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Mathematical Union**



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IMU

**BULLETIN OF THE
INTERNATIONAL MATHEMATICAL UNION**

No. 48

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48TH BULLETIN OF THE INTERNATIONAL MATHEMATICAL UNION

CONTENTS

♦	Executive Committee	02
♦	Members of the Union	03
♦	14 th General Assembly of IMU	04
	• IMU General Assembly / appointment of delegates	06
	• Procedures for the Election of the Executive Committee of IMU 2002 - updated in 1999	07
	• Procedures for the Election of the Executive Committee of ICMI	08
	• Procedures for the Election of CDE	08
	• Procedures for the Election of ICHM	08
	• Addresses of Adhering Organizations and Committee for Mathematics and Affiliated Members	09
♦	Report of the IMU Executive Committee to the 14 th General Assembly	36
	• Members of IMU	36
♦	Scientific Activities of the Union	37
♦	Special Events and New Prizes	37
	• World Mathematical Year 2000	37
	• Abel Prize	40
	• Gauss Prize	41
♦	Conferences supported by IMU in 1998, 1999, 2000, 2001 and 2002	43
♦	Meetings of the Executive Committee (Excerpts of the meetings)	49
♦	IMU News	53
♦	Publications of the Union	53
♦	Postal Ballots	53
♦	General Assembly	54
♦	International Congress of Mathematicians - 2002	54
♦	Support of ICM 2002 participation:	54
	• Fellowships for young mathematicians from developing countries	54
	• Support of mathematicians from Eastern Europe	55
	• Support of mature mathematicians from developing countries	55
♦	Special Development Fund	55
♦	ICM 2006	57
♦	Change in the IMU Statutes	57
♦	Commission on Development and Exchanges (CDE), report for the years 1999-2002	58
♦	International Commission on Mathematical Instructions (ICMI), report for the years 1998-2001	59
♦	International Commission on the History of Mathematics (ICHM), report for the years 1999-2002 (May)	68
♦	Committee on Electronic Information and Communication (CEIC), report	70

INTERNATIONAL MATHEMATICAL UNION

Executive Committee

January 1, 1999 - December 31, 2002

President:	Professor Jacob Palis
Vice-Presidents:	Professor Shigefumi Mori Professor Simon Donaldson
Secretary:	Professor Phillip Griffiths
Members:	Professor Vladimir Arnold Professor Jean Michel Bismut Professor Björn Engquist Professor Martin Groetschel Professor M.S. Raghunathan
Past President:	Professor David Mumford

Members of the Union

The following 65 countries were members of IMU as of January 1, 2001:

- Group I:** Armenia, Bulgaria, Cameroon, Croatia, Cuba, Egypt, Estonia, Greece, Hong Kong, Iceland, Ivory Coast, Kazakhstan, Democratic Republic of Korea, Latvia, Lithuania, New Zealand, Nigeria, Peru, Philippines, Portugal, Romania, Saudi Arabia, Singapore, Slovenia, Tunisia, Turkey, Uruguay, Venezuela, Vietnam.
- Group II:** Argentina, Austria, Chile, Czech Republic, Denmark, Finland, Georgia, Iran, Ireland, Republic of Korea, Mexico, Norway, Slovak Republic, South Africa, Ukraine, Yugoslavia.
- Group III:** Australia, Belgium, Brazil, Hungary, India, Poland, Spain.
- Group IV:** Netherlands, Sweden, Switzerland.
- Group V:** Canada, China, France, Germany, Israel, Italy, Japan, Russia, United Kingdom, United States.

Group	I	II	III	IV	V
Number of Votes	1	2	3	4	5
Dues Unit Contributions	1	2	4	7	10

The listing of China is as follows:

- Chinese Mathematical Society, 3 votes
- Mathematical Society located in Taipei, China, 2 votes

14th General Assembly
International Mathematical Union
August 17-18, 2002, Shanghai, China
Opening Session – 10:00 a.m.

1. Opening of the Assembly
2. Address by the President
3. Appointment of Committees
 - (i) Credentials Committee
 - (ii) Resolutions Committee
 - (iii) Tellers
 - (iv) Committee for Finance and Dues
 - (v) Nomination Committee
4. Members
 - (i) Change of Groups
 - (ii) Dues arrears of Members
 - (iii) New Members
5. Review of the Activities of the Union
 - (i) IMU Bulletin
 - (ii) Symposia and Conferences
 - (iii) World Directory of Mathematicians
 - (iv) ICMI, CDE, ICHM, CEIC
6. Finance and Dues
 - (i) Financial reports for the year 1998-2001
 - (ii) Proposal for a dues increase
 - (iii) Budget for 2003-2006
7. Site of ICM 2006
8. Elections
 - (i) Executive Committee of IMU
 - (ii) Executive Committee of ICMI
 - (iii) CDE
 - (iv) ICHM
 - (v) Representative of IMU to ICSU
9. Adoption of Resolutions
10. Miscellaneous
11. Any other item with the permission of the President
12. Next meeting of the General Assembly

IMU GENERAL ASSEMBLY

The following letter has been sent to all Adhering Organizations of IMU, with a copy to the National Committees, on November 9, 2001

Dear Colleagues,

1. The 14th General Assembly of the International Mathematical Union (IMU) will be held in Shanghai, China, August 17-18, 2002, before the International Congress of Mathematicians (ICM-2002). The meeting will take place at Pudong Shangri-La Hotel, 33 Fu Cheng Road, Pudong New Area, Shanghai 200120, China, telephone 86-21-68828888, fax 86-21-68829998. The procedures for room reservations will be announced with the invitation letters from the Local Organizing Committee to the delegates appointed by the Adhering Organizations/National Committees. More information can be found at www.mathca.com/ICM2002.html.
2. According to the Statutes of the Union, each Adhering Organization "shall appoint and certify to the Secretary of the Union a delegation which shall have the number of votes corresponding to the Group in which it adheres, as follows:

Group:	I	II	III	IV	V
Number of votes:	1	2	3	4	5

provided that the number of delegates shall not exceed the corresponding number of votes. Any Adhering Organization which desires to ensure its full quota of representatives at meetings of the General Assembly by the appointment of alternates for its regularly named delegates may do so, provided that no such alternate shall be permitted to participate in the work of the General Assembly until s/he has been duly certified to the Secretary of the Union as assuming the powers and duties of the delegate s/he has been designated to replace. No person shall be a member of the delegation of more than one country. Voting by the General Assembly shall be by delegations, provided 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."

3. You are hereby requested to designate the delegation of your country. Please enter on the accompanying form the names of your delegates, with alternates if any, together with their addresses and return this form to the Secretariat by March 1, 2002.
4. As provided for in the Statutes of the Union, Adhering Organizations may propose business to be transacted at the General Assembly. Such proposals shall reach the Secretary at least four months before the meeting, and preferably before March 1, 2002.

Yours truly,

Phillip A. Griffiths
Secretary of IMU

INTERNATIONAL MATHEMATICAL UNION

14th General Assembly 2002, Shanghai, China, 2002

Appointment of Delegations

You are hereby requested to designate the delegation of your country.

OBS: *The appointment of delegations is the responsibility of the Adhering Organization*

COUNTRY: _____ GROUP: _____

ADHERING ORGANIZATION: _____

DELEGATES:

1. NAME: _____ E-MAIL: _____

ADDRESS: _____ FAX: _____

2. NAME: _____ E-MAIL: _____

ADDRESS: _____ FAX: _____

3. NAME: _____ E-MAIL: _____

ADDRESS: _____ FAX: _____

4. NAME: _____ E-MAIL: _____

ADDRESS: _____ FAX: _____

5. NAME: _____ E-MAIL: _____

ADDRESS: _____ FAX: _____

ALTERNATE:

1. NAME: _____ E-MAIL: _____

ADDRESS: _____ FAX: _____

This information may be provided by e-mail, or this form may be completed using capital letters and returned, no later than March 1, 2002 to:

IMU Secretariat

IMU-Institute for Advanced Study
Einstein Drive
Princeton, New Jersey 08540-0631 USA
Fax: (609) 683-7605 - e-mail: imu@ias.edu

Procedures for the Election of the Executive Committee of IMU - 2002

Updated in 1999

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:
 1. the President of IMU (chairman),
 2. all Past Presidents who are present (ex-officio),
 3. 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."

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 EC of IMU shall request proposals for the membership of the EC of ICMI from the National Committees for Mathematics and 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.

Procedures for the Election of CDE

The rules for the election of the Commission of Development and Exchange are similar to those for the election of the Executive Committees of IMU and ICMI with the same Nominating Committee.

The EC of IMU shall request proposals for the membership of CDE from the National Committees for Mathematics and will conduct extensive consultations with the existing CDE before proposing slates to the Nominating Committee.

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

Procedures for the Election of ICHM

The rules for the election of the two IMU members of the Executive Committee of ICHM are similar to those for the election of the Executive Committees of IMU, CDE and ICMI, with the same Nominating Committee.

The EC of IMU shall request proposals for the membership of the two IMU members from the National Committees for Mathematics and will conduct extensive consultations with the existing ICHM before proposing slates to the Nominating Committee.

**MEMBERS OF THE INTERNATIONAL MATHEMATICAL UNION - IMU
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Argentina - Group II

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Group III

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Dues

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Italy - Group V

Adhering Organization:

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Ivory Coast - Group I

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Report of the IMU Executive Committee to the 14th General Assembly

This report corresponds to the period 1998 - 2001

MEMBERS OF THE UNION

The following countries were members of IMU as of January 1, 2002:

- Group I:** Armenia, Bulgaria, Cameroon, Croatia, Cuba, Egypt, Estonia, Greece, Hong Kong, Iceland, Ivory Coast, Kazakhstan, Democratic Republic of Korea, Latvia, Lithuania, New Zealand, Nigeria, Peru, Philippines, Portugal, Romania, Saudi Arabia, Singapore, Slovenia, Tunisia, Turkey, Uruguay, Venezuela, Vietnam.
- Group II:** Argentina, Austria, Chile, Czech Republic, Denmark, Finland, Georgia, Iran, Ireland, Republic of Korea, Mexico, Norway, Slovak Republic, South Africa, Ukraine, Yugoslavia.
- Group III:** Australia, Belgium, Brazil, Hungary, India, Poland, Spain.
- Group IV:** Netherlands, Sweden, Switzerland.
- Group V:** Canada, China, France, Germany, Israel, Italy, Japan, Russia, United Kingdom, United States.

SCIENTIFIC ACTIVITIES OF THE UNION

SPECIAL EVENTS AND NEW PRIZES

1. WORLD MATHEMATICAL YEAR 2000: A SUMMARY

Report by Mireille Chaleyat-Maurel

The celebration has taken place all around the world with a great number of events; this article summarizes the great tendencies of this celebration as all the details can be seen on the WMY2000 server (<http://wmy2000.math.jussieu.fr>).

- **Framework - Rio's Declaration**

On May 6th 1992 in Rio de Janeiro (Brazil), the then chairman of the International Mathematical Union (IMU), Professor Jacques-Louis Lions declared the year 2000 to be the "World Mathematical Year". This enterprise, placed under the aegis of UNESCO and the "Third World Academy of Sciences", had three different main objectives:

- The great challenges of the 21st century
- Mathematics, keys for development
- The image of Mathematics

- **Sponsorship of UNESCO**

After the support in 1992, of the then General Director of UNESCO, Federico Mayor, a resolution was presented in November 1997 by Luxembourg, backed up by 15 countries and adopted by the Plenary of the General Conference. The text is on the server.

- **Newsletter WMY2000**

Since 1993, nine issues of a newsletter (Editors: M. Chaleyat-Maurel and G. Tronel) gathering and redistributing widely information on WMY2000 have been published and distributed (7 000 copies for each). Their content is on the server.

- **Server**

Thanks to the Institut of Mathematics of Jussieu (Paris, France), a server has been run by P. Jarraud with the following address:

<http://wmy2000.math.jussieu.fr>

It contains all the information and documents concerning WMY2000: pictures of posters, postcards and stamps, reports of conferences, announcements of Events and other activities.

- **Partners**

All the International Mathematical Societies have contributed to WMY2000, either by special conferences and events or by their annual meeting with sessions devoted to the aims of WMY2000. Some of them have created a special Committee.

More than 40 countries have participated to the celebration of the year with different accomplishments.

Among others, Belgium, Canada, France, Germany, Italy, Portugal, Spain, UK and USA had a very active contribution to the year with a good visibility towards the general public and the politics.

- **Projects**

Conferences

Several international conferences have been held during year 2000 (see the list on the servers with some reports). In some cases, they would have taken place independently of this special occasion; nevertheless, they have contributed to make WMY2000 more visible and very often they have organized round tables or talks about the aims of WMY2000.

Lectures for general public

Since the ten last years, mathematicians are aware of the need for communicating mathematics to the general public and in many countries such events have taken place (Argentina, Australia, Canada, Denmark, Finland, France, Germany, Greece, Italy, Norway, Portugal, Spain, UK,...).

Stamps

Stamps related to WMY2000 were issued in the following countries: Argentina, Belgium, Croatia, Czech Republic, Italy, Luxembourg, Monaco, Slovakia, Spain and Sweden (see the server for some of them).

