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Bulletin of the International Mathematical Union

No. 38, December 1994

Contents:

Secretariat:

Instituto de Matemática Pura e Aplicada - IMPA
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Rio de Janeiro, RJ
22460-320 Brazil

The IMU Executive Committee (1995-1998)

The IMU Executive Committee consists of nine voting members elected for four-year terms: the four officers (president, two vice presidents, and secretary) and five other members. The retiring president is an ex officio member of the Executive Committee without vote for a period of four years. The current members (terms January 1, 1995 to December 31, 1998) of the IMU Executive Committee are

President:

David Mumford (Univ. Harvard, USA)

Vice Presidents:

Vladimir Arnold (Steklov Inst., Moscow, Russia)
Albrecht Dold (Univ. of Heidelberg, Germany)

Secretary:

Jacob Palis (IMPA, Rio de Janeiro, Brazil)

Members:

James Arthur (Univ. of Toronto, Canada)
Simon Donaldson (Oxford Univ., United Kingdom)
Björn Engquist (KTH Stockholm, Sweden)
Shigefumi Mori (RIMS, Kyoto Univ., Japan)
K.R. Parthasarathy (Indian Statist. Inst., New Delhi, India)

Ex Officio Member:

Jacques-Louis Lions (past president; Collège de France, Paris)

IMU Executive Committees 1952-1998

Members of the Union 1994

The following countries were members of IMU as of January 1,1994:

Group I:

Bulgaria, Cameroon, Chile, Croatia, Cuba, Egypt, Greece, Hong Kong, Iceland, Iran, Ivory Coast, Democratic Republic of Korea, New Zealand, Nigeria, Norway, Philippines, Portugal, Romania, Saudi Arabia, Singapore, Slovenia, Turkey,Vietnam, Venezuela.

Group II:

Argentina, Austria, Bulgaria, Czech Republic, Denmark, Finland, Georgia, Ireland, Mexico, Republic of Korea, Slovak Republic, South Africa, Yugoslavia.

Group III:

Australia, Belgium, Brazil, Hungary, India, Israel, Netherlands, Poland, Spain, Sweden, Switzerland.

Group IV:

Canada, Italy.

Group V:

China, France, Germany, Japan, Russia, United Kingdom, USA.

In the 12th General Assembly of IMU, held in Lucern, Switzerland from July 31 - August 1, 1994, the following countries were accepted as new country members of IMU, in Group I, as for January 1, 1995: Armenia, Kazakhstan and Tunisia.

Also in the same meeting, the Group of Adherence of Chile and Iran were raised from I to II. The change will take effect on January 1, 1995. Concerning Israel, the General Assembly approved a raise from Group III to Group IV, as of January 1, 1995.

Bulgaria had its Group of Adherence lowered from II to I, on its own request. The change has taken effect as of January 1, 1994. The Secretary emphasized that this change will be reversed as soon as Bulgaria's economic situation improves, without another ballot. The President asked Prof. B. Sendov, a delegate from Bulgaria, to tell the Bulgarian Academy of Sciences, the Union's appreciation of the scientific work in that country.

ICM 2002

Following the recommendation of the 1990 General Assembly in Kobe, Japan, the Executive Committee has approved the following new guidelines for the operation of the Site Committee for ICM 2002.

1. The Site Committee will consist of the members of the Executive Committee and Prof. Martin Grötschel of the Organizing Committee of the ICM 1998.

2. All Adhering Organizations are now formally invited to place bids to hold ICM 2002. To be considered by the Site Committee, these bids must be received by the Secretary of IMU by November 30, 1996. The Site Committee then will make its recommendation by May 31, 1997. The recommendation of the Site Committee will be communicated to all Adhering Organizations immediately afterwards.

3. The final decision will be taken by the General Assembly to be held at the middle of August, 1998, just prior to the ICM'98 in Berlin. The General Assembly is free to consider bids placed after November 30, 1996 but the E.C. considers most advisable that the Adhering Organizations comply with the above procedure.

4. While it is impossible to spell out precisely all factors that will influence the final recommendation of the Site Committee, it will take into account the mathematical ambiance, the infrastructure and the economic conditions offered by each bidder, as well as the accessibility of the proposed site and the broad geographical distribution of congresses. All countries interested in making a bid are strongly encouraged to do so.

Notes on what information the Site Committee would like to have for each bid are:

BIDS FOR ICM 2002

BIDS FOR ICM 2002

REQUESTED INFORMATION

Among other relevant information that each potential host country may want to supply, the Site Committee wishes to know about the following items:

I. Finances

Clearly, costs may vary considerably from country to country. However, according to the reports of the latest ICM'S, a potential host country may consider a budget of about 1.5 million US dollars, of which about 0.5 or 0.6 million US dollars might be raised through registration fees (such fees should be at most about 200 US dollars). Again, these numbers may go up or down according to local costs and facilities. In considering the budget, printing costs of the Proceedings and other material (posters, announcements, summary of invited lectures, ...) as well as mailing, deserve special attention.

The host country should be prepared to lodge freely about 120 young research mathematicians from developing countries, selected by IMU; they get their trips paid by IMU through its Special Development Fund. Also, in special cases, invited speakers are expected to receive some financial support for attending the meeting when other funds to cover their expenses are not available. Registration fees are waived for invited speakers and the above young research mathematicians from developing countries.

On the other hand, is to be noted that there is an IMU subvention to the ICM as well as some provision in its budget to defray costs of the General Assembly Meeting that takes place just before the Congress; for 1998, these sums amount to 106.000 Swiss Frs. and 16.000 Swiss Frs., respectively.

II. Infrastructure

It is important that good facilities to hold the Congress are available. All lectures should take place in sizable, well equipped, pleasant and audible rooms. Special attention should be given to the Plenary Talks.

III. Accessibility

The city and site of the Congress should be easily accessible. That is, flight connections from all over the world should be easily available, as well as transportation to the site of the Congress. Lodging facilities constitute an important item.

Finally, it is expected that the local mathematical community get involved in the preparations of the Congress, so as to create a nice ambiance during the meeting.

Travel Grants for Young Mathematicians to attend the International Congress of Mathematicians

The International Mathematical Union will award travel grants to young mathematicians to help them to attend the ICM-98, Berlin, Germany August 18-28, 1998. The grants are intended primarily for young mathematicians from developing countries (not necessarily members of IMU). Please notice that Mathematicians from countries with strict monetary regulations are not part of this program, but shall also be considered directly by the Local Organizing Committee.

The age-limit for the grantees is 35 years at the occasion 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 a brief curriculum vitae, including date of birth, plus a list of publications (papers published or accepted for publication).

The Local Organizing Committee of the International Congress of Mathematicians will provide a special allowance to the grantees to cover their registration, board and lodging.

Applications for the travel grant may be sent directly to the Secretary of the Union. Applications may also be submitted through the Committees for Mathematics, which in such a case will send all the relevant information about the candidates to the Secretary.

All applications should reach the Secretary by *January 1, 1998:*

IMU SECRETARIAT:
International Mathematical Union
Professor Jacob Palis, Secretary
Estrada Dona Castorina, 110, Jardim Botánico
22.460-320 - Rio de Janeiro, RJ
Brazil
Fax No. (55) (21) 512 4112
e-mail: imu@impa.br

The Travel Grants Committee (Professors M.S. Narasimhan, A. O. Kuku, Gu Chaohao, Eduard Zehnder and Jacob Palis) met in Paris, at Collége de France on April 9, 1994. The Committee received 197 applications by February/94. The Committee decided to give travel grants to 85 mathematicians, but six of them regretted that they had to decline the invitation for personal reasons. So IMU provided travel grants to 78 young researchers from developing countries and indicated one more to the Swiss Organizing Committee for local expenses. Actually, the local expenses to the 79 guarantees were covered by the Swiss.

Special Development Fund

The Special Development Fund aids IMU to fulfill the important obligation of helping developing countries within the framework of mathematical research. The means of the Fund, which go unreduced 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 accounts:

Account no. 0862-656208-21
Schweizerische Kreditanstalt
Stadtfiliale Zürich-Rigiplatz
Universitätstrasse 105
CH-8033 Zürich
Switzerland

The following contributions have been received in the years 1991-1994:

1991		
American Mathematical Society	US $	14.772,93
Royal Society	US $	8.780,27
London Math. Society	US $	1.730,10
1992		
American Mathematical Society	US $	27.787,00
Wiskundig Gennotschap, Netherlands	US $	1.825,40
Royal Society	US $	8.377,21
Deutsche Math. Vereinigung	US $	6.406,74
1993		
American Mathematical Society	US $	32.500,95
Wiskundig Gennotschap, Netherlands	US $	1.418,43
1994		
American Mathematical Society	US $	30.550,06
Mathematical Society of Japan	US $	18.881,11
Royal Society	US $	4.477,00
Com. Nat. Frac. Math., France	US $	3.404,86
CNPq, Brazil	US $	6.944,44

On behalf of IMU, the Executive Committee of IMU expresses its deep gratitude for these donations.

IMU Lectures

Since 1971, the Executive Committee of IMU has been inviting, from time to time, a distinguished and active mathematician of high international standing, to give a set of four to five lectures, on important new developments in mathematics, to which the lecturer, directly or indirectly, has made a contribution and which deserve to be "surveyed" at some length, for the benefit of younger mathematicians as well as others.

IMU provides an stipend of US$ 2000 to the lecturer upon receiving a manuscript corresponding to his talks. The present Executive Committee has also decided to consider the payment of the transportation of the lecturer when an institution of a developing country is involved.

The lectures should be given at mathematical centers and they will be published in the L'Enseignement Mathématiques.

Report for 1994 of the

International Mathematical Union (IMU)

Professor Jacob Palis
Secretary

Introduction

The International Mathematical Union was founded in its present form in 1951. The purpose of the Union is to promote international cooperation in mathematics, to support and assist the International Congress of Mathematicians and other international meetings and to encourage and support other international mathematical activities considered likely to contribute to the development of mathematical science in any of its aspects , pure, applied, or education. IMU has two commissions, the International Commission on Mathematical Instruction and the Commission on Development and Exchange. The International Commission on the History of Mathematics is a joint commission with the International Union of the History and Philosophy of Science.

