and Goals

Applications and modelling can make fundamental contributions to the development of students' competencies. This is why it ought to be present in all mathematics curricula.

Issue 5a:
Serious applications and modelling activities are always time consuming because attention has to be paid to several crucial phases of the modelling process including work on extra-mathematical matters. This implies that applications and modelling components of general mathematical curricula (at whichever level) will have to "compete" with other components of the mathematics curriculum, in particular work on pure mathematics.

What would be an appropriate balance – in terms of attention, time and effort – between applications and modelling activities and other mathematical activities in mathematics classrooms at different educational levels?

Examples of specific questions:
- What is the actual role of applications and modelling in curricula in different countries?
- Is it possible — or desirable — to identify a core curriculum in applications and modelling within the general mathematical curriculum?
- Which applications, models and modelling processes should be included in the curriculum? Does the answer depends on each teacher or should there be some minimal indications in national and state curricula?
- Is it beneficial to generate specific courses or programs on applications and modelling or is it better to mix them in the standard mathematical courses?
- Is it possible to treat applications and modelling in the curricula as an interdisciplinary activity?
- When applications and modelling are included at different places in mathematics curricula, how can it be guaranteed that basic modelling skills and competencies are acquired systematically and coherently?

The university level represents a particularly problematic case:

Issue 5b:
Although there are major differences between different places and countries, university graduates in mathematics (even the most specialised and advanced ones) embark on a large variety of different professional careers, many of which will have links to matters pertaining to applications and modelling. It can be argued that even future research mathematicians are likely to come in touch with applications and modelling in some way or another, perhaps because their research activities will be informed by application problems or because they will be teaching students with application careers in front of them.

Should a plea be made for all university graduates in mathematics to acquire some applications and modelling experiences as part of their studies? If so, what kinds of experiences should they be?

Concerning general education at the school level, some special questions arise.

Issue 5c:
Mathematics accounts for a large proportion of time in school. This is only justified if mathematics can contribute to general education for life after school.

How and to what extent can applications and modelling contribute to building up fundamental competencies and to enriching a student's general education?

Examples of specific questions:
- What meanings can be given to "general education", and what is the role of mathematical modelling therein? Is applications and modelling really an indispensable part of "general education" for students?
- What pictures do teachers have in their mind about the contribution of mathematics – and in particular of mathematical modelling – to general education, and how can these be influenced?
- What is a suitable balance within general education of the following emphases: to create one's own models of real situations and problems, or to make judgements about models made by others?

3.6. Modelling Pedagogy

The pedagogy of applications and modelling intersects the pedagogy of pure mathematics in a multitude of ways and requires at the same time a variety of practices that are not part of the traditional mathematics classroom.

Issue 6:
While examples of successful applications and modelling initiatives have been documented in a variety of countries, and contexts, the extent of such programmes remains less than desired. Furthermore approaches to teaching applications and modelling vary from the use of traditional methods and course structures, to those that include a variety of innovative teaching practices including an emphasis on group activity.

What are appropriate pedagogical principles and strategies for the development of applications and modelling courses and their teaching? Are there different principles and strategies for different educational levels?

Examples of specific questions:
- What research evidence is available to inform and support the pedagogical design and implementation of teaching strategies for courses with an applications and modelling focus?
- What are the areas of greatest need in supporting the design and implementation of courses with an applications and modelling focus?
- To what extent do teaching practices within applications and modelling courses draw on general theories of human development and/or learning?
- What criteria are most helpful in selecting methods and approaches suggested by such theories?
- What obstacles appear to inhibit changes in classroom culture e.g. the introduction of interactive group work in applications and modelling?
- What criteria can be used to choose (e.g. between individual and group activity) the most desirable option at a particular point within an applications and modelling teaching segment?
- What documentation of successful group learning practices exists?

3.7. Sustained Implementation

To change an educational system is a major challenge as it involves and impacts upon many different parties, including politicians, curriculum developers, teachers, teacher educators, and mathematics faculty members at the post secondary level. Implementing new mathematical modelling curricula involves specific factors, such as in-service teacher training, technological requirements, etc. Sustaining this implementation requires changes in pre-service education, and more general agreement between mathematics faculty members at the post secondary level.

Issue 7:
With the increasing interest in and argument for mathematical modelling both inside and outside the mathematical community, there is a need to ensure that mathematical modelling is implemented in a sustained fashion at all levels of mathematics education.

In spite of a variety of existing materials, textbooks, etc., and of many arguments for the inclusion of modelling in mathematics education, why is it that the actual role of applications and mathematical modelling in everyday teaching practice is still rather marginal, for all levels of education? How can this trend be reversed to ensure that applications and mathematical modelling is integrated and preserved at all levels of mathematics education?

Examples of specific questions:
- What are the major impediments and obstacles that have existed to prevent the introduction of applications and mathematical modelling, and how can these be changed?
- What documented evidence of success in overcoming impediments to the introduction of applications and modelling courses exist?

– What are the requirements for developing a mathematical modelling environment in traditional courses at school or university?
– How does one ensure that the mathematical modelling philosophy in curriculum documents is mirrored in classroom practice?
– What continuing education experiences (and education support for teachers, teaching assistants, mathematics faculty, etc.) need to be provided?

3.8. Assessment and Evaluation

The teaching and learning of mathematics at all levels is naturally closely related to assessment of student achievement. Nevertheless, to assess mathematical modelling is not easy to accomplish. The more complicated and open a problem is, the more complicated it is to assess the solution, and if one adds the component of available technology, assessment becomes even more complicated. Similar problems are inherent at the course level for the evaluation of programmes with application and modelling components.

Issue 8a:
There seem to be many indications that the assessment modes traditionally used in mathematics education are not fully appropriate to assess students' modelling competency.

What alternative assessment modes are available to teachers, institutions and educational systems that can capture the essential components of modelling competency, and what are the obstacles to their implementation?

Examples of specific questions:
– What are the possibilities or obstacles when assessing mathematical modelling as a process (instead of a product)? What can be learnt from assessment in the arts, music, etc.?
– If there is a change in the mathematics conception of students after experiencing and learning mathematical modelling, how do we assess that change?
– In teacher education, what techniques can be used to assess a future teacher's ability to teach and assess mathematical modelling?
– When mathematical modelling is introduced into traditional courses at school or university, how should assessment procedures be adapted?
– When centralised testing of students is implemented, how do we ensure that mathematical modelling is assessed validly?
– How does one reliably assess individual contributions and achievement within group activities and projects?

Issue 8b:
There seems to be a need to develop specific means of evaluating programmes with an applications and modelling content.

What evaluation modes are available that can capture the essential features of applications and modelling, especially of integrated courses, programmes and curricula, and what are the obstacles to their implementation?

Examples of specific questions:
- In what way do usual evaluation procedures for mathematical programmes carry over to programmes that combine mathematics with applications and modelling?
- What counts as success when evaluating outcomes from a modelling programme? For example, what do biologists, economists, industrial and financial planners, medical practitioners, etc., look for in a student's mathematical modelling abilities? How does one establish whether a student has achieved these capabilities?

3.9. Technological Impacts

Many technological devices are available today and many of them are highly relevant for applications and modelling. In a broad sense these technologies include calculators, computers, Internet and all computational or graphical software as well as all kind of instruments for measuring, for performing experiments, for solving all kind of daily life problems, etc. These devices provide not only increased computational power but broaden the range of possibilities for approaches to teaching, learning and assessment. Moreover, the use of technology is in itself a key knowledge in today's society. On the other hand, the use of calculators and computers may also bring inherent problems and risks.

Issue 9:
Technology can obviously provide support for well-structured mathematical problems that students will meet in their mathematical studies from the lower secondary level on.

How should technology be used at different educational levels to effectively develop students' modelling abilities and to enrich the students' experience of open-ended mathematical situations in applications and modelling?

Examples of specific questions:
- What implications does technology have for the range of applications and modelling problems that can be introduced?
- What important aspects of applications and modelling are touched (or not touched) upon by the technological environment?
- How is the culture of the classroom influenced by the presence of technological devices? Will button pressing compromise thinking and reflection or can these be enhanced by technology?
- What evidence of successful or failed practice in teaching and learning applications and modelling has been documented as a direct consequence of the introduction of technology?
- In what cases does technology facilitate the learning of applications and modelling? When may technology kidnap learning possibilities, e.g. by rendering a task trivial, when can it enrich them?
- In which cases is technology a crucial need in modelling in the classroom? Are there circumstances (if any) where modelling processes can't be developed without technology?

– With respect to non-affluent countries: can applications and modelling be successfully done without any technology?
– What are the implications of the availability of technology for the selection of assessment items and practices for use in contexts involving applications and modelling?

4. Call for Contributions to the Study

The ICMI Study on *Applications and Modelling in Mathematics Education* will consist of three components: an invited *Study Conference*, a *Study Volume* and a *Study Website*.

The Study Conference will be held in Dortmund (Germany) on February 13-17, 2004. The conference will be a working one where every participant will be expected to be active. As is the normal practice for ICMI studies, participation in the study conference is by invitation only, given on the basis of a submitted contribution, and is limited to approximately 75 people. The Study Volume, to be published after the conference in the ICMI Study Series, will be based on selected contributions and reports prepared for the conference, as well as on the outcomes of the conference. The Study Website, accessible also after the conference, will contain selected examples of good practice in applications and modelling. A report on the Study and its outcomes will be presented at the 10th International Congress on Mathematical Education to be held in Copenhagen in July 2004.

The International Programme Committee (IPC) for the Study invites submission of contributions on specific questions, problems or issues related to this Discussion Document. Contributions, in the form of synopses of research papers, discussion papers or shorter responses, may address questions raised above, or questions that arise in response, or further issues relating to the theme of the Study. Submissions should not exceed 6 pages in length and should reach the Programme Chair at the address below (preferably by e-mail) no later than June 15, 2003, but earlier if possible. 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 among the conference materials or on the conference website. However an invitation to the conference does not imply that a formal presentation of the submitted contribution will be made during the conference.

It is hoped that the conference will attract not only “experts” but also some “newcomers” to the field with interesting and refreshing ideas or promising work in progress. Unfortunately an invitation to participate in the conference does not imply a financial support from the organisers, 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 it is unlikely than more that a few such grants will be available.

The members of the International Programme Committee for this Study are:
– Werner Blum (University of Kassel, Germany), *Chair of the IPC*
– Claudi Alsina (University of Technology, Barcelona, Spain)
– Maria Salett Biembengut (University of Blumenau, Brazil)

- Nicolas Bouleau (École Nationale des Ponts et Chaussées, Marne-la-Vallée, France)
- Jere Confrey (University of Texas–Austin, USA)
- Peter Galbraith (University of Queensland, Brisbane, Australia)
- Toshikazu Ikeda (Yokohama National University, Japan)
- Thomas Lingefjärd (Gothenburg University, Sweden)
- Eric Muller (Brock University, St. Catharines, Canada)
- Mogens Niss (Roskilde University, Denmark)
- Lieven Verschaffel (University of Leuven, Belgium)
- Shangzhi Wang (Capital Normal University, Beijing, China)
- Bernard R. Hodgson (Université Laval, Québec, Canada), *ex officio, representing the ICMI Executive Committee*
- Hans-Wolfgang Henn (University of Dortmund, Germany), *Chair of the Local Organising Committee*.

For further information and submission of contributions, please contact the Chair of the IPC:

Prof. Dr. Werner Blum
University of Kassel
Fachbereich Mathematik/Informatik
D-34109 Kassel
Germany
Tel : +49 561 804 4623 (secr. -4620)
Fax : +49 561 804 4318
e-mail : blum@mathematik.uni-kassel.de

5. Bibliography

We include some basic references (in English language) published on this topic in recent years, most of them generated by ICMI and ICTMA activities:

Bell, M (1983), *Materials Available Worldwide for Teaching Applications of Mathematics at the School Level.* In: Zweng, M. et al. (eds): Proceedings of the Fourth International Congress on Mathematical Education. Boston: Birkhäuser, 252-267.

Berry, J. et al. (eds) (1984), *Teaching and Applying Mathematical Modelling*, Chichester: Ellis Horwood.

Berry, J. et al., (eds) (1986), *Mathematical Modelling Methodology, Models and Micros*, Chichester: Ellis Horwood.

Berry, J. et al. (eds) (1987), *Mathematical Modelling Courses*, Chichester: Ellis Horwood.

Blum, W. et al. (eds) (1989), *Applications and Modelling in Learning and Teaching Mathematics*, Chichester: Ellis Horwood.

Blum, W., Niss, M. and Huntley, I. (eds) (1989), *Modelling, Applications and Applied Problem Solving-Teaching Mathematics in a Real Context*, Chichester: Ellis Horwood.

Blum, W., Niss, M. (1991), *Applied Mathematical Problem Solving, Modelling, Applications, and Links to Other Subjects - State, Trends and Issues in Mathematics Instruction*, Educational Studies in Mathematics 22 (1), 37-68.

Boyce, W.E. (ed.) (1981), *Case Studies in Mathematical Modeling*, Boston: Pitman Ad. Pub.

Breiteig, T., Huntley, I. and Kaiser-Meßmer, G. (eds) (1993), *Teaching and Learning Mathematics in Context*, Chichester: Ellis Horwood.

Burghes, D., Huntley, I. and McDonald, J. (1982), *Applying Mathematics – A Course in Mathematical Modelling*, Chichester: Ellis Horwood.

Burkhardt, H. (ed.) (1983), *An International Review of Applications in School Mathematics*, Ohio: ERIC.

Burkhardt, H., (1981), *The Real World and Mathematics*, Glasgow: Blackie and Son.

Bushaw, D. et al. (eds) (1980), *A Sourcebook of Applications of School Mathematics*, Reston: NCTM.

Clements, R. et al. (eds) (1988), *Selected Papers on the Teaching of Mathematics as a Service Subject.* Berlin/Heidelberg/New York: Springer.

COMAP, *The UMAP Journal*, Lexington: COMAP.

COMAP (1997-1998), *Mathematics: Modeling Our World*, Cincinnati: South-Western Ed. Pub.

deLange, J. et al. (eds) (1993), *Innovation in Maths Education by Modelling and Applications*, Chichester: Ellis Horwood.

deLange, J. (1996), *Using and Applying Mathematics in Education.* In Bishop, A. et al. (eds), International Handbook of Mathematics Education V.1, Dordrecht: Kluwer Acad. Pub., 49-97.

Galbraith, P., Clathworthy, N. (1990), *Beyond Standard Models – Meeting the Challenge of Modelling*. Educational Studies in Mathematics 21 (2), 137-163.

Galbraith, P. et al. (eds) (1998), *Mathematical Modelling – Teaching and Assessment in a Technology-Rich World*, Chichester: Ellis Horwood.

Giordano, F.P., Weir, M.D. and Fox, W.P. (1997), *A First Course in Mathematical Modeling*, Pacific Grove: Brooks.

Houston, S.K. et al. (eds) (1997), *Teaching and Learning Mathematical Modelling*, Chichester: Albion Pub.

Howson, G. et al. (eds) (1988), *Mathematics as a Service Subject*, Cambridge: Cambridge University Press. (ICMI Study Series)

Huntley, I., James, G. (eds) (1990): *Mathematical Modelling – A Source Book of Case Studies*, Oxford: Oxford University Press.

Klamkin, M. S. (ed.) (1987), *Mathematical Modelling: Classroom Notes in Applied Mathematics*, Philadelphia: SIAM.

Lesh, R. A. and Doerr, H. (eds) (2002), *Beyond Constructivism: A Models and Modelling Perspective on Teaching, Learning, and Problem Solving in Mathematics Education*, Mahwah: Lawrence Erlaum.

MAA and NCTM (eds) (1980), *A Sourcebook of Applications of School Mathematics*, Reston: NCTM.

Matos, J. F. et al. (2001), *Modelling and Mathematics Education: ICTMA-9*, Chichester: Ellis Horwood.

Niss, M. (1987), *Applications and Modelling in the Mathematics Curriculum - State and Trends*, Int. J. for Math. Ed. in Science and Technology 18, 487-505.

Niss, M. (1992), *Applications and Modelling in School Mathematics - Directions for Future Development.* In Wirszup, I. and Streit, R. (eds), Development in School Mathematics Education Around the World V.3, Reston: NCTM, 346-361.

Niss, M. (2001), *Issues and Problems of Research on the Teaching and Learning of Applications and Modelling.* In: Matos et al., loc. cit, 72-88.

Niss, M., Blum, W. and Huntley, I. (eds) (1991), *Teaching of Mathematical Modelling and Applications*, Chichester: Ellis Horwood.

OECD (ed.) (1999*), Measuring Student Knowledge and Skills – A New Framework for Assessment*, Paris: OECD.

Pollak, H. O. (1997), *Solving Problems in the Real World.* In Steen, L.A. (ed.), Why Nymbers Count: Quantitative Literacy for Tomorrow's America, New York: The College Board, 91-105.

Pollak, H. O. (1979), *The Interaction between Mathematics and Other School Subjects*. In: UNESCO (ed.): New Trends in Mathematics Teaching IV, Paris, 232-248.

Pozzi, S., Noss, R., Hoyles, C. (1998), *Tools in Practice, Mathematics in Use*, Educational Studies in Mathematics 36 (2) 105-122.

Sharron, S. (ed.) (1979), *Applications in School Mathematics, NCTM Yearbook*, Reston: NCTM.

Sloyer, C., Blum, W., Huntley, I. (eds) (1995): *Advances and Perspectives in the Teaching of Mathematical Modelling an Applications*. Yorklyn: Water Street Mathematics.

Stillman, G. (1998), *Engagement with Task Context of Applications Tasks: Student Performance and Teacher Beliefs*, Nordic Studies in Math. Ed. 6 (3-4), 51-70.

Stillman, G., Galbraith, P. (1998), *Applying Mathematics With Real World Connections: Metacognitive Characteristic of Secondary Students*, Educ. Studies in Math. 36 (2), 157-195.

Swetz, F., Hartzler, J. (eds) (1991): *Mathematical Modelling in the Secondary School Curriculum*, Reston: NCTM.

Verschaffel, L., Greer, B. and De Corte, E. (2000), *Making Sense of Word Problems*, Lisse: Swets&Zeitlinger.