A stamp on Fermat has been issued in France in 2001.

Posters, brochures, CD, postcards

Following the poster competition arranged by the European Mathematical Society, posters or series of posters have been produced in Belgium, Denmark, France, Germany, Italy, Portugal, Spain and UK. Some of them were in the Public Transportation Systems (Buses and Undergrounds) or presented in Science Museums.

Some CD-ROMs and brochures have been produced.

Postcards inspired by the posters have been printed in Denmark, France, Germany and Portugal. Among many other activities, let us quote mathematical exhibitions, article in Newspapers and some Radio and Television Programmes.

- **Conclusion**

From this big and successful operation, it is clear that since some years, many mathematicians are convinced that communicating mathematics to the general public is necessary and very helpful for the community.

The production of posters with mathematical themes has been of considerable interest to schools, where teachers use them to motivate and inspire pupils.

- **Continuation**

Some Mathematical Societies consider that to raise the public awareness of mathematics is an important task and they have plans to continue the work.

The EMS has appointed a new Committee (RPAMaths Committee) to ensure a continuing presence to the European Science and Technology Week and to encourage activities towards the general public (Chair: V. Hansen (Denmark), Vice-chair: M. Chaleyat-Maurel (France)).

The e-mail list "RPAMaths" (rpamaths@math.jussieu.fr) gives information on all events connected to popularization of mathematics. The future of the WMY2000 is on the way.

IMU wishes to express a great admiration for the beautiful and important work done by Mireille Chaleyat-Maurel (Université Paris 5 René Descartes) and her colleagues Pierre Jarraud (Univ. Pierre et Marie Curie) and Gérard Tronel (Univ. Pierre et Marie Curie) for the World Mathematical Community

2. MATHEMATICS: FRONTIERS AND PERSPECTIVES

Edited by: V. Arnold, *University of Paris IX, France, and Steklov Mathematical Institute, Moscow, Russia*, M. Atiyah, *University of Edinburgh, Scotland*, P. Lax, *New York University-Courant Institute of Mathematical Sciences, NY*, and B. Mazur, *Harvard University, Cambridge, MA*

An IMU Book by Prominent Mathematicians World Mathematical Year 2000

This remarkable book is a celebration of the state of mathematics at the end of the millennium. Produced under the auspices of the International Mathematical Union (IMU), the volume was born as part of the activities observing the World Mathematical Year 2000.

The volume consists of 30 articles written by some of the most influential mathematicians of our time. Authors of 15 contributions were recognized in various years by the IMU as recipients of the Fields Medal, from K. F. Roth (Fields Medalist, 1958) to W. T. Gowers (Fields Medalist, 1998). The articles offer valuable reflections about the amazing mathematical progress we have witnessed in this century and insightful speculations about the possible development of mathematics over the next century.

Some articles formulate important problems, challenging future mathematicians. Others pay explicit homage to the famous set of Hilbert Problems posed one hundred years ago, giving enlightening commentary. Yet other papers offer a deeply personal perspective, allowing singular insight into the minds and hearts of people doing mathematics today.

Mathematics: Frontiers and Perspectives is a unique volume that pertains to a broad mathematical audience of various backgrounds and levels of interest. It offers readers true and unequalled insight into the wonderful world of mathematics at this important juncture: the turn of the millennium.

The work is one of those rare volumes that can be browsed, and if you do simply browse through it, you get a wonderful sense of mathematics today. Yet it also can be intensely studied on a detailed technical level for gaining insight into some of the great problems on which mathematicians are currently working.

<http://www.ams.org/bookstore-getitem?key=isbn&id=0-8218-2697-2>

3. NEW PRIZES

3.1 ABEL PRIZE

To the World Mathematical Community

We are very happy to communicate that our colleagues Jens Erik Fenstad, Olav Arnfinn Laudal, Ragni Piene, Yngvar Reichelt, Arild Stubhaug, and Nils Voje Johansen, have just informed us that the Norwegian Government has created an yearly Abel Prize in Mathematics, comparable to the Nobel Prize! This group of mathematicians are now proposing that the Norwegian Academy of Sciences be given the important task of deciding the yearly winners, upon the advise of an International Advisory Committee that, accordingly to their proposal, should be appointed with the help of IMU.

Our colleagues from Norway are very glad that the Executive Committee of IMU has given the initiative a strong and indeed enthusiastic support. In fact, we do believe that such a prize will represent a great asset for the further development of Mathematics from now on.

Jacob Palis
President

Phillip Griffiths
Secretary

International Mathematical Union - IMU

Procedure for the Choice of the Awardees Tentative Proposal

The Norwegian Academy of Sciences is considering to nominate a 5-person committee , one appointed by the Norwegians, three by IMU and one by the European Math. Society, to indicate the awardees: IMU would provide the Academy a list of six names from which three would be chosen.

3.2 GAUSS PRIZE

International Mathematical Union

Press Information

30 April 2002

GAUSS PRIZE

NEW PRIZE IN SCIENCE PROMOTES MATHEMATICS AS A KEY TECHNOLOGY

Mathematics is an important and ancient discipline—no one doubts that. However, it seems that only the experts know that mathematics is a driving force behind many modern technologies. The *Gauss Prize* has been created to help the rest of the world realize this fundamental fact. The prize is to honor scientists whose mathematical research has had an impact outside mathematics – either in technology, in business, or simply in people’s everyday lives.

The Gauss Prize is awarded jointly by the *Deutsche Mathematiker-Vereinigung (DMV = German Mathematical Union)* and the *International Mathematical Union (IMU)*, and administered by the DMV. The prize consists of a medal and a monetary award (currently valued at EUR 10,000). The source of the prize is the surplus from the *International Congress of Mathematicians (ICM’98)* held in Berlin.

The official announcement of the establishment of the prize takes place on 30 April 2002, the 225th anniversary of the birth of Carl Friedrich Gauss, after whom the award is named. The prize is to be awarded every four years, at the *International Congress of Mathematicians*, with the first award to be presented at the Congress in 2006. The laureates will be chosen by a jury selected by the IMU.

Carl Friedrich Gauss (1777-1855) was one of the greatest mathematicians of all time. He combined scientific theory and practice like no other before him, or since, and even as a young man Gauss made extraordinary contributions to mathematics. His *Disquisitiones arithmeticae*, published in 1801, stands to this day as a true masterpiece of scientific investigation. In the same year, Gauss gained fame in wider circles for his prediction, using very few observations, of when and where the asteroid *Ceres* would next appear. The method of least squares, developed by Gauss as an aid in his mapping of the state of Hannover, is still an indispensable tool for analyzing data. His sextant is pictured on the last series of German 10-Mark notes, honoring his considerable contributions to surveying. There, one also finds a bell curve, which is the graphical representation of the Gaussian normal distribution in probability. Together with Wilhelm Weber, Gauss invented the first electric telegraph. In recognition of his contributions to the theory of electromagnetism, the international unit of magnetic induction is the **gauss**.

The IMU has been awarding the Fields Medals – generally considered as the “Nobel Prize for mathematics” – for fundamental contributions to mathematics since 1936 and the Nevanlinna Prize for outstanding work in the fields of theoretical computer science since 1982. The Nevanlinna Prize and up to four Fields Medals are awarded every four years at the opening of ceremony of the International Congress of Mathematicians. The Gauss Prize will be awarded in the same manner.

With the Gauss Prize, the IMU is broadening the range of its awards, now including the influence of mathematics to other disciplines. The award ceremony will include an overview of the achievements of the prize-winner. The presentation of the mathematical work will be addressed to the general public as well as journalists, so that all may appreciate the importance of mathematics for everyday life.

The statutes of the Gauss Prize can be found at URL:
<http://www.mathematik.uni-bielefeld.de/DMV/Gauss/>

Further information: Prof. Dr. Martin Grötschel, Professor at TU Berlin, Vice President of Konrad-Zuse-Zentrum für Informationstechnik Berlin (ZIB), Member of the IMU Executive Committee, former Chairman of the DMV and former President of the ICM'98 Organizing Committee

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The International Mathematical Union (IMU) is an international non-governmental and non-profit making scientific organization, with the purpose of promoting international cooperation in mathematics. It is a member of the International Council for Science (ICSU).

The Deutsche Mathematiker-Vereinigung (DMV) is the German National Mathematical Society. Its goal is to promote mathematics and its applications.

Statutes of the IMU CARL FRIEDRICH GAUSS PRIZE FOR APPLICATIONS OF MATHEMATICS

The IMU *Carl Friedrich Gauss Prize* for applications of mathematics is to be awarded for outstanding

- mathematical contributions that have found significant practical applications outside of mathematics, or
- achievements that made the application of mathematical methods to areas outside of mathematics possible in an innovative way, e.g., via new modeling techniques or the design and implementation of algorithms.

The *Carl Friedrich Gauss Prize* is given, in particular, for the impact the work of the prize winner has had in practice.

Since the practical usefulness of mathematical results is often not immediately visible and since the applicability and importance for practice may only be realized after a long time lag, no age limit should restrict the choice of a prize winner.

The *Carl Friedrich Gauss Prize* may also be awarded to

- a group of individuals who have jointly made a contribution as specified above or to
- a group of persons whose individual contributions have jointly resulted in the impact that this prize is intended to honor.

The *Carl Friedrich Gauss Prize* is awarded every four years at an *International Congress of Mathematicians (ICM)*, for the first time at ICM'2006. The Prize consists of a Medal and a Cash Prize. For the first award, the cash prize will be Euro 10.000,--. In the case of a shared award each prize winner will receive a medal, the cash prize will be divided.

The International Mathematical Union appoints a Carl Friedrich Gauss Prize Committee in analogy to its other Prize Committees. The Carl Friedrich Gauss Prize Committee reports its choice to the IMU president who informs the prize winner(s), inviting him/her/them to the Award Ceremony at the forthcoming ICM.

The funds of the *Carl Friedrich Gauss Prize* (resulting from a positive balance of ICM'98 in Berlin) are administrated by the *Deutsche Mathematiker-Vereinigung (DMV)*.

The DMV treasurer stays in touch with the IMU president concerning the prize. The DMV treasurer is responsible for the production of the medal(s) and takes care that the medal(s) and check(s) are available at the Award Ceremony. The DMV appoints a representative handing out the *Carl Friedrich Gauss Prize*.

4. CONFERENCES SUPPORTED BY IMU

4.1 - 1998

The major events of the International Mathematical Union in 1998 were its 13th General Assembly, held in Dresden, Germany, August 15-16, 1998, and the International Congress of Mathematicians, held in Berlin, Germany, on August 18-27, 1998.

The General Assembly elected a new Executive Committee for IMU as well as for its International Commission on Mathematical Instruction (ICMI), a new Commission for Development and Exchange (CDE), and two members to the Executive Committee of its joint International Commission on the History of Mathematics (ICHM), as well as representatives to ICSU bodies. The Assembly also decided that the next Congress should take place in Beijing, China, in 2002.

The International Congress of Mathematicians 1998 was held in Berlin, Germany, on August 18-27.

The scientific program of the Congress was in the hands of a Program Committee appointed by the IMU. Its members were Phillip Griffiths (Chairman), Luis Caffarelli, Ingrid Daubechies, Gerd Faltings, Hans Föllmer, Michio Jimbo, John Milnor, Sergei Novikov, and Jacques Tits. The committee divided the program of the Congress into 19 sections and appointed, for each section, a panel to nominate speakers. In early summer of 1997 the Program Committee selected 21 mathematicians to give one-hour plenary addresses and 169 colleagues to present 45-minute invited lectures. Five invited lecturers cancelled their talks at short notice due to personal reasons. Two of them, however, submitted written versions of their lectures to these Proceedings.

The Fields Medal Committee consisted of Yuri Manin (Chairman), John Ball, John Coates, J.J. Duistermaat, Michael Freedman, Jürg Fröhlich, Robert MacPherson, Kyoji Saito, and Steve Smale. The members of the Nevanlinna Prize Committee were David Mumford (Chairman), Bjorn Engquist, Tom Leighton, and Alexander Razborov. Both committees arrived at their decision in spring 1998.

The Organizing Committee was responsible for all other activities of the Congress. Der-Congress handled accommodation, registration and related arrangements as the official travel agent of the Organizing Committee.

The first day of the Congress, including the opening ceremony, took place at the International Congress Center (ICC) of Berlin. During the opening ceremony, attended by about 3,000 persons, the Fields Medals and the Nevanlinna Prize were awarded. Moreover, Andrew Wiles received an IMU silver plaque in recognition of his proof of "Fermat's Last Theorem". The opening ceremony was transmitted worldwide in the Internet via Mbone. In the afternoon of August 18, the work of the Fields Medallists and the Nevanlinna Prize winner was presented in five lectures. The manuscripts of these lectures can be found in this volume. Jürgen Moser concluded the first day with plenary lecture.