Membership

The members of IMU are countries. At the moment IMU has 57 members.

Scientific Meetings

The major event of the Union was the International Congress of Mathematicians 1994, held in Zurich, Switzerland, on August 3-11. A total of 2536 participants from 87 countries attended together with 363 accompanying members and 77 exhibitors of publishing companies. The Congress was organized under the auspices of the International Mathematical Union by the Swiss Mathematical Society and was supported by the University Foundation of the Canton Zurich, the ETH domain of the Swiss Confederation, the Swiss National Science Foundation, the City of Zurich, the Swiss Academy of Sciences and many private corporations.

The Opening Ceremony took place in the Congress Hall of Zurich in the morning of Wednesday, August 3. The President of the International Mathematical Union, Prof. Jacques Louis Lions, declared the Congress open and announced the following members of the Program Committee, which was responsible for the scientific program of the Congress: L.Nirenberg (Chairman), S.K.Donaldson, V. Drinfield, P. de la Harpe, R. Karp, H. Kraft, A.Majda, M. Raynaud and Ya. Sinai. Then, by his proposal, Prof. Henri Carnal, the President of the Organizing Committee, was elected President of the Congress and, by proposal of the Organizing Committee, Beno Eckmann, the founder of the Mathematical Research Institute at ETH-Zurich and former Secretary of IMU, was elected Honorary President. Welcome addresses were given by Mrs. Ruth Dreifuss, Head of the Swiss Federal Department of Home Affairs, by Dr. Alfred Gilgen, Head of the Department of Education of the Canton Zurich and by Dr. Thomas Wagner, City Councillor of Zurich. The Chairman of the Fields Medals Committee. Prof. D. Mumford, announced the recipients of the Fields Medals: Jean Bourgain, Pierre-Louis Lions, Jean Christophe Yoccoz and Efim Zelmanov. Prof. Eckman handed the medals and the prizes to the winners. The Chairman of the Rolf Nevanlinna Prize Committee, Prof. J.L.Lions, announced Avi Wigderson as the recipient of the prize, which was again handed by Prof. Eckmann. The Fields Medal Committee consisted of Prof. David Mumford (Chairman), J.Tits, L.Caffarelli, B.Mazur, S.Varadhan, D.Sullivan, M.Kashiwara and A.Schrijver. and the Rolf Nevanlinna Prize Committee consisted of Prof. J.L.Lions (Chairman), H.W.Lenstra, R.Tarjan, M.Yamaguti and J. Matijasevic.

In the afternoon of August 3, addresses on the works of the prize winners were given. L.Caffarelli described the work of J.Bourgain, S. Varadhan the work of P.L.Lions, J.Matijasevic the work of A.Widgerson, A.Douady the work of J.C. Yoccoz and W.Feit that of E.Zelmanov.

From August 4 to August 11, except for Saturday, August 7, one-hour plenary addresses were delivered in the Congress Hall in the morning (on the last day also in the afternoon) and 45-minutes section lectures in up to 7 parallel sessions were held during the afternoon in the rooms of the University of Zurich and of the ETH Zurich. In total, there were 16 plenary and 148 section lectures. The speakers had been invited by the Organizing Committee according to the decisions of the Program Committee. Six invited speakers declined for different reasons and two could not show up. In addition, there were 4 lectures invited by the International Commission on Mathematical Instruction (ICMI), 3 by the International Commission on the History of Mathematics (ICHM) and a special seminar on the history of the ICMs, which were scheduled along with the section lectures and 978 short communications appeared in a Book of Abstracts. Most of them and some 100 additional contributions were presented at the poster sessions which took place at ETH during the afternoon. There were also several informal seminars as well as a symposium organized on Thursday, August 4, by the Association for Women in Mathematics and the European Women in Mathematics.

The Organizing Committee was able to support the prize winners, 19 of the invited speakers and some 200 participants from Eastern Europe. The International Mathematical Union, through its Special Development Fund, paid the travel expenses of 79 young scholars from developing countries whose living expenses were covered by the Organizing Committee.

At the Closing Ceremony in the afternoon of August 11, Prof. J.L.Lions announced the new members of IMU Executive Committee and of ICMI, CDE and ICHM for the term 1995-1998 (listed below) and the site or ICM98, as decided by the General Assembly in Lucerne. Prof. F. Hirzebruch invited the mathematicians of the world to meet in Berlin in 1998. A banquet was offered to the participants on Friday, August 5, a classical concert by H.H.Schneeberger (violin) and G.Wyss (piano) on Tuesday, August 9 and a performance by the pantomime group Mummenschanz together with the folk music group Trio da Besto on the same evening.

IMU Executive Committee

The General Assembly of IMU, on its 12th meeting that took place in Lucern, Switzerland, from July 31 thorugh August 1, 1994, elected the following IMU Executive Committee for the term 1995-1998:

President
David Mumford (Univ. Harvard, USA)

Vice Presidents
Vladimir Arnold (Steklov Inst., Moscow, Russia)
Albrecht Dold (Univ. of Heidelberg, Germany)

Secretary
Jacob Palis (IMPA, Brazil)

Members
James Arthur (Univ. Toronto, Canada)
Simon Donaldson (Univ. of Oxford, United Kingdom)
Björn Engquist (KTH Stockholm, Sweden)
Shigefumi Mori (RIMS, Kyoto Univ., Japan)
K.R. Parthasarathy (Indian Statist. Inst., New Delhi, India)

Ex Officio Member
Jacques Louis Lions (past president; Collége de France)

Conferences Supported

The following other conferences were supported by IMU in 1994, but without financial help:

- SYMPOSIUM ON HISTORY OF MATHEMATICS, held in Warwick, 1994
  IMU Representative: John Coates

- CONFERENCE INTERNATIONALE DE PHYSIQUE MATHEMATIQUE,
  held in Paris, from July 18-23, 1994
  IMU Representative: Ludwig Faddeev

- INTERNATIONAL CONFERENCE ON DYNAMICAL SYSTEMS AND CHAOS,
  held in Tokyo, from May 23-27, 1994
  IMU Representative: Jacob Palis

- INTERNATIONAL CONFERENCE ON POTENTIAL THEORY,
  held at Kouty in Czech Republic, from August 13-19, 1994.
  IMU Representative: J.L. Lions

- SIBERIAN CONFERENCE ON APPLIED AND INDUSTRIAL MATHEMATICS,
  held at Novosibirsk Akademgorodok, from July 24 through July 30, 1994.
  IMU Representative: Ludwig Faddeev.

Publications

IMU published three bulletins in 1994. The 10th World Directory of Mathematicians came out during the summer of 1994. The Proceedings of the ICM-94 in Zurich shall appear soon.

ICMI published 2 Bulletins, both supported by UNESCO grants. Other publications by ICMI were described above. ICHM also had several publications in 1994; they are described above in the topic of the ICHM activities.

Organizational Matters

The Executive Committee of IMU met twice this year. on April 14-15, 1994 in Budapest, Hungary and on July 30, 1994, Lucerne Switzerland.

The General Assembly was held in Lucerne on July 31-August 1, 1994. It elected a new Executive Committee for IMU as well as for its sub-commission ICMI (International Commission on Mathematical Instruction), a new Commission for Development and Exchange, members to the Executive of its joint International Commission on the History of Mathematicians, as well as representatives to several ICSU bodies. The Assembly also decided the site of the next Congress, Berlin, 1998.

Vital Statistics

members (countries) - 57
6(IMU) + 3(ICMI) + 11(CDE) + 7(ICHM) == 27 conferences supported
3(IMU) + 2(ICMI) == 5 bulletins; most conferences published their proceedings.

Report for 1994 of the

International Commission on Mathematical Instruction (ICMI)

- Education -

Report prepared by Mogens Niss, Secretary of ICMI

1. Organization

In 1994 the Executive Committee of ICMI met in Zurich (Switzerland) on the 4th August, in conjunction with the International Congress on Mathematicians (ICM-94). Besides its meetings, the work in the EC is conducted by correspondence and electronic communication under the direction of the President and the Secretary.

At the General Assembly of the International Mathematical Union, held in Luzerne (Switzerland) in July-August 1994, a new Executive Committee was appointed for the term 1 January 1995 - 31 December 1998.

ICMI now has four affiliated study groups, HPM (The International Study Group for the Relations Between the History and Pedagogy of Mathematics), IOWME (The International Organisation of Women and Mathematics Education), and PME (The International Group for the Psychology of Learning Mathematics), and WFNMC (The World Federation of National Mathematical Competitions) which obtained its affiliation as of 1 April 1994.

2. ICMEs

The planning of ICME-8, to be held in Sevilla (Spain) in July 1996, is in progress. The International Program Committee - chaired by Professor Claudi Alsina, Barcelona - met in Sevilla, 16-17 September 1994, to finally determine the structure of the congress program and to appoint main speakers, group leaders and panel members. By the end of 1994 the editing of the first announcement was completed.

The EC has received three formal declarations of intent to host ICME-9 in the year 2000. The countries offering to host the congress are Argentine, Brazil and Japan. Each country has been invited to prepare an information dossier to substantiate its bid. The new EC of ICMI will deal with the applications in its first meeting, to be held in Madrid (Spain), February 1995.

3. ICMI Studies

The mounting and conducting of so-called ICMI studies on crucial themes and issues in mathematics education was continued in 1994.

The written outcomes of the ICMI study on Gender and Mathematics Education, the study conference of which was held in Hoeoer (Sweden), 7-12 October 1993, are conference proceedings and a volume in the ICMI Study Series. The latter will be published by Kluwer Academic Publishers. Both publications, which are being edited by the chair of the International Program Committee, Professor Gila Hanna, OISE, University of Toronto (Canada), are expected to appear in 1995.