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

The Fifteenth ICMI Study on
Teacher Education and Development

The Executive Committee of ICMI announces its decision to organise a new ICMI Study on the theme *Teacher Education and Development*. The Study is directed by an International Programme Committee (IPC) which is composed as follows:

Deborah BALL (University of Michigan, USA), *co-chair of the IPC*
Ruhama EVEN (Weizmann Institute of Science, Israel), *co-chair of the IPC*
Jo BOALER (Stanford University, USA)
Chris BREEN (University of Cape Town, South Africa)
Frédéric GOURDEAU (Université Laval, Canada)
Marja VAN DEN HEUVEL-PANHUIZEN (Utrecht University, Netherlands)
Barbara JAWORSKI (University of Oxford, UK)
Gilah LEDER (La Trobe University, Australia)
Shiqi LI (East China Normal University, China)
João Filipe MATOS (Universidade Lisboa, Portugal)
Hiroshi MURATA (Naruto University of Education, Japan)
Jarmila NOVOTNA (Charles University, Czech Republic)
Aline ROBERT (IUFM de Versailles, France)
Bernard HODGSON (Université Laval, Canada), *ex officio, representing the ICMI EC.*

Romulo Lins (UNESP, Rio Claro Brazil) will assume the role of Chair of the Local Organising Committee.

The IPC already had its first meeting, which served to prepare the so-called Discussion Document which will be published in the next issue of this Bulletin, and elsewhere. The international Study Conference is expected to take place in 2005 in Brazil.

Contacts with the IPC can be made through its co-chairs:

Prof. Deborah Ball
4119 School of Education
610 E. University
University of Michigan
Ann Arbor, MI 48109-1259
USA

Tel: +1 734 647-7449 or +1 734 647-3713
Fax: +1 734 647-6937
E-mail: dball@umich.edu

Dr. Ruhama Even
Department of Science Teaching
Weizmann Institute of Science
Rehovot 76100
ISRAEL

Tel: +972 8 934 3157
Fax: +972 8 934 4115
E-mail: ruhama.even@weizmann.ac.il

The Sixteenth ICMI Study on
Challenging Mathematics In and Beyond the Classroom

The Executive Committee of ICMI announces its decision to organise an ICMI Study with the (tentative) title *Challenging Mathematics In and Beyond the Classroom.* The Study is directed by an International Programme Committee (IPC) composed as follows:

Edward J. BARBEAU (University of Toronto, Canada), *co-chair of the IPC*
Peter J. TAYLOR (University of Canberra, Australia), *co-chair of the IPC*
Mariolina BARTOLINI BUSSI (University of Modena and Reggio Emilia, Italy)
Albrecht BEUTELSPACHER (University of Giessen, Germany)
Patricia FAURING (University of Buenos Aires, Argentina)
Ingvill HOLDEN (Norwegian University of Science and Technology, Norway)
Derek HOLTON (University of Otago, New Zealand)
Martine JANVIER (IREM du Mans, France)
Vladimir PROTASOV (Moscow State University, Russia)
Ali REJALI (Isfahan University of Technology, Iran)
Mark SAUL (National Science Foundation, USA)
Kenji UENO (Kyoto University, Japan)
Bernard HODGSON (Université Laval, Québec, Canada), *ex officio, representing the ICMI EC.*

The first task of the IPC is to produce a so-called Discussion Document for world-wide circulation. This Discussion Document will be published in a forthcoming issue of this Bulletin, and elsewhere. The next task is to organise an international Study Conference, expected to take place in 2005 or early 2006.

Contacts with the IPC can be made through its co-chairs:

Prof. Edward J. Barbeau
Department of Mathematics
University of Toronto
Toronto M5S 3G3
CANADA

Tel: +1 416 653 1961
Fax: +1 416 978 4107
E-mail: barbeau@math.toronto.edu

Prof. Peter J. Taylor
Australian Mathematics Trust
University of Canberra ACT 2601
AUSTRALIA

Tel: +61 2 6201 2440
Fax: +61 2 6201 5096
E-mail: pjt@amt.canberra.edu.au

Information about Recent and Ongoing ICMI Studies

The two most recently fully completed ICMI Studies are the 10th Study, on *The Role of the History of Mathematics in the Teaching and Learning of Mathematics*, and the 11th, whose topic is *The Teaching and Learning of Mathematics at University Level*. The books resulting from these Studies have appeared as volumes 6 and 7 in the New ICMI Study Series (Kluwer), published respectively in July 2000 and October 2001. Moreover a second outcome of Study 11 is a special issue of the *International Journal of Mathematical Education in Science and Technology* (iJMEST), volume 31, number 1, January-February 2000, which contains fifteen of the papers presented at the Study Conference.

The volume resulting from the 12th ICMI Study, on *The Future of the Teaching and Learning of Algebra*, is expected to appear in the NISS series in June 2004, in time for the ICME-10 congress. This Study Conference took place in Melbourne, Australia, in December 2001.

The theme of ICMI Study 13 is *Mathematics Education in Different Cultural Traditions: A Comparative Study of East Asia and the West*. The Study Conference took place in Hong Kong in October 2002 and the Study volume is expected to appear in 2005.

The next three ICMI Studies are at different stages of early organisation.

Study 14 is on *Applications and Modelling in Mathematics Education*. The Discussion Document for this Study appears in this issue of the *ICMI Bulletin* and the Study Conference will take place in Dortmund, Germany, on February 13-17, 2004.

Studies 15 and 16 are devoted respectively to *Teacher education and Development* and *Challenging Mathematics in and beyond the Classroom*. The International Programme Committees for these Studies have recently been appointed by the ICMI Executive Committee and are listed elsewhere in this issue of the ICMI Bulletin. The IPC for Study 15 met in June 2002 and the Discussion Document will be published in the next issue of this Bulletin. Study 16 IPC will meet late in 2003. It is currently expected that the two Study Conferences should take place during 2005 or early 2006

Individuals may purchase the ICMI Study Volumes published by Kluwer Academic Publishers at a discount of 60% for the hardback and a discount of 25% for the paperback.

More information is available from the Secretary-General of ICMI
bhodgson@mat.ulaval.ca

Report on

ICMI Activities in 2001

1. Organisation

The Executive Committee of ICMI had its third meeting on April 24, 27, 28 and 29, 2001, at East China Normal University in Shanghai, China. An international symposium on mathematics education was held at ECNU in conjunction with the ICMI EC visit. Beside this meeting, the work of the EC during 2001 was conducted by electronic communication under the direction of the President and the Secretary.

There has been no modification to the list of members of ICMI in 2001, and no new Sub-Commission for ICMI has been established. There were a few new appointments among the ICMI Representatives, but a number of ICMI countries still have no Representative at the moment. Contacts with ICMI Representatives is made through the *ICMI Bulletin* and by e-mail (for the 40 or so Representatives for whom an e-mail address is known). In December 2001, on the occasion of the ICMI Study Conference on Algebra taking place in Melbourne, the Secretary had a meeting with members of ASICMI, the Australian Sub-Commission of ICMI.

In preparation for the next General Assembly of the International Mathematical Union, scheduled for August 2002, the President and Secretary of ICMI have been during the year in e-mail contact with the President and Secretary of IMU on ICMI-related matters to be discussed at the GA, especially concerning the election of a new Executive Committee of ICMI for the period 2003-2006 and the updating of the Terms of Reference of ICMI.

2. ICMEs

The 10th International Congress on Mathematical Education, ICME-10, will be held in Copenhagen, Denmark, from July 4 to 11, 2004. A distinctive flavour of ICME-10 is the fact that it is being organised in close cooperation among the Nordic countries — Denmark, Finland, Iceland, Norway and Sweden — under the guidance of a special Nordic Contact Committee chaired by Professor Gerd Brandell, Lund University, Sweden. The International Program Committee, chaired by Professor Mogens Niss, Roskilde University, Denmark, had its first meeting in June 2001 in Copenhagen. The first announcement of the congress is due to appear in 2002. Up to date information about the congress is available on the website

http://www.icme-10.dk

A call for bids to host ICME-11 in 2008, the year of the centennial of the Commission, had been launched by the Secretary of ICMI during the closing session of ICME-9, in August 2000, and published in the *ICMI Bulletin* (No. 49, December 2000). A few countries have responded in 2001 to the invitation then made to inform the ICMI Executive Committee by a declaration of intent that they are considering preparing an official bid, to be submitted by September 2002.

3. ICMI Studies

The mounting and conducting of so-called ICMI Studies on crucial themes and issues in mathematics education were continued in 2001. The resulting ICMI Study volumes are published by Kluwer

Academic Publishers, Dordrecht, the Netherlands, in the "New ICMI Study Series" (NISS) appearing under the general editorship of the President and the Secretary of ICMI. During the year 2001, a new volume of this series (NISS 7) has appeared and one Study Conference (for the 12th Study) was held. Here are the last developments concerning the ICMI Studies.

ICMI Study 11: The Study Volume on the *Teaching and Learning of Mathematics at University Level* (NISS 7) has appeared in October 2001. It was edited by the chair of the International Programme Committee for the Study, Derek Holton. The corresponding Study Conference had been held in Singapore in December 1998 and attended by 89 participants from 25 different countries. Another outcome of this Study is a special issue of the *International Journal of Mathematical Education in Science and Technology* (iJMEST) — volume 31, number 1 — which has appeared in 2000.

ICMI Study 12: The Study Conference on *The Future of the Teaching and Learning of Algebra* was held at the University of Melbourne, Australia, on December 9-14, 2001, and was attended by 110 participants from 26 countries. Kaye Stacey, University of Melbourne, chairs the International Programme Committee and Helen Chick, University of Melbourne, is the Study Secretary. Jill and John Vincent were in charge of the Local Organisation of the Study Conference. The Discussion Document for this Study was published in various journals and newsletters, including the *ICMI Bulletin* No. 48, June 2000, pp. 6-13, *L'Enseignement Mathématique* 46 (2000) pp. 209-217, and *Educational Studies in Mathematics* 42 (2000) pp. 215-224.

ICMI Study 13: The thirteenth ICMI Study is entitled *Mathematics Education in Different Cultural Traditions: A Comparative Study of East-Asia and the West*. The two co-chairs for this Study are Klaus-Dieter Graf, Freie Universität Berlin, Germany, and Frederick K.S. Leung, University of Hong Kong. The Discussion Document for this Study was published in various journals and newsletters, including the *ICMI Bulletin* No. 49, December 2000, pp. 16-33, *L'Enseignement Mathématique* 47 (2001) pp. 185-201, and *Educational Studies in Mathematics* 43 (2000) pp. 95-116. The International Programme Committee had its second meeting in 2001 to finalise the programme of the Study Conference, which will take place at the University of Hong Kong on October 20-25, 2002. Francis Lopez-Real, University of Hong Kong, is in charge of the Local Organisation.

ICMI Study 14: The next Study is devoted to the theme of *Applications and Modelling in Mathematics Education*. The International Programme Committee, chaired by Werner Blum, Universität Kassel, Germany, was appointed in 2000 and met in August 2001 to prepare the Discussion Document for this Study. The Study Conference is expected to take place in February 2004 in Dortmund, Germany.

ICMI Study 15: A new ICMI Study was launched in 2001 on the theme of teacher education and development. The International Programme Committee is co-chaired by Deborah Ball, University of Michigan, USA, and Ruhama Even, Weizmann Institute of Science, Israel. The Study Conference is planned to take place during the first months of 2005.

4. Regional Conferences

There were no ICMI regional conferences in 2001. One meeting previously recognised as an ICMI regional conferences is now under preparation: the second ICMI-EARCOME (East Asia Regional

Conference on Mathematics Education) — also designated as the Ninth Southeast Asian Conference on Mathematics Education or SEACME 9 — will be held in Singapore on May 27-31, 2002.

5. Other Initiatives

ICMI was involved in 2001 in three activities having to do with science and mathematics education or with the International Council for Science (ICSU), the umbrella organisation to which ICMI belongs through IMU.

ICMI has reinitiated contacts with UNESCO on the occasion of the International Conference on Science, Technology & Mathematics Education for Human Development held on February 20 - 23, 2001, in Goa (India) and in which the Secretary took part. This conference, organised jointly by UNESCO and the Commonwealth Association of Science, Technology and Mathematics Educators (CASTME), was related to UNESCO Project 2000+ on science and technology literacy for all.

ICMI has co-sponsored an international workshop entitled "International Perspectives on Standards and Goals for K-12 Mathematics Education" organised in Utah, USA, on July 19-24 in the context of the annual Park City Mathematics Institute hosted by the Institute for Advanced Study (Princeton, USA). The workshop was centred around the theme 'Mathematics Education around the World: Bridging Policy and Practice' and has received a grant of 10 000 USD from ICSU.

ICMI has established during the year contacts with ICSU Committee on Capacity Building in Science and is collaborating with CCBS on the preparation of an international conference on Science and Mathematics School Education to be held in Rio de Janeiro in September 2002, on the occasion of ICSU General Assembly.

6. Affiliated Study Groups

ICMI continues to have four affiliated study groups, *HPM* (The International Study Group on the Relations Between the History and Pedagogy of Mathematics), *IOWME* (The International Organization of Women and Mathematics Education), *PME* (The International Group for the Psychology of Mathematics Education), and *WFNMC* (The World Federation of National Mathematics Competitions).

7. The Solidarity Program

In 1992 ICMI established a Solidarity Program in Mathematics Education. The overall objective of the Solidarity Program is to increase, in a variety of ways, the commitment and involvement of mathematics educators around the world in order to improve the situation of mathematics education, in particular in those parts of the world where the economic and socio-political contexts do not permit adequate and autonomous development. This initiative thus aims at providing means which, together with institutional or other help obtained from various sources, may support concrete initiatives and activities so to foster solidarity in mathematics education between well-defined quarters in developed and less developed countries. Particular emphasis is placed on projects which enable the activation of a self-sustainable infra-structure within mathematics education in the region, country, or province at issue.

ICMI is currently reviewing the functioning and the impact of the Solidarity Fund, after its nine years of existence, so to redefine its orientation and development.

8. The ICMI Awards

It has been suggested frequently in the past that the Commission should establish some ICMI sponsored awards aiming at recognising exceptional contributions to mathematics education. Following the recommendations made to the Executive Committee of ICMI by an ad hoc committee of internationally renowned people, it was announced in the June 2001 issue of the *ICMI Bulletin* that the Commission is establishing two awards, one recognising a major program of research on mathematics education during the past ten years, and the other for life-time achievement in mathematics education. These awards would be announced in odd-numbered years and presented at the next ICME. Hence two awards may be presented at ICME-10, and four at the following ICMEs.

The design of medals to be given to the awardees raises the issue of the visual identification of ICMI in the form of a logo. A call for comments on criteria for the selection of a logo as well as suggestions of logos was launched in the June 2001 issue of the *ICMI Bulletin*.

9. Information and Communication

An important channel for dissemination of information about the Commission and its activities remains the *ICMI Bulletin*, usually published twice a year under the editorship of the Secretary of ICMI. In 2001 however, only one issue has appeared, No. 50, dated June 2001. This special issue contains material celebrating the fiftieth appearance of this vehicle of communication launched in 1972: four Presidents of the Commission, Shokichi Iyanaga (1975-1978), Jean-Pierre Kahane (1983-1990), Miguel de Guzmán (1991-1998) and Hyman Bass, the current President, have prepared texts in which they share their reminiscences of their term as President and their views on current trends and issues in mathematics education and the role the Commission could or should play.

Direct access to the *ICMI Bulletin* or to other information concerning ICMI can be found on the ICMI-pages of the IMU-server on the World Wide Web, at the address:

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

Since the inception of the Commission in 1908, the official organ of ICMI has been the journal *L'Enseignement Mathématique*, established in 1899. ICMI has recently reinvigorated its contact with the journal and in 2001, in addition to the Discussion Document for ICMI Study 13, reports have appeared in *L'Enseignement Mathématique* on the activities of the Commission for the years 1999 and 2000, on the symposium celebrating the centennial of the journal, as well as on the 8th ICMI Study entitled "What is research in mathematics, and what are its results?".

Bernard R. Hodgson, Secretary
Université Laval, Québec, Canada
5 March 2002

ICMI Accounts 2001

1 January - 31 December

BALANCE AS OF JANUARY 1:

ICMI	• **Canadian Dollars**	**119 722,42**
	• **US Dollars**	**55 812,11**
Solidarity Fund (US Dollars)		**33 347,12**

Canadian Dollars Account:

Income:	
balance 2000	119 722,42
ICMI Study 14: reimbursement of expenses by Local Organising Committee[1)]	1 635,20
interest	6 858,91
total	128 216,53

Expenditure:	
ICMI Study 10: purchase of 13 extra copies of the Study Volume[2)]	1 129,29
ICMI Study 12: Study Conference, Melbourne, travel & local expenses of IPC	10 772,57
ICMI Study 13: IPC meeting, Hong Kong, travel & local expenses of IPC	6 453,19
ICMI Study 14: IPC meeting, Kassel, Secretary's travel & local expenses of IPC[1)]	4 683,21
ICMI EC meeting, Shanghai	8 802,48
bank charges (checks and foreign transfers)	66,40
ICMI balance 2001	**96 309,39**
total	128 216,53

US Dollars Account:

Income:	
ICMI balance 2000	55 812,11
IMU (Schedule A: Administration — 11 000,00 CHF)	6 180,00
IMU (Schedule B: Scientific Activities — 22 000,00 CHF)	12 359,99
ICMI interest	2 524,37
Solidarity Fund balance 2000[3)]	*33 347,12*
Contribution to the **Solidarity Fund**, by Joel Schneider, New York	100,00
Solidarity Fund interest	1 508,29
total	111 831,88

Expenditure:	
ICMI Study 12: Study Conference, Melbourne, travel & local expenses of IPC	1 003,00
ICMI Study 13: IPC meeting, Berlin, December 2000, IPC members' travel	1 650,00
ICMI Study 13: IPC meeting, Hong Kong, October 2001, IPC member's travel	340,00
ICMI EC meeting, Shanghai, members' travel	2 000,00
bank charges	3,20
ICMI balance 2001	**71 880,27**
Solidarity Fund balance 2001	***34 955,41***
total	111 831,88

Average exchange rate, 2001 1 USD = 1,55 CAD

Notes:

1. The International Programme Committee for the fourteenth ICMI Study on *Applications and Modelling in Mathematics Education* met in Kassel, Germany, in August 2001. This Study is generously supported by the Deutsche Forschungsgemeinschaft (DFG) through a grant of 23 500 DEM which allowed to cover most of the costs of the IPC meeting.

