

# NOTICES

OF THE NIGERIAN MATHEMATICAL SOCIETY

**ETF  
PROJECT  
2010**



**PROFESSOR EMERITUS JAMES  
OKOYE CHUKUKA EZEILO** (CON, FAS, KSC)

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*Editor*

**DR (MRS) TEMI O. OLUYO**

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# Notices

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### Submissions

NMS Notices hereby calls on lovers and users of mathematics as well as members of NMS to send in articles and letters for publication in editions of NMS Notices to give live to it and spice up the content with our collective ideas. Such submissions, sent to [nmsnotices@yahoo.com](mailto:nmsnotices@yahoo.com), shall be treated on first come first served basis.

### About the cover page: Birth-day Greetings at 80

#### **BRIEF PROFILE OF PROFESSOR EMERITUS JAMES OKOYE CHUKUKA EZEILO (CON, FAS, KSC)**

Emeritus Professor J.O.C. Ezeilo (popularly called JOC) was born on January 17, 1930 at Nanka in Anambra State, Nigeria. He is married with four children. He has the following degrees: B.Sc. (First Class Hons.) in Mathematics (1953); B.Sc. Advanced (Passed with Distinction) (1954); M.Sc. (1955) all from the University of London; Ph.D. (1958) Cambridge University, England; D.Sc. (h.c.) (1989) University of Maiduguri; D. Tech. (h.c.) (1995) Federal University of Technology, Akure; D.Sc. (h.c.) (1996) University of Nigeria, Nsukka; D.Sc. (h.c.) (2008) Anambra State University, Uli.

Professor Emeritus Ezeilo started his academic career as a Lecturer in Mathematics at the University of Ibadan in 1958 and rose to the rank of a full Professor of Mathematics in 1964. In 1963, he was a Visiting Lecturer and Research Associate (University of Michigan, Ann Arbor, Michigan, USA); From 1966 - 1988, Professor of Mathematics, University of Nigeria, Nsukka; In 1979, a Benedict Distinguished Visiting Professor of Maths (Carlton College, Northfield, Minnesota, USA) and in 1980 a Visiting Professor of Mathematics (Howard University, Washington DC, USA). During the years 1967 - 1978 at the University of Nigeria, he was Head, Department of Mathematics; Dean, Faculty of Science; Acting Vice-Chancellor and Vice-Chancellor. In 1978 - 1979, he was also the Vice Chancellor, Bayero University, Kano, Nigeria and Chairman, Committee of Vice-Chancellors (of Nigerian Universities). From 1988 - 1994, he was the (Founding) Director, National Mathematical Centre, Abuja, Nigeria.

Professor Emeritus JOC has published not less than 87 scientific papers in learned journals. Also, he has various academic prizes and awards. These include: University Major Scholar, University College, Ibadan, Nigeria (1949 - 1953); Ayrton Premium Award for a publication in the 1963 proceedings of the Institution of Electrical Engineers (U.K.) (1964); National Honour of the Commander of the Order of the Niger by the

Federal Military Government (1979); A commemorative plaque of the Nigerian Mathematical Society for "outstanding pioneering contributions to the advancement of Mathematics in Nigeria"; the Gold Medal of the National Mathematical Centre for pioneering contributions to the development of Mathematics and in 2010, the Distinguished Professor Award by the National Universities Commission, Abuja.

He served the public in the following areas: Member, Nigerian Council for Science and Technology (1970 1975); Chairman, Projects Development Agency of the East Central State of Nigeria (1970 1974); Chairman of the review panel for the mathematical curriculum for the Secondary Schools of the Federation (1978); Member, National Merit Award Committee (1979); Member, Board of the National Institute for Policy and Strategic Studies (1983 1989); Member, University of Abuja Planning Panel (1983); Chairman, Council of the Federal Polytechnic, Bauchi, Nigeria (1986 1990); Chairman, University of Abuja Planning Committee (1987); Representative of the International Centre for Theoretical Physics (ICTP) Trieste, Italy for the West African Region (1990 - 1997); Member of the Scientific Council of ICTP Trieste, Italy (1993 - 1997); Member of the Scientific Council of Institut de Recherch`e Mathematiques, Abidjan; Member of the Scientific Council of Institut de Mathematiques et de Sciences Physiques of Porto Novo, Benin Republic.

Professor Emeritus JOC Ezeilo belongs the following societies: Member, Nigerian Mathematical Society (President 1984 1991); Member, Mathematical Association of Nigeria (President 1972 1974); Member, Mathematical Association of America; Member, London Mathematical Society; Member, Society of Industrial and Applied Mathematics; Fellow, Nigerian Academy of Sciences; Fellow, Third World Academy of Sciences; Fellow, African Academy of Sciences; Fellow, Mathematical Association of Nigeria.

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## **FROM THE NMS PRESIDENT**

### **THE STATE OF MATHEMATICS EDUCATION IN NIGERIA**

It is indeed pleasant to share some thoughts with you as we produce the forth volume of the Notices of the Nigerian Mathematical Society.

The performance of candidates who took NECO and WAEC examinations in General Mathematics and Further Mathematics suggests that there is need to improve mathematics education so that Nigerians can compete effectively with other nations in Science and Technology.

However there is no consensus of opinion on the direction the country needs to follow. Some are of the view that the curriculum should be reviewed. Of course, mathematics curriculum should be reviewed from time to time to include new topics.

Clearly, the poor performance does not depend on the curriculum. The performance reflects the understanding of candidates. Many candidates did not write meaningful points as answers to some questions, showing that such students lack adequate knowledge to answer such questions.