The study conference on What is Research in Mathematics Education, and What Are Its Results? was held at the University of Maryland, near Washington DC, 8-11 May 1994 with 81 participants from 23 different countries. As part of the conference program a one-day symposium 'Perspectives on Mathematics Education

Research' was held at the U.S. National Academy of Sciences, 10 May. This symposium attracted an additional 18 US attendees. The study conference - which was organized by an International Program Committee, chaired jointly by Professors Jeremy Kilpatrick, University of Georgia, Athens (USA), and Anna Sierpinska, Concordia University, Montreal (Canada), and by Professor James T. Fey, University of Maryland as the Local Organizer - was based on a Discussion Document published officially in l'Enseignement Mathematique 39, fasc. 1-2, janvier-juin 1993, pp 179- 86, and in the ICMI Bulletin, No. 33, December 1992. A resulting volume to be published in the ICMI Study Series is being edited by Jeremy Kilpatrick and Anna Sierpinska.

The next ICMI Study in the series will be Perspectives on the teaching of geometry for the 21st century. An International Program Committee was appointed in 1994. It is chaired by Professor Vinicio Villani, Pisa (Italy). The study conference will be held at the University of Catania, Sicily (Italy) 28 September - 2 October 1995. The Local Organizing Committee is chaired by Professor Carmelo Mammana, Catania. The Discussion Document for this study was published officially in l'Enseignement Mathematique 40, fasc. 3-4, juillet-decembre 1994, pp 345-357, and in the ICMI Bulletin, No. 37, December 1994, pp 6-16.

Plans for a further study on the role of the history of mathematics in mathematics education are being developed as well. The same is true for a number of other ideas for future studies.

4. Regional Conferences

Financial support was given by ICMI to The ICMI-China Regional Conference in Mathematics Education, held at East China Normal University, Shanghai (China), 16-20 August 1994. The theme of the conference was Teacher Preparation in Mathematics.

The Executive Committee has further decided to sponsor Regional Collaboration in Mathematics Education: An ICMI Regional Conference to be held at Monash University, Melbourne (Australia), 19-23 April 1995. As this conference takes place in a developed country ICMI's sponsorship does not involve financial support.

5. ICMI Lectures at ICM-94

As in the past ICMI organized a number of lectures at the International Congress of Mathematicians (ICM-94), Zurich (Switzerland), 3-11 August, 1994. The following ones were given: Christian Mauduit (Universite de Aix-Marseilles II, France): Challenging mathematical activities for young people, 6th August; Jeremy Kilpatrick (University of Georgia, Athens, USA) & Anna Sierpinska (Concordia University, Montreal, Canada): What is research in mathematics education? - Preliminary outcomes of an ICMI study, 9th August; Henry Pollak (Columbia University, New York, USA): The role of applications in mathematics education, 9 August; David Tall (University of Warwick, UK): Understanding processes of advanced mathematical thinking, 10 August. A fifth lecture, to be given by Roger Penrose, was in the program but was unfortunately canceled by the speaker.

6. The Solidarity Program

In 1992 ICMI established a Solidarity Program to help the development of mathematics education in countries in which there is a need for it that justifies international assistance.

A first stage in this program was the mounting of a Solidarity Fund based on private contributions by individuals, associations, etc. The Fund is to be activated to support concrete initiatives and activities that may foster solidarity in mathematics education between well-defined quarters in developed and less developed countries. For the time being the Fund will be in charge of a committee chaired by Professor Jean-Pierre Kahane, Past-President of ICMI and with administrative assistance from the ICMI Secretariat. In 1994 a major addition to the Fund was that the net profit (almost US$ 16.000) of ICME-7, held in Quebec (Canada), August 1992, was transferred to the Solidarity Fund. The ICMI EC is most grateful to the ICME-7 organizers for this generous support of the Solidarity Program.

In 1994 the Fund was activated to support (a) a project (begun in February 1994) in El Salvador to help

establishing master programs in statistics and in mathematics education, (b) the attendance of an IPC member and plenary speaker at the ICMI-China Regional Conference in Mathematics Education, Shanghai (China), August 1994. By the end of 1994 the Solidarity Fund contained a total of about US$ 31.300.

7. ICMI Bulletins

In 1994 ICMI Bulletins No. 36 (June) and 37 (December) were published under the editorship of the Secretary of ICMI. By the end of 1994 the Secretary has applied for an ISSN-number for the Bulletin. It is expected that such a number will be in place as from issue 38, June 1995.

Report for 1994 of the

Commission on Development and Exchange (CDE)

- Activities Involving Developing Countries -

Report prepared by Pierre Bérard, Secretary, 1994

The purpose of CDE Programs is to stimulate, supporting financially mathematical research activities in developing countries.

1. The program *"Support to Individual Mathematicians"* offers partial travel support to mathematicians who make an extended research visit in an advanced mathematical center which commits itself to cover the local expenses. This program applies both to mathematicians from developing countries and to mathematicians from advanced countries who visit a mathematical center in a developing country. This program includes the *"IMU-UNESCO Visiting Mathematician Program"* and has been made possible through special funding by ICSU, UNESCO-ROSTA and UNESCO-ROSTE.

2. The program *"Support to Conferences"* offers partial support for the academic activities of conferences organized in developing countries.

As in the past years, the CDE has received many applications an has to make a strict selection before awarding funding.

The CDE has also continued supporting the two research teams it has supported earlier.

Report for 1994 of the

International Commission on the History of Mathematics (ICHM)

Report prepared by Prof. J. Dauben

General History of the ICHM:

The International Commission on the History of Mathematics was established by Kenneth O. May (University of Toronto) in 1969 as a companion to the journal he also started as founding editor at virtually the same time, Historia Mathematica. Realizing that the journal could only prosper with truly international support, the Commission was the vehicle through which May launched the journal. Subsequently the Commission has provided a stimulus to serious study of the history of mathematics in virtually all parts of the world (for a brief History of the ICHM, see the notice at the end of this block of information concerning the Commission). The Commission not only organizes and cosponsors international meetings intended to promote both research and teaching of the history of mathematics, but it has undertaken (and currently oversees) a number of special projects as described below.

Organizational Structure and Current Officers:

The ICHM is a joint Commission of the International Mathematical Union and the International Union of History and Philosophy of Science. It receives annual financial support from the IUHPS to help defray administrative expenses, and occasional support from both the IMU and the IUHPS in support of international meetings and special projects. The Commission consists of an Executive Committee elected every four years by its members throughout the world (with two positions appointed every four years by the IMU). As of January, 1995, the Executive Committee is comprised of the following individuals:

Chairman
Eberhard Knobloch (Germany)

Vice-chair
Kirsti Andersen (Denmark)

Secretary
Jeanne Peiffer (Luxembourg)

Treasurer
Menso Folkerts (Germany)

Members
Ubiratan d'Ambrosio (Brazil)
John Fauvel (England)
Giorgio Israel (Italy)
Liu Dun (China)
Chikara Sasaki (Japan)
Evgeny A. Zaitsev (Russia)

IMU members
Karen Parshall (USA)
Laura Toti Rigatelli (Italy)

Ex-Officio

Christoph J. Scriba (Germany)
Joseph W. Dauben (USA)
David Rowe (Germany/USA), Editor

Current and On-Going Projects

Historia Mathematica:

The major undertaking of the ICHM is production of its quarterly journal, Historia Mathematica, published by Academic Press (San Diego, CA, USA). The journal publishes scholarly research on the history of the mathematical sciences in all periods and cultures. Currently responsible for its content are:

- David Rowe (Mainz, Germany), Editor
- Karen Parshall (Charlottesville, VA, USA), Managing Editor
- Catherine Goldstein (Orsay, France), Book Review Editor
- Paul Wolfson (West Chester, PA, USA), Book Review Editor
- David Zitarelli (Philadelphia, PA, USA), Abstracts Editor

The ICHM World Directory

Periodically, the Commission publishes a World Directory of Historians of Mathematics. Work on a new edition is underway in preparation for release later in 1995. This edition will include more than 1000 names and addresses with complete institutional affiliation, telephone, E-Mail and FAX numbers (as available). Professor Kirsti Andersen, History of Science Department, University of Aarhus, Ny Munkegade DK-8000 Aarhus, Denmark. E-Mail: ievhka@aau.dk.

ICHM Data Base

In conjunction with the new World Directory, the International Commission is also compiling a database containing information about historians of mathematics around the world. This will include both biographical and bibliographic information, as well as photographs (see details of the photo archive project, below) for individual historians of mathematics (to constitute, eventually, a sort of Poggendorff for history of mathematics).

Photo Archive

The ICHM has recently entered into a tentative agreement with the Karl-Sudhoff-Institut at Leipzig University, to begin work on an ICHM catalogue of photographs of mathematicians, to complement the collections already housed, for example, at the Mathematisches Forschungsinstitut in Oberwolfach, Germany, and at the Institut Mittag-Leffler, Djursholm, Sweden. The photo archive includes negatives, prints and slides, along with a projected database of known pictures, to include brief descriptions of each representation, its provenance and availability. Anyone with photographs to contribute to the photo archive, or wishing more information about the project as it exists for now in Leipzig, should contact: Hans-Joachim Ilgauds, Karl-Sudhoff-Institute, Universitaet Leipzig, Augustusplatz 9, D-04109 Leipzig, Germany

Historiography Project

The Commission is in the last stages of completing a final draft of a major cooperative effort: Historiography of the History of Mathematics. At present, nearly forty colleagues from all parts of the world are collaborating to describe the history of history of mathematics from the first historical writings on mathematics by the ancient Greeks and Chinese, to the present. It is hoped that this work will be ready for publication before the end of 1996. Anyone interested in further information about this project may contact either Christoph J. Scriba at the address given above, or: Joseph W. Dauben, Ph.D. Program in History, The Graduate Center, CUNY, 33 West 42nd Street, New York, NY 10036 USA, FAX: 212-642-1963, E-Mail: jdx@cunyvms1.gc.cuny.edu

ICHM Dictionary on History of Mathematics

A Dictionary project edited by John Fauvel (Open University, Milton Keynes, UK) continues to progress. It is to be published by Oxford University Press, probably in Oxford Companion series, i.e. as a Companion to the History of Mathematics. There are still unallocated entries for which help would be very much appreciated. Anyone interested in the progress of the project or in participating by writing entries should contact: John Fauvel, Mathematics Faculty, The Open University, Milton Keynes, MK7 6AA England

World Mathematical Year 2000

The International Mathematical Union has declared the year 2000 as World Mathematical Year. The first aim of WMY 2,000 is to consider the great challenges of the 21st century. In conjunction with the International Congress of Mathematicians held in Zurich in 1994, the Commission organized an historical Symposium which surveyed the history of International Congresses from Zürich to Zürich, looking ahead to the first century of the next millennium.