2. In order to provide each author with a free copy, thirteen extra copies of the Study Volume resulting from the ICMI Study on *The Role of the History of Mathematics in the Teaching and Learning of Mathematics* were purchased from Kluwer. The surplus resulting from the corresponding ICMI Study Conference (540 CAD) was transferred by the Local Organising Committee to ICMI accounts in 2000, so that the actual cost of the purchase to ICMI is 1 129,29 – 540,00 = 589,29 CAD. (See Note 1 in the 2000 ICMI financial report, *ICMI Bulletin* No. 50, June 2001, p. 29.)

3. As a consequence of the ICMI General Assembly and Executive Committee meetings held in Québec, August 1992, it was decided to establish an ICMI Solidarity Fund based on private contributions. The **Solidarity Fund** was mounted to assist mathematics education and mathematics educators in less affluent countries. Its money can only be spent (by a committee chaired by Professor Jean-Pierre Kahane) to serve such purposes and is therefore **not** part of ICMI's general resources. However, the appearance of the Solidarity Fund on the ICMI accounts is due to the wish to keep ICMI's number of different bank accounts low. The accounts exhibit the ICMI balance and the Solidarity Fund balance separately.

4. In addition to the amounts displayed directly in the accounts, considerable extra sums should appear but do not and cannot. In particular Université Laval, the Secretary's home institution, has contributed in 2001 a substantial support to ICMI's work (e.g. telephone and fax, e-mail facilities, postage, all the printing and distribution costs of the Bulletin, secretarial help of various sorts, plus a partially reduced teaching load for the Secretary). It is estimated that the total contribution of Université Laval is equivalent to more than 8 000 USD. The ICMI Executive Committee expresses its gratitude for this generous support.

The Executive Committee's thanks also go to the institutions of its other members, as well as to those of some of the individuals involved in the preparation of ICMI activities. These institutions, too, have given substantial support to ICMI's work in a variety of ways. For instance, in many cases these institutions have paid travel and other expenses related to participation in meetings (EC, IPC), and so forth. This was the case in particular for the Conference of ICMI Study 12 held in Melbourne, for the IPC meetings for the ICMI Studies 13 and 14 held in Hong Kong and in Kassel, as well as for the EC meeting held in Shanghai, which are mentioned in this report. However it appears that this type of "invisible" support is becoming more and more problematic, due to the financial situation of several higher education institutions around the world, thus putting a severe constraint on ICMI finances in the long run.

Bernard R. Hodgson, Secretary
Université Laval, Québec, Canada
12 March 2002

A Report from PME

Rina Hershkowitz

Introduction

The International Group for the Psychology of Mathematics Education (PME) celebrated its 25th anniversary in 2001. The group was established in 1976 at ICME-3 in Karlsruhe and is an Affiliated Study Group of ICMI. The major goals of the group are:

- to promote international contacts and the exchange of scientific information in the psychology of mathematics education;
- to promote and stimulate interdisciplinary research in the aforesaid area, with the cooperation of psychologists, mathematicians and teachers;
- to further a deeper insight into the psychological aspects of teaching and learning mathematics and the implications thereof.

Membership is open to those involved in active research consistent with the aims of PME. The organization has about 800 members from some 50 different countries. The group's main activity is its annual conference of four or five days.

There are a number of various scientific activities at the PME conferences: personal presentations like plenary lectures, research reports, short oral communications, poster presentations; and group activities like plenary panel, research forums, working sessions and discussion groups.

As a community of researchers, who share common goals and responsibilities of ensuring the scientific development of the Psychology of Mathematics Education field, PME members established channels through which reviews on the current research work of PME, including critic and reflective issues, are discussed and presented. For example the special PME issues of the journal *Educational Studies in Mathematics* and the PME special presentations within the ICME conferences.

Conferences

After the 25th anniversary conference in Utrecht, The Netherlands, in July 2001, under the chair of Marja van Den Heuvel-Panhuizen, the full attention was directed to the next conference in the University of East Anglia at Norwich, UK which was held in July 2002. The conference chair was in hands of Anne Cockburn (University of East Anglia), while Janet Ainley (University of Warwick) had the chair of the Program Committee. The theme of the PME 26th Conference was "Learning from learners".

The Local Organizing Committee and the Program Committee of the 27th PME Conference, to be held in Honolulu Hawai'i, on July 13-18, 2003 in the Hawai'i Convention Center, have already started with the conference preparations. The theme of the conference will be "Navigating between theory and practice". This conference is quite a special one, as it is held jointly with the 25th Annual Meeting of PME's North American Chapter (PMENA25). For further information visit

http://igpme.tripod.com/hawaii.html

or contact Dr. Sandy Dawson (dawsons@prel.org, phone: +1-808-441-1331) or Dr. Joseph Zilliox (zilliox@hawaii.edu, phone: +1-808-956-5358).

Further Information
The 28th Annual Conference of PME will be held in Bergen, Norway, on July 14-18, 2004. In due time more information will be available from the PME website.

Except the usual preparations for the next conference (in Honolulu) the group has started preparations for its presentations at the ICME-10 conference in Copenhagen 2004.

For the coming year, the Officers of PME are:

President:	Rina Hershkowitz (Israel) rina.hershkovitz@weizmann.ac.il
Vice-President:	Luciana Bazzini (Italy) bazzini@dm.unito.it
Secretary:	Tad Watanabe (USA) txw17@psu.edu
Treasurer:	Peter Sullivan (Australia) p.sullivan@latrobe.edu.au

More information about PME and its activities can be obtained on the website of PME :
http://igpme.tripod.com
or by contacting the Executive Secretary of the Group:
Dr. Joop van Dormolen (joop@techunix.technion.ac.il, fax: +971 4 8258071)

Rina Hershkowitz, President of PME
Department of Science Teaching
The Weizmann Institute of Science
Rehovot 76100 ISRAEL
rina.hershkovitz@weizmann.ac.il

A New IOWME Website

Jo Boaler

IOWME, the International Organisation of Women and Mathematics Education, is putting together a new website for anyone who's interested in discussing or exploring cutting-edge ideas about equity and mathematics education. Although still under construction, the site will feature an interactive discussion board where members can submit and discuss online ideas for the upcoming ICME-10 conference, as well as other issues relevant to IOWME's goals and vision. Recent IOWME newsletters and ICMI-9 conference reports will also be available for downloading at the new site, and users will find pages and links for relevant publications and related sites there, too. For a look at the

new and improved IOWME website, please go to

http://www.stanford.edu/~joboaler/iowme/index.html

This website includes all of the IOWME Newsletters, up to date information about the conference and publications, and a discussion forum so that members can interact and discuss ideas, regarding the conference and other issues.

Comments about the website should be sent to:

Jo Boaler, International Convenor of IOWME
Department of Mathematics Education, School of Education,
485 Lasuen Mall, Stanford University, Stanford, CA 94305-3096 USA
joboaler@stanford.edu

Progress Report on Activities of the World Federation of National Mathematics Competitions (WFNMC)

Peter Taylor

The years 2001 and 2002 have been rather active ones for the WFNMC. The main priority has been to establish a policy document defining competitions and related activities in the broader sense as mathematics enrichment activities and in articulating the value of these in mathematics education.

At the end of 2002 such a document has been established (see below, under General Business).

The principal activities of the WFNMC can be classified according to the headings below. The last of the three major items (Conference) also describes some business discussions and decisions.

Journal

The Journal *Mathematics Competitions*, edited by Warren Atkins and published by the Australian Mathematics Trust, has continued to disseminate news and scholarly articles. Some articles are now posted on the internet. The Journal's web site can be found at

www.amt.canberra.edu.au/wfnmcj.html

Awards

In 2002 according to established policy and after appropriate review by the Awards Committee, three winners of the Erdös Award were announced. The winners and their citations, appear below.

Bogoljab Marinkovich (Yugoslavia)
During his lengthy career in mathematics education, Bogoljub Marinkovich has served as teacher, educator of teachers, and curriculum developer. He is currently Counsellor for Mathematics at the Ministry of Education, where he is responsible for the advancement of teaching mathematics in the schools. His work has resulted in significant reforms in the study of mathematics. He initiated, and has for twenty-five years, been Chair of a continuing seminar for advanced training of teachers.

Beginning in 1967, he became involved in competitions in primary and secondary schools. Since then, he has maintained a continued involvement in competitions at all levels, including the International Mathematical Olympiad.

He was founder of Arhimedes, the National Mathematics Competition in Serbia, a comprehensive program aimed at identifying bright young students and then training them for potential IMO competitions and for university studies.

As an extension of the activity, in 1998 the Arhimedes organisation brought the Tournament of the Towns to Serbia.

He has lectured internationally on the training of teachers, is the editor of two popular mathematical journals, and has authored more than six hundred publications.

Harold Braun Reiter (USA)
For thirty years, Harold Reiter has provided competitive academic opportunities for students. Through workshops, conferences and articles, he has spread the good word about mathematics competitions. He has given generously of his time and energy in creating and improving competitions at the local, national and international levels.

A listing of his activities includes the following. At one time or another he has been: founder of the Charlotte Mathematics Club; founder of the Mecklenburg Mathematics Club; founder of the University of North Carolina at Charlotte Mathematics Contest; Chair of the North Carolina High School Mathematics Contest.

These are local activities. At the national level he has been: Chair of the MAA Committee on Local and Regional Competitions; member of the Board of Advisors for the COMAP Math Modeling Contest; member of the American Junior High School Mathematics Exam, the American Invitational Mathematics Exam, and the United States Mathematical Olympiad.; Vice President of the International Tournament of Towns; member of the Committee for the Canadian Mathematics Competition; question writer of the Mathematics Foundation Middle School competition.

In addition to outstanding committee administrative skills, it is estimated that he has authored some 2,000 problems for competitions at all levels from early junior level to Olympiad level.

For many years he has offered workshops locally, nationally and internationally.

In addition to this devotion to mathematics competitions, he is also an outstanding educator. In recent years, he has been awarded distinguished teaching awards by his university, by the North Carolina Council of Teachers and by the Southeastern Section Mathematics Association.

Wen-Hsien Sun (Taiwan)

Wen-Hsien Sun completed an undergraduate degree in mathematics education, but did not become a teacher because of unhappiness with an examination-driven culture. Instead, he became a businessman supplying stationery to the schools. In 1978, he created Chiu Chang Mathematics Publishing Company, aimed at making good enrichment materials available to schools. On many occasions, he subsidized publications personally in order to increase their availability.

In 1988, he was instrumental in introducing the IMO to Taiwan and since that time has played a significant role in the Taiwan IMO experience, organizing, training and leading their team, often at his own expense.

In other areas, he has created a bookstore in Beijing, through which Chinese mathematicians have had access to Western publications, has introduced the Tournament of the Towns to Taiwan, and has encouraged the enrolment of Taiwan schools in the Australian Mathematics Competition.

He has been a major reason for the enrolment of Taiwan students in elementary and intermediate competitions and has ensured that enrichment materials are available for study. As an offshoot of this activity, selected students are able to attend the Chiu Chang-University of Alberta Summer Camp, learning Mathematics, English and Canadian Culture.

In 2000, he founded the Chiu Chang Mathematics Foundation, which sponsors the exchange program, and which, in addition, supports local activities and puzzle competitions.

Note: Two of these awards were presented at the WFNMC Conference in Melbourne, discussed below. The third, to Professor Marinkovic, is expected to be presented to him in Belgrade in August 2003.

WFNMC Conference, Melbourne 2002

This conference, the fourth of its type to be held, was held in Melbourne from 04 to 11 August, 2002. The main venue was the Ibis Hotel, although some parts of the program were held at the University of Melbourne. Previous Conferences had been held in Waterloo (Canada, 1990), Pravetz (Bulgaria, 1994) and Zhong Shan (China, 1998).

Program

Keynote speakers were: John Conway (Princeton University); Jean-Christophe Deledique (Paris, France); Robert Geretschlaeger (Graz, Austria); Petar Kenderov (Bulgarian Academy of Sciences); Andy Liu (University of Alberta); Alexander Soifer (University of Colorado at Colorado Springs) and David Coulson (University of Melbourne), joint lecture; Kaye Stacey (University of Melbourne); Anne Street (University of Queensland).

The key part of the conference was the presence of Professor John Conway, Von Neumann Professor at Princeton University, who gave a memorable lecture and was an active participant during the week. The main topic areas were in a seminar form. Each participant was invited to make a presentation on a favourite problem. There were also special topic areas focused on different competition-related topics.

General Business

A number of general items were discussed as follows:

- An official policy stating the links between competitions and related activities with mathematics education was adopted. It can be found on the WFNMC web site:
  www.amt.canberra.edu.au/wfnmcpol02.html
- Tony Gardiner led plenary and group discussion on the role of teachers with competitions and related activities.
- It was decided to merge the Hilbert and Erdös Awards in future, with all past awards being unaffected. Chung Soon-Yeong, of Korea, was added to the Awards Committee.
- At the initiative of the current President, the Executive is considering constitutional changes which would require the Presidency to rotate.
- Two new Associate Editors for the Journal *Mathematics Competitions* were added to provide extra support to Editor Warren Atkins, particularly with a role of advising on the suitability of submitted articles for publication. These new Associate Editors are Jaroslav Svrcek, Czech Republic and Gareth Griffith, Canada.
- The 2006 Conference has been awarded to the United Kingdom.

Peter Taylor, President of WFNMC
Australian Mathematics Trust
University of Canberra
Belsonnen, ACT 2601, AUSTRALIA
pjt@amt.canberra.edu.au

In Memoriam — Bernhard Neumann (1909–2002)

Michael F. Newman

Bernhard (Hermann) Neumann was actively involved in the work of ICMI. He was the Australian Representative to ICMI from 1968 to 1975, a Member-at-large (*) of ICMI from 1975 to 1982, and a member of the ICMI Executive Committee from 1979 to 1982.

He attended seven ICMEs from the first held in Lyons in 1969 through to the seventh held in Québec in 1992. He was a member of the International Programme Committee for the third ICME which was held in Karlsruhe in 1976.

He had already established an outstanding reputation as a mathematician in Europe before moving to Australia in 1962 to become the foundation Professor of Mathematics in the Institute of Advanced Studies of the Australian National University in Canberra. He lived there till his (sudden) death at the age of 93 on 21 October 2002. He is survived by his wife Dorothea and the five children of his first marriage (to Hanna, also a well-known mathematician, Professor of Pure Mathematics at the ANU at the time of her death in 1971). Two of his children are research mathematicians and a third has been an active teacher of mathematics.

A long and active life cannot easily be compressed into a few words. Fortunately there is his own description as one of the Video Histories of Australian Scientists (transcript at http://www.science.org. au/scientists/bn.htm), in the essays he wrote to introduce the chapters in the Selected Works of B.H. Neumann and Hanna Neumann (1988), and in his entry in the International Who's Who. So it is possible to be reasonably brief.

Bernhard (I follow the informal Australian practice of using the given name) was born in Berlin on 15 October 1909 and grew up there. He earned a doctorate from the University of Berlin in 1931 for work in what in now known as Combinatorial Group Theory. In 1933 he moved from Germany, where being Jewish he saw no career prospects, to England. He then earned a doctorate from the University of Cambridge in 1935 for a dissertation in which he laid the foundations for the theory of varieties of groups.

He started a university career as a Temporary Assistant Lecturer at Cardiff. At the onset of World War 2 he was interned as an alien and later recruited into the British military. He recommenced his university career in 1946 as a Temporary Lecturer in Hull and then in 1948 moved to Manchester where later he became a Reader. It was there that he started his active involvement with mathematics education more broadly through the Manchester Branch of the Mathematical Association of Great Britain. In 1949 he won a prize for his solution of a problem on infinite groups proposed by the Wiskundig Genootschapte Amsterdam. He wrote a winning essay for the Adams Prize (1951–2); published as: An essay on free products of groups with amalgamations. In 1959 he was elected a

Fellow of the Royal Society of London for his researches in abstract algebra and in particular for his numerous and influential contributions to the theory of infinite groups.

In 1960 Bernhard was invited to become the Foundation Professor of Mathematics in the ANU with the special goal of establishing a healthy PhD program. During Bernhard's headship (1962–74) about 50 graduate students completed their degrees. He always had an open door and fostered a feeling of family. The students sometimes found his expectation of intellectual rigour daunting but came to appreciate it. Many of these graduates went on to senior positions and some to very active roles in mathematics education. He travelled widely and spread the message that good mathematics was being done in Australia and that Australia was a good place in which to do mathematics.

He expected intellectual rigour not only in mathematics but more widely. He was also known for his rigour in other activities such as editing typescripts and recording minutes of meetings.

Within days of his permanent arrival on 2 October 1962 Bernhard Neumann became involved in activities supporting the teaching of mathematics in schools. The following year he played a key role in forming a local association of teachers of mathematics, the Canberra Mathematical Association, and became its first president. He was part of a group which met in Adelaide in 1964 and decided to push for the formation of a national association. The Australian Association of Mathematics Teachers (AAMT) was founded in 1966 with Bernhard as its first President. He became a regular participant in AAMT biennial conferences. Indeed, the memory most members have of him is that of a keen auditor, and making pertinent contributions to subsequent discussion.

Bernhard Neumann was elected to the Australian Academy of Science in 1964. He served an extended term on the National Committee for Mathematics (1963–75) and on Australian delegations to many meetings of the International Mathematical Union (IMU), held in conjunction with International Congresses of Mathematicians (he attended 13 of these congresses). At the Nice meeting in 1970 he was appointed to improve communication among mathematicians. This led to his founding the IMU Canberra Circular which he edited almost single-handedly from 1972 to 1999; it provided timely information about mathematics meetings as well as announcements of honours and deaths within the mathematics community internationally. Its circulation rose to more than 1100 before becoming largely electronic. It was especially valued by colleagues outside the major centres and Bernhard ensured that it continued to circulate to them on paper. He chaired the panel discussion at the ICMI-Symposium on The Education of Mathematics Teachers held at the ICM held in Helsinki in 1978. Bernhard also served (1975–9) on the Exchange Commission of the IMU. Through the Academy he initiated the Australian Subcommission of ICMI and chaired it from 1968 to 1975. His visibility at the early ICMEs lead to the suggestion (at Karlsruhe) that Australia consider hosting a forthcoming ICME. He and other members of AAMT were able to respond with enthusiasm and intensive work led to the successful bid to hold the 1984 Congress in Adelaide. There was then an unprecedented period of cooperative work across all sectors of mathematics education and mathematics, involving many Australians and a number of significant international figures, that resulted in the extremely successful Adelaide congress and much greater ongoing recognition internationally for the work of Australian mathematics educators.