Can we then conclude that teachers are to blame? Or should we blame the students or the governments? We may have to blame the three: students, teachers and the governments. For tangible improvements, students must work harder, the teachers must improve teaching and the government should ensure that students spend enough time learning. All avoidable strikes should be prevented!

What is your view? Send your comment to the Editor of Notices of Nigerian Mathematical Society.

**Professor R.O Ayeni**

## EDITO!

It is with great pleasure we present to you all esteemed mathematicians, both members and non members of NMS as well readership outside our membership radius that are friends of NMS- another edition of NMS Notices from the tables of Nigerian Mathematical Society, in agreement with AMS. While we appreciate the flow of information with respect to dissemination of scholarly research results among members of NMS as evidenced from our journal publication efforts both offshore and onshore, the editorial team is yet to be satisfied as far as membership response and disposition to the onerous task of producing our notices. We have repeatedly called for inputs from members into the making of subsequent editions of notices of NMS but we are yet to get many feedbacks from the majority of our members. The notices belong to all of us and as we all know "The more the merrier," the more we get the better and richer our notices become. Let us emulate Professors Ayeni and Okoya among a few others that have been giving us necessary backups at different times.

So much for that. Let me quickly intimate you with what to expect in this edition. There is an array of write ups (as listed in table of content) and the usual membership listing from the tables of the Treasurer of NMS-Prof. S. Okoya is not left out. A word from the President-Prof. R.O. Ayeni, an update of recent mathematical degree awards (Master's and PhD) and lots more.

Just before you get on reading, let me quickly inform you that your great society, Nigerian Mathematical Society is on the internet. To access our website, just type [www.nigerianmathematicalsociety.org](http://www.nigerianmathematicalsociety.org) and you will be on to the website of NMS. As the editor of your notices, I have personally visited the website and found out that it is possible to link the site by <http://nigerianmathematicalsociety.org> as well. The features of the website are the Home page, About us, Membership, Publications, Meetings and Contact us. You need to explore the site to discover how rich it is. One great experience of the website is that paid up members of NMS no longer have to wait for Conferences or editions of Notices of NMS to see membership listing, it's right there on the website. Please use the website as a virtual mega notice board where you pick information about your great society, say information about conferences, executives' contacts or even members/colleague contacts.

While you seat back to enjoy your notices, remember that we covet your feedback. This time around, get back to us even if you don't enjoy it, let us know. If any information concerning your profile or data is distorted, let us get a feedback so we can amend.

Welcome on board.

**Mrs Temi Oluyo, PhD**  
*Editor*  
*NMS Notices*

# EXTRACTS FROM THE ANNUAL REPORT OF THE NIGERIAN ACADEMY OF SCIENCE 2010

## 1.0 The Nigerian Academy of Science

The Nigerian Academy of Science (NAS) established 34 years ago, is the second oldest merit-based academy in sub-Saharan Africa, The Academy, which started with 41 Foundation Fellows, has now grown to 126 Fellows (current membership). The uniqueness of the Academy is in her outstanding scholarship with the ability to promote scientific excellence as an independent and unbiased body capable of generating evidence-based science advice for the government and other stakeholders.

Being the foremost academy in Nigeria, NAS represents the national scientific community on such bodies as the international Council on Science (ICSU) and the Inter-Academy Panel (IAP). Also collaborates with other science academies around the world.

### 1.1 Vision

The vision of the Academy is to enable an improved quality of life for the Nigerian Society through the promotion and application of sound science and technology.

### 1.2 Mission

The mission of the Academy is to strengthen the nation's ability to deliver the fruits of science to society by the acquisition, growth and dissemination of sound scientific knowledge and facilitation of its use in the solution of major national problems.

### 1.3 Aims and Objective

The aim and objectives of the Academy are to promote the growth, acquisition and dissemination of scientific knowledge and to facilitate its use in the solution of major problems of national interest.

#### **The Academy strives to do this by:**

- Providing advice on specific problems of a scientific or technological nature presented to it by the government and its agencies, as well as by private organizations;
- Bringing to the attention of the government and its agencies problems of national interest that science and technology can help to solve; and
- Establishing and maintain the highest standard of scientific Endeavour and achievement in Nigeria, through:
  - 0 Publication of journals and reports
  - 0 Organization of conferences, seminars, workshops and symposia
  - 0 Recognition of outstanding contributions to science in Nigeria
  - 0 Development of a working relationship with other national and international scientific bodies and academies.

### 1.4 The core values of the Academy include the following:

- merit
- excellence
- credibility
- volunteerism
- commitment



**The Nigerian Academy of Science  
Meeting of Science Bodies in Nigeria  
10th May 2011**

The Nigerian Mathematical Society received an invitation to attend a meeting of Science Bodies in Nigeria scheduled for May 10, 2011 at The Nigerian Academy of Science Secretariat in Abule-Oja, Lagos.

Our society was asked to send the President and the Secretary or their representatives to attend the meeting.

The Agenda for the meeting include:

1. The Nigerian Academy of Science affiliations with international science bodies and national science associations.
2. Funding of the Nigerian Academy of Science.
3. Ph.D research work in Nigerian Universities.
4. Funding of Research in Nigerian Universities

The Nigerian Mathematical Society was represented by Prof. F.I. Njoku and Dr. O.J. Fenuga.

The meeting decided that

- (i) All science bodies should affiliate with appropriate international science bodies.

The Nigerian Mathematical Society (NMS) has satisfied this objective. NMS is a member of IMU (International Mathematical Union).