A significant aim of WMY 2000 is to consider Mathematics, Keys for Development. Here the International Commission on History of Mathematics plans to support various projects and possible international meetings at which the connections between pure and applied mathematics in particular may be explored in their historical context, especially in countries that are not currently members of the IMU (another of the goals emphasized by WMY 2,000). The question of increasing the availability and exchange of information related to the history of mathematics among colleagues everywhere, including schools, colleges, universities, research institutes, etc., is a continuing concern of the Commission in connection with its own international activities.

The Commission hopes to contribute substantially as well to yet another aim of WMY 2000, namely to the Image of mathematics. One way to account for the systematic presence of mathematics in the Information Society (another interest of WMY 2,000) is through the history of mathematics, which can effectively demonstrate the significance of mathematics in cross-cultural ways in the widest possible variety of contexts. Again, local meetings, international symposia, special exhibitions and long-range publication efforts can all help to achieve the goal of creating a higher public awareness of mathematics and the crucial role it has played in world history.

Recent International Meetings

- XIXth International Congress for History of Science, Zaragoza, Spain (August, 1993):
- ICHM Symposia Sponsored During the Congress
- Historiography of History of MathematicsS (4 sessions) , (Organized by Joseph Dauben and Christoph Scriba)
- Mathematics in Asia (3 sessions), (Organized by Karine Chemla, Liu Dun, and Chikara Sasaki)
- Arts and Mathematics (2 sessions), (Organized by Kirsti Andersen and Eberhard Knobloch)
- Logics and Foundations of Mathematics, 1885-1905S (3 sessions), (Organized by Ivor Grattan-Guinness and F. Rodriguez-Consuegra)
- National Schools in the 19th and 20th Centuries (3 sessions), (Organized by Serguei Demidov and Mariano Hormign)
- Celebration in Honor Of 20 Years Of Historia Mathematica

In 1994 Historia Mathematica began publication of its 20th volume, and this anniversary was celebrated in appropriate style during the Zaragoza Congress thanks to the generous support of its publisher, Academic Press. A special evening was set aside by the Congress Organizing Committee for the Commission on Friday, August 27, at 8:00 P.M., in the Drawing Room of the Council of Zaragoza, Plaza del Pilar, Zaragoza. All Congress participants were invited to attend. The evening included a number of special awards.

Second Kenneth O. May Prize Awarded in Zaragoza

The International Commission on History of Mathematics awarded the second Kenneth O. May Prize during

the XIXth International Congress of History of Science in Zaragoza, Spain, during the open plenary meeting of the Commission on August 26, 1993. The Prize was given jointly to Professor Dr. Christoph J. Scriba of the University of Hamburg, and to Professor Dr. Hans Wussing of the University of Leipzig. Both Professors Scriba and Wussing are well-known to historians of mathematics for their many publications and scholarly contributions to the international community of historians of mathematics, and the Commission is pleased to congratulate them both warmly on the announcement of this years award.

International Congress of Mathematicians Zurich 1994

Three invited one-hour lectures on the history of mathematics were given at the most recent ICM in Zurich (August, 1994):

Jan Hogendijk
: Mathematics in Medieval Islamic Spain

Erhard Scholz
: Hermann Weyl's Purely Infinitesimal Geometry and Its Philosophical Implications

Karen Hunger Parshall
: Mathematics in National Contexts (1875-1900): An International Overview.

With the cooperation of the Congress Program Committee, the ICHM organized a special historical symposium consisting of five one-hour lectures on The History of Congresses from Zürich to Zürich. These included:

Erwin Neuenschwander
: International Mathematical Congresses from Zurich 1897 to Zurich 1994

Ulrich Krengel
: History of Probability at the ICMs

Hourya Sinaceur
: Algebra and Logic in XXth Century: Tarski's Work on Real Algebra

A Committee chaired by Erwin Neuenschwander (and comprised of Umberto Bottazzini, Serguei Demidov, and Ivor Grattan-Guinness) oversaw the planning of this symposium, the papers from which (along with other contributions that could not be included during the 1994 Congress) are being readied for publication.

ICHM Publications:

Toronto Workshop Proceedings

Proceedings of an ICHM Workshop held at the University of Toronto (July-August, 1983), entitled History in Mathematics Education, are still available in paperback (as part of the series Cahiers d'Histoire et de Philosophie des Sciences). The book may be ordered directly from the Commission by sending a check in the amount of US $20.00 (this includes postage) to the Commission Us Treasurer, Menso Folkerts.

A Brief History of the ICHM:

With the cooperation of Ren Taton and A. P. Youshkevich, Kenneth O. May laid the foundation for the publication of an international journal for the history of mathematics during the Twelfth International Congress of the History of Science in Paris in 1968. The following year, in 1969, the International Commission on the History of Mathematics was founded with May as its first Chairman, a position he retained until shortly before his death in 1978. The Commission was to provide a "common House of Learning for all historians of mathematics in which there is room for everybody doing serious research,"wrote C. J. Scriba [Drake 1978, 9]. "[May] dream was that of a world community of historians of mathematics working together unanimously regardless of race, political conviction or other non-scientific barriers" [bid]. To further support the journal in its early years, and literally generate its first mailing list, May complied the first World Directory of Historians of Mathematics (1972), a work containing more than 500 names and listing the major interests of each individual.

In order to receive financial support from the Canadian government, May was also instrumental in forming a national Canadian association to help support the journal, Historia Mathematica, which initially was published by the University of Toronto Press. May served as the journals first editor, and issued its first volume in 1974. Two years later the Canadian Society for the History and Philosophy of Mathematics was formally established in 1976, adopting Historia Mathematica as its official journal. It is also the official journal of the British Society for History of Mathematics.

Archival Materials: ICHM Documents and Editorial Files of Historia Mathematica:

The ICHM has concluded an agreement with the Archives of the Niedersächsische Staats- und Universitätsbibliothek Göttingen, to designate the University Archives as the official repository of all documents, correspondence and other information related to the history of the Commission and its journal, Historia Mathematica. Sixty files related to the period 1986-1993 are already in Göttingen, and the commission expects to add regularly to the materials on deposit there for study and research.

Kenneth O. May Medal for Exemplary Contributions to the History Of Mathematics

The International Commission, in conjunction with the May Committee at the University of Toronto, commissioned a bronze medal in honor of K.O. May which was designed in 1993 and struck by the Canadian sculptor Salius Jaskus. The first of the new medals was engraved and presented, officially, to Dirk J. Struik during a session devoted to History of Mathematics organized by Judith V. Grabiner and Karen Parshall during the annual meeting of the American Association for the Advancement of Science, in Boston, February 13, 1993. The second medal was presented a few weeks later to A.P. Youschkevitch during a meeting at the Institute for History of Science and Technology in Moscow that spring. Both Professors Struik and Youschkevitch were jointly awarded the first May Prizes during the International Congress for History of Science when it met in Hamburg in August of 1989, but the medals were not then ready for presentation. The Prize, which commemorates the first Chairman of the Commission and founding editor of Historia Mathematica, is intended to acknowledge significant contributions to the history of mathematics. In addition to receiving an honorarium, recipients of the Prize are also given a certificate of award and a commemorial bronze medal.

The Executive Committee of the Commission has established an Endowment Fund to help support the Kenneth O. May Prize. Anyone wishing to honor his memory and to support the work of the International Commission is invited to contribute. The May Prize is supported by the Institute for the History and Philosophy of Science and Technology, University of Toronto; by the International Commission on the History of Mathematics; and by individual contributions to the ICHM May Prize Fund. Further information may be obtained from the Commissions Treasurer, Menso Folkerts (address above).

Bibliography for further information about the Commission and its history:

Drake, Stillman et al, RA Memorial Tribute to Kenneth O. May, Historia Mathematica , 5 (1978), 3-12.

Jones, Charles V. and Philip C. Enros, "Kenneth O. May, 1915-1977. His Early Life to 1946", Historia Mathematica , 11 (1984), 359-379

What is the IMU?

Editorial Note

The *Notices of the AMS* presented this two-part article in its issue of november/December of 1994 to help the mathematical community become better acquainted with the International Mathematical Union (IMU) and its work. The first part is by *Notices* managing editor Allyn Jackson, and the second part by David Mumford of Harvard University, new president of the IMU. The articles are reproduced here under permission.

What is the IMU?

Allyn Jackson

The International Mathematical Union (IMU) is often seen as a monolithic entity that mysteriously makes the International Congress of Mathematicians (ICM) happen every four years. The prevalent image of the IMU is that of a group of mathematical high rollers presiding over the most coveted prizes and speaking invitations in the mathematical world; often overlooked is the Union's important work in supporting research mathematics in developing nations. David Mumford of Harvard University, who will become president of the IMU in January 1995, points out that the purpose of the IMU is to facilitate international connections among mathematicians. "For that reason," he says, "the IMU having more direct broad input from the rank and file of the mathematical community makes sense." Increasing understanding about how the Union works is the first step toward demystifying the IMU and insuring that it is responsive to the needs of the mathematical community.

Organizing the ICM

The membership of the IMU consists of nearly sixty nations, each of which has a corresponding National Committee that serves as a liaison between the mathematicians of that country and the IMU. There are five categories of membership, each presupposing a certain level of mathematical activity and each with its own level of dues. (The member nations in each category are listed at the end of this article.) Dues account for the greatest share of the IMU's' budget, which was about $200,000 in 1993.

To join the IMU, a nation must submit an application describing the level of mathematics research activity in the country, which must meet a certain standard. A country applies through what is called its "adhering organization", usually either its national academy of sciences or its mathematical society. The IMU General Assembly, which consists of delegations from each member country, meets every four years just prior to the ICM. At its meeting, the General Assembly discusses and votes on various policy matters concerning the IMU; each delegation has a certain number of votes (from one to five) according to its category of membership. There are international unions like the IMU in all other scientific fields, and these unions are in turn members of ICSU, the International Council of Scientific Unions, a Paris-based umbrella organization.