Some of Bernhard's contributions to mathematics are recognised through namings such as the Higman-Neumann-Neumann construction for groups, the Douglas-Neumann theorem in geometry and the Mal'cev-Neumann construction for division rings.

The first two international conferences in Australia on a mathematics topic were held under his leadership, on the theory of groups, in 1965 and 1973. Both were notable for the quality of the main speakers and the range of countries from which they came. The first was also notable because Bernhard was able to arrange for young people from overseas to earn their way by teaching at a university in Australia. A third international conference on the theory of groups was held in 1989 to mark his 80th birthday.

Bernhard was active in mathematical circles in Australia. He became President of the Australian Mathematical Society (1964–6), was elected an honorary member in 1981, and was further honoured by having a prize named after him for the most outstanding talk by a student at the Annual Meeting of the Society. Two of his mathematical grandchildren have won that prize.

On retiring as Professor and Head of the Department of Mathematics at the end of 1974, he was made Professor Emeritus and an Honorary Fellow of ANU. He was also appointed a Senior Research Fellow at CSIRO for three years and then became an Honorary Research Fellow, reappointed annually, till his death. In 1975 he also became an Honorary Member of the Canberra Mathematical Association, the Australian Association of Mathematics Teachers, and the New Zealand Mathematical Society.

In ‘retirement’ he continued his own research in mathematics and his support of work in mathematics by others, directly, through teaching, and through editorial and committee work. He continued to be an ambassador for mathematics and for Australia, in particular he continued to support activities aimed at stimulating and developing mathematics talent.

He gave considerable encouragement to Peter O'Halloran and his colleagues involved in the formative stages of what is now the internationally known Australian Mathematics Competition and maintained an active interest in it. The Australian Mathematics Trust recognises, through the B.H. Neumann Awards, people who have made significant contributions over many years to the enrichment of mathematics learning in Australia and its region. Also he became involved in mathematical Olympiad activities. He chaired the Australian Mathematical Olympiad Committee from its inception in 1980 till 1986. A better structure and operation of the International Mathematical Olympiads resulted from a Site Committe he chaired (1981–83). The holding of the 1988 IMO in Australia, in the bicentenary year, had much to thank him for.

Bernhard was a strong supporter of all endeavours in mathematics — he supported people who did mathematics for its own sake, people who applied mathematics and people who taught mathematics. To him it was important to share and spread the joy of doing mathematics. His continual and effective promotion of mathematics among students of all ages, combined with his interest in and support for mathematics education at all levels, were each significant and together profound in their impact upon all aspects of mathematics. He contributed much to mathematics and became a much loved and respected figure. He was a positive influence on an immense number of people.

In spite of all this visible activity he was perhaps at his best giving quiet, often unnoticed and unrecognised help to individuals.

In 1994 he was made a Companion of the Order of Australia for service to the advancement of research and teaching in mathematics.

He was awarded honorary doctorates from a number of universities: the University of Newcastle (NSW), Monash University, the University of Western Australia, the University of Hull, the ANU, Waterloo University and the Humboldt University of Berlin.

However Bernhard was not a person who was narrowly focussed on mathematics. He was well known in other circles. He was an active chess player and was more than once champion of Manchester. At the time of his death he was the oldest rated chess player in Australia. He was known to the broader Canberra public as a familiar figure cycling on its roads; in more recent times wearing an electric blue helmet. He was an active musician. He played the cello and recorder. He was for many years Vice-President of the Friends of the Canberra School of Music; he helped judge an annual chamber music competition the day before he died. He enjoyed exploring the countryside and showing visitors around it.

Bernhard Neumann was the right person at the time for mathematics in Australia and beyond with his energy, enthusiasm and commitment to the subject and to people. During his lifetime, Australia changed from a mathematically underdeveloped country to one with a significant mathematical profile which he built with help from many others. His was a life well lived.

May the memory of him as a warm and supportive person, and of his many contributions to mathematics and to mathematics education, serve to stimulate us all!

Michael F. Newman
Mathematical Sciences Institute
Australian National University
Canberra, Australia
newman@maths.anu.edu.au

(*) Note of the Editor: The notion of "Member-at-large of ICMI" was part of the structure of ICMI as defined in the Terms of Reference of the Commission adopted by the IMU Executive Committee in April 1960 (see *ICMI Bulletin* 5, April 1975, pp. 3-6). These members-at-large were not on the Executive Committee of ICMI. This notion was abolished with the amendments to the Terms adopted in August 1982 by the Ninth General Assembly of IMU (see *ICMI Bulletin* 13, February 1983, p. 5).

In Memoriam — Georges Glaeser (1918–2002)

François Pluvinage

All those appreciating the intellectual activity provoked by mathematics will enjoy a long time yet the works written by Georges Glaeser, alone or in collaboration with other authors. Even those for whom mathematics is not their *cup of tea* will still be much interested in reading Glaeser's texts, or reading works about Glaeser. The fact is that the public targeted by Glaeser extends much beyond mathematical circles. I personally saw him embarking on fiery pleas in favour of mathematics with interlocutors of all allegiances. He could speak with officials such as the *Recteur de l'Académie* at a distribution of awards for the *Rallye mathématique d'Alsace* (Alsatian Mathematics Rally) — in France, the *Recteurs d'Académie* are appointed by the Minister of Education among the *Professeurs d'Université* of all fields —, or regional politicians at the inauguration of an exhibition. He could also confer with invited speakers and visiting artists, who would not *a priori* expect their performance to provoke remarks pertaining to mathematics. Far from being dogmatic, Glaeser was strongly holding to a few principles, explicit (most of the time) or implicit (seldom — anyone who knew Georges will never maintain he was an introvert). One of these principles can be stated as follow: "It is important, socially and politically, that mathematicians take advantage of any opportunity to praise most highly their discipline."

Nowadays mathematics is visible through all the applications it has, thanks to computers and the countless uses of imagery and simulations. About thirty years ago, mathematics was much more hidden and esoteric. The range of jobs offered to professional mathematicians at that time was far from matching the current choices. In France, the IREMs (*Instituts de Recherche sur l'Enseignement des Mathématiques*) were being created at that time and the name of Georges Glaeser is now so strongly linked with the IREM of Strasbourg that it must sometimes be denied that he was its founder. The main goal of the creation of IREMs was to diffuse *"la mathématique"* **(*)** — some were talking of *modern* or *"new" maths* — to all levels of teaching. Elementary school teachers and other teachers whose professional activity was totally or partly dedicated to the teaching of mathematics had thus been lead to follow as *trainees* so-called *recycling actions*. The idea was to present them the mathematical edifice exactly as they would be brought to profess it via ad hoc transpositions: a basis of set theory (with Zermelo-Fraenkel axiomatics), upon which structures are fixed such as groups, rings and fields. This formal and global vision of mathematics was in opposition with a so-called *traditional* approach, much more scattered as it was emerging from the primitive anchoring of mathematics in the material world (physical reality, everyday life), and its diffusion was strongly supported by the Piagetian school psychologists.

The first director of the IREM of Strasbourg was Jean Frenkel, who was convinced of the importance of a reform of the teaching of mathematics, as were his colleagues Revuz (Paris) and Glaymann (Lyon). Nevertheless, he had the foresight that a vision that would be too dogmatic would be likely to clash with the reality of school operation. The ideas of Georges Glaeser, exposed in his book

"*Mathématiques pour l'élève-professeur*" (*Mathematics for the Student Teacher*), had attracted his attention, probably because some of these ideas were deviating from the then fashionable presentation schema. For instance, Georges Glaeser thought that the presentation of mathematics was to be subordinated to mathematical activity, and not the opposite. He did not go as far as adhering to the idea of "*learning by doing*" popularised by the famous American educator John Dewey (1859-1952), because he considered the acquisition of a strong culture as a major goal of mathematics teaching; however he never lost an opportunity of condemning views connected to the "*pédagogie sans élève" (teaching without students)*, to use to one of his favourite expressions. So, in some respects, he was iconoclast towards ideas of the mainstream, which was often subverting the well-known saying "what is clearly understood can be clearly expressed" in its converse.

Elected Director of the IREM of Strasbourg, Georges Glaeser actually gave it an impetus along the lines of his key ideas about mathematical culture and the place of problems in the learning of mathematics. A simple bookcase would host at the beginning a selection of a few works on pure mathematics, but also on methodology, such as the classic *How to Solve It (Comment poser et résoudre un problème)* by George Pólya, as well as on psychopedagogy. This bookcase has become today a set of three rooms constituting the IREM library, with its thousands of works among which regular pruning is necessary in order to accommodate the indispensable new publications. Three initiatives were taken in order to promote problems in the learning of mathematics: the organisation of working sessions on *heuristics*, the development of the *Livre du Problème* (*The Book of the Problem*) and the launching of an open contest for secondary-school students, the *Rallye mathématique d'Alsace (Alsatian Mathematics Rally).*

Should one see the heuristics groups as the beginnings of Georges Glaeser's subsequent didactical works? However that may be, these groups have contributed in nourishing his reflections upon the didactics of mathematics. This becomes an evidence when reading his work *Introduction à la Didactique expérimentale des mathématiques* (*Introduction to the Experimental Didactics of Mathematics*) published in 1999 by the Éditions de la Pensée Sauvage, a strong ingredient being the historical references found therein. The *Livre du Problème*, for its part, gave rise to a few booklets, some of which are remarkably interesting. Admittedly, this project involved quite talented collaborators. I have in mind for example the Diener couple, now both teachers at the Université de Nice, who were the main artisans of a real gem in this collection, the fascicle entitled "*Autour d'un thème mathématique : la parité"* (*About a mathematics theme: parity*). Those who never saw this fascicle can hardly imagine all the richness that such a seemingly simple theme — one could almost say such a poor theme — can contain. As regards the Alsatian Mathematics Rally, its success is more and more evident with the passing years. Its approach is undoubtedly most appealing: candidates can cooperate in couples, to each of whom a room is allocated for the duration of the competition. The wager thus laid by Georges Glaeser, namely to *promote mass elitism*, without doubt proved to be a winning one.

In *Récit de Vie* ("*A Life Story*"), written from interviews with Georges Glaeser and published by the IREM of Strasbourg in 2002, the emphasis is on periods prior to the ones just evoked. This is why I began by recalling a few elements that appeared to me as constituting the most important points of his action, say after May 1968. As a matter of fact, I personally met Georges Glaeser after 1970, precisely when he became Director of the IREM. It is clearly what he initiated since that time that

makes his notoriety nowadays. But one should not conclude that the entire work of Georges Glaeser is posterior to May 1968. Even if he used to say of himself, as noted in his *Récit de Vie*, that he was a mathematician but not a great mathematician, the contribution of Georges Glaeser to analysis is of such importance that it still is a reference nowadays. This is particularly true of *Glaeser's Composition Theorem*. His composition problem gives rise to current research of the following form. Given a compact subset E of R^n and a real-analytic mapping Φ in a neighbourhood of E, one seeks differential and geometrical conditions on E and Φ such that, from the C_M ultradifferentiable regularity on E of a composite function $g \circ \Phi$, one can deduce a C_{M+} regularity of g on $\Phi(E)$ with an optimal control of the loss of regularity $M \to M+$.

The last issue of the *Bulletin Vert* of the APMEP (Association des Professeurs de Mathématiques de l'Enseignement Public — http://www.apmep.asso.fr/), n° 443, 2002, includes a paper by Bernard Blochs, a mathematics teacher who was once a student of Georges Glaeser. The following lines, recounting the career of Glaeser, are taken from this paper. He decided to become a teacher while still very young, at only eight years of age. He was first attracted by history, an interest he kept throughout his life, and then turned to mathematics. In 1946, after having obtained the mathematics *Agrégation*, he started his teaching life in a *lycée* located in the suburb of Lyon. Laurent Schwartz invited him afterwards to join him at Nancy as "*Chef des Travaux*". Georges Glaeser was in contact there with such mathematicians as Jean Dieudonné, Jean-Pierre Serre, Alexander Grothendieck,… After preparing and defending a thesis in the circle of Laurent Schwartz, he started a career as a teacher and researcher with a specialisation in analysis. Among other important results, he gave the generalisation to indefinitely derivable functions of Newton's theorem on symmetric polynomials. In 1971, Georges Glaeser turned to a discipline then just in its beginnings: the didactics of mathematics. The same year, he became Director of the IREM of Strasbourg. Still in Strasbourg, he took part in the creation of one of the first French third cycle in didactics of mathematics in 1975. Until the very end of his professional life, he brought a substantial contribution to the development of this field.

It must be added that even after his retirement, he never stopped showing an active interest in mathematical didactics. In spite of the fatigue caused by his worsening health condition, he thus still insisted in attending the Argentoratum colloquium held in Strasbourg in July 2002, where many of his former third-cycle students had the opportunity of meeting him and paying him a vibrant homage. A document from the group "*Mathématique et Philosophie*" of the IREM of Strasbourg is soon the be published, with a personal contribution from Glaeser (on the website http://irem.u-strasbourg.fr/ is posted the full bibliography of George Glaeser in the field of didactics of mathematics). So, even if the man has passed away, the author Georges Glaeser is still having works in progress!

Quoted work:

Jean-Claude REGNIER, Françoise PERRIER, 2002, *La didactique des mathématiques au travers d'un récit de vie - Entretiens avec Georges Glaeser*. IREM de Strasbourg.

From the back cover: *The "Récit de vie" differs from a biography as its goal is more to identify the decisive factors in the orientations of a life, rather than itemising simple facts. Why did a mathematician come to devote himself to this discipline? In the case of Georges Glaeser, it was*

almost a necessity. On the other hand, the period Glaeser lived through, with its historical events and the evolution of mathematical thought, is reflected intensively and accurately in this "Récit de vie".

François Pluvinage
UFR de Mathématique et d'Informatique
Université Louis-Pasteur
7, rue René Descartes
Strasbourg 67084 FRANCE
pluvin@math.u-strasbg.fr

(*) Note of the Editor: The use of the singular "*la mathématique*", instead of the more common "*les mathématiques*", is somewhat unusual in French. It was promoted by Bourbaki to stress the unity of mathematics inside his structural perception of the mathematical landscape.

A Project in Russia: Electronic Textbooks for Geometry

Igor F. Sharygin

Today, as at all times, mathematics is one of the main subjects studied at high school. Among all mathematical disciplines, geometry plays a special role. It possesses the widest spectrum of educational and cultivating possibilities.

On the other hand, recently, new information and learning technologies have been developed, and a market of electronic learning facilities has already appeared. True, the main efforts are focused on creation of CD ROM versions of standard textbooks. Great possibilities of the Internet are almost not

used. Note that the situation with the electronic textbooks on geometry is the worst, both in terms of their context and the ways of their electronic implementations.

Currently, a project on the creation of electronic textbooks on geometry, based on the textbooks of I. F. Sharygin, has been initiated at the Institute for Systems Analysis (ISA) of the Russian Academy of Sciences. In addition to Sharygin, a number of other well-known scientists and specialists in the field of high-school mathematics take part in this work. Among them are N.P. Dolbilin (Steklov Institute of Mathematics), I. Kh. Sabitov (Moscow State University), R.G. Khazankin (high-school teacher), and others. We plan to create electronic textbooks for students of all forms, starting from juniors through upperclass students. Three learning levels — minimal, normal, and advanced — are suggested. In the process of learning, the student can turn from one level to another.

The software is developed by a large group of high-qualified specialists from the Institute for Systems Analysis and Moscow State University. The textbooks to be created will be implemented both on CD ROMs and in the Internet environment. The learning methodology will be based on the original author's approach. The students will have an opportunity to be trained by well-known specialists on a real-time basis. Two versions — Russian and English — of the textbooks are developed. If required, they can be translated into other languages. We plan to complete this project by the ICME-10 Congress, to be held in 2004 in Copenhagen.

It is quite clear that this project requires not only great intellectual efforts but also considerable financial expenditures. The latter is the most difficult problem we face, which cannot be completely solved inside our country. Therefore, we ask the international mathematics and mathematics education communities, as well as all others who are interested in this project, for cooperation.

Please send your suggestions to geometry@isa.ru

Igor F. Sharygin
Moscow Centre for Continuous Mathematical Education (MCCME)
Bolshoy Vlasievskiy per., d. 11
121 002 Moscow, Russia
sharygin@mccme.ru

EMF 2003 (Tozeur, 2003)
Announcement of an ICMI Regional Conference

On the occasion World Mathematical Year 2000, the CFEM (*Commission française pour l'enseignement des mathématiques*, the French Sub-Commission of ICMI) organised in Grenoble the "Espace Mathématique 2000" symposium, which aimed at gathering mathematics educators from French-speaking countries. The EM 2000 meeting was officially recognised as an ICMI Regional Conference, where the "region" was defined not in geographical but rather in linguistic terms, the gathering being based on a common language.

The great success of EM 2000 convinced the organisers and participants of the merit of repeating such an international meeting on a regular basis. The CFEM, the Tunisian Commission on Mathematics Education and the Tunisian Association for the Mathematical Sciences are thus pleased to announce that the symposium EMF 2003 ("Espace Mathématique Francophone 2003") will take place in Tozeur, Tunisia, on December 19-23, 2003. This conference, which aims 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, has officially been recognised as an ICMI Regional Conference by the Executive Committee of ICMI.

The work of the conference will be organised around plenary talks (by André Antibi, Nadine Berdnarz and Marie-Jeanne Perrin, Ahmed Djebbar, Hikma Smida, Jean-Christophe Yoccoz) and on presentations and group discussions on the following themes:

- 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;
- Vocational education;
- Mathematics and other disciplines.