All further sessions of the Congress took place on the campus of the Technische Universität Berlin. The plenary lectures were held in morning sessions in the Audimax of the TU Berlin. They were transmitted via closed-circuit television to another large lecture hall. The 45-minute invited lectures were given in six parallel sessions from 2 p.m. to 6 p.m. each afternoon, from August 19 to 26, except for Sunday, August 23, which was kept free for excursions etc. The last day of the Congress, August 27, consisted of four plenary addresses and the closing ceremony. In addition to the invited and plenary lectures, 1,098 short 15-minute contributions and 236 poster presentations were given. Moreover, 235 ad-hoc talks of 15 minutes length were scheduled during the Congress. Thus, ICM'98 had a total of 1569 contributed presentations.

The organization of the Congress was, to a large extent, based on electronic communication. Already in 1994, a World Wide Web Server on the International Congress was set up at the Konrad-Zuse-Zentrum in Berlin. This server was continuously extended to contain up-to-date material so that every mathematician interested in ICM'98 could look up most recent information. In addition to this, circular letters were e-mailed to all those who registered for the Congress electronically. These circular letters complemented the printed First and Second Announcements that were mailed out in August 1997 and January 1998, respectively, to thousands of mathematicians worldwide.

The Organizing Committee also offered the possibility of electronic registration. Two thirds of the ICM'98 members took advantage of this facility; 95% of the abstracts of the invited and contributed presentations were submitted electronically. Moreover, all but one of the plenary and invited speakers submitted their paper for the proceedings volume electronically. This made it possible to produce Volumes II and III before the Congress, to make them available in the Internet, and to deliver them to the participants in printed form at registration in Berlin.

In all, 3,346 mathematicians from 98 countries participated in the Congress together with an estimated number of 800 accompanying persons; 31 exhibitors were present.

The Organizing Committee made significant efforts, together with the International Mathematical Union, to give financial support for participants from developing countries and Eastern Europe. A fund of more than DM 900,000 made it possible to sponsor the attendance of approximately 450 mathematicians. About 510 colleagues were invited, around 60 were unfortunately unable to attend; 93 young and 37 mature colleagues from developing countries received grants from the IMU and the local organization, 305 persons from the support program of the local Organizing Committee for mathematicians from Eastern Europe. Special grants from mathematical institutions and other support programs complemented these efforts.

The social events included a buffet lunch after the opening ceremony, an opera performance of the Magic Flute in the Deutsche Opera on August 23, and an ICM'98 party on August 26. To convey some of the many facets of Berlin to the ICM'98 participants, and in particular to accompanying persons, many Berlin mathematicians, their friends and spouses offered informal tours, so called footloose tours, to points of special interest in Berlin. About 1,200 ICM'98 members and accompanying persons participated in these tours.

In accordance with the Program Committee and the IMU, the Organizing Committee opened a Section of Special Activities to cover topics of mathematical relevance that would not fit elsewhere in the official scientific program. These special activities included an afternoon session on electronic publishing with three talks and a panel discussion on "The Future of Electronic Communication, Information, and Publishing"; presentations of mathematical software on three afternoons; several special activities related to women in mathematics including the Emmy Noether Lecture given by Cathleen Synge Morawetz, and a panel discussion "Events and Policies: Effects on Women in Mathematics"; an afternoon on "Berlin as Center of Mathematical Activity" (this workshop was suggested by the International Commission on the History of Mathematics); a roundtable discussion on "International Comparison of Mathematical Studies, University Degrees, and Professional Perspectives".

The exhibition "Terror and Exile" honored the memory of 53 Berlin mathematicians who suffered under the Nazi terror; this topic was also addressed in a special session "Mathematics in the Third Reich and Racial and Political Persecution".

Other events enhanced the scope of the ICM'98 activities. The special evening lecture of Andrew Wiles on "Twenty Years of Number Theory" on August 19 attracted an audience of about 2,300. Olli Lehto's book on the International Mathematical Union was presented and an exhibition of mathematical cartoons was shown at the TU Mathematics Library.

A major attempt to reach out to the non-mathematical public during the Congress were the activities in the Urania, an institution with a long tradition in the popularization of science. These included 11 lectures on mathematics for a general audience, the VideoMath Festival in which the VideoMath Reel, a composition of selected short videos on mathematics, and several other mathematical films were shown. Exhibitions on "Hands-on Mathematics" (addressing high-school students and teachers in particular), "Mathematical Stone Sculptures", "Mathematics and Ceramics", and works by high-school students on "Mathematics and the Art" complemented the Urania activities. An additional exhibition featuring paintings and sculptures related to mathematical objects (Innovation) was shown at the Ludwig-Erhard-Haus. More than 5,000 persons attended the Urania lectures and video performances, about 10,000 visited the exhibitions in the Urania.

4.2 - CONFERENCES SUPPORTED BY IMU - 1999

RESEARCH SEMESTER - THREE WEEKEND SEMINARS

Linz, Austria, first half of 1999

Organizer: James B. Cooper

IMU Representative: Björn Engquist

XII LATIN AMERICAN SCHOOL OF MATHEMATICS

Lima, Peru, June 28-July 3, 1999

Organizer: César Camacho

IMU Representative: Jacob Palis

PAUL ERDŐS AND HIS MATHEMATICS

Budapest, Hungary, July 4-11, 1999

Organizer: Vera T. Sós

IMU Representative: László Lovász

FOUNDATIONS OF COMPUTATIONAL MATHEMATICS (FOCM) Cambridge, England,

July 18-28, 1999

Organizer: Michael Shub

IMU Representative: David Mumford

THEORY OF FIXED POINTS AND ITS APPLICATIONS

São Paulo, Brazil, July 26-30, 1999

Organizer: Daciberg Lima Conçalves

IMU Representative: A. Dold

INTERNATIONAL CONFERENCE ON COMPLEX ANALYSIS AND THE VIIIITH

ROMANIAN-FINNISH SEMINAR

Iassy, Romania, August 23-27, 1999

Organizer: C. Andreian Cazacu

IMU Representative: Olli Lehto

PROBLEMS OF THEORETICAL AND MATHEMATICAL PHYSICS ("BOGOLIUBOV CONFERENCE")

Moscow and Dubna, Russia, September 27-October 1, 1999

Organizer: Oleg Zavialov

IMU Representative: Yakov Sinai

4.3 - CONFERENCES SUPPORTED BY IMU - 2000

TATA INSTITUTE COLLOQUIUM

Mumbai, India, January 4-12, 2000

Organizer: Balwant Singh

IMU Representatives: Shigefumi Mori, A. Suslin

MATHEMATICS AND THE 21ST CENTURY

Cairo, Egypt, January 15-20, 2000

Organizer: A.A. Ashour

IMU Representatives: Jacob Palis, Phillip Griffiths

SIXTH PAN AFRICAN CONFERENCE ON MATHEMATICS (PACOM 2000)
Cape Town, South Africa India, January 21-31, 2000
Organizer: Ahmed Kerkour
IMU Representatives: Jacob Palis, Phillip Griffiths

2000 YEARS TRANSMISSION OF MATHEMATICAL IDEAS
Bellagio, Italy, May 8-12, 2000
Organizers: Joseph W. Dauben, Yvonne Dold-Samplonius
IMU Representative: Jean-Michel Bismut

THIRD EUROPEAN CONGRESS OF MATHEMATICS (3ECM)
Barcelona, Spain, July 10-14, 2000
Organizer: Sebastian Xambo Descamps
IMU Representative: Simon Donaldson

INTERNATIONAL CONGRESS OF MATHEMATICAL PHYSICS XIII
London, England, July 17-22, 2000
Organizer: Boguslaw Zegarliniski
IMU Representative: Vladimir Arnold

LATIN AMERICAN CONGRESS OF MATHEMATICS
IMPA, Rio de Janeiro, July 31-August 4, 2000
Organizer: Mario Wscherbor
IMU Representative: Jacob Palis

INTERNATIONAL CONGRESS ON THE TEACHING OF MATHEMATICS (ICME-9)
Makuhari/Chiba, Japan, July 31-August 7, 2000
Organizers: Hyman Bass, Bernard Hodgson
IMU Representative: Phillip Griffiths

IMU has offered its imprimatur, but no financial support, for the following conferences in the year 2000:

MODERN ANALYSIS AND ITS APPLICATIONS
Voronezh Winter Mathematical School 2000, Voronezh, Russia,
January 28-February 4, 2000
Organizer: V.G. Zuyagin
IMU Representative: Vladimir Arnold

SYMPOSIUM ON THE LEGACY OF J.C. FIELDS
Fields Institute, Toronto, Canada, June 18-9, 2000
Organizer: William Langford
IMU Representatives: Jacob Palis, Phillip Griffiths

ROLF NEVANLINNA COLLOQUIUM
Helsinki, Finland, August 8-12, 2000
Organizer: Olli Lehto
IMU Representative: Olli Lehto

WORKSHOP ON TOPOLOGICAL ALGEBRAS
Tartu, Estonia, September 2000
Organizer: Mati Abel

4.4 - CONFERENCES SUPPORTED BY IMU - 2001

MATHEMATICAL PROBLEMS OF NONLINEAR DYNAMICS
Nizhny Novgorod, Russia, July 2-6, 2001
Organizer: L. Shilnikov
IMU Representative: Jacob Palis

NINTH PRAGUE TOPOLOGICAL SYMPOSIUM
Prague, Czech Republic, August 20-25, 2001
Organizer: Josef Štěpán
IMU Representative: Simon Donaldson

WORKSHOP ON MATHEMATICAL PHYSICS
Mambucaba, Rio de Janeiro, Brazil, August 19-25, 2001
Organizer: Vladas Sidoravicius
IMU Representative: Jacob Palis

IMU offered its imprimatur, but no financial support, for the following conferences in 2001:

INTERNATIONAL CONFERENCE ON COMPLEX ANALYSIS AND THE
IXth ROMANIAN-FINNISH SEMINAR
Brasov, Romania, August 27-31, 2001
Organizer: Cabiria Andreian Cazacu

SECOND INTERNATIONAL CONFERENCE "HARMONIC ANALYSIS AND APPROXIMATIONS"
Yerevan, Armenia, September 11-18, 2001
Organizer: Mamikon Ginovian

GEOMETRIE AU VINGTIEME SIECLE: 1930-2000
Paris, France, September 24-29, 2001
Organizer: Dominique Flament

4.5 - CONFERENCES SUPPORTED BY IMU - 2002

RAMANUJAN INTERNATIONAL SYMPOSIUM, "KAC-MOODY LIE ALGEBRAS AND
APPLICATIONS"
Chennai, India, January 28-31, 2002
Organizer: N. Sthanumoorthy
IMU Representative: M. Raghunathan

200th ANNIVERSARY OF THE BIRTH OF ABEL
Oslo, Norway, June 2-8, 2002
Organizer: N. Sthanumoorthy
IMU Representative: P. Griffiths

IMU offered its imprimatur, but no financial support, for the following conference in 2002:

INTERNATIONAL CONFERENCE DEDICATED TO THE MEMORY OF J.L. LIONS

Paris, France, July 1-5, 2002

Organizer: Jean-Pierre Puel

5. Meetings of the Executive Committee

- The 65th Meeting of the Executive Committee of IMU, was held in Dresden, 1998
- The 66th Meeting of the Executive Committee of IMU, was held in Rio de Janeiro, on May 10-11, 1999
- The 67th Meeting of the Executive Committee of IMU, was held in Madrid, Spain, on May 15-16, 2000
- The 68th Meeting of the Executive Committee of IMU, was held in Princeton, New Jersey, on May 14-15, 2001
- The 69th Meeting of the Executive Committee of IMU, was held in Paris, France, on April 12-13, 2002

Excerpts of the IMU Executive Committee Meetings between 1999-2001

5.1 - Meeting of May 10-11, 1999 - IMPA, Rio de Janeiro, Brazil

- The year 2000 had been proclaimed the UNESCO/ICSU World Mathematical Year. In that connection, it was decided that all IMU-funded conferences for the year would differ from the norm in focus and scope. Specifically, each would be required to be multinational and to cover several subject areas. The goal would be to support one or two such broadly conceived conferences on each continent during the year 2000. (IMU-supported conferences for the year 2000 are listed on page 10.)
- It was noted that World Mathematical Year 2000 is being publicized and observed through exhibitions, performances, a specially designed postage stamp, posters, and a newsletter. Further information about WMY2000 can be found at <http://wmy2000.math.jussieu.fr>. Oversight and coordination of the year's special activities are being provided by Mireille Chaleyat-Maurel of Université Pierre et Marie Curie.
- Among the main activities of IMU to celebrate the year 2000, a book was published to provide the views of outstanding mathematicians on the state of mathematics at the end of the millenium. The book, edited by V. Arnold, M. Atiyah, P. Lax, and B. Mazur, is called *Mathematics: Frontiers and Perspectives*. The American Mathematical Society was selected to publish the volume, which is now available for purchase from AMS.
- The members of the Program Committee for ICM 2002 were selected. The Chairman is Professor Yuri Manin.
- Two mathematical societies were recommended for affiliate status within IMU and were subsequently approved by postal ballot. According to a 1998 amendment to the IMU Statutes, affiliate status was created "for the purpose of facilitating jointly sponsored activities pursuing the objectives of the IMU." The new affiliates are the European Mathematical Society and the Unión Matemática de América Latina y el Caribe (U.M.A.L.C.A.).
- Following a discussion regarding the clarification of election procedures, a proposed new version for Election of the Executive Committee of IMU was disseminated via circular and subsequently approved

- There was a decision to bring to a vote at the General Assembly in 2002 a proposal to increase by one the number of members-at-large on the Executive Committee. Should the vote be affirmative, the first larger Executive Committee would be elected in 2006.
- The new Committee on Electronic Information and Communications (CEIC) was discussed.