Moreover we have reciprocity agreements with American Mathematical Society and London Mathematical Society.

- (ii) Each university should have a well equipped and proper managed central research laboratory.
- (iii) Science bodies in a university should demand from the Vice-Chancellor of the university the status of quality of research grant normally given to a University by the Federal Government.
- (iv) The Nigerian Academy of Science should assist Ph.D students to complete their programmes on time.
- (v) The Nigerian Academy of Science should seek funding through ETF by way of a bill from the National Assembly.

The science bodies will meet again before the end of the year.

**PROFESSOR R.O. AYENI**

## **A MATHEMATICIAN WINS PROFESSOR AFOLABI'S PRIZE**

Dr. M. O. Olatinwo of the Department of Mathematics has been awarded the 2010 Dapo Afolabi Most Productive Science Scholar (DAMPSS) in the Faculty of Science, the third in the series. This award was instituted by Professor Dapo Afolabi, who is the current Head of Service, Federal Republic of Nigeria. The award recognizes and honours outstanding research publications in reputable international journals by a scientist in the Faculty of Science, Obafemi Awolowo University, Ile-Ife.

Dr. Olatinwo was honoured for research which involved the use of two new iterative processes of kirk-type in fix point analysis.

The prize consists of a plaque, a certificate and cash. The presentation was done by the Dean, Faculty of Science and Chairman, Committee of Deans, Professor V. O. Olarewaju to the admiration of those present including the Dean elect, Professor W. A. Muse.

Responding, Dr. Olatinwo said that the papers are already finding useful applications around the world.

The DAMPSS prize is awarded annually for research work in the Faculty of Science OAU Ile-Ife. Another award is expected to be made in 2011 for the 2010/2011 academic session. The deadline for submission of application is 30<sup>th</sup> November, 2011.

## **DR. SURAJU AJADI WINS DEPARTMENTAL PRIZE**

### **Obafemi Awolowo University, Ile-Ife**

The Head of Department of Mathematics, Professor Samuel Segun Okoya, says his administration will commend and reward any staff member adjudged outstanding in community work.

Professor Okoya gave the assurance while presenting 2011 staff of the year award in the Department of Mathematics to Dr. Suraju Olusegun Ajadi for his successful coordination and implementation (without bias) of the Departmental social and welfare activities since 2009 after his return from Israel. He also commended Dr. Ajadi's confidence, self determination, diligence and faithfulness.

Extolling him, the HOD, Professor S. S. Okoya, said that Dr. Ajadi's commitment to the goals and vision of staff welfare accounted for the desirable social and welfare status the Department achieved during his tenure, and advised others to emulate his sterling qualities through their loyalty and dedication to duty.

Responding, to the award, Dr. Suraju O. Ajadi thanked the Head of Department for the gesture and promised to continue to support the Department.

Previous recipients of the prestigious Staff of the Year Award in the Department of Mathematics are Dr. M. A. Olagunju (2007), Dr. S. A. Odejide (2008), Mr. I. E. Ireka (2009) and Dr. M. O. Ogundiran (2010).

# RECIPROCIITY AGREEMENTS

## Africa

Egyptian Mathematical Society (ETMS)\* Apply to: M. H. Fahmy, Department of Mathematics, Faculty of Science, Al-Azhar University, Nasr City 11884, Cairo, Egypt; email: Secretary\_etms@yahoo.com; http://www.etms-web.org.

**Dues:** U.S. \$15, payable to Egyptian Mathematical Society at the above address.

**Privileges:** Receive a 60% discount on the prices of ETMS publications, a 50% discount on the publication charge per printed page in *ETMS Journal*, and reduced charge for participating at ETMS conferences.

**Officers:** A.-S. F. Obada (President), E. H. Doha (Vice-President), F. F. Ghaleb (Treasurer), M. H. Fahmy (Secretary).

## Nigerian Mathematical Society

Address for mail: Department of Pure and Applied Mathematics, Ladoke Akintola University of Technology, Ogbomoso, Nigeria; email: ayeni\_ro@yahoo.com; http://www.nigerianmathematicalsociety.com.

**Apply to:** Franic I. Njoku (Secretary), Nigerian Mathematical Society, Department of Mathematics, University of Nigeria, Nsukka, Nigeria.

**Dues:** U.S. \$60, payable to Samuel S. Okoya (Treasurer), Department of Mathematics, Obafemi Awolowo University, Ile-Ife, Nigeria.

**Privileges:** *Journal of the Nigerian Mathematical Society* and *Notices of the Nigerian Mathematical Society*.

**Officers:** Reuben O. Ayeni (President), Michail O. Osilike (Vice-President), Samuel O. Okoya (Treasurer), Franic I. Njoku (Secretary).

The American Mathematical Society has "reciprocity agreements" with a number of mathematical organizations around the world. A current list appears here.

These reciprocity agreements provide for reduced dues for members of these organizations who choose to join the AMS and who reside outside of the U.S. and Canada. Reciprocally, members of the AMS who reside

in the U.S. or Canada may join these organizations at a reduced rate. Summaries of the privileges available to AMS members who join under

## South African Mathematical Society\*

Address for mail: School of Mathematics, Witwatersrand University, Private Bag 3, Wits 2050, South Africa; email: clint.VanAlten@wits.ac.za.

**Apply to:** Erwin Bruening, School of Mathematical Sciences, Kwazulu-Natal University, Private Bag X54001, Durban 4000, South Africa.