More information on the conference can be obtained on the website

http://www.mathinfo.u-picardie.fr/EMF2003/

or by contacting Hédi Daboussi (hedi.daboussi@math.u-psud.fr), Chair of the International Programme Committee, or Hikma Smida (hikma.smida@ipest.rnu.tn), Chair of the Local Organising Committee.

Outcome from an ICMI Regional Conference: EM 2000

The ICMI Regional Conference *Espace Mathématique 2000* (EM 2000) was organised in Grenoble in July 2000 on the occasion World Mathematical Year 2000 by the French Sub-Commission of ICMI. This Conference was centred on the francophone mathematics teaching community, and its theme was "Mathematics education in the French-speaking countries in the XXth century, and its perspectives for the beginnings of the XXIst century".

A global overview of the conference (in English) and a selection of ten papers (in French, with abstract in English) have been published in the international journal ZDM, *Zentralblatt für Didaktik der Mathematik*. This special issue, ZDM 4/2002, is now available on the web to ZDM-subscribers at the address

http://www.fiz-karlsruhe.de/fiz/publications/zdm/zdm024i.html

Developing a Statistically Literate Society — Report on ICOTS-6

Maria Gabriella Ottaviani, Dani Ben Zvi and Brian Phillips

The Sixth International Conference on Teaching Statistics (ICOTS–6) was held in Cape Town (South Africa) from 7 to 12 July 2002. The gathering was undoubtedly a great success, both from the organisational and the scientific point of view. The 472 attendants, in fact a large majority of the International Association for Statistics Education (IASE) membership, met for six days, during which they presented their papers. The superb accommodation of the Holiday Inn Cape Town gave the delegates the possibility to exchange views and to dwell upon their past, present and future projects and activities in a pleasant place. All of this allowed participants the opportunity to strengthen old friendships and to start new ones. The atmosphere was of an active, scientific community open to new fellow members, happy to share their experiences, to receive information and input coming from different sources and suggesting new ideas and projects for the future.

The success of ICOTS–6 is based on a well organised team work. In September 1998, the IASE Executive Committee began the process by choosing the Conference theme "*Developing a Statistically Literate Society*" and appointing a team of people to act as the Executive Committee of the International Program Committee (IPC): M. Gabriella Ottaviani (Chair), Brian Phillips

(International Organiser and Editor) and Dani Ben-Zvi (Scientific Secretary). After this a group of people were co-opted as members of the IPC. Within the IPC, eleven topics were proposed, including statistics literacy, statistics education at the school level, the post secondary level, and the workplace, statistics education and the wider society, research in statistics education, technology in statistics education, other determinants and developments in statistics education, and an international perspective on statistics education.

The IPC members have co-operated worldwide to gradually construct an interesting and useful program showing the best of the activities, studies and research in Statistics Education, in order to work towards "Developing a statistically literate society". Through the interest of their proposals and the quality of the authors they invited, they ensured the standard of ICOTS–6 to be very high. Communications were kept and maintained by e-mail. Of enormous assistance were the IPC and the LOC Websites. A very special thanks goes to Dani and Dagan Ben-Zvi, for the wonderful IPC website which they designed and maintained in very trying circumstances. It constantly showed where the Conference preparations were at, what the next steps were and the corresponding deadlines. The IPC Website is now available at

http://icots6.haifa.ac.il/icots6.html

and will soon include the full manuscripts of all papers. The LOC Website, designed and maintained by the University of Natal Public Section, gave all important logistic local information and it proved to be most important in providing information.

ICOTS–6 is the first ICOTS where a refereeing system has been proposed to the authors. This was due not only to the request coming from some colleagues who needed their papers refereed for funding purposes, but also from a scientific desire of the Exec and IPC who thought that time had come to improve the quality of the papers presented at the ICOTS Conferences. This no doubt increased the task of the Exec, particularly of Brian Phillips who had to follow the refereeing process, but as Brian Phillips noticed, "The larger than expected response for authors to have their paper refereed was also most heartening". The papers presented at this Conference were numerous, nearly 300 papers form the Proceedings of ICOTS–6. In fact the IPC Executive Committee decision to produce a CD of the ICOTS–6 Proceedings, rather than hard copy, was very well received, and the work done by Brian Phillips and his Editorial Board to edit the CD has been epic. In addition some 25 posters were on display throughout the conference.

There were several other scientific products of the Conference: the ICOTS–6 Abstract Book is a useful printed guide to the CD. The ICOTS–6 Papers for School Teachers is a peculiarity of ICOTS–6 that put in evidence a further achievement of this successful Conference. In fact, following the suggestions of the IPC Executive Committee, the Local Organising Committee and in particular Jacky Galpin, Delia North and Jacky Scheiber, succeeded in organising a series of events to reach out to local school teachers.

In fact, a major local thrust for ICOTS-6 was a series of events put in place to reach out to local school teachers. The South African Statistics Association (SASA), Association of Mathematics Educators of South Africa (AMESA), Statistics South Africa and the Department of Education united to present a wonderful program for local school teachers to become acquainted with basic statistics

concepts (many local school teachers have had no previous statistics training) which will soon be part of the new school syllabus in South Africa.

On the Saturday a 1-day CensusAtSchool workshop was held in Durban (following on from the national mathematics school teachers conference). This workshop was repeated in Cape Town on Sunday. The attendees of this CensusAtSchool workshop consisted of some international ICOTS delegates, local school teachers from the Cape Town area and teachers, from each province in South Africa, selected by the Department of Education. These teachers include key mathematics co-ordinators from the 9 provinces of South Africa. Aspects of CensusAtSchool from other countries were also presented at both workshops, giving an international perspective to the data sets, which will be made available to all schools in South Africa.

A local teacher session, running for the full duration of the conference, was organised by SASA and AMESA, and ensured that the teachers got sufficient training in statistics to be able to meet the demands of the statistics section of their new school syllabus (to be fully implemented in 2005). The local teacher session was split into two strands, Primary (grades 4, 5, 6) and Senior (grades 7, 8, 9). A workshop approach prevailed throughout and this ensured that the teachers would have adequate materials to use in the class room. Each teacher received a die, plastic cups and various coloured poker chips and in no time groups were merrily simulating their data and arguing the finer points of probability theory! Other sessions focused on using details of histograms, charts, plots and other aspects of the school syllabus, as well as interpretation of newspaper articles and other material incorporating statistical concepts. The teachers were very excited to discover the relevance of statistics to all aspects of teaching at school, and in fact to all aspects of life. The local teacher session and the CensusAtSchool workshop was captured on video camera in order to be used in follow-up workshops to be held in the various provinces in South Africa. Presentation of these workshops was a requirement for funding received by many of the teachers who attended ICOTS-6. Support from SASA and AMESA will assist these teachers in spreading knowledge gained at ICOTS-6. ICOTS-6 certainly gave local teachers the training to assist in creating a statistically literate society in South Africa!

Many persons have committed themselves to design and organise this conference during the last four years, but no doubt all of this has been worthwhile. A conference like ICOTS only happens because of the commitment of a large number of people from around the world who are prepared to freely give much time and effort. We would like to pay tribute to the great support we received from so many people who helped in the making the conference such a success. This includes three IASE Executives from 1997 to 2002, an International Program Committee of 18 people, many who also worked as Topic Convenors, a Local Organising committee of 11 people, 76 session organisers.

We greatly appreciated the excellent co-operation of well over 300 authors and give special thanks to more than 70 referees who so generously gave of their time and expertise to do such a professional job. We certainly could not have finished with such a quality product without the work of the sub-editors and the CD designers. Furthermore, we wish to thank the Local Organising Committee, especially Jacky Galpin, who were extremely helpful in getting the program together as well as the many other aspects of hosting the conference. We also express sincere thanks to the 18 sponsors for easing the financial and logistic problems of running such a conference. Besides this it was an honour

for the IASE that the conference was opened by the Honorable Trevor Manuel, Minister of Finance of South Africa and that Tami Mseleku, Director General of Education and Pali Lehohla, the Statistician General of SA took part to the Conference.

We think that the IASE should be proud of this event that has contributed to better understand its task and its potentialities in divulging statistics, its teaching/learning, and its usefulness in everyday life.

Maria Gabriella Ottaviani
Dipartimento di Statistica, Probabilità e Statistiche applicate
Università di Roma "La Sapienza"
P.le A. Moro 5, 00185 Roma. Italy
e-mail: mariagabriella.ottaviani@uniroma1.it

Dani Ben Zvi
Faculty of Education
University of Haifa
Mount Carmel, Haifa 31905, Israel
e-mail: dbenzvi@univ.haifa.ac.il

Brian Phillips
Director, Graduate Statistics Courses
School of Mathematical Sciences
Swinburne University of Technology
Box 218 Hawthorn 3122, Australia
e-mail: bphillips@swin.edu.au

Statistics Education Research Journal

The International Association for Statistical Education (IASE) is pleased to announce the establishment of the *Statistics Education Research Journal* (SERJ), a peer-reviewed journal published electronically twice a year. The Journal is freely accessible via the Internet at:

http://fehps.une.edu.au/serj

and its editors are Carmen Batanero (Spain) and Flavia R. Jolliffe (UK). IASE is a section of the International Statistical Institute (ISI) and seeks to advance statistical education at all levels and contexts, from primary school through training of professionals. IASE places a strong emphasis on international cooperation and the exchange of information through its program of publications and

meetings, and aims to contribute to the international community of people interested in statistical education.

For some years IASE members had been suggesting that IASE should have its own research journal as a vehicle through which we could encourage research in statistics education, advance our knowledge about student's attitudes, conceptions and errors as regards stochastic knowledge, and improving the teaching of statistics at all educational levels. The *Statistics Education Research Journal* (SERJ) was developed by the IASE to fulfil these aims, as one of the ISI-sponsored journals.

The first two issues of SERJ's first volume, published in May 2002 (V1, N1) and December 2002 (V1, N2), were a transition from the earlier *Statistical Education Research Newsletter* (SERN, see http://www.ugr.es/~batanero/sergroup.htm), and hence included, in addition to refereed papers, also notes on recent publications and dissertations, information about past and forthcoming conferences, and other summaries. However, starting in late 2003, the journal will focus on research-oriented refereed papers only.

Examples for original research articles published in SERJ in 2002 include:

- Maxine Pfannkuch and Amanda Rubick, "An Exploration of Students' Statistical Thinking with Given Data".
- Maria Meletiou and Carl Lee, "Teaching Students the Stochastic Nature of Statistical Concepts in an Introductory Statistical Course".
- Beth Chance and Joan B. Garfield, "New to Approaches to Gathering Data on Students' Learning for Research in Statistics Education".
- Nigel Smeeton, "Undergraduate Courses in Dental Statistics in Britain and Ireland".

The intended readership includes those engaged in statistical education research, interested in the implications of the research for their teaching or in any aspect of statistical education. The editorial board encourages the submission of quality research-oriented papers related to statistical education, including research reports, theoretical or methodological analyses, and literature reviews. Papers giving details of ongoing studies or consisting of reflective thoughts may be submitted, provided that they include a theoretical framework and, in the case of studies, some preliminary results. Contributions in English are preferred, but contributions in French and Spanish are also acceptable. All papers are peer refereed (non-blind refereed by one member of the editorial board, blind refereed by two external experts).

Inquiries and submissions should be sent to co-editor Flavia R. Jolliffe (UK) at:

F.Jolliffe@kent.ac.uk

Guidelines for authors and referees, a template for authors, and a copyright form, as well as prior and current issues of the journal itself can be downloaded from SERJ web page at

http://fehps.une.edu.au/serj

EARCOME 2002 and SEACME 9 — Report on an ICMI Regional Conference

LIM-TEO Suat Khoh

The second East Asian Regional Conference on Mathematics Education (EARCOME) was held in Singapore from 28 to 31 May 2002. It was jointly the ninth Southeast Asian Conference on Mathematics Education. There were over 600 participants with 130 foreign participants coming from 18 different countries. The conference attracted fewer foreign participants due to the event of September 11, 2001. However the conference was fully supported by the local mathematics educators from schools, polytechnics, universities and the Ministry of Education (MOE).

The conference took place on the new campus of the National Institute of Education, Nanyang Technological University, in Jurong, the western part of Singapore. The conference theme, *Mathematics Education for a Knowledge Based Era*, was explored through four principal areas: assessment, curriculum, teacher education, and technology. There was a plenary forum on assessment and three plenary lectures, one for each of the remaining areas. Nearly 20 speakers were also invited to give regular lectures, sharing their various expertise, while nearly 80 papers were presented by both local as well as foreign mathematics educators. There were also school teachers and graduate students who shared their research findings with other fellow teachers.

A special forum was organized for MOE to share Singapore mathematics curriculum with foreign participants. As part of the conference, 8 workshops on the latest practices in teaching and learning mathematics were conducted, with 6 of them repeated to cater for the enthusiastic response from the participants. Furthermore, a twentieth anniversary celebration was held for the popular book *Thinking Mathematically*, with all three authors present.

EARCOME and SEACME are the two popular series of conferences in the region. The past conferences were held in Beijing (1991), Shanghai (1994), and Korea (1998) for EARCOME (the numbering of the series began with Korea), and Manila (1978), Kuala Lumpur (1981), Singapore (1984), Haad Yai (1987), Brunei (1990), Surabaya (1993), Hanoi (1996), and Manila (1999) for SEACME. EARCOME 2005 will be held in Shanghai (contact: Li Shiqi, sqli@math.ecnu.edu.cn) and EARCOME 2007 in Penang (contact: Rosihan M. Ali, rosihan@cs.usm.my).

LIM-TEO Suat Khoh
Mathematics and Mathematics Education Academic Group
National Institute of Education
1, Nanyang Walk
Singapore 637616
skteo@nie.edu.sg

From ERME to YERME — News from the European Society for Research in Mathematics Education

Konrad Krainer

The future of an academic field lies in its young scientists. Thus it is a major task of scientific societies to motivate graduates to start a post-graduate research and to promote their efforts. ERME, the European Society for Research in Mathematics Education, although — or maybe even because of — being a young academic society itself and having its first conference (CERME 1) in August 1998, very early recognized the importance of investing in the future. At CERME 2 in February 2001, ERME helped to establish a self-organized group of junior researchers who gave themselves the name YERME, which stands for Young European Researchers in Mathematics Education.

From the very beginning, YERME as well as ERME stressed that junior researchers do not strictly have to be either young or European to be involved. The main idea is to provide a forum in which people who are new to research in mathematics education can communicate with each other, offering support as well as practical advice. As a reaction to the birth of YERME, ERME nominated one member of the board to keep contact with YERME and to support its growth. Jointly, representatives of YERME and ERME initiated a first summer school, which took place at the University of Klagenfurt in August 2002.

In order to show the joint venture character of this summer school, a programme committee (PC) with two representatives each from ERME and YERME and two representatives from the local organizer has been established. Together the group decided upon five major themes of the summer school but also determined that the programme should have some flexibility in order to be adaptable to specific needs of the participants which might rise during the summer school. The PC looked for five researchers in mathematics education who had expertise in these fields, were experienced in working with PhD-students and would have time and interest to contribute to the Summer school.

The PC was very happy to get positive responses from five experts from five different countries, namely Michèle Artigue (France), Mariolina Bartolini Bussi (Italy), Willi Dörfler (Austria), Tommy Dreyfus (Israel) and Barbara Jaworski (Great Britain). These five experts made an excellent job of supporting the 47 participants of the summer school. The evaluation showed that the experts not only delivered valuable input and gave useful feedback but also fostered communication among the participants and invested a lot of time outside the official programme in giving personal feedback in private meetings. Even during the excursions intensive communication took place. Together experts and participants established a network of "critical friends" with intensive processes of reflection and networking. New relationships in this scientific field have grown, professionally and personally.

As the responsible person for YERME at the ERME-board, I am very grateful to YERME and its representatives, who actively took co-responsibility for the summer school, to the local organizers, who helped to build up a good infrastructure, the experts, who acted as a professional team, and finally ERME

with his president Paolo Boero, who demonstrated with his presence and his support during the summer school that promoting young researchers is not only an empty phrase within this society. CERME 3 at Bellaria (Italy) from February 28 to March 3, 2003 (see http://www.dm.unipi.it/~didattica/CERME3/), will be preceded by a special YERME-day on February 27 (see http://www-studenti.dm.unipi.it/yerme/). The next YERME summer school is planned for the year 2004.

Konrad Krainer
Department of School and Societal Learning
Institute for Interdisciplinary Studies (IFF)
Universität Klagenfurt
A-9020 Klagenfurt, AUSTRIA
Konrad.Krainer@uni-klu.ac.at

Young Researchers in Mathematics Education: YERME-Summer School 2002 — "Networking" on an International Level

Rita Borromeo Ferri, Simone Reinhold and Jürgen Roth

Note from Konrad Krainer: The following text is a translation of a report on the YERME-Summer School 2002 delivered by three German doctoral students which is published in the Newsletter (2002, Vol. 75) of the GDM (Gesellschaft für Didaktik der Mathematik), the Society of mathematics educators in German speaking countries.

From 23rd to 28th of August 2002 the first YERME Summer School — with international participation — took place at the University of Klagenfurt in Austria. ERME stands for European Society for Research in Mathematics Education and is the European forum for exchange in the field of mathematics education. Conferences (CERME) are organized every second year. So far two conferences have taken place: in Osnabrück, Germany and Marienbad, Czech Republic. Proceedings from both conferences are available.

At the conference in 2001 (CERME 2) it was one of the main goals on behalf of ERME to stress specific support for all junior researchers. There Konrad Krainer initiated and moderated a meeting of junior

researchers at which the great variety of possibilities and general conditions of the junior researchers became obvious. The foundation of YERME was finally carried out at a self-organised meeting at CERME 2, and soon the homepage

http://www-studenti.dm.unipi.it/yerme/index.php

was set up. YERME articulated the idea to organise a summer school, which was picked up actively by ERME and was jointly realised. The basic idea of this plan was to establish an international network of junior researchers in the field of mathematics education. Paolo Boero (President) and Konrad Krainer (responsible person for the junior researchers) were nominated as ERME representatives on the programme committee, the PhD's Michele Cerulli (Italy) and Jukka Törnroos (Finland) were nominated as YERME representatives as well as Günther Ossimitz and Werner Peschek for the organizers in Klagenfurt.