The meeting was followed by a two-day "International Conference on Frontiers of Mathematics" featuring talks by some of the Executive Committee members, as follows:

Jean-Michel Bismut (France), "Index Theorem and the Verlinde Formulas"

Björn Engquist (Sweden), "Computational Geometrical Optics"

Phillip Griffiths (USA), "K2 (C) and Hodge Theory"

Martin Grötschel (Germany), "The Polyhedral Approach to Combinatorial Optimization"

Shigefumi Mori (Japan), "The Quotient Space as an Algebraic Space"

Madhusudan S. Raghunathan (India), "Loop-Spaces of Affine Algebraic Homogeneous Spaces"

5.2 - Meeting of May 15-16, 2000 - Madrid, Spain

- The Executive Committee authorized the transfer from a Swiss franc account to a US dollar account of all IMU reserve funds. Although IMU's financial operations are based on Swiss francs, financial reports to ICSU must be presented in dollars, and it was agreed that the possibility of converting budget, dues, and other calculations to US dollars would be raised at the next meeting of the General Assembly.
- Planning for ICM-2002 in Beijing, China, is well underway. Members of the EC met twice in 1999 with members of the Chinese Local Organizing Committee to offer guidance and review the status of fundraising, publicity and local arrangements.
- As of May 2000, three countries had expressed interest in extending bids for ICM-2006. To encourage maximum participation in the International Congresses, an attempt is made to vary the world regions where they are held, so while there is no formal rule, Europe will be favored as a site for ICM-2006.
- The members of the Fields Medal committee were appointed.
- The members of the Nevanlinna Prize committee were appointed. The scope of the Nevanlinna prize, formerly limited to theoretical computer science, was broadened to encompass outstanding contributions in Mathematical Aspects of Information Sciences, including: all mathematical aspects of computer science, e.g. complexity theory, logic of programming languages, machine models, cryptography; scientific computing, numerical analysis and optimization; and information theory, signal processing, control theory and the modeling of intelligence. It was agreed that if in the future a new prize is established that covers some of these expanded areas, the scope of the Nevanlinna Prize could be narrowed again.
- There was preliminary discussion of a proposed new monetary prize for applications of mathematics.
- The president and secretary of the International Commission on Mathematical Instruction (ICMI) were invited to meet with the IMU EC to discuss ways to strengthen relations between IMU and ICMI, making them more mutually supportive. There were several specific conclusions reached:
 - International Congresses: Talks are to be geared primarily to research mathematicians as opposed to educators; the ICM section will be renamed "Mathematics education; popularization of mathematics"; the core of the selection panel should draw at least one member from the ICMI Executive Committee.
 - International Congress on Math Education (ICME): The International Program Committee (IPC) will include one member designated by IMU.

- An IMU delegate will attend ICMI Executive Committee meetings.
- Representatives of ICMI, as well as IMU's other commissions, will be invited to attend the IMU General Assembly.
- Also in the interest of strengthening relations among IMU, its constituent commissions, and other organizations, it was agreed that a representative of CICIAM (Committee for International Conferences on Industrial and Applied Mathematics) would attend the May 2001 IMU Executive Committee meeting to explore avenues of cooperation.
- There was a brief discussion regarding the feasibility of replacing or supplementing the World Directory of Mathematicians with an electronic version.
- The IMU publication, "*Mathematics: Frontiers and Perspectives*" has sold out in hardcover and will be reprinted in paperback. A Russian translation has been authorized and a Japanese translation is under consideration.
- Two membership changes were agreed on by the Executive Committee and subsequently approved via postal ballot: The Netherlands was upgraded from Group III to Group IV, and Peru and Estonia were invited to join Group I.

5.3 - Meeting of May 14-15, 2001 - Princeton, New Jersey

The Executive Committee of IMU met May 14-15, 2001, in Princeton, New Jersey, U.S.A. Among the items discussed by the Executive Committee were the following:

- The Committee on Electronic Information and Communication (CEIC) presented an intermediate report and plans to present a final report in Beijing, China, at ICM 2002. It discussed the development of electronic information as it impacts the international mathematical community.
- The Committee has a goal to make all mathematical literature available to the public through the Internet, a goal that will not only benefit the mathematical community but will benefit mathematicians as well.
- The Committee presented the document "Call to all mathematicians" that states "open access to the mathematical literature is an important goal." The EC endorsed the document, and it was sent to the Committee for Mathematics and Adhering Organizations.
- The CEIC presented a 10-page document that can guide authors through the publishing process. The EC endorsed an "Executive Summary" of the document. It was sent to the Committee for Mathematics and Adhering Organizations.

Preparations were outlined by the Local Organizing Committee (LOC) for the International Congress of Mathematicians 2002, to be held in Beijing, China, August 20-28.

- The Congress will be opened by President Jiang Zemin on August 20, in the Great Hall of the People in Tiananmen Square.
- The LOC is organizing universities from all over China to take part in ICM 2002. Satellite conferences are being held in Hong Kong, Japan, Lhasa (Tibet), Russia, Singapore, South Korea, and other sites.
- The registration fee is US \$240 before April 30, 2002 and US \$280 after May 1, 2002. It was agreed that a special rate of US \$100 before April 30, 2002 and US \$150 after May 1, 2002 be applied to graduate students.
- All attendees are encouraged to visit the ICM 2002 website to pre-register, <http://www.icm2002.org.cn>.
- A Travel Grants Committee was appointed to select recipients of travel grants to ICM 2002 in three areas: 1) young mathematicians, aged 35 or younger at the time of the Congress, 2) young and senior mathematicians from Eastern Europe, and 3) senior mathematicians from Latin America and Africa.

- Olavi Nevanlinna, president of International Council for Industrial and Applied Mathematics (ICIAM), discussed the cooperation of IMU and stressed the importance of applications of mathematics in the IMU congresses. IMU and ICIAM approved a proposal to have an IMU representative to ICIAM, and vice versa. It was also suggested that some collaboration take place between ICIAM and IMU on mathematical education, for instance in developing countries.
- The EC agreed on a new prize for applications of mathematics proposed by the German Mathematical Society, consisting of a monetary prize and a golden medal to be awarded every four years, commencing in 2006.
- The EC approved the initiative of the Norwegian Mathematical Society to propose to the Norwegian Parliament the creation of an annual “Abel Prize” to be awarded to mathematicians without an age limit. The prize would be administered by the Norwegian Academy of Sciences.
- The International Commission on Mathematical Instruction (ICMI) indicated that they would like an IMU representative present at their meetings. It was agreed that the IMU EC member who is geographically closest to the location will attend the meeting.
- Site bids for ICM 2006 were discussed. A site will be recommended to the General Assembly.
- It was agreed that the World Directory of Mathematicians 2002 would be published in book format and would not be available electronically.

6. IMU AND ICM on the World Wide Web

IMU SERVER

Informations about IMU and ICM/2002 are available in the IMU homepage:
<http://www.mathunion.org/>

7. PUBLICATIONS OF THE UNION

Six issues of the IMU Bulletin have come out in the last three and half years: Number 43 in October 1998, Number 44, in December 1998, Number 45, in December 1999, Number 46, in December 2000, Number 47, in December 2001, and present number 48 (Special Number), in June 2002.

The 11th Edition of the World Directory of Mathematicians came out in 1998. The compilation of material and printing were done by the American Mathematical Society and Prof. James Arthur was the Editor. The AMS. is the sole distributor of the Directory.

8. POSTAL BALLOTS

The following postal ballots were conducted among the Adhering Organizations, with the knowledge of the National Committees for Mathematics, in the years 1999-2002.

1999:

- Number 1/99. Substitution of Prof. Fazal Mohamed for Prof. Ousseynou Nakoulima on the Commission on Development and Exchange (CDE) for the term January 1, 1999 - December 31, 2002. All votes received were in favor.
- Number 2/99. Approval of the Terms of Reference and Membership of the Committee on Electronic Information and Communication (CEIC). All votes received were in favor
- Number 3/99. Approval of Candidates for Affiliate Status in IMU: European Mathematical Society (EMS) and União Matemática da América Latina e do Caribe (UMALCA). All votes received were in favor.

2000:

- Number 1/2000 - Holland to change from Group III to Group IV, as of January 1, 2001. All votes received were in favor.
- Number 2/2000 - Admittance of Peru as a member of IMU, Group I, as of January 1, 2001. All votes received, were in favor.
- Number 3/97 - Admittance of Estonia as a member of IMU, Group I, as of January 1, 2001. All votes received were in favor.

2002:

- Number 1/02 - Egypt from Group I to Group II.
- Number 2/02 - CEIC Terms of Reference - Israel was not in favor

9. GENERAL ASSEMBLY - 2002

The General Assembly shall take place in Shanghai, August 17-18, 2002, Pudong Shangri-La Hotel and the Executive Committee will meet on August 16, 2002.

10. INTERNATIONAL CONGRESS OF MATHEMATICIANS 2002

The next International Congress of Mathematicians will be held in Beijing, China, from August 20-28 2002. The first announcement has been sent out in September, 2001 and the second one in the end of 2001. For further information please contact the Local Organizing Committee:
<http://www.icm2002.org.cn/A/general.htm>

10.1 - SUPPORT OF ICM 2002 PARTICIPATION

IMU and the Organizing Committee are making great efforts to ensure ICM2002 participation of mathematicians coming from countries with small financial basis. In particular, IMU and the local organization have established three different support programs for

1. Young mathematicians from developing countries
2. Mathematicians from Eastern Europe
3. Mature mathematicians from developing countries

1. Fellowships For Young Mathematicians from Developing Countries

To attend the International Congress of Mathematicians, Beijing, The International Mathematical Union will award fellowships to young mathematicians to help them attend the ICM'2002, Beijing, China, August 20-28, 2002. The grants, provided by the IMU Special Development Fund, will support travel costs and are intended for young mathematicians from developing countries (not necessarily members of IMU).

The Local Organizing Committee of the International Congress of Mathematicians will provide a special allowance to the grantees of the travel grants to cover their registration, board and lodging in Beijing. The age-limit for the grantees is 35 years at the time of the Congress. The candidates should present evidence of research work on post-doctoral level, and they should be able to benefit from the interaction with mathematicians from other countries attending the Congress. In addition to the name and address of the candidate, the applications should contain brief curriculum vitae, including date of birth, plus a list of publications (papers published or accepted for publication).

2. Support of Mathematicians From Eastern Europe

To attend the International Congress of Mathematicians, Beijing, 2002. The Local Organizing Committee has set up the Committee for the Support of Mathematicians from Eastern Europe (CSMEE) to support mathematicians with residence in Eastern European countries and the independent states of the former Soviet Union to attend ICM'2002.

The funds of the Organizing Committee for financial support are limited. To secure the participation of as many persons as possible the local Organizing Committee will only support local costs in Beijing. Travel grants are not available. Every person applying for a grant from CSMEE is expected to cover travel expenses from other sources.

3. Support of Mature Mathematicians From Developing Countries

To attend the International Congress of Mathematicians, Beijing, 2002 The Local Organizing Committee has set up a Committee for the Support of Mathematicians from Developing Countries (CSSMDC) to support mature mathematicians (older than 35 years of age at the time of the Congress) with residence in developing countries to attend ICM'2002

The funds for financial support, partially provided by IMU, are quite small. To ensure the participation of as many persons as possible, a limited grant is provided to cover local costs in Berlin (registration, board and lodging) and travel.

10.2 - SPECIAL DEVELOPMENT FUND

The Special Development Fund helps IMU to fulfill the important obligation of helping developing countries within the framework of mathematical research. The means of the Fund, which go un-reduced to mathematicians from developing countries, are used primarily for travel grants to young mathematicians, to make it possible for them to participate in International Congresses of Mathematicians. The Executive Committee of IMU elects an international committee to distribute the grants. Means to the Special Development Fund come from donations. Donations can be sent, at any time and in any convertible currency, to the following account:

IMU account at Institute for Advanced Study
PNC Bank
76 Nassau Street - Princeton, NJ 08540
ABA # 031207607
Account # 8011913872

The goal now is to collect funds for travel grants for the 2002 International Congress of Mathematicians in Beijing, to have as participants as many qualified young mathematicians from developing countries. For the ICM-98 in Berlin the IMU financed the trip of 99 young mathematicians and the German Organizing Committee kindly cover the local expenses. We hope to increase this number to 110 or even 120 in 2002. As you may know, the American Mathematical Society, has asked its members to make a donation to the SDF when paying their membership fees. We hope that other societies could consider a similar action. Also, from the start the London Mathematical Society and the Royal Society have made major contributions.

Other countries that have been making important contributions to the Fund are: Brazil, Germany, Finland, France, Holland, Japan, Norway, Sweden, Switzerland, United Kingdom.