**Dues:** R210.00 (Two hundred ten rands), payable to the South African Mathematical Society (SAMS), c/o Prof. Erwin Bruening (Treasurer) at the above address.

**Privileges:** The right to receive the *Notices of the SAMS* at no additional cost; reduced fees at SAMS meetings. Officers: Nigel Bishop (President), Themba Dube (Vice-President), Erwin Bruening (Treasurer), Clint Van Alten (Secretary).

## Tunisian Mathematical Society\*

**Apply to:** Khalifa Trim'eche, Faculty of Sciences of Tunis, Department of Mathematics, CAMPUS 2092, Tunis, Tunisia; email: TMS@tms.rnu.tn; http://www.tms.rnu.Tn.

**Dues:** \$20, payable to Lotfi Kamoun at the above address. Privileges: Obtain the publications of the Society, and possible partial financial support to attend the annual colloquium of the Society.

**Officers:** Khalifa Trim'eche (President); Mohamed Sifi (Vice-President); Lotfi Kamoun (Treasurer); Abderrazek Karoui (Secretary).

## The Americas

### Canadian Mathematical Society\*

**Apply to:** Canadian Mathematical Society, 105-1785 Alta Vista Drive, Ottawa, Ontario, Canada K1G 3Y6; email: office@cms.math.ca; http://www.cms.math.ca/. The terms of reciprocity agreements are given on the following pages. Members of these organizations who join the AMS as reciprocity members enjoy all the privileges available to ordinary members of the Society. AMS dues for reciprocity members are \$84 for 2010 and \$84 for 2011. Each organization was asked to

review and update its listing in the spring. An asterisk (\*) after the name of an organization indicates that no response to this request had been received when the November *Notices* went to press.

**Dues:** 50% off applicable rate, payable in U.S. funds to the Canadian Mathematical Society at the above address. Privileges: *CMS Notes*; access to members section on website; reductions on all CMS periodicals, publications, promotional items, and meeting registration.

**Officers:** Anthony To-Ming Lau (President); Michael Lamoureux, Kumar Murty, Cathy Baker, Pengfei Guan (Vice-Presidents); Jacques Hurtubise (President-Elect); David Rodgers (Treasurer); Johan Rudnik (Executive Director/Secretary).

#### **Sociedad Colombiana de Matemáticas\***

**Address for mail:** Apartado Aereo 2521, Bogotá, Colombia; email: [scm@scm.org.co](mailto:scm@scm.org.co); <http://www.scm.org.co>. Apply to: Carlos H. Montenegro E., Apartado Aereo 2521, Bogotá, Colombia.

**Dues:** U.S. \$27, payable to Sociedad Colombiana de Matemáticas.

**Privileges:** Subscription to one of the publications of the Society (*Revista Colombiana de Matemáticas* or *Lecturas Matemáticas*), discounts for participation in Society activities, and e-mail in the [scm.org.co](http://scm.org.co) domain.

**Officers:** Carlos H. Montenegro E. (President), Jose Ricardo Arteaga (Vice-President).

#### **Sociedad de Matemática de Chile\***

**Apply to:** Sociedad de Matemática de Chile, María Luisa Santander 0363, Providencia, Santiago, Chile; email: [socmat@mat.puc.cl](mailto:socmat@mat.puc.cl); <http://www.socmachi.cl>.

**Dues:** U.S. \$50, payable to Sociedad de Matemática de Chile.

**Privileges:** Receive *Gaceta de la Sociedad de Matemática* *Notas de la Sociedad de Matemática de Chile*

**Officers:** Rubí E. Rodríguez (President), Ana Cecilia De La Maza (Vice-President), Hernán Burgos

(Treasurer), Andrés Navas (Secretary).

#### **Sociedad Matemática de la República Dominicana\***

**Apply to:** Isidro Rodríguez, Sociedad Matemática de la República Dominicana, Apartado 797-2, Santo Domingo, República Dominicana.

**Dues:** U.S. \$10, payable to Amado Reyes at the above address.

**Privileges:** Right to receive *Notimat* (bimonthly newsletter) and *Revista Matemática Dominicana* (twice a year). Officers: Isidro Rodríguez (President), Mariana Morales (Vice-President), Amado Reyes (Treasurer), Eliseo Cabrera (Secretary).

#### **Sociedad Matemática Mexicana\***

**Apply to:** Olivia Lazcano, Apartado Postal 70-450, México, D.F. 04510, México; email: [smm@smm.org.mx](mailto:smm@smm.org.mx); <http://www.smm.org.mx/>.

**Dues:** U.S. \$25, payable to Sociedad Matemática Mexicana.

**Privileges:** To be a regular member paying half of the regular fee for persons living outside of Mexico. Newsletter, *Bulletin of the Mexican Mathematical Society*, or *Miscelánea Matemática*.

**Officers:** Emilio Lluís-Puebla (President), Carlos Siginoret (Vice-President), Eugenio Garnica (Treasurer), Pablo Padilla (General Secretary), Isidro Romero (Secretary), Lino Reséndiz and Silvia Morelos (Vocal).

#### **Sociedad Uruguaya de Matemática y Estadística (SUME)\***

**Address for mail:** J. Herrera y Reissig 565, CC 30, CP 11300, Fac. de Ingeniería, IMERL, Montevideo, Uruguay; email: [jlvb@fing.edu.uy](mailto:jlvb@fing.edu.uy)

**Apply to:** José L. Vieitez (Presidente de SUME), at the above address.

**Dues:** U.S. \$100, payable to Jorge Blanco at the above address.

**Privileges:** Receive PMU series and Predat series free.

**Officers:** José L. Vieitez (President), Jorge Blanco (Vice-President), Gonzalo Perera (Treasurer), F. Pelaez (Secretary).