All 47 participants regarded this "experiment" as great success, due to the structure of the summer school. Before the summer school started, all participants had the opportunity to put their papers on the homepage of the summer school:

http://yerme2002.uni-kl.ac.at

Therefore it was possible for the members of the working groups to prepare themselves for the discussion of the different pieces of research. The following themes were offered by the experts:

Working Groups:	**Experts:**
Advanced Mathematical Thinking	Michèle Artigue (Université Paris 7, France)
Teacher Preparation	Barbara Jaworski (University of Oxford, UK)
Semiotic Aspects in Mathematics Education	Mariolina Bartolini Bussi (Università di Modena e Reggio Emilia, Italy)
Computer/Technology in Mathematics Education	Tommy Dreyfus (Holon Academic Institut of Technology, Israel)
Psychological and Theoretical Foundations of Mathematics Education	Willi Dörfler (Universität Klagenfurt, Austria)

Within the working groups the participants' plans for and the results of research were presented and discussed. In addition, discussion groups were already offered in the first part of the summer school. They could be chosen according to personal interests and they related to more general themes of our research areas. One theme, for example, was "How to write a research article".

A first evaluation was carried out in the middle of the summer school. The feedback of the participants (mostly PhD and Master students) was taken up and influenced positively the second part of the week. Altogether, one essential part of the whole concept was that the needs of the participants should be considered. Thus a further evaluation was carried out on the last day included, whose results will give

new ideas for the design of the YERME-day as well as for the preparation of the next YERME Summer School.

The fact that one could meet an expert any time and discuss one's own research work confidentially was one of the most important aspects of this conference. Besides this, the informal exchange between the participants from 14 nations was very productive. Almost half of the participants came from France, Italy and Portugal. Another large group came from Nordic countries (with three young researchers each from Denmark and Sweden) as well as five researchers each from Germany and Hungary. Individual participants also came from non-European countries like Brasil, Israel or Mexico. Altogether, there were seven young researchers who complete their theses not in their own country, but in France (3), United Kingdom (3) and the USA (1).

Especially remembered will surely be our informal meetings, the excursions and our evening programmes. The atmosphere was very open and friendly, which encouraged further exchange. Participating in further events like this is certainly worthwhile.

Many thanks to all who helped to organise and make this Summer School 2002 possible. It also must be mentioned that the local representatives, in particular Werner Peschek and Günther Ossimitz, the representatives of ERME, Paolo Boero and Konrad Krainer, highly contributed to the success of this conference.

Rita Borromeo Ferri
University of Hamburg, Institute for Mathematics Education
Von-Melle-Park 8, 20146 Hamburg, GERMANY
borromeo@erzwiss.uni-hamburg.de

Simone Reinhold
University of Hannover, Institute for Didactics of Mathematics
Bismarckstr. 2, 30173 Hannover, GERMANY
reinhold@erz.uni-hannover.de

Jürgen Roth
University of Würzburg, Institute for Didactics of Mathematics
Am Hubland, 97074 Würzburg, GERMANY
mail@juergen-roth.de

Science, Technology & Mathematics Education for Human Development — A Look at an International Conference

Bernard R. Hodgson

Note from the Editor: As a delegate of the Canadian Commission for UNESCO, I have attended the international conference "Science, Technology & Mathematics Education for Human Development", held in Goa, India, on February 20-23, 2001. The following report has first appeared in French in the *Canadian Journal of Science, Mathematics and Technology Education* 2(1), January 2002, pp. 121-123. (Reproduced here with kind permission of the Editors.)

The international conference "Science, Technology & Mathematics Education (STME) for Human Development" was held in Goa, India, from February 20th to 23rd, 2001. Organised jointly by the Commonwealth Association of Science, Technology and Mathematics Educators (CASTME) and UNESCO in collaboration with the Homi Bhabha Centre for Science Education (Tata Institute of Fundamental Research, Mumbay), this conference was part of the UNESCO Project 2000+ launched in 1993 with the collaboration of various organisations, among which the International Council for Science (ICSU), taking active part in the Goa conference. About 400 participants attended the conference, among whom a majority of from India itself as well as an important proportion of teachers of all levels.

As stated in the final programme, the aims and objectives of the conference were as follows:

- To provide a forum for exchanging ideas on various themes focusing on the role of STME in human development;
- To review the achievements of the Project 2000+ and provide directions for future actions;
- To identify new strategies to narrow the gap between developed and developing countries in the field of STME;
- To work out how the new ICT can be used for enhancing the reach of STME for all;
- To find ways to enhance the cooperation among the consortium of international organisations working in the area of STME;
- To promote access and participation of girls and women in STME and STM related careers;
- To adopt the Conference Statement and Framework for Action.

The programme was mainly built around plenary lectures, parallel lectures, poster presentations, and round tables. The organisers' wish was that the conference format, especially the numerous opportunities for work in small groups, would foster interaction among participants and thus lead to concrete actions proposals — and so it was in fact. Work in parallel sessions were grouped under the following six strands:

- Curriculum and Assessment
- Cost Effective Technology / Research
- Professional Development

- Scientific and Technological Literacy
- Empowerment of Women and Ethics
- Theoretical and Empirical Issues in STME

Some of the working papers that circulated during the Goa conference made explicit reference to the World Conference on Science, held in 1999 in Budapest; but the claimed links with the important World Conference on Higher Education, which was organised by UNESCO in Paris in 1998 and attracted more than 4000 participants, were not clear to me. However the relationship with UNESCO's Project 2000+, aiming at promoting science and technology literacy for all, could be seen throughout the meeting. The head of UNESCO Science and Technology Education Division has even made reference to the follow-up to this project as a medium-term priority for UNESCO (fiscal period 2002-2007), mathematics being henceforth an integral part of it.

In many respects, the Goa conference was in my opinion a remarkable success. The structure of the conference made possible small group working sessions that were numerous and generally quite stimulating — at least those in which I took part. Plenary sessions were of quality and gave rise to interesting and often quite spirited exchanges — especially when participants from developing countries were stressing the frequently naive viewpoint of some of the lecturers as regards the real needs of their countries. I also appreciated that throughout the conference, the crucial component, in my opinion, of the programme was kept as the central focus, namely, human development and ultimately greater welfare of humankind. The role of science, mathematics and technology education in human development and education of individuals as "honest citizens" occupied a prominent place in the discussions, especially in the comments of several participants from developing countries.

At the very beginning of the conference, the identification of a series of concrete actions and recommendations to be submitted to governments, non-governmental organisations, etc., was presented as the main goal of the conference. This goal, acting as both a catalyst and a guideline for small group work, clearly had a positive impact on the development of the conference: participants made a point of identifying opportunities leading to short- and medium-term actions. A lengthy working document had circulated at the outset of the meeting but did not seem to be supported as it was by the representatives of the various organisations sponsoring the Goa conference. The text finally submitted for discussion at the closing session was shorter and many of its recommendations remained quite general. A few of these recommendations, however, are more direct and aim at developing actions to be implemented in a near future. (A report on the "Framework for Action" adopted at this final session appears in the proceedings of the Goa Conference: S.C. Agarkar and V.D. Lale, eds., *Science, Technology and Mathematics Education for Human Development.* 2 vols. Homi Bhabha Centre for Science Education, Tata Institute of Fundamental Research, Mumbay, 2002. See Volume 2, pp. 431-440.)

In this connection, I would like to make a brief comparison with the follow-up to another recent activity of UNESCO, the World Conference on Higher Education. Of course, this conference had an importance and a significance that can hardly be compared with the Goa conference. It seems moreover to have had an important impact over the last few years. Judging from some UNESCO documents, I am not under the impression that the global context underlying the Goa conference is at this stage as "mature" and as well-structured as that of the Conference on Higher Education— but this impression may come from my unfamiliarity with UNESCO and its global programming. Nevertheless, there is no doubt in my opinion

that the theme of the Goa conference has aroused a major interest and that the organisations which sponsored it, especially UNESCO, seem desirous of elaborating reflection and implementation of concrete actions.

I would like to conclude this report with a few comments inspired by my daily work as a mathematician involved in mathematics education. Both the documents which circulated in Goa and the contacts I had there with participants have left me amazed at the ambiguity surrounding the role and importance of mathematics in projects of UNESCO, as well as in discussions taking place in meetings such as the Goa conference. It seems evident that the non-replacement, a few years ago, of those explicitly in charge of mathematics in the UNESCO structure effectively resulted in a substantial decrease, if not a quasi disappearance, of mathematics among UNESCO's concerns. This is highlighted by many facts, for instance that mathematics was not included in Project 2000+ — apparently this omission would be corrected for the next term of the project. It was quite striking, looking at the working document submitted for discussion at the closing session, that mathematics did not really seem to be an integral part of it. While it is true that the word "mathematics" was employed in the document, the general impression is that the word may simply have been appended to the expression "science and technology", without being really integrated in the spirit of the text. This fate reserved for mathematics is also illustrated in the fact that many active people in science and technology simply see mathematics as a service discipline they need in their work, and not as a domain with its own importance and vitality which can contribute in its specific way to the education and self-realisation of individuals. Fortunately, things seem to evolve — as is witnessed by the explicit presence of mathematics in the theme of the Goa conference — and there is no doubt in my mind that the improvement of the current situation rests on more frequent and substantial contacts between experts of the different domains. In this respect, I believe a crucial point is to insure that mathematics occupies a more official place among UNESCO's concerns. In this connection let me mention that the following recommendation was adopted in Goa by the working group in which I took part:

> *That UNESCO explicitly recognizes and supports the view, in its own work and in the work of related NGOs, that mathematics is an intrinsic part of the Science and Technology Literacy initiative and that contacts with related bodies be established in this connection.*

Unfortunately this recommendation was not kept by the organizers for discussion at the closing plenary session. Still one can hope that there will be other opportunities… and that such a recommendation will eventually make its way to and inside UNESCO.

In conclusion, I would like to reproduce a text quoted by one of the organizers during the closing plenary. Most probably this text is quite well-known and already been used in various contexts. But I see it as synthesizing in a remarkable way the state of mind of many participants to the Goa conference.

Dear Teacher,

I am a survivor of a concentration camp. My eyes saw what no man should witness: gas chambers built by learned engineers; children poisoned by educated physicians; infants killed by trained nurses; women and babies shot by high school and college graduates.

So I am suspicious of education. My request is: help your students to become human. Your efforts must never produce learned monsters, skilled psychopaths, educated Eichmanns.

Reading, writing and arithmetic are important only if they serve to make our children more human.

That such a plea be still of actuality, maybe even more today than ever when transposed in terms of nuclear, chemical or bacteriological war or bio-terrorism, remains the fundamental challenge of education in all branches of science, mathematics and technology.

Bernard R. Hodgson
Département de mathématiques et de statistique
Université Laval
Québec G1K 7P4 Canada
bhodgson@mat.ulaval.ca

Mathematics and Science Education: Partners in Capacity Building

Shirley M. Malcom

The Committee on Capacity Building in Science (CCBS) is one of the so-called Interdisciplinary Bodies of the International Council for Science (ICSU). It was established in 1993 at the 24th General Assembly of ICSU and replaced the previous Committee on the Teaching of Science. The founding chair of the Committee was Nobel Laureate Dr. Leon Lederman.

The purpose of CCBS was to articulate a set of goals to be addressed by the science community to support capacity building for sustainable development worldwide. The members of the initial group came from around the globe and included, besides Lederman, persons such as G. Charpak (France), Wei Yu (China) or C.N.R. Rao (India). In developing a programme of work the Committee quickly arrived at a consensus as to the more burning issues in capacity building that the committee needed to address :

- The poor quality of science education, especially at the primary level;
- The isolation of scientists; and
- The need for public understanding of science and technology.

In light of the consensus that the quality of early science education affected developing and developed countries alike, limited the public understanding of science as well as the pipeline into science and engineering careers, the CCBS chose to begin its work by focusing on primary school science. There was some concern from the disciplinary unions about their role in education below the tertiary level and how they would relate to and/or interact with CCBS. At the same time it was clear to CCBS members that Committee work should complement the efforts of the disciplinary unions as they continued their own area specific capacity building activities (including education and training initiatives) at secondary, tertiary and professional levels. But in light of the primary school focus on science as opposed to any particular discipline the Committee deemed it appropriate to undertake community building activities at this level.

The primary science activities were based around the following premises:

- There exist projects, programmes and resources around the world that can be shared by those interested in promoting quality, hands on science;
- The ideas and resources should be made widely available to provide resources for possible local consideration and/or adaptation;
- The World Wide Web would facilitate ease of sharing resources and information, and building networks of interested persons;
- Scientists and engineers could be mobilized to examine and/or adapt shared resources and to assist educators in advocacy for and work toward a quality, inquiry based, hands on science programme at the primary level.

The project began by assembling information on programmes, developing these into a website and convening a conference at the World Conference on Science (WCS) held in Budapest in Summer 1999 to share information between the scientific and education communities. The workshop in Budapest represented a turning point for CCBS. Held prior to the WCS, participants in the sessions identified a number of science education programmes and projects that were underway. They also identified initiatives that were needed to address concerns of capacity building. While many projects had similar themes organizers were often unaware of efforts undertaken elsewhere. The dialogue helped to disseminate initiatives of the unions and to build bridges between their work and that of CCBS. The Conference recognised that highest priority needed to be given to improving science education at all levels, with particular emphasis on the elimination of the effects of gender bias and bias against disadvantaged groups. It also recommended that international organizations play an important role in sharing the experience in science teaching and education and increase the support of North-South and

South-South cooperation as an important means of helping all countries. A major science education strand was included in the official WCS and included some of the same participants. It was clear from all these discussions that a new model for science education for capacity building was needed, one that provided global resources to support local and regional education initiatives and that was aimed at education for all.

It was during the pre-conference workshop that the goal was articulated to hold an international conference in Beijing in November 2000 focused on Primary School Science and Mathematics Education. Some 200 participants from across China as well as from some 20 countries attended that conference. The Beijing meeting was organized thematically and included such topics as:

- What Science and Mathematics Should Be Learned?
- How Does One Prepare Teachers to Teach the New Curricula?
- How Does New Knowledge of How Students Learn Inform This Work?

Similarities in curriculum content and instructional goals were seen across countries. Concerns about appropriate assessment were raised by participants across the globe. Many of the attendees embraced the idea that technology could provide new tools for teaching and learning science and mathematics, but they also agreed that it was unlikely to be a panacea. Lively discussions about the training and continuing professional education of teachers were held throughout the sessions with the realization that scientists and mathematicians had to become more involved in these activities and to accept greater responsibility for undertaking this work. The examples that were held up at the Beijing meeting were those where very senior scientists and prestigious science organizations had put the full weight of their prestige, access to policymakers, and real effort behind efforts to reform primary school science. And the recommendations flowed from this urging to "lead by example."

Other topics included how to work with policymakers, how to connect in-school and out of school learning opportunities and how to move the ICSU family of organizations to join in this work and to understand its fundamental importance and connection to their larger interests of supporting science and developing the next generation of scientists, engineers, technicians, health professionals and so on. Capacity building for sustainable development would have to begin with basic education that includes firm grounding in science and mathematics and move forward from there.

One major outcome of the conference was support for dissemination and scaling up of a hands on primary science education programme in China based on the programme launched in France by the French Académie des Sciences, *La Main à la Pâte*. Another outcome was the proposal of an Asia Pacific regional network and conference that was held in October 2001 in Kuala Lumpur, Malaysia.

Central to the recommendations of the Beijing conference was the need to greatly increase the attention to mathematics education in the work of CCBS at the primary level, given its central relationship to science and in recognition that, at least at the primary level, the same teacher often teaches both, and often teaches both poorly. Those of us in science education recognize that numerous opportunities exist in the teaching of our areas to reinforce concepts in mathematics. We understand that the collection, analysis and display of data are central to science and present an occasion to show the real connection between these areas. In our work as well as in our consideration of issues there was the need to make mathematics and science true partners in education for capacity building.

A recommendation emerged from the Beijing conference to hold a follow on international conference in Rio de Janeiro coincident with the meeting of the General Assembly of ICSU. This conference was held 21-23 September 2002. When planning for this meeting began with the CCBS there was direct outreach to the International Commission on Mathematical Instruction through involvement of ICMI Secretary-General Bernard Hodgson as a member of the planning group as well as identification of prominent mathematicians and mathematics educators who could be speakers and full participants in these sessions. We anticipate that this will signal a new working relationship and partnering of those involved in efforts to improve the teaching of mathematics and science at the primary level.

As we share concerns related to initial professional education, ongoing professional development, research in teaching and learning, curriculum, instruction and assessment, there is an opportunity to leverage our resources and to learn from each other.

Information on CCBS can be found by visiting ICSU website

http://www.icsu.org

under the section on "Interdisciplinary ICSU Bodies". For more on the work of the CCBS as well as a reporting of its meetings, use the direct link to its homepage

http://www.icsu.org/about/structure/IIB/ccbs/

Current members of the CCBS include: Wei Yu (China); Jajah Koswara (Indonesia); Hideo Ohashi (Japan); Yves Quéré (France); and Leon Lederman (USA).

Shirley M. Malcom
Chair, Committee on Capacity Building in Science
Director, Directorate for Education and Human Resources Programs
American Association for the Advancement of Science
Washington, DC, 20005 USA
smalcom@aaas.org

AMUCHMA Newsletter on the History of Mathematics in Africa

AMUCHMA, the African Mathematical Union Commission on the History of Mathematics, announces that the issue 26 of the *AMUCHMA Newsletter on the History of Mathematics in Africa* is now available. An electronic version of the Newsletter can be obtained from Paulus Gerdes at pgerdes@virconn.com.

All the earlier issues of the Newsletter are available at:
http://www.math.buffalo.edu/mad/AMU/amuchma_online.html

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

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/

A Note on Copyright

Future Conferences

3rd Mediterranean Conference on Mathematics Education, January 2003

The Third Mediterranean Conference on Mathematics Education will be held in Athens on January 3-5, 2003. This conference with an international participation is organised jointly by the Hellenic Mathematical Society and the Cyprus Mathematical Society and follows successful first and second Mediterranean Conferences organised in Cyprus during January 1997 and January 2000 respectively.