Donations to the SDF can be sent at any time and any convertible currency to any of the following accounts:

IMU account at Institute for Advanced Study
PNC Bank
76 Nassau Street
Princeton, NJ 08540
ABA # 031207607
Account # 8011913872

The following contributions have been received in the years 1998-2002:

1998

American Mathematical Society	US \$	30.972,63
CNPq, Brazil	US \$	4.727,65
Mathematical Society of Japan	US \$	14.084,50
Société Mathématique de France	US \$	3.092,76

1999

London Math Society	US \$	3,321.17
American Mathematical Society	US \$	32,081.10
Wiskundig Genootschap Netherlands	US \$	5,349.80
London Math Society	US \$	5,083.89
Mathématique France Institute	US \$	3,120.10
Brazil	US \$	5,000.00

2000

American Mathematical Society	US \$	29,972.27
London Math Society	US \$	5,000.00

2001

American Mathematical Society	US \$	41,048.79
London Math Society	US \$	5,000.00

2002

American Mathematical Society	US \$	23.471,51
Mathematical Society of Japan	US \$	14.642,57

11. ICM 2006

Applications to hold the ICM 2006 have been received from Spain. The Site Committee, consisting of the EC members and Prof. Ma, has decided to recommend to the next General Assembly that the Congress should be held in Spain. This decision was taken under the fundamental assumption that all mathematicians of the world will be allowed to participate in the meeting. Thus, the Executive Committee expects that the final vote at the General Assembly, will take into account the importance of the host country to abide by ICSU's principle of free circulation of scientists.

12. CHANGE IN THE IMU STATUTES

The 13th General Assembly of IMU accepted the following proposed Change of Statutes (all the other items remain the same, renumbered as necessary):

CHANGE IN STATUTES of the INTERNATIONAL MATHEMATICAL UNION

Approved in the 63th meeting of the Executive Committee, held in Berlin on May 15-16, 1997
Approved in the 13th General Assembly of IMU, held in Dresden, Germany, August 15-16, 1998

III. AFFILIATION

1. For the purpose of facilitating jointly sponsored activities and jointly pursuing the objectives of the IMU, multi-national mathematical societies and professional societies can be affiliated with the Union.
2. The members of the Union shall elect the affiliate members by Postal Ballots or at meetings of the General Assembly upon recommendation of the EC. The affiliation may be terminated by the same procedure.
3. Affiliate members have the right to participate in the General Assembly but shall have no voting rights.
4. Such affiliate members have the right to submit proposals for joint activities to the General Assembly and to the President and Secretary for consideration of the Executive Committee.
5. The Executive Committee, with the support of the Adhering Organizations and National Committees, shall look for ways to keep close relations with the affiliated organizations and to enhance mathematical activities in their regions. They shall receive the Bulletin of the IMU and be kept informed of all activities relevant to them.

The full Statutes of IMU is at: http://www.mathunion.org/statutes_99.html

Report on the activities of the Commission on Development and Exchanges (CDE) of the International Mathematical Union (IMU) for the period 1999-2002

Herbert Clemens

Secretary/Treasurer, IMU/CDE

During the period 1999-2002, after initial routine screening by the Secretary/Treasurer to insure that requests fell within IMU program guidelines, the CDE has processed 94 applications from mathematicians in developing countries for support for research travel, conferences and projects. 30 applications for individual research travel were supported with at least partial funding, and 36 conferences were supported, typically with a contribution of roughly US\$2,000. One long-term project in southern Africa, primarily using dedicated funds raised externally by IMU, was also supported.

CDE wishes to encourage wider use of its programs by developing world mathematicians. At this point geographical distribution of applications and awards is quite uneven. Fully half of the proposals funded by CDE this past year were for research travel by Indian mathematicians or for conferences in India. This seems entirely due to the fact that many qualified mathematicians in many other parts of the developing world do not apply to CDE for research support.

**REPORT ON
INTERNATIONAL COMMITTEE OF MATHEMATICAL
INSTRUCTIONS (ICMI)
ACTIVITIES IN 1998-2001**
Report prepared by Bernard R. Hodgson, Secretary of ICMI

1. Organisation

A new Executive Committee of the International Commission on Mathematical Instruction was elected at the General Assembly of the International Mathematical Union held in Dresden (Germany) in August 1998 and has taken charge as of January 1, 1999. This resulted in the change of all the officers and most of the members of the Executive Committee. In order to prepare and facilitate the transition process, the outgoing EC has produced a document containing information, advice, and recommendations to the incoming EC. Also, the outgoing Secretary and the incoming Secretary met and worked in Copenhagen for three days in October 1998 to prepare the take-over of the EC responsibility, and the past and new Presidents and Secretaries had a three-day working meeting in New York in February 1999 to finish the transition.

A farewell statement by the outgoing President and Secretary of ICMI was published in the December 1998 issue (No. 45) of the *ICMI Bulletin*.

The EC meetings for the period covered are as follows. The 1995-1998 Executive Committee met on April 21, 1998 (Luminy, France) and had its final meeting on November 6-9, 1998 (Saint-Séverin/Saint-Marcellin, France). An unofficial and informal meeting of members of the outgoing and the incoming ECs was held in conjunction with the ICMI Study Conference in Singapore in December 1998. The 1999-2002 Executive Committee had its first meeting at the IREM of Université de Paris 7 (France) on July 18-21, 1999. This meeting was in particular the occasion of a thorough study and discussion of the "testament" document prepared by the outgoing EC for the incoming EC. The EC had its second meeting in Tokyo/Makuhari, Japan, during the ICME-9 congress. The Committee then met on July 28-30, 2000, prior to the congress, as well as on the closing day of ICME-9. The President, Vice-Presidents and Secretary of the Commission also met in October 2000 in Geneva, on the occasion of the symposium celebrating the centennial of *L'Enseignement Mathématique* (see item 5 below). The third meeting of the EC took place 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. Besides in meetings, the work of the EC was conducted by correspondence and electronic communication under the direction of the President and the Secretary.

During 2000, *Estonia* and *Peru* became members of ICMI, following their admission as new members of the International Mathematical Union. Since 1998, one country was co-opted non-IMU member of ICMI, with the endorsement of the International Mathematical Union: *Brunei Darussalam* (1998). No National Representatives to ICMI have yet been appointed by these three new members.

It continues to be part of ICMI's general policy to encourage member states to establish National Sub-Commissions of ICMI. In recent years two countries have formed a National Sub-Commission, *Sweden* (1998) and *Spain* (1999), thus bringing the total number of countries with a Sub-Commission of ICMI to fourteen. More countries are expected to establish a National Sub-Commission in the years to come. In May 2000, on the occasion of a meeting in Madrid with the

Executive Committee of IMU, the President and Secretary of ICMI had a meeting with the newly established Spanish Sub-Commission of ICMI. In December 2001, during 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.

Out of the 81 countries members of ICMI by the end of 2001, 18 had not appointed an ICMI National Representative. More generally, the need is felt to reinvigorate the contribution of National Representatives. In some cases, no news have been received for a number of years from the Representative, so that it is unknown if the person is still active. There are instances where the rule adopted by the General Assembly of IMU in Kobe (Japan, 1990) as Resolution 5, according to which National Representatives should normally not be asked to serve for more than two consecutive four-year terms, is not respected.

The National Representatives represent a crucial part of ICMI life, the Commission being composed of the Executive Committee of ICMI and the National Representatives, as stipulated in the Terms of Reference of ICMI. While the “system” of National Representatives is functioning reasonably well in many aspects, the Executive Committee believes there is place for improvement and wishes to involve more regularly the Representatives in various aspects of ICMI life. In particular, there is a need for closer and more frequent contacts between the EC and the National Representatives and also for a better use of the local expertise of the Representatives. Electronic communication plays an essential role in facilitating these contacts and it is unfortunate that the e-mail addresses of only forty or so Representatives are known to the Secretary.

The General Assembly of ICMI held its quadrennial session on August 4, 2000, in conjunction with ICME-9 (Tokyo/Makuhari, Japan). The minutes of the Assembly are published in the *ICMI Bulletin* No. 51, December 2001.

At the request of the ICMI Executive Committee, the President and Secretary of ICMI were invited to participate in part of the meeting of the Executive Committee of IMU in Madrid on 14-17 May, 2000. A report was prepared by the President of ICMI (see the June 2001 issue, No. 50, of the *ICMI Bulletin*) about the outcome of this meeting, which allowed constructive and successful discussion of issues such as the participation of the President and Secretary in the EC meetings of the other organisation, the presence of the President and Secretary of ICMI at the General Assembly of IMU, the role of ICMI in the programme of the “Mathematics education; popularisation of mathematics” section of ICMEs, the representation of IMU in the Programme Committees of ICMEs or the general financial situation of ICMI. In preparation for the next General Assembly of IMU, scheduled for August 2002, the President and Secretary of ICMI have been 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.

The transfer of ICMI assets from the outgoing to the incoming Secretary was accomplished early in 1999. Two accounts have been opened for ICMI, one in Canadian dollars and the other in US dollars. These accounts are located at the Caisse populaire de l’Université Laval, Cité universitaire, Québec (accounts Nos 68 033 and 800 394).

2. ICMEs

The ninth International Congress on Mathematical Education, ICME-9, was held in Tokyo/Makuhari, Japan, from July 31 to August 7, 2000. The congress was attended by 2012

delegates (and 239 accompanying persons) from 70 different countries. The International Program Committee, chaired by Professor Hiroshi Fujita, has proposed a rich and intensive program and the organisational infrastructure and logistic support offered by the organisers was of an exceptional quality. The novel feature instigated at ICME-8 of imposing a “Solidarity Tax” on all registrations was repeated at ICME-9. It had been announced in the Second Announcement of ICME-9 that a Grant Fund would be set to provide support to participants from non-affluent countries. This Fund was to be made of two components: (i) 7% of all the registrations fees ; (ii) a sum equivalent to 3% of the total of the registration fees to be collected from domestic donations. It has turned out that this second component, essentially made of individual donations, was substantially higher, as it amounted to 8% of the registration fees, so that the organisers could provide support to 96 participants coming from 37 different countries. The distribution of the money generated for the Fund was made by a specially appointed Grants Committee which, as is customary, worked incognito in order to minimise potential problems of pressure.

As indicated in the 1995-1997 report of ICMI to IMU, Brazil had produced a declaration of intent to let ICMI know that it was preparing a bid to host ICME-10 in 2004. However at the end of 1998 ICMI was informed that this bid would not materialise. In January 1999, the Secretary thus wrote to all the National Representatives calling for bids for ICME-10. In spite of contacts with various countries during the first months of 1999, no official bid had been received when the EC held its annual meeting in July 1999. It was then decided to launch a new series of contacts, which led to the presentation early November 1999 of a bid to have ICME-10 take place in Copenhagen, Denmark, from July 4 to 11, 2004. This invitation was officially accepted by the EC in December 1999. A distinctive flavour of ICME-10 is the fact that it is being organised in close co-operation 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 is chaired by Professor Mogens Niss, Roskilde University, Denmark, and its composition was announced in the December 2000, No. 49, of the *ICMI Bulletin*. The IPC had its first meeting in June 2001 in Copenhagen. The first announcement of the congress is due to appear in 2002.

A call for bids to host ICME-11 in 2008, the year of the centennial of the Commission, was 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 the years 1998-2001. The ICMI Studies are published by Kluwer Academic Publishers, Dordrecht, the Netherlands, under the general editorship of the President and the Secretary of ICMI. A synthesis paper giving basic information about the Studies since their beginning in the 1980s was prepared by the Secretary for the June 1999 issue of the *ICMI Bulletin* (No. 46, pp. 32-36).

After the publication of five volumes in the “New ICMI Study Series” (NISS) during the period 1993-1998, it was felt appropriate to reexamine the content of the contract signed between Kluwer and ICMI. This was particularly timely as two new series editors were taking charge as of January 1999 and the publication of two new ICMI Study Volumes was then under preparation. The negotiation with Kluwer expanded over several months and led to a new agreement (formally approved by the EC of ICMI early in 2000). New clauses in particular were

adopted concerning the number of free copies made available to ICMI and to contributors to a volume, as well as the conditions under which individuals can obtain a copy of the volumes for their personal use — individual orders made under ICMI patronage are entitled to a 60% discount on the hardbound edition.

During the period 1998-2001, four new volumes (for the Studies 8, 9, 10 and 11) have appeared in the New ICMI Study Series and three Study conferences (for the Studies 10, 11 and 12) have taken place. Reports on two Studies (10 and 11) were presented during special ICMI Studies sessions at ICME-9, in Makuhari, August 2000.