#### **Sociedade Brasileira de Matemática (SBM)**

**Address for mail:** Estrada Dona Castorina 110, 22460-320 Rio de Janeiro, Brazil; email: presidente@sbm.org.br; http://www.sbm.org.br

**Apply to:** secretaria@sbm.org.br

**Dues:** BRL 40,00 (50% discount); email: secretaria@sbm.org.br

**Privileges:** *Revista Matemática Universitária* (free subscription) and 25% discount on SBM books.

**Officers:** Hilario Alencar (President), Marcelo Viana (Vice-President), Nancy Garcia (Treasurer), Maria Aparecida Ruas and Ronaldo Garcia (Secretaries).

### **Sociedade Brasileira de Matemática Aplicada e Computacional**

**Apply to:** Andrea Alves Ribeiro, SBMAC/ICMC, Caixa Postal 668, Av., 13560-970 São Carlos SP, Brazil; email: sbmac@icmc.usp.br; http://www.sbmac.org.br

**Dues:** U.S. \$50, payable to Sociedade Brasileira de Matemática Aplicada e Computacional at the above address. **Privileges:** Free copies of SBMAC journals.

**Officers:** Geraldo N. DaSilva (President), Antonio J. DaSilva Neto (Vice-President), Antonio Castello (Treasurer), Eliana X. L. De Andrade (Secretary).

### **Sociedade Paranaense de Matemática**

**Apply to:** Marcelo Escudeiro Hernandes, UEM-CCE-DMA, Av. Colombo 5790, 87020-900, Maringá-PR, Brasil. Http://www.spm.uem.br

**Dues:** U.S. \$12, payable to Nelson Martins Garcia at the above address.

**Privileges:** A free subscription to the print version of *Boletim da Sociedade Paranaense de Matemática* (two issues per year).

**Officers:** Marcelo Moreira Cavalcanti (President), Marcelo Escudeiro Hernandes (Vice-President), Nelson Martins Garcia (Treasurer), Rodrigo Martins (Secretary).

### **Union Matemática Argentina**

**Apply to:** Beatriz Marron, Departamento de Matemática, Universidad Nacional del Sur, Av. Alem 1253, 8000 Bahía Blanca, Provincia de Buenos Aires, Argentina; email: uma@union-

matematica.org.ar; http://www.union-matematica.org.ar.

**Dues:** U.S. \$60, payable to Rosana Entizne at the above address.

**Privileges:** Same as those granted to UMA members

**Officers:** Hernán Cendra (President), Hugo Aimar (Vice-President), Rosana Entizne (Treasurer), Beatriz Marron (Secretary).

### **Asia**

Allahabad Mathematical Society

**Apply to:** S. Srivastava, Treasurer, Allahabad Mathematical Society, 10 C. S. P. Singh Marg, Allahabad-211001, India; email: ams10marg@gmail.com; http://www.amsallahabad.org

**Dues:** U.S. \$30 for annual members, payable to Allahabad Mathematical Society at the above address.

**Privileges:** 50% discount on annual membership.

**Officers:** D. P. Gupta (President), S. P. Singh and S. L. Singh (Vice-Presidents), S. Srivastava (Treasurer), M. Khare (Secretary).

### **Calcutta Mathematical Society\***

**Apply to:** M. R. Adhikari, Secretary, Calcutta Mathematical Society, AE-374, Sector-1, Salt Lake City, Calcutta 700 064, India; telephone: (033) 2337-8882; Fax: (0091) 33-2337-6290; email: cms@cal2.vsnl.net.in

**Dues:** U.S. \$40, payable to Secretary, Calcutta Mathematical Society, at the above address.

**Privileges:** *Bulletin of the Calcutta Mathematical Society*; *News Bulletin of the Calcutta Mathematical Society*; *Review Bulletin of the Calcutta Mathematical Society*; library; seminars/symposia, summer and winter schools; workshops, popular lectures, etc.

**Officers:** K. Ramachandra (President), A. Chakraborty, N. D. Chakraborty, P. Muldowney, E. Trelle, and H. M. Srivastava (Vice-Presidents), U. C. De (Treasurer), M. R. Adhikari (Secretary), H. P. Mazumdar (Editorial Secretary).

### **Indian Mathematical Society\***

**Apply to:** Shashi Prabha Arya (Treasurer), 90, Saakshara Apts., A-3 Block, Paschim Vihar, New Delhi-

110063, India; email: shsh\_ry@yahoo.co.in;  
<http://www.indianmathsociety.org.in>

**Dues:** U.S. \$100 (annual) or \$1000 (life), payable to Indian Mathematical Society, at the above address.

**Privileges:** Complimentary copy of the *The Mathematics Student*

**Officers:** A. K. Agarwal (President), S. P. Arya (Treasurer), B. Nimse (Administrative Secretary), S. Deo (Academic Secretary), V. M. Shah (General Secretary).

#### **Indonesian Mathematical Society (IndoMS)\***

**Apply to:** Indonesian Mathematical Society, c/o Dr. Hilda Assiyatun, Department of Mathematics, Institut Teknologi Bandung (ITB), Jalan Ganesa 10 Bandung, Indonesia; <http://www.indoms-center.org>.