As an example of the kind of issue the General Assembly considers, at its meeting before ICM-90 in Kyoto, the General Assembly passed a resolution about increasing the number of women speakers at the ICM. The resolution appears to have had some effect: at ICM-94 in Zurich, there were two women plenary speakers, as many as at all previous Congresses combined, and ten invited women speakers in all. Sometimes controversy erupts at the General Assembly. At the meeting in Lucerne before ICM-94, a resolution about increasing the number of speakers who are women or members of ethnic minorities was put forth by the American delegation. One female delegate from Eastern Europe said the resolution was insulting to women, who should be able to compete for speaking invitations without special privileges. Another delegate from an African nation wondered about what the term "ethnic minorities" meant in countries like his, where there are dozens of such groups. In the end, the General Assembly decided not to consider the resolution.

The General Assembly is mainly a policy-making body; the IMU is really run by its Executive Committee, which is elected by the General Assembly. Members of the Executive Committee serve for four years, long enough to organize the ICM, and are elected from a slate of candidates proposed by the sitting Executive Committee and the IMU member nations. The Executive Committee oversees all of the operations that go into organizing the ICM. The first step is the selection of a site. After evaluating proposals for sites for the Congress, the Executive Committee presents its recommendation to the IMU General Assembly, which votes on the choice. For ICM-98, proposals from Berlin and Jerusalem, as well as a late proposal from Beijing, were received. The Executive Committee chose Berlin, and the General Assembly approved the choice.

The next step is the appointment of the ICM Program Committee. At its yearly meeting next May, the IMU Executive Committee will appoint the Program Committee for ICM-98. In the past, the names of the Program Committee members were kept secret until after the Congress was over. However, in a small but significant step toward making the organization of the ICM less secretive, the General Assembly voted at its Lucerne

meeting to make public the name of the Program Committee chair upon appointment.

The Program Committee meets twice; its first meeting in preparation for ICM-98 will take place in the fall of 1995. At that meeting, the Committee will appoint the chairs and about half the members of the panels that will select speakers for the forty-five-minute parallel sessions. Then these panel appointees, in consultation with the Program Committee, choose the remaining panel members. There are nineteen panels, one for each mathematical section (logic, algebra, number theory, geometry, topology, etc.). The Program Committee decides on the total number of lectures and then assigns to each panel a number of lecturer slots to fill.

One oft-heard complaint about the ICM panels is that the names of the panelists are never revealed, even after the ICM is over. Opinions differ on whether this confidentiality is necessary. Some say the stakes are so high that the panels would come under too much pressure if their names were known, so confidentiality is necessary to insure that the panels are free to choose speakers based purely on mathematical merit; in this regard, the panels are similar to journal referees. Others disagree, noting that because the panel members must consult with experts outside the panel, the names of the panelists cannot be kept entirely secret, making the pressures greater than if the whole process had been open from the beginning. A long discussion of this issue at this year's General Assembly led to the resolution to make the name of the Program Committee chair public at the time of appointment.

The panels develop a list of recommended speakers and alternates and also make recommendations for plenary speakers. All of the lists are submitted to the Program Committee. The alternates are important because sometimes more than one panel chooses the same speaker, or a speaker declines. In addition, the Program Committee must also ensure that the whole program is balanced, representing all major areas of new activity. The Program Committee at its second meeting then makes the final selection. In addition, the Program Committee has the responsibility for choosing plenary speakers.

Traditionally, all of the planning for the mathematical program for the ICM has been carried out by groups under the IMU; advice has not been sought from any other mathematical organizations. However, ICM-98 will be an exception in this regard. The IMU General Assembly has sanctioned collaborations between the IMU and other mathematics organizations in developing the applied areas of the program for ICM-98. This includes applied mathematics in the traditional sense, computer science, mathematical physics, etc.

IMU Commissions

While organizing the ICM every four years consumes most of the IMU's attention, the Union does have a number of commissions that initiate various international activities. The IMU Commission on Development and Exchange (CDE) provides partial support for mathematical activities in developing nations. Its program of travel grants allows mathematicians to visit mathematical centers which can provide local expenses for the visitor. In 1993 the CDE supported visits by nine mathematicians from China, India, the Ivory Coast, Tunisia, and other countries; over the last four years, thirty-eight such visits have been supported. In addition, the CDE helps support conferences in developing countries. It provided partial funding for seventeen conferences in the last four years, on topics ranging from arithmetic geometry to numerical analysis and in countries ranging from Egypt to China.

In addition to the CDE, the IMU Executive Committee oversees another program to enrich mathematical life in developing countries. The IMU Special Development Fund provides support for young research mathematicians to attend the ICM. For the ICM-94, eighty such mathematicians were supported, approximately double the number the Fund was able to support at the previous Congress. The IMU pays the airfare, and the country hosting the Congress pays the local expenses. Monies for the Special Development Fund are contributed by member nations of the IMU. The U.S. has been the largest contributor; this contribution is coordinated by the AMS, which pools individual donations by means of a check-off box on dues notices. Other major contributors are Brazil, Britain, Germany, Holland, Japan, and France. In some cases, the contribution comes from individual mathematicians, while in others it comes from a national or governmental organization.

The International Commission on Mathematical Instruction (ICMI) has its own quadrennial international congress, ICME (International Congress on Mathematical Education). The next ICME will be held in 1996 in

Sevilla, Spain. Out of ICME-92 in Quebec City came the ICMI Solidarity Fund to assist in the improvement of mathematics education in developing countries. In 1993 this fund allowed two mathematics education specialists to present two-week courses in Nicaragua. In addition, ICMI conducts studies on crucial themes and issues in mathematics education. The next ICMI study will focus on the teaching of geometry; the study conference will be held in Sicily in 1995.

The International Commission on the History of Mathematics (ICHM) is a joint commission of the IMU and IUHPS, the International Union for the History and Philosophy of Science. ICHM does not hold its own congress, but it organizes sessions on the history of mathematics for the International Congress of History of Science and for the ICM. Every four years, the ICHM presents the Kenneth O. May Prize for outstanding contributions to the history of mathematics. The Commission also maintains a directory and database of mathematical historians and a photo archive of prominent mathematicians.

World Mathematical Year 2000

As ICM-98 draws near, the IMU will be designing another major event, World Mathematical Year 2000 (WMY2000). The IMU, with the sponsorship of UNESCO and national science organizations in various countries, is organizing a worldwide celebration of mathematics in the year 2000. The celebration is set around three aims. The first is to outline the research challenges for the twenty-first century in the tradition of David Hilbert, who, in a talk at the ICM in Paris in 1900, presented his list of the outstanding mathematical problems of the day. The IMU appointed in 1991 a ``Turn of the Century'' Committee which made preliminary recommendations for such activities to the 1994 General Assembly.

The second aim of WMY2000 is to bring most UNESCO member countries up to a level of mathematical development that permits admission to the IMU. This aim recognizes the importance of mathematics in the economic and scientific development of nations. Improving education, training, and access to scientific information are important means to achieving this goal. The CDE and ICMI will have special responsibilities in this area.

Improving the image of mathematics is the third aim of WMY2000. Mathematics pervades the technological advances of the information age, but often its contributions are invisible. WMY2000 will organize activities to help increase public awareness of the importance of mathematics. One suggestion put forth is to organize a set of world-girdling mathematical meetings-some on history, some on education, some on development issues-which are linked by satellite with common plenary sessions.

UNESCO already collaborates with the IMU in activities of the CDE and ICMI. This collaboration consists mainly of joint publications (such as a selected mathematical bibliography for third-world countries and a directory of mathematicians from developing countries), support for visiting professors and researchers, and support for mathematicians from developing countries to attend international mathematical events. To assist in meeting the aims of WMY2000, UNESCO is stepping up its collaborations with IMU during 1994--1995. UNESCO also plans to establish regional mathematical information and documentation centers in the third world.

An Array of Responsibilities

The IMU is involved with many other smaller projects and activities to further international mathematical cooperation. It sponsors each year roughly half a dozen international meetings, making financial contributions especially to meetings in the developing countries. It also sponsors a program of occasional IMU Lectures, in which distinguished mathematicians present a series of four or five lectures. Any mathematical center may apply and propose an individual for a series of IMU Lectures. Finally, the IMU, with the assistance of the AMS, publishes once every four years in time for each International Congress, the World Directory of Mathematicians, which strives to list all active research mathematicians in the world.

The IMU has a wide array of responsibilities, from presenting the frontiers of mathematical research at the ICM to helping to improve mathematics education in developing countries. These responsibilities reflect the importance of mathematics as an intellectual, educational, and economic resource for all nations. As World Mathematical Year 2000 draws near, the IMU is looking toward the international mathematical community to

join in the celebration and to help in strengthening all aspects of the field the world over.

How the IMU Can Work for the Community

David Mumford

As the incoming president of the IMU, one of my goals is to help explain to the whole mathematical community what the IMU is and how you can help make it work. My own first contact with the IMU was when I spoke at the Stockholm Congress in 1962 and received various letters from this mysterious organization, the International Mathematical Union. Over the intervening years, I had contact with it from time to time, and it came to represent a rarified high-level mathematical establishment, located in places like Zurich and Helsinki, from which benign powers kept the Congresses running through the viscissitudes of the cold war and the postwar explosion of mathematical research. One day, C.S. Seshadri, one of the least political beings that I've ever met, called me up on behalf of the Union and said, "Please accept a nomination to the Executive Committee of the IMU." Not having a ready excuse and being cornered by his assurances that the only duties were to meet at a pleasant locale once a year with a friendly group og colleagues, I had to accept. having gotten into it, I have gradually learned a bit about its history and now have my own ideas of waht it is good for and what it is not good for. That is what I want to explain in this short article.