Educators and researchers interested in attending the conference should contact

Hellenic Mathematical Society (fax: +3010-3641025, email: mes3@hms.gr) or Cyprus Mathematical Society (fax: +357-2-379122, email: cms@cms.org.cy). Details on the conference can be found on the websites

www.hms.gr or www.cms.org.cy

International Conference on Science, Mathematics and Technology Education, January 2003

The Third International Conference on Science, Mathematics and Technology Education, organised jointly by the National Key Centre for School Science and Mathematics, Curtin University of Technology (Australia) and by Rhodes University (South Africa), will be held in East London, South Africa, on January 15-18, 2003. Following the success of the first two International Conferences on Science, Mathematics and Technology Education held in Vietnam and Taiwan, this conference will provide another challenging and culturally enriching experience for science, mathematics and technology teachers, teacher educators, researchers, and administrators at the primary, secondary and higher education levels from around the world.

For further information, please contact either of the Conference convenors, Darrell Fisher (D.Fisher@smec.curtin.edu.au) or Terry Marsh (T.Marsh@ru.ac.za).

CERME 3, February 2003

The Third Conference of the European Society for Research in Mathematics Education will be held in Belaria, near Bologna, Italy, from 28 February to 3 March 2003. The chief aims of European Society for Research in Mathematics Education are to promote communication, cooperation and collaboration in research in mathematics education in Europe. This Third Conference proposes working groups on the following topics: (1) The role of metaphors and images in the learning and understanding of mathematics; (2) Emotion and mathematical thinking; (3) Building structures in mathematical knowledge; (4) Argumentation and proof; (5) Stochastic thinking; (6) Algebraic thinking; (7) Geometrical thinking; (8) Social Interactions in mathematical learning situations; (9) Tools and technologies in mathematical didactics; (10) Teaching and learning mathematics in multi-cultural

classrooms; (11) Inter-relating theory and practice; (12) From a study of teaching practices to issues in teacher education.

For further detailed information visit the conference website:
http://www.dm.unipi.it/~didattica/CERME3

International Conference on Teacher Education, March 2003

The College of Education (COE) at the United Arab Emirates University will hold an international conference on teacher education under the theme "Redesigning Teacher Education for the Third Millennium". The conference, to take place on March 9-11, 2003, is an opportunity for teacher educators, policy makers, and practitioners to meet and explore teacher education issues through discussion groups and presentation sessions, and share views on theories and practices of teacher education worldwide. The Conference organizers hope that the discussion and the sharing processes will lead to better understanding of teacher education and will provide new ideas and resources to meet the challenges that teacher education is currently facing.

The program of the Conference will consist of keynote addresses, plenary sessions, paper sessions, and cultural and recreational visits. The COE invites participants to submit abstracts and papers for presentations relevant to the conference theme in general and the following sub-themes in particular: (1) Current Trends in Teacher Education; (2) Exemplary Teacher Education Programs; (3) The Internal, Social, and Professional World of the Teacher; (4) Information Technology and Teacher Education Program; (5) Quality Assurance in Teacher Education Program; (6) Diversity in Teacher Education; (7) Teachers' Learning Communities; (8) Teacher Education and Teaching Effectiveness in Subject Area; (9) Partnership of Colleges of Education with K-12 Schools; (10) Professional Development Schools.

All inquiries should be directed to:

Prof. Abdullateef H. Haidar
Dean, College of Education
United Arab Emirates University
P. O. Box 17551, Al-Ain
United Arab Emirates
A.Haidar@uaeu.ac.ae

World Conference on Science and Technology Education, April 2003

The International Council of Associations for Science Education (ICASE) announces that the 2003 World Conference on Science and Technology Education will be held in Penang, Malaysia, on April 7-11, 2003, under the theme "Increasing the Relevance of Science and Technology Education for All in the 21st Century". The emphasis of the conference will be on discussions between the various

educational and scientific professionals present to identify ways in which relevance science and technology courses and approaches can be popular and appropriate for all.

The World Conference will build on the ideas established in the Forum on Scientific and Technological Literacy, held at UNESCO, Paris, in 1993 and on the concerns of scientists as expressed in the Word Conference on Science, held in Budapest, in 1999. English is the official language of the Conference.

To enhance greater interaction between policy makers, curriculum developers, scientists, industrialists, teacher educators and teachers (both primary and secondary) involved in shaping the goals and directions of science and technology education, this conference wishes to recognise, and cater for, 'teams', involving combinations of such persons from a country/state/region, participating as a group, and willing to take the lead in encouraging follow-up action in their own country.

For information, please contact

Mr Tan Khun, Director, RECSAM
Jalan Sultan Azlan Shah
11700 Gelugor, Penang, Malaysia
Fax: +60-4-6572541
e-mail: director@recsam.edu.my

or visit the website

http://icase.unl.edu/worldconference

ICASE is an international umbrella organisation established in 1973 whose main objective is to extend and enhance the quality of formal and non-formal science and technology education for all, with particular reference to the children and youth of the world, and to provide and support activities and opportunities to that end. ICASE links national and regional science teacher associations (or associations of teachers for the separate sciences) and other societies, institutions, universities, foundations and companies interested in the promotion of science and technology education at the primary and secondary level. It has official relations with UNESCO.

ITEM / CAME 2003, June 2003

Organised by the Institut Universitaire de Formation des Maîtres (IUFM) of Reims and the inter-IREM Committee for Mathematics and Information Technology (CII Math-Info), the congress "Integrating Technology into Mathematics Education" (ITEM) will be take place in Reims, France, on June 20-22, 2003. This congress, whose main language is French, will be followed by the third CAME (Computer Algebra in Mathematics Education) Symposium, on June 23-24, 2003. These two events will be fully complementary, the congress being mainly intended for teachers, researchers and educational policy makers, and the symposium focusing more on research studies about the contribution of symbolic software to the learning of algebra and calculus.

CAME was originally founded at ICME-8 in Seville in July 1996. Its principal activity is a two-yearly Symposium: the first was held in Israel in 1999 and the second in the Netherlands in 2001. CAME's work is steered by an International Committee. More information about CAME and the 2003 symposium can be found on the website

http://ltsn.mathstore.ac.uk/came/index.html

The website for the ITEM meeting is

http://www.reims.iufm.fr/Recherche/ereca/colloques/tice_math_juin_2003_gb.htm

ALM-10, June 2003

Adults Learning Mathematics - A Research Forum: ALM is an international research forum which brings together researchers and practitioners in adult mathematics/numeracy teaching and learning in order to promote and disseminate knowledge, awareness and understanding of adults learning mathematics at all levels. It is a registered charity and company in England.

The 10th International Conference on Adults Learning Mathematics will be held in Strobl, Wolfgangsee, Austria on June 29 – July 2, 2003, and the theme will be "Learning mathematics to live and work in our world".

The members of the Local Organising Committee are Jürgen Maaß (Juergen.Maasz@jku.at) and Wolfgang Schlöglmann (wolfgang.schloeglmann@jku.at), University of Linz, Austria. Information about the conference and about Adults Learning Mathematics (ALM) may be obtained from the ALM website:

http://www.alm-online.org

XI CIAEM, July 2003

The 11th Inter-American Conference on Mathematics Education (XI Conferencia Inter-Americana de Educación Matemática) will be held in July 13-17, 2003, at the Universidade Regional de Blumenau (FURB), Blumenau, Brazil. The conference, whose topic is "Mathematical education for the 21st century: challenges and perspectives", is dedicated to the memory of Luis Antonio Santaló. The conference coordinator is Maria Salett Biembengut. Further information can be obtained by contacting xi-ciaem@furb.br or by visiting the website

http://www.furb.br/xi-ciaem/

PME 27, July 2003

The 27th Annual Conference of the International Group for the Psychology of Mathematics Education (PME) and the 25th Annual Meeting of PME-North America Chapter (PMENA) will be jointly held in Honolulu, Hawai'i, on July 13-18, 2003 in the Hawai'i Convention Center. The theme of the conference is "Navigating Between Theory and Practice". The conference will highlight examples of the interactions between research and practice — practice that has been affected by research and

research that stems from practice. For example, research on student learning could impact teacher development. The conference is sponsored by the University of Hawai'i-Manoa (UH-M) and Pacific Resources for Education and Learning (PREL).

For the further information visit

http://igpme.tripod.com/hawaii.html

or contact either Dr. Sandy Dawson, PME27 Program Chair, (dawsons@prel.org, Phone: +1-808-441-1331) or Dr. Joseph Zilliox, PMENA25 Chair, (zilliox@hawaii.edu, Phone: +1-808-956-5358).

CIEAEM 55, July 2003

The International Commission for the Study and Improvement of Mathematics Education (CIEAEM — Commission internationale pour l'étude et l'amélioration de l'enseignement des mathématiques) is holding its 55th conference on the theme "The use of didactic materials for developing pupils' mathematical activities" from July 22 to 28, 2003 in Plock, Poland.

CIEAEM meetings are more than just an annual exchange of research work. In contrast to other events in the domain of mathematics education, they have some distinctive characteristics :

- the thematic nature of the conferences, where work is organized around a general theme and related subthemes, problems and questions;
- the composition of the group of participants, which includes teachers, teachers educators and researchers, from various institutions and schools, working in the fields of mathematics and mathematics education, history, psychology, sociology and philosophy of mathematics;
- the kind of activities designed, where lectures, presentations and workshops take place, but working groups are at the "heart of the conferences".

English and French are the official working languages at these meetings.

Any communication concerning the CIEAEM 55 Conference should be sent to the Conference Secretariat, at the address cieaem55@wlodkowic.pl.

ICTMA-11, July 2003

The Eleventh International Conference on the Teaching of Mathematical Modelling and Applications (ICTMA-11) will be held at Marquette University, Milwaukee, Wisconsin (U.S.A.) on July 27-31, 2003. The theme for ICTMA-11 is "Mathematical Modelling: A Way of Life".

Updated information is available from the ICTMA-11 Conference Organisers at ictma@cs.com or on the Conference website

http://mscs.mu.edu /~sue/ICTMA/ictma_11.html

ICCME&EGS-03, August 2003

The Third International Conference on Creativity in Mathematics Education and the Education of Gifted Students (ICCME&EGS-03) will be held in Rousse, Bulgaria, on August 3-9, 2003.

The main aim of the conference is to formulate the problem and globally define the direction of the development of creative mathematics education of gifted students on the basis of contemporary realia (educational systems, culture, technologies, etc.) and positive practices, theories and research results. The basic issues to be discussed are: (1) How to stimulate mathematical creativity in students and their teachers; (2) What areas, methods and problems in mathematics are appropriate for stimulating the creative activity of students; (3) Who the gifted students are and how can we identify them. The conference is also directed towards mathematically gifted, promising and talented school and university students.

For further information, contact

ICCME&EGS
Organizing Committee (Vice-president of OC: Emiliya Angelova Velikova)
The University of Rousse
8 Studentska str.
7017 Rousse, BULGARIA
Fax: (+359 82) 84 57 08
e-mail: conf_orgcom@ami.ru.acad.bg or emily@ami.ru.acad.bg

or visit the conference website
www.cmeegs3.rousse.bg or www.ami.ru.acad.bg/conference2003

IASE, August 2003

The International Association for Statistical Education (IASE), in cooperation with the German Statistical Society, the Section on Stochastics of the German Mathematics Education Association, the Max-Planck-Institute for Human Development, and the Probability and Statistics Interest Group of the German Mathematical Association, organises an IASE Satellite Conference on "Statistics Education and the Internet". This conference will immediately precede the ISI session in Berlin and will be held on 11-12 August 2003 at the Max-Planck Institute for Human Development, Berlin.

The aim is to discuss the implications of the Internet for teaching and learning statistics: web based teaching, learning, materials and resources. This meeting is intended to be of interest to a wide cross section of society including teachers, educational administrators, and researchers in statistical education. There will be a number of invited speakers, as well as the opportunity for others to give contributed presentations. The presentations are planned to include discussions of the main effects and challenges that the Internet is posing to statistics education. In addition to research reports, there will also be non-technical presentations, suitable for teachers who would like to learn how to make better use of Internet resources in their everyday work in the classroom.

Possible topics include: Overview of Internet resources for statistics education; Use of Internet in

statistics classes and in assessment; Training teachers to teach statistics with Internet resources; Research on how students learn or about what they learn in teaching environments based on the web; Challenges for statistics education at the Internet age, and Adding socialisation and verbalisation to online statistics education

More information is available from the chair of the Scientific Committee, Larry Weldon (weldon@sfu.ca) or from the chair of the Local Committee, Joachim Engel (engel_joachim@ph-ludwigsburg.de), or by visiting the website

http://www.ph-ludwigsburg.de/iase/

SEMT 03, August 2003

The seventh bi-annual Symposium on Elementary Mathematics Teaching (SEMT 03) is being held from August 24 - 29, 2003 in Prague. The programme focuses on the teaching of mathematics to children within the range 5-11 years. The general theme of SEMT 03 is "Knowledge starts with pre-conceptions".

Further information is available on the website

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

or by contacting the Organizing Committee at the address

SEMT 03
Charles University
Faculty of Education
Dept. of Mathematics and Mathematical Education
M.D. Rettigove 4
116 39 Praha 1
Czech Republic

The contact person is Jarmila Novotna (jarmila.novotna@pedf.cuni.cz).

Mathematics Education Into the 21st Century, September 2003

The Mathematics Education Into the 21st Century Project is organising its sixth international conference with the title "The Decidable and Undecidable in Mathematics Education". It will be held in Brno, Czech Republic, on September 19-25, 2003. Information on this Conference and on the Project itself is available from Dr. Alan Rogerson, Australia (arogerson@vsg.edu.au).

ICTMT-6, October 2003

The 6th International Conference on Technology in Mathematics Teaching (ICTMT-6) will be held in Volos, Greece, on October 10-13, 2003. This Conference will be organised in parallel with the 6th Panhellenic Conference on the Didactics of Mathematics and Informatics in Education.

The first International Conference on Technology in Mathematics Teaching was held in 1993 at the University of Birmingham in England and since then this conference took place every other year. The goal of the conference is the exploration of the role of technology in the teaching and learning of mathematics at all educational levels as well as the improvement of the quality of its instruction and learning. The goals of the conference also include applications of technology in other school subjects as well as in industry or trade, in cases where these applications are directly related to mathematics.

More specifically, the central thematic axes around which the conference has been organised are the following: (1) The influence of technology on the teaching and learning of mathematics; (2) Access to mathematics education through technology; (3) Technology and assessment; (4) Future trends in the development of technology in mathematics.

For information contact ictmt6@uth.gr or visit

http://ictmt6.pre.uth.gr/

EMF 2003, December 2003

The success of the "Espace Mathématique 2000" (EM 2000) symposum, organised in July 2000 at the initiative of the CFEM (*Commission française pour l'enseignement des mathématiques*, the French Sub-Commission of ICMI), convinced all interested parties in French-speaking countries of the merit of such international gatherings based on a common language. The CFEM, the Tunisian Commission on Mathematics Education and the Tunisian Association for the Mathematical Sciences are thus pleased to announce that the symposium EMF 2003 ("Espace Mathématique Francophone 2003") will take place in Tozeur, Tunisia, on December 19-23, 2003. This conference, which aims 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, 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.

More information on the EMF 2003 conference can be obtained on the website

http://www.mathinfo.u-picardie.fr/EMF2003/

or by contacting Hédi Daboussi (hedi.daboussi@math.u-psud.fr), Chair of the International Programme Committee, or Hikma Smida (hikma.smida@ipest.rnu.tn), Chair of the Local Organising Committee.

ATCM 2003, December 2003

The 8th Asian Technology Conference in Mathematics (ATCM 2003) will take place at Chung Hua University, Hsin-Chu, Taiwan, on December 15-19, 2003. It aims to provide an interdisciplinary forum for teachers, researchers, educators and decision makers around the world in the fields of mathematics and mathematical sciences. It also provides a venue for researchers and developers of computer technology to present their results in using technology in both basic research and pedagogical research, and to exchange ideas and information in their latest developments. The conference will cover a broad range of topics on the relevancy of technology in mathematical research and teaching.

Information is available from the International Programme Committee co-chairs, Wei-Chi Yang, Radford University, U.S.A. (wyang@radford.edu) or Tilak de Alwis, Southeastern Louisiana University, U.S.A. (talwis@selu.edu). The website of the conference is

http://www.atcminc.com

ICMI Fourteenth Study: "Applications and Modelling in Mathematics Education", February 2004

The Study Conference for the Fourteenth ICMI Study will be held at the University of Dortmund, Germany, on February 13-17, 2004. The theme of the Study is "Applications and Modelling in Mathematics Education ". The Discussion Document for this Study appears in the current issue of the *ICMI Bulletin* (December 2002, No. 51) and elsewhere.

Information on this ICMI Study can be obtained on the Study website

http:// www.uni-dortmund.de/icmi14

or by contacting the Study Chair

Prof. Dr. Werner Blum
University of Kassel
Fachbereich Mathematik/Informatik
D-34109 Kassel
Germany
Tel : +49 561 804 4623 (secr. -4620)
Fax : +49 561 804 4318
e-mail : blum@mathematik.uni-kassel.de

International Conference on School Mathematics, February 2004

The 9th International Conference on School Mathematics is being held on February 23-26, 2004, at the Vienna University of Technology. The Conference is being hosted by the Department of Algebra

and Computational Mathematics and its theme is “Alternative Methods of Instruction and Assessment”.

Information is available from Anita Dorfmayr (anita.dorfmayr@tuwien.ac.at) or Manfred Kronfellner (manfred.kronfellner@tuwien.ac.at) or by visiting

http://www.algebra.tuwien.ac.at/institut/schulmathematik/index_engl.html

CASTME, April 2004

The Commonwealth Association for Science, Technology and Mathematics Educators (CASTME) announces the CASTME International and CASTME Europe Conference to be held from 15 to 18 April 2004 at the Intercollege-Nicosia in Cyprus. The theme of the Conference is “Linking Science, Mathematics and Technology Education and their Social Relevance” and the target audience include educators, researchers, lecturers, administrators, classroom teachers and students from within and from outside the Commonwealth, who are interested in exploring and contributing to the theme..