**Dues:** U.S. \$15, payable to Dr. Hilda Assiyatun (Treasurer) at the above address.

**Privileges:** Reduced registration at conferences sponsored by The IndoMS and reduced price for any publications.

**Officers:** Edy Tri Baskoro (President), Widodo, Stevanus Budi Waluya, Angie Siti Anggari (Vice-Presidents), Hilda Assiyatun (Treasurer), Budi Nurani (Secretary).

#### **Korean Mathematical Society**

**Apply to:** Korean Mathematical Society, Korea Science and Technology Center 202, 635-4 Yeoksamdong, Kangnam-gu, Seoul 135-703, Korea; email: kms@kms.or.kr; <http://www.kms.or.kr/>.

**Dues:** U.S. \$40, payable to Korean Mathematical Society, at the above address.

**Privileges:** Members will receive six volumes of *Journal of the KMS* and six volumes of *Bulletin of the KMS*.

**Officers:** Dohan Kim (President), Jong Hae Keum, Kil Hyun Kwon, Sun Young Jang (Vice-Presidents), Hye Sook Park (Treasurer), Dosang Joe (Secretary).

#### **Mathematical Society of Japan**

**Apply to:** Yukino Ueno, Secretary, Mathematical Society of Japan, 34-8, Taito 1 chome, Taito-ku, Tokyo 110-0016, Japan; <http://wwwsoc.nii.ac.jp/msj6/math>.

**Dues:** Category I: 9,000 yen; Category II: 10,800 yen, payable to Mathematical Society of Japan at the above address.

**Privileges:** Category I: *Journal of the Mathematical Society of Japan, Sugaku-Tsusin* (2 issues); Category II: *Journal of the Mathematical Society of Japan, Sugaku* (in Japanese), *Sugaku-Tsushin* (4 issues).

**Officers:** Takashi Tsuboi (President), Liang Zhang (Treasurer), Yukino Ueno (Secretary).

#### **Mathematical Society of the Philippines\***

**Address for mail:** Mathematical Society of the Philippines, Institute of Mathematics, University of the Philippines, Diliman, Quezon City, Philippines 1101; email: mathsoc@mathsocietyphil.org; <http://www.Mathsocietyphil.org>.

**Apply to:** Reginaldo Marcelo, Mathematics Department, Ateneo de Manila University, P.O. Box 154, Manila, Philippines.

**Dues:** U.S. \$7, payable to Mathematical Society of the Philippines.

**Privileges:** Publications of the Mathematical Society of the Philippines; discount on conference fees.

**Officers:** Fidel Nemenzo (President), Jumela Sarmiento (Vice-President), Marian Roque (Treasurer), Ederlina No-con (Secretary).

#### **Mathematical Society of the Republic of China**

**Address for mail:** c/o Department of Mathematics, National Taiwan University No. 1, Roosevelt Road Section 4, Taipei 10617, Taiwan; email: tms@math.ntu.edu.tw; <http://www.taiwanmathsoc.org.tw>

**Dues:** U.S. \$45, payable to Mathematical Society of the Republic of China at the above address.

**Privileges:** One-year free subscription to the *Taiwanese Journal of Mathematics*

**Officers:** Sze-Bi Hsu (President), Gerard Jennhwa Chang (Vice-President), Hui-Wen Lin (Treasurer), Jenn-Nan Wang (Secretary).

#### **Mongolian Mathematical Society**

**Apply to:** Artbazar Galtbayar, Mongolian Mathematical Society, P. O. Box 187, Post Office 46A,

Ulaanbaatar, Mongolia; email: [galtbayar@num.edu.mn](mailto:galtbayar@num.edu.mn).

**Dues:** U.S. \$20, payable to Artbazar Galtbayar at the above address.

**Privileges:** Right to receive the *Mongolian Mathematical Journal* for free and to publish in the *MMJ*

**Officers:** A. Mekei (President), B. Battengel (Vice-President), A. Galtbayar (Secretary).

#### **Nepal Mathematical Society\***

**Apply to:** Chet Raj Bhatta, Secretary, Nepal Mathematical Society, Central Department of Mathematics, Tribhuvan University, Kirtipur, Kathmandu, Nepal; email: [cdmath@wlink.com.np](mailto:cdmath@wlink.com.np).

**Dues:** U.S. \$20, payable to Kabita Luitel (Treasurer) at the above address.

**Privileges:** All privileges enjoyed by an ordinary member, which includes purchasing NMS publications and participation in seminars at concessional rates.

**Officers:** Bhadra Man Tuladhar (President), Sharada Shrestha (Vice-President), Kabita Luitel (Treasurer), Chet Raj Bhatta (Secretary).

#### **Persatuan Sains Matematik Malaysia\***

**Address for mail:** Pusat Pengajian Sains Matematik, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia; email: [maslina@pkrisc.cc.ukm.my](mailto:maslina@pkrisc.cc.ukm.my); <http://www.tmsk.uitm.edu.my/~persama>.

**Apply to:** Dr. Maslina at the above address.

**Dues:** U.S. \$7.50, payable to Bendahari, PERSAMA, at the above address.

**Privileges:** *Warkah Berita PERSAMA* (two issues per year), *Bulletin of the Malaysian Mathematical Society* (two issues per year), *Menemui Matematik* (two issues per year).

**Officers:** Mohd Salmi Md Noorani (President), Husna Hassan and Arsmah Ibrahim (Vice-Presidents), Wan Rosmanira Ismail (Treasurer), Maslina Darus (Secretary).

#### **Punjab Mathematical Society\***

**Address for mail:** Department of Mathematics,

University of the Punjab, Quaid-i-Azam Campus, Lahore, Pakistan; email: [mathdept@paknet.ptc.pk](mailto:mathdept@paknet.ptc.pk).