First, some history: The first International Congress was held in 1897, and the International Mathematical Union was formed in 1919 to organize these and other international activities. However, the period between World War I and World War II was full of political infighting and boycotts, and the Union collapsed with the beginning of World War II. In 1950 the Union was reborn at the Cambridge (Massachusetts) Congress with a strong sense that its goal was to avoid politics and to find ways to bring mathematicianss together to talk mathematic regardless of what their governments stood for or did. I have heard that this goal was sorely tested at the height of the cold war, with some very strong personalities seeking to alter the IMU, but, by one means or another, serious mathematical congresses were still pulled off, from Moscow to Berkeley. When I got involved in the Executive Committee, Serre told me what he considered the two secrets of its success. First, no one was ever nominated to the Executive Committee who wanted the job; second, the IMU has no money to speak of.

One of the techniques used to avoid political interference has been precisely the secrecy of its operation-which is now being rethought. The Program Committee of each congress, the many panels to select speakers, the Fields and Nevanlinna Prize Committees have all been confidential. The only publication of the IMU is a leaflet called *Bulletin of the IMU*, which is sent to each "Adhering Organization", usually a National Academy of Science, and "National Committee" and gets filed away there. This issue of secrecy was extensively debated at the last General Assembly (see the article by Allyn Jackson). Curiously, some of the French seem most insistent on the continuing importance of secrecy, although (or perhaps because) the Paris gossip mill is so effective that the Fields Medal winners became known there this spring within a week of the committee's final vote!

My personal belief is that the IMU should move away from its tradition of confidentiality, which is no longer essential. But one must not forget the underlying reason it was introduced: to avoid political interference. If the IMU wants to avoid being interfered with, it must not be tempted to interfere politically either. There are some who believe that high-level organizations like the IMU must, by virtue of their height, have political clout and should try to exercise this clout to improve conditions in various countries: to snub or threaten one or another country, for example. This seems to me to be exactly what destroyed the IMU in the 1920s and 1930s. The goals which are stated in the Statutes of the IMU are only "to promote international cooperation in mathematics".

I would like to discuss another very different challenge to the IMU and to the mathematical community of the world. For most of my career I took for granted the unity of mathematics: that ideas from one field of mathematics routinely had an impact on many other fields and that we listened to talks in all the different fields of mathematics from time to time. When my own interests shifted from algebraic geometry to the mathematics of pattern recognition and artificial intelligence, however, I realized that mathematics was an exception in this regard. In many disciplines, there are few or no meetings in which people in overlapping subfields get a chance to hear the best new ideas from a different subfield and to seek applications of these ideas in their own specialty. There is no analog of the ICM in computer science, for example, or even in

physics in recent years. Then I also became aware that in mathematics too, with so many people travelling routinely on Peano curves through the world, specialized international meetings bringing together every key player in some specialty were becoming common. Maybe we too are not listening as often to each other! I think mathematicians should be aware how rare a gift it is that we listen to each other as much as we do, and how easy it is to split into separate subdisciplines with narrower focuses. We all know how easy it is to give overly technical talks, in which all the basic examples an definitions of a small specialty are assumed known to the whole audience.

As president, I would like to facilitate a broader involvement of the whole mathematical community in the next International Congress so that this tradition of listening to and drawing inspiration from our colleagues is not lost. This is another reason for dropping the veil of secrecy: to encourage everyone to suggest to the Program Committee topics and speakers they would like to hear, especially in fields other than their own. Specifically, the General Assembly passed a resolution to make public the name of the chair of the Program Committee so suggestions can be sent directly to a person, not a faceless committee.

The split in cultures between pure and applied mathematics has been especially apparent to me since I changed my own field. (I use the words "applied mathematics" broadly to include not only the applied math of SIAM but computer science, mathematical physics, statistics, and operations research.) While proving theorems drives pure mathematics, inventing and analyzing the right mathematical model is the essence of much applied mathematics. There are many international meetings in applied mathematics, and I would say that the ICM has always been a meeting whose intellectual center was pure mathematics: 60 percent of the talks at Zürich, by my count, were in the core pure mathematics areas. The Zurich Congress was, I believe, very successful in presenting excellent talks both in pure and applied mathematics (thanks to all the committees that organized it and especially to the chairman, Louis Nirenberg). But, without having statistics to back this up, I believe a substantial majority of the attendees were pure mathematicians. It may be possible to use the approximately one-third of the Congress devoted to applied math to create more discussion and interchanges between the pure and applied communities. One move in this direction was the resolution passed at the last General Assembly asking the Program Committee to explore the possibility of introducing sessions cosponsored with other scientific bodies.

Finally, I want to inform everyone that, thanks to the marvels of the "worldwide-web", the IMU has now started a home page in which a great deal of information will be posted. This will be updated and will serve to keep everyone informed of what this now very public union is up to. Connect up by mosaic, for instance, to:

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http://icm98.zib-berlin.de/icm/IMU.html
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I welcome reactions to these ideas and comments on these issues from everyone: write to me via

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mumford@math.harvard.edu
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or, of course, by surface mail to Department of Mathematics, Harvard University, Cambridge, MA 02138.

World Directory of Mathematicians

10th Edition

The 10th Edition of the World Directory of Mathematicians became available in August, 1994, on the occasion of the International Congress of Mathematicians. This 896 page Directory, contains the names and addresses of approximately 42.028 individual mathematicians from 69 countries.

The price of the Directory is US$ 45. Postage for surface delivery is included in this price. Please add US$ 6.50 for optional delivery by air. All orders must be prepaid in U.S. funds; proforma invoices will be sent for any unpaid orders that are received.

Prepaid orders should be sent to:

American Mathematical Society
P.O.Box 5904
Boston, MA 02206-5904
USA

Unpaid and charge card (Visa and Master Card) orders should be sent to:

American Mathematical Society
P.O.Box 6248
Providence, RI 02940-6248
USA
800-321 4267 or 401-455 4000
e-mail: cust-serv@math.ams.org

For 1998, IMU plans to publish the 11th Edition with as much electronic mail addresses as possible.

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Education:

1957 B.A., Magna Cum Laude, Harvard College
1961 Ph.D., Harvard University

Positions:

1961-1962 Instructor and Research Fellow in Mathematics, Harvard University
1962-1963 Assistant Professor, Harvard University
1962-1963 Member, Institute for Advanced Study, Princeton and Visiting Professor, University of Tokyo
1963-1967 Associate Professor, Harvard University
1967-1977 Professor, Harvard University
1967-1968 Visiting Professor, Tata Institute of Fundamental Research
1970-1971 Nuffield Professor, University of Warwick
1976-1977 Visiting Professor, Institut des Hautes Etudes Scientifiques, Paris
1977- Higgins Professor of Mathematics, Harvard University
1978-1979 Visiting Professor, Tata Institute of Fundamental Research
1981-1984 Chairman, Department of Mathematics, Harvard University
1985- Member, Division of Applied Science, Harvard University
1991-1994 Vice-President, International Mathematical Union
1993 Rothschild Professor, Isaac Newton Institute, Cambridge University
1995-1998 President, International Mathematical Union

Selected Awards, Honours and Distinctions

1953 Westinghouse Science Talent Search, finalist
1958-1961 Society of Fellows, Harvard University, Junior Fellow
1974 Fields Medal, International Congress of Mathematics
1975 Elected to the National Academy of Sciences
1978 Honorary Fellow, Tata Institute of Fundamental Research
1983 Honorary Degree of Doctor of Science, University of Warwick
1987-1992 MacArthur Foundation Fellow
1991 Elected Foreign Member, Accademia Nazionale dei Licei, Rome
1995 Elected Honorary Member, London Mathematical Society

Research interests:

1959-1982
: Algebraic Geometry, specifically the classification and moduli spaces of curves, surfaces and abelian varieties.

1983-present
: Theory of vision, specifically the statistics of visual signals, algorithms in computer vision and issues of neural computation, human/animal vision.

various
: Pedagogical projects, e.g. elementary book on the computation of limit sets of Kleinian groups, multi-variable calculus with Calculus Consortium based at Harvard.

Selected Publications:

1. Geometric Invariant Theory,
   Springer-Verlag, 1965; 2nd enlarged edition, (with J. Fogarty), 1982; 3rd enlarged edition, (with F. Kirwan and J. Fogarty), 1994.
2. On the Equations Defining Abelian Varieties I, II, III,
   Inv. Math., vol. 1, 1966, and vol. 3, 1967.
3. Enriques' Classification of Surfaces in Char. p, I,
   in Global Analysis, Spencer and Iyanaga editors, U. of Tokyo Press, 1969; II and III (with E. Bombieri), in Complex Analysis and Algebraic Geometry, Baily and Shioda editors, Cambridge Univ. Press, 1977, and
   Invent. Math., 1976, 35.
4. The Irreducibility of the Space of Curves of Given Genus (with P. Deligne),
   Publ. Math. de l'I.H.E.S., 1969, vol. 36.
5. Abelian Varieties,
   Oxford University Press, 1st edition 1970, 2nd edition 1974.
6. The Structure of the Moduli Spaces of Curves and Abelian Varieties,
   Congress Int. du Math., Nice, 1970.
7. Algebraic Geometry I: Complex Projective Varieties,
   Springer-Verlag, New York, 1976.
8. Tata Lectures on Theta (with C. Musili, M. Nori, P. Norman, E. Previato and M. Stillman),
   Birkhauser-Boston, Part I, 1982, Part II, 1983, Part III, 1991.
9. On the Kodaira Dimension of the Moduli Space of Curves (with J. Harris),
   Inv. Math., 1982.
10. Optimal Approximations of Piecewise Smooth Functions and Associated Variational Problems (with J. Shah),
    Comm. in Pure and Appl. Math., 1989, vol. 42.
11. On the Computational Architecture of the Neocortex, I: The role of the thalamo-cortical loop; II: The role of cortico-cortical loops,
    Biological Cybernetics, 1991, vols. 65, 66.
12. Pattern Theory: a Unifying Perspective,

in Proceedings 1st European Congress of Mathematics, Paris, 1992; publ. Birkhauser-Boston, 1994.
13. Filtering, Segmentation and Depth, (with M. Nitzberg and T. Shiota),
Springer Lecture Notes in Computer Science vol. 662, 1993.
14. Neuronal Architectures for Pattern-theoretic Problems,
in Large Scale Neuronal Theories of the Brain, MIT Press, 1994.
15. The Statistical Description of Visual Signals,
to appear in the Proc. ICIAM, Hamburg, 1995.