Science, Technology and Mathematics are often taught in isolation and the skills and knowledge of one area rarely applied to the others. Yet many concepts and skills are common to all these subject areas. This conference seeks to explore links between science, mathematics and the technologies within formal and non-formal educational opportunities, across the stages of education, including life long learning and their relevance to social aspects of citizenship. The conference will highlight the social context and relevance of these subjects and explore the potential of involving out of school sites for learning within local communities as well as the role of subject areas in the social development of learners. There will be a daily discussion group on strategies for delivering citizenship with a different focus for each day to cover science, mathematics and technology.

For further details please send a message to:

Dr Gregory Makrides, Chairman of Local Organising Committee
Dean – Intercollege
46 Makedonitissas Avenue, P.O.Box 24005
CY1700 Nicosia
Cyprus
Tel.: +357-22841555
Fax: +357-22352059
e-mail: makrides.g@intercollege.ac.cy

or visit the website

www.intercollege.ac.cy or www.castme.org

IASE, June 2004

The International Association for Statistical Education (IASE) and the International Statistical Institute (ISI) are organizing the 2004 Round Table Conference on *Curricular Development in Statistics Education*, which will be held at Lund Institute of Technology, at Lund University, in Lund, Sweden from 28 June to 3 July 2004. The Round Table will bring together a small number of experts, representing as many different countries as possible, to discuss one another's views and approaches to curriculum for teaching statistics. The Round Table Conference will provide opportunities for developing better mutual understanding of common problems and for making recommendations concerning the statistics curriculum. A main outcome of the Roundtable will be a monograph containing a set of papers, which have been prepared for and discussed during the conference. The monograph will present a global overview of the conference that can serve as starting point for further research on issues related to the statistics curriculum.

The need for processing the increasing amount of data people receive in the course of their work and lives has made it imperative that students leave elementary and secondary schools prepared to make reasoned decisions based on sound statistical thinking. Countries and communities have approached this problem in different ways. The Round Table will provide the opportunity for sharing what works and to highlight the challenges and potential solutions researchers have faced as they design and implement curricula to produce statistically literate citizens.

Information on the scientific programme can be obtained from Gail Burrill at burrill@msu.edu. For local information, contact Lena Zetterqvist at lena@maths.lth.se. The home page of the conference is

http://hobbes.lite.msu.edu/~IASE_2004_Roundtable/

ICME-10, July 2004

The Tenth International Congress on Mathematical Education (ICME-10) will be held in Copenhagen, Denmark, from July 4 to 11, 2004. While ICME-10 will be in accordance with the principles established by the ICME tradition, a distinctive flavour is the fact that it is being organised in close cooperation among the Nordic countries — Denmark, Finland, Iceland, Norway and Sweden. To emphasise this Nordic flavour, a special Nordic Contact Committee has been formed to support collaboration in the planning process. This Committee is chaired by Prof. Gerd Brandell, Lund University, Sweden (Gerd.Brandell@math.lth.se).

The International Programme Committee of ICME-10, appointed by ICMI, is chaired by Prof. Mogens Niss, Roskilde University, Denmark (mn@mmf.ruc.dk). The members of the IPC are listed in the *ICMI Bulletin* No. 49, December 2000, pp. 12-13. The Local Organising Committee of ICME-10 is chaired by Prof. Morten Blomhøj of Roskilde University, Denmark (morten@mmf.ruc.dk).

Information about various aspects of the organisation of ICME-10 can be accessed on the congress website:

http://www.icme-10.dk/

HPM, July 2004

The International Study Group on the Relations between History and Pedagogy of Mathematics (HPM), an Affiliated Study Group of ICMI, announces that the HPM Satellite Conference of ICME-10 will take place on July 12 - 17, 2004 in the historic town of Uppsala, Sweden. It will be organized by the Department of Mathematics at Uppsala University.

The HPM Satellite Conference is a unique occasion to attend lectures, workshops, research reports from all over the world about the use of history in mathematics education, history of mathematics, history of mathematics education. The participants to the HPM meetings are researchers in history, in mathematics education, and teachers who have experimented the use of history in their teaching.

For further information contact the chair of the Local Organising Committee, Sten Kaijser (sten@math.uu.se) or visit the website

http://www.math.uu.se/hpm

PME 28, July 2004

The 28th International Conference of the International Group for the Psychology of Mathematics Education (PME), an Affiliated Study group of ICME, will be held in Bergen, Norway, on July 14-19, 2004, just following the ICME-10 congress in Copenhagen. The Conference theme is: *Inclusion and Diversity*.

Information can be obtained from the PME web site

http://igpme.org

or from the Conference site

http://www.pme28.org

XI IOSTE, July 2004

The XI Symposium of the International Organization of Science and Technology Education (IOSTE) will be held at Marie Curie-Sklodowska University in Lublin, Poland, from 25 to 30 July 2004. The theme of the Symposium is "Science and Technology Education for a Diverse World — Dilemmas, Needs and Partnerships". The symposium will concentrate on a series of sub-themes (vg science curricula, interdisciplinary science education, assessment, teacher education, general and culture role of STE, international cooperation) presented with respect to research, practice or policy.

Detailed information can be found on the website

http://ioste11.umcs.lublin.pl/

ICOTS-7, July 2006

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

ICM 2006, August 2006

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

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 REPRESENTATIVES

(Readers are asked to notify the Secretary-General of any errors in or changes to this list. ICMI Representatives whose e-mail addresses do not appear below should provide this information to the Secretary-General at their earliest convenience.)

ARGENTINA — Professor **Norma Cristina Pietrocola**
Olimpiada Matematica Argentina
Santa Fe 3312 - 9o Piso
(1425) Buenos Aires
ARGENTINA
norma@oma.org.ar

ARMENIA — *Not known*

AUSTRALIA — Mr. **Desmond Fearnley-Sander**
Department of Mathematics
University of Tasmania
GPO Box 252-37
Hobart, Tasmania 7001
AUSTRALIA
Desmond.FearnleySander@utas.edu.au

AUSTRIA — Professor Dr. **Hans-Christian Reichel**
Universität Wien
Institut für Mathematik
Strudlhofgasse 4
A-1090 Wien
AUSTRIA
hans-christian.reichel@univie.ac.at

BANGLADESH — Professor **S.M. Sharfuddin**
58 Lake Circus
Kalabagan, Dhaka-1205
BANGLADESH

BELGIUM

Professor **Dirk Janssens**
Kath. Universiteit Leuven
Department of Mathematics
Celestijnenlaan 200B
B-3001 Leuven
BELGIUM
dirk.janssens@wis.kuleuven.ac.be

BOTSWANA

Mr. **B.J. Radipotsane**
Ministry of Education
Private Bag 005, Gaborone
BOTSWANA

BRAZIL

Dr. **Marcio Soares**
Federal University of Minas Gerais
Av. Antonio Carlos 6627
31270-901 Belo Horizonte
BRAZIL
msoares@mat.ufmg.br

BRUNEI DARUSSALAM

Not known

BULGARIA

Academician **Blagovest Sendov**
Bulgarian Academy of Sciences
1,7 Noemvry
Sofia 1040
BULGARIA
bsendov@argo.bas.bg

CAMEROON

Professor **Henri Hogbe-Nlend**
Société Mathématique du Cameroun
BP 12041 Yaoundé
CAMEROUN
hhogbenlend@yahoo.fr, h2n@camnet.cm

CANADA

Professor **Eric R. Muller**
Department of Mathematics
Brock University
St. Catharines, Ontario L2S 3A1
CANADA
emuller@spartan.ac.brocku.ca

CHILE

Professor **Rubi Rodriquez**
Facultad de Matemáticas
Pontificia Universidad Catolica de Chile
Casilla 306, Correo 22
Santiago
CHILE

CHINA

Chinese Mathematical Society
Professor **Li Daqian**
Institute of Mathematics
Fudan University
Shanghai 200433
CHINA
dqli@fudan.edu.cn

Mathematical Society located in Taipei, China
Professor **Fou-Lai Lin**
Institute of Mathematics
National Taiwan Normal University
Taipei
TAIWAN
linfl@math.ntnu.edu.tw

COSTA RICA

Professor **B. Montero**
Associación Matemática Costarricense
Escuela de Matemática
Universidad de Costa Rica
San José
COSTA RICA

CROATIA

Professor **Mirko Polonijo**
Matematicki odjel PMF
Bijenicka cesta 30
41000 Zagreb
CROATIA

CUBA

Professor **M. Prieto**
Facultad de Matemática
Universidad de le Habana
Habana 4
CUBA

CZECH REPUBLIC

Professor **Jan Chvalina**
Mathematics Department
Pedagogical Faculty
Masaryk University
Porící 31, 603 00 Brno
CZECH REPUBLIC
chvalina@jumbo.ped.muni.cz

DENMARK

Professor **Hans Christian Hansen**
Copenhagen College of Teacher Education
Bybjergvej 25
2740 Skovlunde
DENMARK
Hans.Christian.Hansen@skolekom.dk

EGYPT

Professor **Attia A. Ashour**
Faculty of Science
Cairo University
Giza
EGYPT
ashour@frcu.eun.eg

ESTONIA

Not known

FINLAND

Professor **Olli Martio**
Department of Mathematics
Helsinki University
P.O Box 4, SF-00014 Helsinki
FINLAND
olli.martio@helsinki.fi

FRANCE

Professor **Jean-Luc Dorier**
IUFM de l'Académie de Lyon
Centre de Villeurbane
24 rue Alfred de Musset
F-69628 Villeurbane
FRANCE
Jean-Luc.Dorier@imag.fr

GEORGIA

Not known

GERMANY

Professor, Dr. **Günter Törner**
Fachbereich Mathematik
Gerhard-Mercator-Universität
Gesamthochschule Duisburg, Lotharstr. 65
D-47048 Duisburg
GERMANY
toerner@math.uni-duisburg.de

GHANA

Professor **D.A. Akyeampong**
Department of Mathematics
University of Ghana
P.O.Box 62, Legon, Accra
GHANA

GREECE

Not known

HONG KONG

Mr. **Pak-Hong Cheung**
Munsang College (HK Island)
26 Tai On Street
Sai Wan Ho
HONG KONG
phcheung@imsc.edu.hk

HUNGARY

Professor, Dr. **Janos Szendrei**
Juhász Gyula Teacher Training College
Boldogasszony sgt. 6
H-6701 Szeged
HUNGARY

ICELAND

Professor **Gudmundur Birgisson**
Iceland University of Education
v/ Stakkahlid
IS-105 Reykjavik
ICELAND
gbirgiss@khi.is

INDIA

Professor **R. C. Cowsik**
Department of Mathematics
University of Bombay, Vidyanagari
Bombay 400098
INDIA
cowsik@math.mu.ac.in

INDONESIA

Dr. **Y. Marpaung**
FKIP Universitas Sanata Dharma
P.O. Box 29
Yogyakarta 55002
INDONESIA
yanmar@usd.ac.id

IRAN

Professor **Megherdich Toomanian**
Department of Mathematics, Faculty of Science
University of Tabriz,
Tabriz
IRAN

IRELAND

Professor **Alastair D. Wood**
The National Sub-Commission for Mathematical Instruction
The Royal Irish Academy, Academy House
19 Dawson Street, Dublin 2
IRELAND
Alastair.Wood@dcu.ie

ISRAEL

Professor **Theodore Eisenberg**
Department of Mathematics
Ben-Gurion University
P.O.Box 653, Beer Sheva 84105
ISRAEL
eisen@black.bgu.ac.il

ITALY

Professor **Ferdinando Arzarello**
Università degli Studi di Torino
Dipartimento di Matematica
Via Carlo Alberto 10
10123 Torino
ITALY
arzarello@dm.unito.it

IVORY COAST

Professor **Pierre Nezit**
Société Mathématique de Côte d'Ivoire (S.M.C.I.)
08 B.P. 2030 Abidjan 08
IVORY COAST

JAPAN — Professor **Yukihiko Namikawa**
Graduate School of Mathematics
Nagoya University
Nagoya, 464-8602
JAPAN
namikawa@math.nagoya-u.ac.jp

KAZAKHSTAN — *Not known*

DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA — *Not known*

REPUBLIC OF KOREA — Professor **Han Shick Park**
Faculty of Mathematics
Korea National University of Education
Chongwon-kun
Chungbuk, 363-791
REPUBLIC OF KOREA
haspark@cc.knue.ac.kr

KUWAIT — Mr. **Mansour Hussein**
Mathematics Advisory, Ministry of Education
P.O.Box 7
Safat
KUWAIT

LATVIA — Dr. **Daina Taimina**
Department of Mathematics
Cornell University
Ithaca, NY 14853-4201
USA
dtaimina@math.cornell.edu

LITHUANIA — *Not known*

LUXEMBOURG — Professor **Jean-Claude Delagardelle**
Centre Universitaire de Luxembourg
162 A, avenue de la Faïencerie
L-1511 Luxembourg
Luxembourg
jean-claude.delagardelle@education.lu

MALAWI

Inspector for Mathematics
c/o Secretary for Education & Culture
Ministry of Education & Culture
Private Bag 328, Capital City, Lilongwe 3
MALAWI

MALAYSIA

Professor **Abu Osman Md. Tap**
School of Mathematical Sciences
Faculty of Science and Technology
Universiti Kebangsaan Malaysia
43600 UKM Bangi, Selangor DE,
MALAYSIA.
abu@pkrisc.cc.ukm.my

MEXICO

Dr. **Emilio Lluis-Riera**
Instituto de Matematicas
Universidad Nacional Autonoma de Mexico
Circuito Exterior, Ciudad Universitaria
Coyoacan, D.F. 04510
MEXICO
emilio@matem.unam.mx

MOZAMBIQUE

Dr. **Abdulcarimo Ismael**
Head of Department of Mathematics
Higher Pedagogical Institute (I.S.P.)
C.P. 3276, Maputo
MOZAMBIQUE

NETHERLANDS

Professor **Fred Goffree**
Bremlaan 16
NL-3735 KJ Bos en Duin
NETHERLANDS
f.goffree@fi.uu.nl

NEW ZEALAND

Dr. **Glenda Anthony**
Technology, Science and Mathematics Education
College of Education
Massey University
PB 11222, Palmerston North
NEW ZEALAND
G.J.Anthony@massey.ac.nz

NIGERIA	Dr. **Sam O. Ale** Abubakar Tafawa Balewa College School of Science and Science Education Ahmadu Ballo University Bauchi Campus, Bauchi NIGERIA
NORWAY	Dr. **Kari Hag** Department of Mathematical Sciences NTNU - Norwegian University of Science and Technology NO-7491 Trondheim NORWAY Kari.Hag@math.ntnu.no
PAKISTAN	*Not known*
PERU	*Not known*
PHILIPPINES	Professor **Bienvenido F. Nebres** S.J. Ateneo de Manila University P.O.Box 154, Manila PHILIPPINES bnebres@admu.edu.ph
POLAND	Professor **Stefan Turnau** Institute of Mathematics Pedagogical University (WSP) P.B. 115, PL-35-959 Rzeszow POLAND sturnau@atena.univ.rzeszow.pl
PORTUGAL	Professor **M.R.F. Moreira** Department of Mathematics University of Porto 4000 Porto, PORTUGAL
ROMANIA	*Not known*

RUSSIA

Professor **Igor Fedorovich Sharygin**
Moscow Centre for Continuous Mathematical Education (MCCME)
Bolshoy Vlasievskiy per., d. 11
121 002 Moscow
RUSSIA
sharygin@mccme.ru

SAUDI ARABIA

Not known

SENEGAL

Not known

SINGAPORE

Dr. **Peter Pang**
Department of Mathematics
National University of Singapore
2 Science Drive 2
SINGAPORE 117543
smsuser@math.nus.edu.sg

SLOVAKIA

Professor **Vladislav Rosa**
Faculty of Mathematics and Physics
Comenius University
Mlynská dolina
842 15 Bratislava
SLOVAKIA

SLOVENIA

Not known

SOUTH AFRICA

Dr. **Mamokgethi Setati**
Department of Mathematics
University of the Witwatersrand
Private Bag 3, P O Wits, 2050
Johannesburg
SOUTH AFRICA
setatim@educ.wits.ac.za

SPAIN

Professor **Tomás Recio**
Departamento de Matemáticas, Estadística y Computación
Facultad de Ciencias
Universidad de Cantabria
39071 Santander
SPAIN
recio@matesco.unican.es

SWAZILAND	Mr. **E.D. Bicknell** William Pitcher College P.O.Box 1473, Manzini SWAZILAND
SWEDEN	Dr. **Gerd Brandell** LTH Centre for Mathematical Sciences Lund University Box 118 SE 221 00 Lund SWEDEN Gerd.Brandell@math.lth.se
SWITZERLAND	Professor **Urs Kirchgraber** Mathematik ETH-Zentrum CH-8092 Zürich SWITZERLAND kirchgra@math.ethz.ch
THAILAND	Professor **Siriporn Thipkong** The Mathematical Association of Thailand Mathematics Building Chulalongkorn University Bangkok 10330 THAILAND
TUNISIA	Dr. **S. Aidi** 18 rue des Suffètes Salammbo TUNISIA
TURKEY	*Not known*
UKRAINE	*Not known*
UNITED KINGDOM	Professor **Derek Woodrow** Manchester Metropolitan University Institute of Education Crewe Green Road Crewe CW1 5DU UK d.woodrow@mmu.ac.uk

UNITED STATES OF AMERICA	Dr. **Daniel L. Goroff** c/o Dr. Tamae Maeda Wong National Academy of Sciences 500 Fifth Street, N.W. Washington, DC 20001 USA USNCMI@nas.edu
URUGUAY	*Not known*
VENEZUELA	*Not known*
VIET NAM	Professor **Nguyen Dinh Tri** Hanoi National University of Technology Dai Co Viet Road Hanoi VIET NAM ndtri@ifi.edu.vn
YUGOSLAVIA	Dr. **Milosav Marjanovic** Union of Mathematicians Societies of Serbia and Montenegro Kneza Mihaila 35/IV 11000 Belgrade YUGOSLAVIA nastava@matf.bg.ac.yu
ZAMBIA	Dr. **S.M. Bayat** Secretary, Mathematical Association of Zambia P.O. Box RW 204 Ridgeway Lusaka ZAMBIA