**Apply to:** Zia ul Haq, Secretary, Punjab Mathematical Society, Department of Maths., University of the Punjab, Lahore, Pakistan.

**Dues:** U.S. \$30 for life membership, payable to Umar Farooq Qureshi, Treasurer, P.M.S.

**Officers:** G. Mustafa Habibullah (President), Zia Ullah Randhawa and Munir Ahmad Ch. (Vice-Presidents), Umar Farooq Qureshi (Treasurer), Nawazish Ali Shah (Secretary).

#### **Ramanujan Mathematical Society\***

**Apply to:** Professor V. Thangaraj, Secretary, Ramanujan Institute for Advanced Study in Mathematics, University of Madras, Chennai-600005, India; email: [riasm@md3.vsnl.net.in](mailto:riasm@md3.vsnl.net.in); <http://rms.enmail.com/>.

**Dues:** U.S. \$20 (annual), U.S. \$200 (life), payable to Professor V. Thangaraj at the above address.

**Privileges:** Complimentary copy of the *Journal of the Ramanujan Mathematical Society*

**Officers:** Phoolan Prasad (President), S. Sri Bala (Vice-President), P. Paulraja (Treasurer), V. Thangaraj (Secretary).

#### **Singapore Mathematical Society**

**Apply to:** Singapore Mathematical Society, c/o Department of Mathematics, National University of Singapore, 10 Lower Kent Ridge Road, Singapore 119076; email: [smsuser@math.nus.edu.sg](mailto:smsuser@math.nus.edu.sg); <http://sms.math.Nus.edu.sg>.

**Dues:** 10 Singapore dollars, payable to Singapore Mathematical Society at the above address.

**Privileges:** Complimentary copy of *Mathematical Medley*, the Society's official magazine, and discounts on the Society's publications and activities.

**Officers:** Chengbo Zhu (President), Helmer Aslaksen (Vice-President), Seng Kee Chua (Treasurer), Ng Kah Loon (Secretary).

#### **Southeast Asian Mathematical Society\***

**Apply to:** c/o School of Mathematical Sciences, Universiti Sains Malaysia, 11800 USM Penang, Malaysia; email: [rosihan@cs.usm.my](mailto:rosihan@cs.usm.my);

<http://seams.math.nus.edu.sg>.

**Dues:** None, membership by society of SEAMS only.

**Officers:** Rosihan M. Ali, Dato (President), Le Tuan Hoa and Fidel Nemenzo (Vice-Presidents), Saiful Hafizah Jaaman (Treasurer), Maslina Darus (Secretary).

#### **Vietnam Mathematical Society**

**Address for mail:** c/o 18 Hoang Quoc Viet Road, Cau Giay District, 10307, Hanoi, Vietnam; email: [vms@vms.org.vn](mailto:vms@vms.org.vn); <http://www.vms.org.vn>.

**Apply to:** Phung Ho Hai at above address.

**Dues:** Hoi Toan Hoc Viet Nam, Account Number: 0491371684139, Vietcombank Thang Long, SWIFT: BFTVVNVX 049, 98 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam.

**Privileges:** Pay conference fees at the same rate as individual VMS members in any conferences organized or jointly organized by the VMS; buy (a) *Notices of the VMS* (in Vietnamese), 4 issues/year: U.S. \$15 per year, or (b) *Vietnam Journal of Mathematics* (in English), 4 issues/year: U.S. \$60 per year.

**Officers:** Le Tuan Hoa (President), Phung Ho Hai (Treasurer), Nguyen Huu Du (Secretary)

#### **Vijnana Parishad of India**

**Apply to:** R. C. Singh Chandel, Secretary, Vijnana Parishad of India, D. V. Postgraduate College, Orai-285001, U.P., India; email: [rc\\_chandel@yahoo.com](mailto:rc_chandel@yahoo.com)

**Dues:** U.S. \$10, payable to Vijnana Parishad of India, D. V. Postgraduate College, Orai-285001, U.P., India. **Privileges:** *Jñānābhā* (an interdisciplinary mathematical journal currently published once a year); back volumes available at 25% discount.

**Officers:** G. C. Sharma (President), S. L. Singh, A. P. Singh, and A. K. Srivastava (Vice-Presidents), R. C. Singh Chandel (Secretary-Treasurer), H. M. Srivastava (Foreign Secretary).

#### **Europe**

##### **Azerbaijan Mathematical Society\***

**Apply to:** A. Ali Novruzov, Department of Mechanics and Mathematics, Baku State University, Baku, Azerbaijan, 370145.

**Dues:** U.S. \$10, payable to Azerbaijan Mathematical

Society.

**Privileges:** All privileges of ordinary members plus 50% discount on all AzMS publications.

**Officers:** O. A. Veliev (President), F. A. Abdullaev (Treasurer), V. A. Gasimov (Secretary).

##### **Balkan Society of Geometers**

**Apply to:** Constantin Udriste, Treasurer, Department of Mathematics-Informatics I, University Politehnica of Bucharest, Splaiul Independentei 313, Bucharest 060042, Romania; email: [udriste@mathem.pub.ro](mailto:udriste@mathem.pub.ro); <http://www.Mathem.pub.ro>.

**Dues:** 30 euros (except persons from countries with financial difficulties, 10 euros), payable to the Balkan Society of Geometers at the above address.

**Privileges:** Participation in meetings and all other privileges enjoyed by an ordinary member; discounts (at least 10%) on the prices of BSG publications.