- ICMI Study 8: *What is Research in Mathematics Education and What are its Results?*
The Study Conference was held in College Park, USA, May 1994, and attended by 81 participants from 24 different countries. The Study Volume (two books) was published in 1998 under the title: *Mathematics Education as a Research Domain: A Search for Identity*, eds: Anna Sierpiska and Jeremy Kilpatrick. (NISS 4)
- ICMI Study 9: *Perspectives on the Teaching of Geometry for the 21st Century*
The Study Conference was held in Catania, Italy, September 1995, and attended by 72 participants from 33 different countries. The Study Volume appeared in 1998 under the same title; eds: Carmelo Mammana and Vinicio Villani. (NISS 5)
- ICMI Study 10: *The Role of the History of Mathematics in the Teaching and Learning of Mathematics*
The Study Conference was held in Luminy, France, in April 1998, and attended by 67 participants from 28 different countries. The resulting Study Volume entitled *History in Mathematics Education: The ICMI Study* was published in 2000; eds: John Fauvel (deceased) and Jan van Maanen. (NISS 6)
- ICMI Study 11: *Teaching and Learning of Mathematics at University Level*
The Study Conference, which took place in Singapore in December 1998, was attended by 89 participants from 25 different countries. This Study has resulted in two different publications. The first of these is a special issue of the *International Journal of Mathematical Education in Science and Technology* (iJMEST) — volume 31, number 1, January-February 2000 — containing fifteen of the papers presented at the Study Conference. The other is the Study Volume which has appeared in October 2001 under the same title as the Study; ed.: Derek Holton. (NISS 7)
- ICMI Study 12: *The Future of the Teaching and Learning of Algebra*
The Study Conference was held at the University of Melbourne, Australia, on December 9-14, 2001, and 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.

Three new ICMI Studies are now under way.

- ICMI Study 13: *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, and the composition of the IPC was announced in the *ICMI Bulletin*, No. 48, June 2000, p. 14. 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. Members of the International Programme Committee were able to meet during ICME-9 and a more formal meeting took place in Berlin in December 2000, which resulted in the Discussion Document. The IPC had another meeting in October 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: *Applications and Modelling in Mathematics Education***
The International Programme Committee, chaired by Werner Blum, Universität Kassel, Germany, was appointed in 2000 and its composition is given in the December 2000 issue (No. 49) of the *ICMI Bulletin*, p. 34. The IPC met in August 2001 to prepare the Discussion Document for this Study. The Study Conference is expected to take place in October 2003 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 composition of the IPC is announced in the December 2001 issue of the *ICMI Bulletin*. The Study Conference is planned to take place during the first part of 2004.

Plans for further studies, on average one per year without an ICME congress, are under development.

4. Regional Conferences

In spite of the international character of its nature and its role, ICMI regularly sponsors regional activities related to mathematics education, most of the times in less affluent parts of the world. The requirements for a conference under planning being granted the status of *ICMI Regional Conference* were presented in the 1995-1997 ICMI report to IMU — see also the webpage <http://www.mathunion.org/ICMI/bulletin/40/activities.html>

Since 1998, the following regional conferences were sponsored (financially, morally or both) by ICMI.

The First ICMI East Asia Regional Conference on Mathematics Education (ICMI-EARCOME 1), was held in Chungbuk, Republic of Korea, 17-21 August 1998.

The 8th South East Asian Conference on Mathematics Education (SEACME-8) was held from 30 May to 4 June 1999, at the Ateneo de Manila University, Quezon City, Philippines, with the theme “Mathematics for the 21st Century”. A report on SEACME-8 has appeared in the *ICMI Bulletin* No. 47, December 1999, pp. 64-66.

The symposium EM 2000 (Espace Mathématique 2000) was held in Grenoble, France, from July 15 to 17, 2000. The theme of the conference was *L'enseignement des mathématiques dans les pays francophones au XXe siècle et ses perspectives pour le début du XXIe siècle* (Mathematics

education in French-speaking countries in the XXth century and prospects for the beginning of the XXIst century). It was the first ICMI Regional Conference where the “region” was defined not in geographical but rather in linguistic terms, the gathering being based on a common language. A project of the CFEM (ICMI National Sub-Commission for France) for the World Mathematical Year 2000, the symposium was attended by 178 participants coming from 18 different countries. A report on EM 2000 has appeared in the *ICMI Bulletin* No. 49, December 2000, pp. 45-47.

The All-Russian Conference on Mathematical Education devoted to the theme “Mathematics and Society. Mathematical Education at the Frontier of Centuries” took place in Dubna (near Moscow), Russia, from September 19 to 22, 2000. It was attended by over 300 participants and a report was published in the *ICMI Bulletin* No. 50, June 2001, pp. 33-34.

There were no ICMI regional conferences in 2001. One meeting recognised by the EC as an ICMI regional conference 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

The international journal *L'Enseignement Mathématique*, the official organ of ICMI since the inception of the Commission in 1908, was established in 1899 by Henri Fehr and Charles Laisant. On the occasion of the centennial of the journal, ICMI and the University of Geneva organized jointly, as a contribution to the celebration of the World Mathematical Year 2000, a symposium with the aims of looking at the evolution of mathematics education over the last century and identifying some guidelines and trends for the future, taking into account, among other sources, the documents, debates and related papers having appeared in *L'Enseignement Mathématique*. This symposium was devoted to the theme *One Hundred Years of L'Enseignement Mathématique : Moments of Mathematics Education in the 20th Century* and it took place in Geneva, the home of the journal since its birth, from October 20 to 22, 2000. There were 55 participants coming from 18 different countries. Some reflections by former ICMI Secretary Geoffrey Howson on the symposium and its theme were published in the *ICMI Bulletin* No. 49, December 2000, pp. 48-50. The Symposium Proceedings will be published in 2002 under the responsibility of the Editorial Board of the *Monographies de l'Enseignement Mathématique*, in collaboration with the Programme Committee, which is composed of Daniel Coray, Fulvia Furinghetti, Hélène Gispert, Bernard R. Hodgson and Gert Schubring.

ICMI was involved recently 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, 2001, 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 2001 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. ICMI-Related Activities at ICM-98

For the first time in many years, there were no specific ICMI lectures, symposium or suchlike at the 1998 International Congress of Mathematician. At ICM-98, in Berlin, Germany, the ICMI-related activities were integrated into the program of *Section 18: Teaching and Popularization of Mathematics*. In the final program, outgoing and incoming ICMI officers (Miguel de Guzmán, Mogens Niss, Bernard Hodgson, and Michèle Artigue) were involved as invited speakers in lectures or panels. The papers given are published in the Proceedings of the congress.

7. 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). All these groups were part of the program of ICME-9. Formal information about these groups (constitution, rules, etc.) has appeared in the *ICMI Bulletin* No. 47, December 1999, pp. 37-52. Quadrennial reports from the Affiliated Study Groups for the years 1996-2000 were published in the June 2000 issue, No. 48, of the *ICMI Bulletin*, pp. 32-41. Updated information about the groups has appeared in the *ICMI Bulletin* No. 49, December 2000, pp. 36-44.

8. 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.

The first stage in this program of international assistance was the mounting of a Solidarity Fund based on contributions by individuals, organisations, etc. The Solidarity Fund has received over

the years donations from various organisations and individuals in mathematics education for which it is most grateful. Thus, in 1998 the Korean Sub-Commission of ICMI, in continuation of the successful completion of the First ICMI East Asian Conference on Mathematics Education, ICMI-EARCOME-1, made a donation of 1000 USD. A donation of 3 189,27 USD was made by the ICME-8 organisers from the residue of the Solidarity Tax Fund of the congress. Donations to the amount of 100 USD were received for each of the years 1998, 2000 and 2001 from Joel Schneider (New York). Being based on voluntary donations, the Solidarity Fund is kept separate from ICMI's funds.

The steering committee for the Solidarity Fund (chaired by Professor Jean-Pierre Kahane, Orsay, France) has decided in 1998, on the recommendation of the EC, to give a grant of 18 000 USD to support two collaborative projects on the education and professional development of mathematics teachers in Burkina Faso and Cameroun. Half of this amount was given in 1999. The project is supervised by the French Sub-Commission of ICMI in co-operation with the French association for mathematics teachers.

An ad hoc committee, chaired by Colette Laborde (Université Joseph Fourier, Grenoble, France) has been set up in 1999 by the EC of ICMI to review the functioning and the impact of the Solidarity Fund, after its eight years of existence, and to bring recommendations to the EC concerning its orientation and development. A preliminary report was received by the EC in 2000.

9. ICMI WMY 2000 Committee

In order to prepare ICMI's involvement in the World Mathematical Year 2000, an ad hoc Committee has been formed, under the chairmanship of past ICMI President, Professor Miguel de Guzmán. The composition of this Committee was given in the *ICMI Bulletin* No. 42, June 1997, pp. 18-19. While various projects were envisaged by the Committee, it was finally decided to concentrate mainly on the ICME-9 congress, a very extensive activity if not specific to the year 2000. In particular the International Round Table which took place on the opening day of ICME-9 can be seen as a special contribution in the context of the WMY 2000. Moreover ICMI and the University of Geneva have organised jointly, as a contribution to the celebration of the WMY 2000, the symposium organised on the occasion of the centennial of *L'Enseignement Mathématique* which took place in Geneva in October 2000 (see item 5 above). Finally the French Sub-Commission of ICMI has organised the symposium EM 2000 as a contribution to the WMY 2000 (see item 4 above).

10. 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*.

11. Information and Communication

In the years 1998-2001, eight issues of the *ICMI Bulletin* have been published, two each year (June and December). Issues Nos. 44-45 have been published under the editorship of past ICMI Secretary Mogens Niss, and issues Nos. 46-51 under the editorship of the new ICMI Secretary Bernard R. Hodgson. The June 2001 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* on the WWW, through the IMU master site, can be obtained at the address

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

The *ICMI Bulletin* is also available electronically directly from the Secretary either as an attached document (RTF or Word file — prepared with Word 8) or as a plain text inside an e-mail message.

In order to facilitate retrieval of information contained in past issues of the *ICMI Bulletin*, the Secretary has published the tables of contents of all issues having appeared between 1972 and 1998. See *ICMI Bulletin* No. 47, December 1999, pp. 79-91 for issues Nos. 1-29 (1972-1990), and *ICMI Bulletin* No. 46, June 1999, pp. 42-49 for issues Nos. 30-45 (1991-1998).

Since the end of 1995, information concerning ICMI can be found on the ICMI-pages of the IMU-server on the World Wide Web. The location of these pages was changed in 2000, so that the ICMI website is now accessible at the address:

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

The information available about ICMI on its website was in serious needs of being updated. A renewed content for the ICMI webpages was made accessible around June 2000.

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, especially on the occasion of the celebration, together with the University of Geneva, of the centennial of *L'Enseignement Mathématique*. During the recent years, in addition to the Discussion Documents for ICMI Studies 12 and 13 (respectively, Algebra Study and Comparative Study), 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 and 9th ICMI Studies (respectively, “What is research in mathematics, and what are its results?” and “Perspectives on the teaching of geometry for the 21st century”).

INTERNATIONAL COMMISSION ON THE HISTORY OF MATHEMATICS (ICHM)

Report 1999-May 2002
Karen Hunger Parshall and Jan P. Hogendijk

The members of the Executive Committee (EC):

From 1999 through 2001, the members of the EC of the ICHM were:

Kirsti Andersen (Denmark), Chair; Craig Fraser (Canada), Vice Chair; Jeanne Peiffer (France), Secretary; Menso Folkerts (Germany), Treasurer; Natalja Ermolaeva (Russia); Alejandro Garcíadiego (Mexico); Mariano Hormigon (Spain); Giorgio Israel (Italy); LIU Dun (China); SASAKI Chikara (Japan). IMU representatives were: Karen Hunger Parshall (United States) and Jan P. Hogendijk (The Netherlands). Ex officio members were: Joseph W. Dauben (United States); Eberhard Knobloch (Germany); and Christoph Scriba (Germany).

The EC's current (2002-2005) members are: Karen Hunger Parshall (United States), Chair; Craig Fraser (Canada), Vice Chair; Jan P. Hogendijk (The Netherlands), Secretary; Menso Folkerts (Germany), Treasurer; Natalja Ermolaeva (Russia); Alejandro Garcíadiego (Mexico); Mariano Hormigon (Spain); Giorgio Israel (Italy); QU Anjing (China); SASAKI Chikara (Japan). Ex officio members are: Kirsti Andersen (Denmark); Joseph W. Dauben (United States); Eberhard Knobloch (Germany); and Christoph Scriba (Germany).

At present there are two vacancies on the EC for IMU representatives. The EC has proposed the names of Ahmed Djebbar (Algeria and France) and Jeremy Gray (United Kingdom) to the IMU to fill these vacancies.

Meetings of the EC:

The EC met at regular intervals from 1999 through 2001 with face-to-face meetings of a small percentage of the membership at the Centre International de Rencontres Mathématiques in Luminy, France in 1999, at the Mathematisches Forschungsinstitut in Oberwolfach, Germany in 2000, and at the XXIst International Congress of History of Science in Mexico City, Mexico in 2001. Beginning in 2002, the EC adopted a new meeting policy. It meets at least four times yearly via e-mail to discuss matters of interest to the international history of mathematics community. Its first two e-meetings of 2002 have already taken place. When feasible, it will have face-to-face meetings, although our experience has been that the reliance on face-to-face meetings has tended to render the EC a less democratic body than we would like it to be.