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Education:

1954 - 1961 Faculty of Mechanics and Mathematics, Lomonosov University, Moscow, U.S.S.R.
1961 Candidate Phys.-Math Sci. at the Institute of Applied Mathematics, Moscow
1963 Ph.D., Institute of Applied Mathematics, Moscow

Positions:

1961 - 1965 Assistant, Faculty of Mechanics and Mathematics, Lomonosov University, Moscow
1965 - 1986 Professor, Faculty of Mechanics and Mathematics, Lomonosov University, Moscow
1986 - Steklov Institute of Mathematics, Moscow

1993 - CEREMADE, University Paris-Dauphine
1995 - 1998 Vice-President, International Mathematical Union

Selected Awards, Honours and Distinctions:

1958 Award of the Mathematical Society of Moscow
1965 Lenin Award of the Government of the U.S.S.R.
1976 Honorary Member, London Mathematical Society
1979 Honorary Doctor, University P. and M. Curie, Paris
1982 Carfoord Award of the Swedish Academy
1983 Foreign Member, National Academy, U.S.A.
1984 Foreign Member, Academy of Sciences, Paris
1987 Foreign Member, Academy of Arts and Sciences, U.S.A.
1988 Honorary Doctor, Warwick University, Coventry
1988 Foreign Member, Royal Soc. London, GB
1988 Foreign Member, Accademia Nazionale dei Lincei, Rome, Italy
1990 Member, Academy of Sciences, Russia
1990 Foreign Member, American Philosophical Society
1991 Honorary Doctor, Utrecht
1991 Honorary Doctor, Bologna
1991 Member, Academy of Natural Sciences, Russia
1991 Member, Academia Europaea
1992 Lobachevsky Prize of Russian Academy of Sciences
1994 Harvey Prize Technion Award
1994 Honorary Doctor, University of Madrid, Complutense

Research Interests:

Dynamical Systems, Differential Equations, Hydrodynamics, Magnetohydrodynamics, Classical and Celestial Mechanics, Geometry, Topology, Algebraic Geometry, Symplectic Geometry, Singularity Theory

Selected Publications:

1. Small denominators and problems on the stability of motions in the classical and celestial mechanics.
   Uspehy Math. Nauk, 1963, 18:6, 91 - 192

2. On the nonstability of dynamical systems with many degrees of freedom.
   Doklady, 1964,156:1, 9 - 12

3. Sur la geometrie differentielle des groupes de Lie de dimension infinie et ses applications a l`hydrodynamique des fluides parfaits.
   Ann. Inst. Fourier, 1966, 16:1, 319 - 361

4. On the dispositions of ovals of real plane algebraic curves, involutions of four-dimensional smooth manifolds and arithmetics of integer quadratic forms.
   FAA, 1971, 5:3, 1 - 9

5. Singularities of Caustics and Wave Fronts.
   Kluwer, 1990

6. Topological Invariants of Plane Curves and Caustics.
   Dean Jacqueline B. Lewis Memorial Lectures, Rutgers University. University Lecture Series, vol. 5
   AMS, Providence, 1994, 60 pp.

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Education:

1948 - 1954 Studies of Mathematics, Physics and Astronomy, University of Heidelberg
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Positions:

1954 - 1956 Assistant, Institute of Mathematics, University of Heidelberg
1956 - 1958 Assistant, Institute for Advanced Study, Princeton, NJ
1958 - 1960 Lecturer, Institute of Mathematics, University of Heidelberg
1960 - 1962 Professor, Columbia University, New York
1962 - 1963 Full Professor, University of Zürich
1963 - Full Professor, University of Heidelberg
1995 - 1998 Vice-President, International Mathematical Union

Selected Awards, Honours and Distinctions:

1974 Member Heidelberger Akademie der Wissenschaften
1983 Honorary Doctorate conveyed by Faculty of Economics, University of Karlsruhe

1985 Member Dt. Akademie der Naturforscher Leopoldina

Research Interests:

Algebraic Topology

Selected Publications:

1. Quasifaserungen und unendliche symmetrische Produkte.
   Annals of Math. vol. 67, 239-281. (with R. Thom)

2. Homologie nicht additiver Funktoren. Anwendungen (with D. Puppe)
   Annales de L'Institute Fourier, IX (1961), 201-312

3. Ueber die Steenrodschen Kohomologieoperationen.
   Annals of Math. 73 (1961), 258-294.

4. Partitions of unity in the theory of fibrations.
   Annals of Math. 78 (1963), 223-255 (s. auch Proc. Int'l Math. Congr. 1962,459-461).

5. Chern classes in general cohomology.
   INDAM Symposia Math. V (1970) 385-410.

6. Lectures on Algebraic Topology, 377 pp.
   Springer-Verlag, Berlin-Heidelberg-New York 1972. 2nd edition 1980 and 1995.

7. The Fixed Point Transfer of Fibre-Preserving Maps.
   Math. Z. 148 (1976) 215-244.

8. Fixed point indices of Iterated Maps.
   Invent.math. 74 (1983) 419-435.

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Born:

March 15, 1940, Uberaba, MG, Brazil

Education:

1962 Bachelor, Federal University of Rio de Janeiro
1966 Master, University of California, Berkeley
1967 Ph.D., University of California, Berkeley
1993 Post-Doctoral Fellowship, Guggenheim Foundation

Positions:

Permanent:
Professor at Instituto de Matemática Pura e Aplicada (IMPA),

Visiting:
1969 University of Warwick and Institut des Hautes Études Scientifiques, France
1973 University of California, Berkeley
1980 University of Warwick and Institut des Hautes Études Scientifiques
1982 Université de Dijon and École Polytechnique - Paris
1984 City University of New York, Mathematical Sciences Research Institute - Berkeley and Institute Mittag-Leffler
1987 Steklov Institute, Moscow and ETH-Zurich
1988 Universities of Nagoya, Tokyo and Kyoto

1990 ETH-Zurich, Universités de Dijon e Toulouse
1991 Universitá di Roma and Polytechnical Institute-Stockholm
1993 Université de Paris-Orsay and Université de Nice
1994 ETH-Zurich and Collège de France

Selected Awards, Honours and Distinctions:

1973 Member of the Brazilian Academy of Sciences
1976 Prize Moinho Santista (highest Brazilian prize for science at the time)
1978 Invited Speaker, International Congress of Mathematicians, Helsinki
1988 Prize Third World Academy of Sciences - Mathematics
1990 National Prize for Science and Technology, Brazil
1991 Member of the Third World Academy of Sciences
1995 InterAmerican Prize for Science, Organisation of the American States

Research interests:

dynamical systems, differential equations

Themes:
Global stability and hyperbolicity bifurcations, attractors and chaotic systems: a global perspective

Students:
Ph.D. thesis adviser to 33 students from 10 different countries.

Selected Publications:

1. On Morse-Smale Dynamical Systems,
   Topology 19, 1969 (385-405).

2. Structural Stability Theorems, with S. Smale,
   Proceedings of the Institute on Global Analysis, American Math. Society, Vol. XIV, 1970 (223-232).

3. A Note on Omega-Stability,
   Proceedings of the Institute on Global Analysis, American Mathematical Society, Vol. XIV, 1970 (220-222).

4. Cycles and Bifurcations Theory, with S. Newhouse,
   Asterisque 31, Societe Mathematique de France, 1976 (44-140).

5. The Topology of Holomorphic Flows near a Singularity, with C.Camacho and N. Kuiper,
   Publications Math.Institut Hautes Etudes Scientifiques 48, 1978 (5-38).

6. Moduli of Stability and Bifurcation Theory,
   Proceedings of the International Congress of Mathematicians, Helsinki, 1978 (835-839).

7. Stability of Parameterized Families of Gradient Vector Fields, with F. Takens,
   Annals of Mathematics 118, 1983 (383-421).

8. Cycles and Measure of Bifurcation Sets for Two-Dimensional Diffeomorphisms, with F. Takens,
   Inventiones Mathematicae 82, 1985 (397-422).

9. Homoclinic Orbits, Hyperbolic Dynamic and Fractional Dimensions of Cantor Sets (Lefschetz Centennial Conference)
   Contemporary Mathematics - American Mathematical Society, 58, 1987 (203-216).

10. Hyperbolicity and Creation of Homoclinic Orbits, with F.Takens,

Annals of Mathematics 125, 1987 (337-374).

11. On the C1 Omega-Stability Conjecture,
Publications Math. Institut Hautes Etudes Scientifiques, 66, 1988 (210-215).

12. Bifurcations and Global Stability of Two-Parameter Families of Gradient Vector Fields with M. J. Carneiro,
Publications Math. Institut Hautes Etudes Scientifiques 70, 1990 (103-168).

13. A Glimpse at Dynamical Systems: the Long Trajectory from the Sixties to Present Developments,
Prize Speech at the Third World Academy of Sciences, Proceedings of the TWAS, 1992.

14. On the Contribution of Smale to Dynamical Systems,
volume in honour of Stephen Smale, Springer-Verlag, 1993.

15. Homoclinic Tangencies for Hyperbolic Sets of Large Hausdorff Dimension, with J.C. Yoccoz,
Acta Mathematica 172, 1994 (91-136)

16. High Dimension Diffeomorphisms Displaying Infinitely Many Sinks, with M. Viana,
Annals of Mathematics 140, 1994 (207 - 250).

Books:

1. Geometric Theory of Dynamical Systems, with W. de Melo
Springer-Verlag, 1982; translated into Russian and Chinese

2. Hyperbolicity and Sensitive-Chaotic Dynamics and Homoclinic Bifurcations, Fractal Dimensions and Infinitely Many Attractors, with F. Takens
Cambridge Univ. Press, 1993; Second Edition, 1994.