Conferences /Symposia/ Congresses:

From 1999 through 2001, members of the ICHM contributed to or organized numerous conferences, symposia, and congresses internationally. Examples include: Special Sessions at the annual joint meetings of the American Mathematical Society and Mathematical Association of America (United States) (1999, 2000, 2001); the conference "Mathematics and Culture: New Tendencies in Ethnomathematics and the History of Mathematics" (Canary Islands) (1999); the symposium "Methods in the History of Mathematics" at the Centre International de Rencontres

Mathématiques, Luminy (France) (1999); the "VIème Colloque Maghrebin sur l'Histoire des Mathématiques Arabes" (Algeria) (2000); the conference "2000 Years of Transmission of Mathematical Ideas" (Italy) (2000); the symposium "The History of Mathematics in the Twentieth Century" at the Mathematisches Forschungsinstitut, Oberwolfach (Germany) (2000); ; the conference "Certainty, Doubt, Error: Knowledge Production and its Impediments in the Practice of Pre- and Early-Modern Science" (Germany) (2001); the "International Conference of the New Millennium on the History of Mathematics (India) (2001); and the XXIst International Congress of History of Science (Mexico City) (2001).

Projects:

1. The ICHM, in cooperation with the American Mathematical Society, produced the CD-ROM edition by Albert C. Lewis (United States) of Joseph W. Dauben's (United States) *The History of Mathematics from Antiquity to the Present: A Selective Annotated Bibliography* (ISBN 0-8218-0844-3). The CD-ROM, which appeared in 2000, has already won an award from the reviewing body, Choice.
2. The ICHM has sponsored and coordinated an edition on the historiography of the history of mathematics currently in production at Birkhauser Verlag. This massive volume, edited by Joseph W. Dauben (United States) and Christoph Scriba (Germany), represents a truly international collaboration with individual chapters authored by upward of twenty historians on the development of the history of mathematics in countries around the world.
3. The ICHM has mounted and is maintaining a webpage of its activities and of matters of interest to historians of mathematics internationally. See <http://www.math.uu.nl/ichm>
4. The ICHM is presently compiling a database of information on historians of mathematics around the world.

Publications:

1. *Historia Mathematica* is the official journal of the ICHM. It appears four times annually and publishes roughly 500 pages of original research in the history of mathematics from all times and cultures. Edited from 1996 through 1999 by Karen Hunger Parshall (United States) and Jan P. Hogendijk (The Netherlands), it has been edited since 2000 by Craig Fraser (Canada) and Umberto Bottazzini (Italy). The journal, published by Academic Press through 2001, is now being published by Elsevier Science and is available electronically to subscribers of IDEAL.
2. Beginning in 2002, the Chair and Secretary of the ICHM will prepare a yearly Newsletter to update the members of the ICHM on the Commission's activities. The Newsletter will also be made available to the public on the ICHM's website.
3. Once a year, the Chair and the Secretary of the EC send a report on the scientific activities of the ICHM to Jacob Palis (Brazil), Secretary of the IMU. These reports are published in the *Bulletin of the International Mathematical Union*.
See: <http://www.mathunion.org/bulletin/45/ICHM.html> and
See: http://www.mathunion.org/bulletin/46/bulletin_2000.PDF

Medals:

In 2001, the Kenneth O. May Prize for Excellence in the History of Mathematics was awarded for the fourth time to Ubiratan D'Ambrosio (Brazil) and Lam Lay Yong (Singapore). D'Ambrosio received his medal at the XXIst International Congress of the History of Science in Mexico City, Mexico in 2001; Lam Lay Yong will receive her medal at ICM '02 in Beijing, China.

REPORT OF THE COMMITTEE ON ELECTRONIC INFORMATION AND COMMUNICATION (CEIC) OF THE INTERNATIONAL MATHEMATICAL UNION

February, 2002

The CEIC is a standing committee of the International Mathematical Union. It has met as a committee on five occasions, with three of those meetings taking place in the context of workshops/conferences on issues within the Committee's remit.

Typically, a committee meeting has included formal presentations by members and invited expert visitors on issues to be considered; reports by members on matters for which they have taken responsibility; comment on relevant experience and activity peculiar to the organisations, nation, and region of which they have direct knowledge; redefinition and refinement of duties; preparation of recommendations to the Executive Committee of the IMU; general discussion of continuing and new issues; decision on actions to be taken in the immediate future.

Several of the issues that have exercised the CEIC are matters that properly allow for passionate and widely varying opinion. Notwithstanding that, the Committee attained a highly productive commonality of purpose and of mutual understanding.

IMU Math-Net. Generalising Germany's MathNet initiative has been an important concern of the CEIC. See http://www.ceic.math.ca/records/Math-Net_Charter.html. A phase of this endeavour will culminate with the announcement in April that the Math-Net pagemaker for homepages of Institutes, Departments, and Centres is now available.

Copyright. The CEIC occasioned the creation (by Wilfrid Hodges) of the checklist 'What do you want from your publisher' and its executive summary (endorsed formally by the EC); see <http://www.maths.qmul.ac.uk/~wilfrid/copyright.html>. This project will be enhanced and updated by the preparation of webpages providing brief summaries of and links to related pages.

Call to Mathematicians. The EC endorsed the statement (see www.ams.org/ams/call.html) that "open access to the mathematical literature is an important goal. Each of us can contribute to that goal by making available electronically as much of our own work as feasible."

Our recent work is likely already in computer readable form and should be made available variously in TeX source, dvi, pdf (Adobe Acrobat), or PostScript form. Publications from the pre-TeX era can be scanned and/or digitally photographed. Retyping in TeX is not as unthinkable as first appears.

Our action will have greatly enlarged the reservoir of freely available primary mathematical material, particularly helping scientists working without adequate library access."

World Mathematical Directory. The CEIC came to the reluctant conclusion that privacy laws strongly inhibit the creation and maintenance of a highly desirable electronic version of the Directory.

UNESCO/ICSU Conference. The attendance on behalf of the IMU of a CEIC member (Alf van der Poorten) at the UNESCO/ICSU Conference "Electronic publishing in science" held in Paris, February 20--23, 2001, highlighted the importance of mathematics being represented at general scientific meetings.

Recommendations to the EC. Recommendations, currently in draft form, are still under discussion by the CEIC. Eventual versions endorsed by the EC will be reported to the General Assembly of the IMU, Shanghai, August, 2002.

As a hint of the content of the CEIC's remarks, their working titles are: *For Mathematicians:* Structure and Format; Linking and Enrichment; Versions; Personal Homepages; Personal Collected Works; Preprints and Archives; Copyright; *For Librarians (and Mathematicians):* Journal Price and Policy; Validation; Statistics; *For Publishers:* Partial Access; Eventual Free Access; Archiving Format; Archiving Responsibility; Licensing and Bundling.

1. Meetings of the CEIC

1.1. Berlin, 11/1998. The first meeting of the CEIC (on the instigation of Martin Grötschel, and funded by and at the invitation of the ZIB) was held at ZIB, Berlin, Saturday, November 14, 1998, following a Workshop on Electronic Information and Communication matters organized by the ZIB and featuring presentations from representatives of the German scientific and library communities as well as from CEIC members.

The CEIC identified tasks to be given priority and distributed duties among its members. Initiatives confirmed at the meeting included the web presence of the CEIC <<http://www.ceic.math.ca/>>, a committee address (ceic@esi.ac.at), a decision to report on copyright and associated intellectual property issues, preparation of a conference at MSRI, Berkeley, a decision that it was not *per se* productive to enter full bore into journal pricing issues. This, and *inter alia* issues concerning archiving, peer review and related validation, were noted for future discussion.

1.2. Berkeley, 12/1999. The second meeting of the CEIC took place at MSRI, Berkeley, during and after the conference 'The Future of Mathematical Communication' Berkeley, Dec. 1-5, 1999, see: <<http://msri.org/activities/events/9900/fmc99/index.html>> for the full record of the meeting including overheads and streaming video.

The conference was attended by some 100 participants and included 35 speakers from more than a dozen countries and representing mathematicians, computer scientists, physicists, educators, librarians, software developers, publishers and many other perspectives. It was jointly sponsored by the three Canadian Research Institutes (CRM, Fields, and PIMS) and by MSRI, with additional support from the IMU, AMS, CMS, Springer, Cambridge University Press, Mathematica, and Maple. Highlights included a stimulating public symposium on December 4.

Matters discussed by the CEIC and its visitors included the notion of secondary home pages in Math-Net; metadata - a tool for indexing and linking mathematical preprints globally; copyright issues (Wilfrid Hodges: What do you want from your publisher?); electronic services offered by the EMS (European Mathematical Society); developing countries issues (Kapil Paranjape: The

situation in India); the arXiv as a model preprint archive. For more detail see <http://www.ceic.math.ca/records/ceic_reportdec99.html>.

1.3. ESI, Vienna, 10/2000. The third meeting of the CEIC held at the ESI, October 5--7, 2000, included several mathematics lectures presented by members allowing the Erwin Schrödinger Institute partly to support the costs of the meeting.

The Committee reviewed reports from members (see the general introduction above), it confirmed several agreements on the propagation of Math-Net and MPRESS, it made incremental progress on its 'copyright statement', on Peter Michor's instigation it resolved to prepare material calling on mathematicians 'to create online versions of their 'collected works'', it discussed the CEIC website; and it considered the issues involved in turning the IMU World Directory of Mathematicians from print into electronic form. For further details of the meeting see <<http://www.ceic.math.ca/Tex/20001005/>>.

1.4. IAS, Princeton, 05/2001. The fourth meeting of the CEIC was scheduled to intersect with a meeting of the EC at the Institute for Advanced Study, Princeton and took place May 12--14, 2001. Much of the CEIC meeting was attended by Jacob Palis, President of the IMU. Conversely, the morning session of the EC meeting was attended by members of the CEIC and consisted substantially of discussion of CEIC issues.

Highlights warranting mention here included the endorsement by the EC of the Executive Summary of the Copyright Checklist (by Wilfrid Hodges), and of the statement 'Call to Mathematicians'.

In respect of the World Directory of Mathematicians it was agreed that for 2002 there was no alternative to preparing a print directory, as in the past. Looking to the future, members of the Committee noted that privacy laws may well inhibit the highly desirable alternative of maintaining a publicly accessible electronic list of mathematicians.

Alf van der Poorten reported briefly on his attendance on behalf of the IMU at the UNESCO/ICSU Conference 'Electronic publishing in science' held in Paris, February 20--23, emphasising the importance of mathematics being represented at general scientific meetings (see <<http://www.ceic.math.ca/PDFs/2001/UNESCOreport.pdf>>. For further details of the CEIC meeting see <http://www.ceic.math.ca/PDFs/2001/CEIC_Minutes.pdf>.

1.5. SFU, Vancouver, 02/2002. The fifth meeting of the CEIC was held at the Morris J. Wosk Centre for Dialogue, Simon Fraser University, Vancouver, February 15--17, 2002.

It included, on Saturday, February 16, a CEIC Workshop 'Managing digital information in mathematics: From journals to the grey literature'; for the program see <<http://www.cecm.sfu.ca/ceic/programme.html>>.

The CEIC determined the parameters of the present report; it made first and second draft formulation of a series of 'best practice' statements (the Recommendations to the EC alluded to above); it extensively discussed access problems in third-world countries; it endorsed the formal announcement of the availability of the Math-Net pagemaker and resolved to ask that such a pagemaker also be created for personal secondary homepages.

The CEIC noted that the IMU/CEIC statement prepared by Wilfrid Hodges, and links pointing to it, is almost the only web item on mathematical copyright and general copyright guidelines. Nonetheless, there are related matters of interest to mathematicians on the web. It was therefore agreed that the CEIC website be enhanced and updated by preparing brief summaries of and links to such items.

The CEIC received a detailed report on the World Digital Mathematical Library Project and resolved to urge the IMU to accept a central role in the co-ordination and facilitation of this retrodigitisation project.

Acting on an e-mailed request of David Mumford, the CEIC rediscussed the Budapest Open Access Initiative (BOAI) <<http://www.soros.org/openaccess>> noting that parts of the BOAI of course coincide with advice and recommendations of the CEIC, but more particularly remarking that its more impassioned demands are less than totally realistic.

The minutes of the meeting will be available at
<http://www.ceic.math.ca/PDFs/2002/CEIC_Minutes.pdf>.

Membership and Participation 1998--2002.

Peter Michor (Austria), Chair [5/5];
Jonathan Borwein (Canada), Deputy-Chair [5/5];
John Ewing (USA) [5/5];
Jonas Gomes (Brazil) [1/3];
Martin Grötschel (Germany) [5/5];
Wilfrid Hodges (UK) [5/5];
David Morrison (USA) [5/5];
Kapil Paranjape (India) [3/4];
Alf van der Poorten (Australia) [5/5];
Alexei Zhizhchenko (Russia) [4/4];
Qing Zhou (China) [1/4].

Note: Several members did not join the Committee until subsequent to the Berlin meeting; one member effectively resigned during the term of the Committee.

Appendix 1: the CEIC's Terms of Reference

Building on the enabling resolution passed by the General Assembly (GA) in Dresden on August 16, 1998, the Executive Committee of the International Mathematical Union establishes a {it Committee on Electronic Information and Communication (CEIC)} of the International Mathematical Union (IMU).

Terms of Reference:

- a) The CEIC shall be a standing committee of the Executive Committee (EC) of the IMU, to be reviewed every four years by the EC at its meeting preceding that of the GA. Members will be appointed for four year terms by procedures similar to those for Commissions of the IMU. The Executive Committee will appoint one of its members to serve on the CEIC.
- b) The CEIC may meet as necessary in each four year period, review the development of Electronic Information and Communication as it impacts the international mathematical community and submit a report to the EC.
- c) The CEIC may organize or sponsor international meetings or forums to bring together representatives of all interested parties, including societies, publishers, libraries, and researchers, publish and otherwise disseminate proceedings, reviews of recent developments, and technical surveys for the use of the mathematical community.
- d) The CEIC may recommend international standards on issues related to electronic communication. Such recommendations should be reviewed by the EC and, if approved, may be published and promoted in the name of the IMU.
- e) During its first 4 year term, the CEIC is specifically asked to address the coordination of world-wide efforts to establish web-based servers for mathematical papers, preprints, journals, and books. This includes issues of uniformizing metadata, document identifiers and supported formats, promoting mirroring and the development of search engines for mathematical material and coordination of existing servers. It should publish its findings with the goal of making the use of these servers universally understood and usable by the whole mathematical community. It is also asked to consider transferring the World Directory of Mathematicians to an electronic freely accessible form.

Committee on Electronic Information and Communication Terms of Reference

Building on the enabling resolution passed by the General Assembly in Dresden on August 16, 1998, the Executive Committee of the International Mathematical Union establishes a "Committee on Electronic Information and Communication" (CEIC) with the following terms of reference:

- a) The CEIC shall be a standing committee of the Executive Committee (EC) of the IMU, to be reviewed every four years by the EC at its meeting preceding that of the GA. Members will be appointed for four-year terms by procedures similar to those for Commissions of the IMU. The Executive Committee will appoint one of its members to serve on the CEIC.
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f) Membership:

* Peter Michor (chair), Austria
Peter.Michor@esi.ac.at

* Jonathan Borwein, Canada
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* John Ewing, USA
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* Jonas Gomes, Brazil
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* Martin Grötschel (EC member), Germany
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*Wilfrid Hodges, UK
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*David Morrison, USA
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*Kapil Paranjape, India
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*Alfred J. (Alf) van der Poorten,
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*Alexei Zhizhchenko, Russia
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*Qing Zhou, China
qzhou@math.ecnu.edu.cn

Best Current Practices:

Recommendations on Electronic Information Communication (2002)

Endorsed by the IMU Executive Committee on April 13, 2002 in its 69th session in Paris, France

Communication of mathematical research and scholarship is undergoing profound change as new technology creates new ways to disseminate and access the literature. More than technology is changing, however; the culture and practices of those who create, disseminate, and archive the mathematical literature are changing as well. For the sake of present and future mathematicians, we should shape those changes to make them suit the needs of the discipline. For this reason, we have identified a number of "best practices" for those involved with the mathematical literature—mathematicians, librarians, and publishers. Many of these are practices that apply to other academic disciplines as well. Although we focus primarily on mathematics, we recognize that we can learn from each other as we move forward, and that no single discipline should act in isolation.

Our advice is meant to guide practice as it changes rather than to set forth a collection of firm rules and admonitions. The recommendations concern all forms of scholarly publishing and do not promote any particular form. Indeed, the authors of this document hold many differing

views on the future of scholarly publishing. The common principle used to formulate our recommendations is that those who write, disseminate, and store mathematical literature should act in ways that serve the interests of mathematics, first and foremost.

This is advice that is meant to ease the transition in scholarly communication for present mathematicians. Most importantly, however, it is advice aimed at protecting mathematicians in the future.

FOR MATHEMATICIANS

1. Structure and Format. Logically structured documents correctly reflect the content of a mathematician's work, setting forth results, arguments, and explanations to make them understandable to readers. But a logical structure also makes it possible to retrieve and eventually to update the document. Identifying the constituent parts of an electronic document is essential in order to move from one format to another without human intervention. Authoring documents should be more than setting down mathematical research in a pleasing format. Authors are encouraged to provide the structure necessary to use their documents now and in the future. The aim is to create a master file from which the various other formats can be derived. [In mathematics, LaTeX is a congenial and accessible way to give documents some structure without adding unreasonable burdens on the author.]

2. Linking and Enrichment. An electronic publication can offer much more than a print publication. Electronic publication gives the user the ability to move effortlessly among the various parts of a paper or even from one paper to another. In order to make this possible, however, someone must add the necessary information to establish links in the electronic version.

Adding links is easier when authors provide the information necessary to establish them. [Correct cross-referencing and citation in LaTeX transforms readily into hyperlinks, yielding enriched electronic versions of one's work. Hyperlinks may be used in PDF files as well.] Moreover, electronic publication is not restricted by the constraints of the traditional print medium. This provides an opportunity to detail material that might otherwise be dismissed as "well known" and to add explanatory appendices. A little less easily, whenever appropriate, one may include graphic enhancements, animations, extensive data, tools to analyze that data, or even active examples that may be varied by the reader.

3. Versions. Online publication can lead to severe problems in citation, because the posted paper can be updated continuously until it bears little resemblance to the original, as an author corrects, adds, and deletes material without indicating that changes were made. As the mathematical literature grows, references to non-existent papers and results will eventually jeopardize its coherence. To avoid this problem, papers that have achieved a sufficiently final state should be stored in an immutable form. This includes any paper to which others may make reference, whether published in refereed journals or posted as a preprint. If revisions subsequently are necessary, each released version should be clearly labeled with its own version number and old versions should remain available.

4. Personal Homepages. Mathematical communication is more than merely posting or publishing papers. Information about the mathematical community and its activities is valuable to all mathematicians, and it is now easier than ever to circulate and to find such material. Mathematicians are encouraged to have their own homepage. Ideally, basic data on such a page (or on a "secondary" homepage) should be presented in standard form to allow ready automatic compilation into databases. [Material found at http://www.math-net.org/Math-Net_Page_Help.html describes the Math-Net project, which provides standardized homepages for departments and institutes.]

5. Personal Collected Works. Mathematics ages slowly. Access to older literature is important for most mathematicians, and yet much of the older literature is likely to remain unavailable in electronic form in the immediate future. Mathematicians can change that by taking collective action. Whenever legally and technically possible, mathematicians are

encouraged to scan their old (pre-TeX) papers and post them on their homepages, making their "collected work" readily available to all. This relatively small effort on the part of every mathematician will provide enormous benefit to the entire community. The Call to Mathematicians found at <http://www.mathunion.org> provides further information.

6. Preprints and archives. Mathematical writing is ineffective if it is not communicated. A generation ago, the photocopier made it easy to send preprints to one's peers. Today, as a substitute, we have departmental servers, homepages, and public archives. [The arXiv (<http://www.arxiv.org/>) is one prominent example.] It is a good practice to place one's preprints both on a homepage and in an appropriate archive. Either copy serves to communicate the mathematics to one's peers, but the public archive will make it more likely that others can reference your work in the future.

7. Copyright. While copyright is a complex subject that is far removed from mathematics, copyright law and policy can profoundly affect the ways in which mathematics is disseminated and used. Copyright is important for mathematicians. Authors should be aware of the basic principles of copyright law and custom. Decisions about copyright for one's own work should be made thoughtfully. The material found at <http://www.ceic.math.ca/> serves as a good reference.

FOR LIBRARIANS AND MATHEMATICIANS

8. Journal Price and Policy. Libraries have limited budgets, which often grow more slowly than the prices of journals, forcing libraries to cancel subscriptions. The cumulative effect of cancellations goes beyond individual institutions because it shifts costs to an ever smaller number of subscribers, accelerating the process of price increase and cancellation. Journal prices matter to all mathematicians. When deciding where to submit a paper an author may choose to be aware of a journal's standing and impact, but an author also should take account of a journal's price (as well as its general policies, including archiving). In addition, one might consider a journal's price and policies when considering whether to referee or serve on an editorial board.

9. Validation. Publication and peer review processes are increasingly detached. The emergence of overlay journals, archival preprint servers, and other new structures of publication raise new and pressing questions about the appropriate forms of validation. These are important issues for all scholarship, but even more important for mathematics since it is essential to know which parts of the mathematical literature are valid. Both mathematicians and decision makers need to be alert to the distinction between posting and providing validation. Editorial boards should be explicit about the form and the level of validation they provide for papers and make this information plain to all users.

10. Statistics. Electronic delivery of information has changed the nature of statistics available to assess the usage and the 'value' of academic literature. Gathering statistics from the Internet is notoriously complicated, and even those who are knowledgeable about the pitfalls can be inadvertently or intentionally misled. As librarians and other decision makers increasingly rely on web statistics (such as the number of hits, page accesses or downloads) it is important to be informed about the nature of such measurements and the difficulty in gathering and interpreting them. Moreover, the value of a particular resource is often not best measured by simply counting the number of times it is currently used in some way. This is especially true in a field like mathematics in which current research continues to play such a significant role far into the future. Given that statistics, while subject to misuse, are valuable and will be used, it is important that mathematics researchers and research librarians are alert to these rapidly changing issues and are prepared to make appropriate arguments for mathematics.

FOR PUBLISHERS AND MATHEMATICIANS

11. Partial Access. Many journals restrict access to (paying) subscribers. As the web of mathematical literature grows, however, it will be increasingly important for all mathematicians to navigate that web, whether or not they have access to complete articles. This allows mathematicians to learn basic information about an article, even when they do not belong to institutions that have the financial resources to support the journal. It is especially advantageous to mathematicians from the developing world. Journals should provide unrestricted access to tables of contents, abstracts of papers, and other data, such as keywords. Where practical, journals should also provide unrestricted access to reference lists with links, allowing all mathematicians to navigate the web of literature, even when they don't have access to the full-text of some parts of that web.

12. Eventual Free Access. The scholarly enterprise rests on the free exchange of ideas, and scholars need to have easy access to those ideas. Many journals, however, rely on subscriptions to recover costs and to provide an incentive to publish, forcing them to limit access to subscribers. Access should be a balance between those two needs, of scholars and of publishers.

Limiting access to subscribers for a fixed period of time after publication may be necessary for many journals. In order to ensure appropriate accessibility for the electronic literature, we encourage all journals to grant free access after that fixed period of time.

13. Archiving format. Ensuring the success of long-term archiving is more than storing the electronic data on reliable media in multiple locations. As software and formats change in the future, the data will require modification and updating. Not all electronic formats are suitable for these purposes. In general, electronic documents should be stored in their most primitive format, that is, the format used to derive subsequent formats. Any format in which material is stored should follow an "open standard" that has a detailed public specification. This will increase the likelihood that scholars working decades or centuries from now will be able to use the material.

14. Archiving responsibility. Traditionally, maintaining the older literature has been the responsibility of librarians rather than publishers. Even in the electronic age, scholars and the librarians who represent them have the greatest motivation among all of the affected parties to ensure the preservation of older material. We recommend that electronic archives of the mathematical literature should ultimately be under the control of the academic community.

15. Licensing and Bundling. Some licensing and bundling arrangements for journals accelerate the transfer of control of our literature away from mathematicians and research librarians. When institutions are forced to accept or reject large collections of scholarly literature covering many different disciplines, the decisions are less likely to be made by scholars. As a consequence, the normal processes that promote the highest quality journals become less effective. The best protection, as always, comes through staying well informed and alert to these issues. In general, decisions about journal adoptions and cancellations should be made by academics and librarians.

Postscript on Developing Countries. Today, active mathematicians depend on access to electronic information—online journals, databases of reviews, and preprint servers. More than access, research mathematicians need the tools to create and edit documents in standard formats [such as LaTeX, Postscript, and PDF]. This is true for mathematicians everywhere, including those in developing countries. Implementing many of the recommendations in the preceding document makes little sense if mathematicians are not connected to the Internet or have no tools to create electronic documents. National mathematical societies and academies in developing countries need to impress on their governments the need to establish the infrastructure necessary to provide high speed connectivity among academic institutions. The

entire mathematics community should encourage and support specific actions designed to help in this effort, which include:

- Establishing "mirror" services that provide quick access to users of electronic services within each region.
- Establishing local help and service centers that spread expertise on the use of common standards [for example, LaTeX].
- Creating small groups who tour the region and demonstrate the use of technology for research and study.

Because scholarly communication is changing rapidly, there is great urgency to begin these efforts.

Committee on Electronic Information Communication
International Mathematical Union

Remark: The above recommendations have been stated in very general form. Whenever reference to existing formats [e.g., LaTeX, PDF], to archiving systems [e.g., arXiv], or to information and communication systems [e.g., Math-Net] has been made this is meant for illustration and not to promote these formats and systems. The IMU EC has asked CEIC to enhance, whenever appropriate and useful, individual recommendations by adding links to web pages that explain some of the technical issues involved, provide additional information, or contain (possibly controversial) discussions of the topics addressed. These links will be under the responsibility of CEIC and are not subject of the IMU EC recommendations.