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Education:

1966 B.Sc., University of Toronto
1967 M.Sc., University of Toronto
1970 Ph.D., Yale University

Positions:

1970 - 1972 Instructor, Princeton University
1972 - 1976 Assistant Professor, Yale University
1976 - 1978 Professor, Duke University
1978 - Professor, Department of Mathematics, University of Toronto
1987 - University Professor, University of Toronto

Selected Awards, Honours and Distinctions:

1974 - 1975 University Junior Faculty Fellowship, Yale (held at Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France)
1975 - 1977 Sloan Fellowship (held at Institute for Advanced Study, Princeton)
1980 Elected Fellow of the Royal Society of Canada
1982 E.W.R. Steacie Memorial Fellowship

1983 Invited Lecturer for International Congress of Mathematicians, Warsaw
1987 Synge Award (of Royal Society of Canada)
1992 Elected Fellow of the Royal Society of London

Research Interests:

Representation theory, automorphic forms, number theory

Selected Publications:

1. On a family of distributions obtained from Eisenstein series II: Explicit formulas
   Amer. J. Math. 104 (1982) 1289-1336.

2. A Paley-Wiener theorem for real reductive groups
   Acta Math. l50 (l983) 1-89.

3. On a family of distributions obtained from orbits
   Canad. J. Math. 38 (1986) 179-214.

4. The invariant trace formula. II. Global theory
   J. Amer. Math. Soc. 1 (1988) 501-554.

5. The L^2-Lefschetz numbers of Hecke operators
   Invent. Math. 97 (1989) 257-290.

6. Unipotent automorphic representations: Conjectures
   Asterisque 171-172 (1989) 13-71.

7. A local trace formula
   Pub. Math. I.H.E.S. 73 (1991) 5-96.

8. Simple Algebras, Base Change and the Advanced Theory of the Trace Formula (Book, with L. Clozel)
   Annals of Math. Studies, Vol. 120, 1989, Princeton University Press.

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1979 BA Cambridge University
1984 D. Phil. Oxford University

Positions:

1983 - 1985 Junior Research Fellow, All Souls College, Oxford
1983 - 1984 Visiting Member, Institute for Advanced Study, Princeton
1985 - Wallis Professor of Mathematics, Oxford University

Selected Awards, Honours and Distinctions

1986 Fields Medal, International Congress of Mathematics
1986 Elected to Fellowship of Royal Society (London)
1992 Royal Medal of Royal Society
1994 Crafoord Prize of Swedish Academy of Science (with S.T. Yau)

Research Interests:

Differential geometry and differential topology: particularly gauge theory, complex and symplectic geometry.

Selected Publications:

1. An application of gauge theory to four-dimensional topology
   J. Differential Geometry 18, 279-315 (1983)

2. Anti-self-dual Yamng-Mills connections on complex algebraic surfaces and stable vector bundles
   Proc. London Math. Soc. 3 1-26 (1985)

3. Connections, cohomology and the intersection forms of four-manifolds
   Jour. Differential Geometry 24 275-341 (1986)

4. Infinite determinants, stable bundles and curvature
   Duke Math. Jour. 54 231-247 (1987)

5. The geometry of four-manifolds (with P. B. Kronheimer)
   Oxford University Press (1990)

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Education:

1973 B.A., Kyoto University, Japan
1975 M.A., Kyoto University, Japan
1978 Dr. Sci., Kyoto University, Japan

Positions:

1975 Assistant, Kyoto University, Japan
1977 - 1980 Assistant Professor, Harvard University
1980 Lecturer, Nagoya University, Japan
1981 - 1982 Visiting Member, I.A.S. Princeton
1982 Associate Professor, Nagoya University, Japan
1985 - 1987 Visiting Professor, Columbia University
1988 Professor, Nagoya University, Japan
1990 - Professor, RIMS, Kyoto University, Japan
1991 - 1992 Visiting Professor, University of Utah

Selected Awards, Honours and Distinctions:

1983 Japan Mathematical Society Iyanaga Prize
1984 Chunichi Culture Prize
1988 Japan Mathematical Society Autumn Prize (with Y. Kawamata)
1989 Inoue Science Prize
1990 American Mathematical Society Cole Prize
1990 Japan Academy Prize (with S. Iitaka and Y. Kawamata)
1990 Fields Medal
1990 Japanese Government Prize (Person of Cultural Merits)

Research Interests:

Algebraic Geometry,
especially birational classification and the birational geometry of algebraic varieties

Selected Publications:

1. Projective manifolds with ample tangent bundles, Ann. Math. 110 (1979) 593-606
2. Threefolds whose canonical bundles are not numerically effective, Ann. Math. 116 (1982) 133 - 176
3. Flip theorem and the existence of minimal models for 3-folds, Journal of the AMS 1 (1988) 117 - 253
4. Rationally connected varieties (with J.Kollar and Y. Miyaoka), Journal of Alg. Geom. 1 (1992) 429 - 448
5. Classification of three dimensional flips (with J. Kollar), Journal of the AMS 5 (1992) 533 - 703

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1953 - 1956 B.A. Hons in Mathematics, Vivekananda College, University of Madras
1956 - 1959 Professionals Statisticians Course, Indian Statistical Institute, Calcutta
1962 Ph.D., Indian Statistical Institute, Calcutta

Positions:

1962 - 1963 Visiting Fellow, Steklov Mathematics Institute, Moscow
1963 - 1965 Lecturer, Indian Statistical Institute, Calcutta
1965 - 1968 Lecturer, Senior Lecturer and Reader, Department of Probability & Statistics, University of Sheffield, U.K.
1968 - 1970 Professor of Statistics, Statistical Laboratory, University of Manchester, U.K.
1970 - 1973 Professor of Mathematics, University of Bombay, India
1973 - 1976 Professor of Mathematics, Indian Institute of Technology, New Delhi, India
1976 - 1984 Professor, Indian Statistical Institute, Delhi Centre, New Delhi, India
1984 - till now Distinguished Scientist, Indian Statistical Institute.

Selected Awards, Honours and Distinctions:

1974 Elected Fellow of the Indian Academy of Sciences, Bangalor

1976 S.S. Bhatnagar Prize for mathematical sciences of Council of Scientific and Industrial Research (India)
1976 Elected Fellow of the Indian National Science Academy, New Delhi
1994 Invited Lecture at the International Congress of Mathematicians, Zurich, Quantum stochastic calculus
1995 G.H. Hardy Lecture Tour of the London Mathematical Society

Research Interests:

Stochastic processes,
Mathematical foundations of quantum theory,
Quantum stochastic calculus

Selected Publications:

1. On the category of ergodic measures,
   Illinois J. Math. 5 (1961) 648-656

2. Probability distributions on locally compact abelian groups,
   Illinois J. Math. 7 (1963) (with R. Ranga Rao & S.R.S. Varadhan)

3. Representations of complex semisimple Lie groups and Lie Algebras,
   Ann. Math. 25 (1967) 383-420 (with R. Ranga Rao & V.S. Varadarajan)

4. Probability Measures on Metric Spaces,
   Academic Press, New York (1967)

5. Representations of current groups and the Araki-Woods imbedding theorem,
   Acta Mathematica 128 (1972) 53-71 (with K. Schmidt)

6. Quantum Ito's formula and stochastic evolutions,
   Commun. Math. Phys. 93 (1984) 301-323 (with R.L. Hudson)

7. Unification of boson and fermion stochastic calculus,
   Commun. Math. Phys. 104 (1986) 457-470 (with R.L. Hudson)

8. Cohomology of power sets with applications in quantum probability,
   Commun. Math. Phys. 124 (1989) 337-364 (with J.M. Lindsay)

9. Stop times in Fock space stochastic calculus,
   Probab. Th. Rel. Fields, 75 (1987) 317-349 (with K.B. Sinha)

10. An Introduction to Quantum Stochastic Calculus,
    Birkhauser Verlag, Basel (1992)

11. Markov dilations of nonconservative dynamical semigroups and a quantum boundary theory,
    To appear in Annales de l'Institut H. Poincare 1995 (with B.V.R. Bhat)

IMU Executive Committees 1952-1998

Prof. Olli Lehto (Helsinki), former member of the IMU Executive Committee and IMU Secretary from 1983 to 1990, is currently writing a book about the history of IMU. Its appearance is expected before 1998 and will be announced in this server. Prof. Lehto kindly provided the list of the Executive Committees of the current International Mathematical Union.

	President	**Vice-Presidents**	**Secretary**	**Members**	**Past President**
1950-52 Interim Executive Committee	-	-	B. Jessen	E. Bompiani M. Brelot W.V.D. Hodge D.D. Kosambi K. Kuratowski M.H. Stone	-
1952-54	M.H. Stone	E. Borel E. Kamke	E. Bompiani	W.V.D. Hodge S. Iyanaga B. Jessen	-
1955-58	H. Hopf	A. Denjoy W.V.D. Hodge	E. Bompiani (1955-56) B. Eckmann (1956-58)	K. Chandrasekharan J.F. Koksma S. MacLane	-
1959-62	R. Nevanlinna	P. Alexandrov M. Morse	B. Eckmann (1959-61) K. Chandrasekharan (1961-62)	K. Chandrasekharan (1959-61) C. Choquet H. Kneser J.F. Koksma K. Kuratowski	H. Hopf
1963-66	G. de Rham	H. Cartan K. Kuratowski	K. Chandrasekharan	J.C. Burkill F. Hirzebruch M.A. Lavrentiev D. Montgomery B. Segre	R. Nevanlinna
1967-70	H. Cartan	M.A. Lavrentiev D. Montgomery	O. Frostman	M.F. Atiyah K. Chandrasekharan G. Hajós E. Vesentini K. Yoshida	G. de Rham
1971-74	K. Chandrasekharan	A.A. Albert L.S. Pontrjagin	O. Frostman	M.F. Atiyah Y. Kawada N.H. Kuiper M. Nicolescu E. Vesentini	H. Cartan
1975-78	D. Montgomery	J.W.S. Cassels M. Nicolescu (1975-76) G. Vranceanu (1976-78)	J.L. Lions	E. Bombieri M. Kneser O. Lehto M. Nagata L.S. Pontrjagin	K. Chandrasekharan
1979-82	L. Carleson	M. Nagata J.V. Prohorov	J.L. Lions	E. Bombieri J.W.S. Cassels	D. Montgomery

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1995-98	D. Mumford	V. Arnold A. Dold	J. Palis Jr.	J. Arthur S. Donaldson B. Engquist S. Mori K.R. Parthasarathy	J.-L. Lions