**Officers:** Constantin Udriste (President), Mihai Anas-tasiei, Gabriel Pripoae, Vladimir Balan (Vice-Presidents), Constantin Udriste (Treasurer), Vasile Iftode (Secretary).

##### **Belgian Mathematical Society\***

**Apply to:** Jan van Casteren, Secretary, University of Antwerp, Department of Mathematics, Middelheimlaan 1, B-2020 Antwerp, Belgium; email: [bms@ulb.ac.be](mailto:bms@ulb.ac.be); email: [jan.vancasteren@ua.ac.be](mailto:jan.vancasteren@ua.ac.be); <http://bms.ulb.ac.be>.

**Dues:** 18 euros, payable to Belgian Mathematical Society, Campus Plaine, CP 218/01, Bld. du Triomphe, B-1050 Brussels, Belgium. Account number: 000-0641030-54 (IBAN : BE 42 0000 6410 3054, BIC : BPOTBEB1).

**Privileges:** Membership includes a subscription to *Bulletin of the Belgian Mathematical Society* *Simon Stevin*; newsletter.

**Officers:** Cath'érine Finet (President), Stefaan Caenepeel (Vice-President), Guy Van Steen (Treasurer), Jan van Casteren (Secretary).

##### **Berliner Mathematische Gesellschaft e.V.**

**Apply to:** Berliner Mathematische Gesellschaft, Schriftfu"hr-er, Freie Universit"at Berlin, Institut fu"r Mathematik, Sekretariat Frau B. Wengel, Arnimallee 3, 14195 Berlin, Germany; email:



wolfgang.volk@berlin.de; <http://www.BerlMathGes.de>.

**Dues:** 10 euros, payable to BMG Schatzmeister at the above address. IBAN : DE80 1002 00002530 873 400, BIC : BEBEDEBBXXX.

**Privileges:** Reciprocity members receive the quarterly journal *BMG-Forum*.

**Officers:** Gerhard Preuss (President), Rudolf Baierl (Vice- President), Michael E. Klews (Treasurer), Wolfgang Volk (Secretary).

#### **Croatian Mathematical Society**

**Apply to:** Renata Svedrec, Secretary, HMD, Department of Mathematics, Bijenička 30, 10000 Zagreb, Croatia; email: [hmd@math.hr](mailto:hmd@math.hr); <http://www.matematika.hr>.

**Dues:** U.S. \$10, payable to HMD, Zagrebačka banka d.d. Zagreb, 2500-03688780IBAN: HR442360000-1101530802.

**Privileges:** *Vjesnik HMD* (in Croatian) and one of five journals edited by CMS free of charge. All publications of the CMS and all fees reduced by at least 25%.

**Officers:** Hrvoje Krayević (President), Ivica Gusić and Petar Mladinić (Vice-Presidents), Hrvoje Šikić (Treasurer), Renata Svedrec (Secretary).

#### **Cyprus Mathematical Society\***

**Apply to:** Gregory Makrides, 36 Stasinou Street, Suite 102, Strovolos 2003, Nicosia, Cyprus; email: [cms@cms.org.cy](mailto:cms@cms.org.cy)

**Dues:** U.S. \$20, payable to Cyprus Mathematical Society at the above address.

**Privileges:** Receive the annual periodical *Mathematiko VEMA* in Greek. Invitations to conferences organized in Cyprus and the Annual Summer Math School organized in Cyprus at the end of June.

**Officers:** Gregory Makrides (President), Athanasios Gagatsis (Vice-President), Antreas Philippou (Treasurer), Savvas Antoniou (Secretary).

#### **Dansk Matematisk Forening (Danish Mathematical Society)\***

**Address for mail:** c/o President Vagn L. Hansen, Department of Mathematics, Building 303 S, Technical University of Denmark, DK-2800

Kongens Lyngby, Denmark; email: [dmf@mathematics.dk](mailto:dmf@mathematics.dk); <http://www.Mathematics.dk/>.

**Apply to:** Please use the electronic form at <http://www.mathematfcs.dk/>

**Dues:** DKK 155, payable to Carsten L. Petersen, Treasurer, Department of Science, NSM, Roskilde University (RUC), Building 27.2, Universitetsvej 1, Postbox 260, DK-4000 Roskilde, Denmark

**Privileges:** *Mathematica Scandinavica* (750 DKK per year), *Nord. Mat. Tidss. (Normat)* (320 SEK per year). Members of the American Mathematical Society do not have to join Dansk Matematisk Forening to obtain the journals. Subscription orders should be sent directly to the journals: *Normat*, NCM Göteborgs Universit'e, Box 160, SE-405 30 Gothenburg, Sweden; *Mathematica Scandinavica*, Matematisk Institut, Aarhus Universitet, 8000 Aarhus C, Denmark. Members of the American Mathematical Society who join the Danish Mathematical Society as reciprocity members will receive the newsletter *Matilde*.

**Officers:** Vagn Lundsgaard Hansen (President), Poul Hjorth (Vice-President), Carsten Lunde Peterson (Treasurer), Poul Hjorth (Secretary).  
Deutsche Mathematiker-Vereinigung e.V.

#### **(DMV) (German Mathematical Society)**

**Apply to:** Roswitha Jahnke, DMV-Office, c/o WIAS, Mohrenstr. 39, 10117 Berlin, Germany; email: [dmv@wias-berlin.de](mailto:dmv@wias-berlin.de); <http://dmv.mathematik.de>.

**Dues:** 50 euros, payable to Deutsche Mathematiker-Vereinigung e.V., Volksbank Freiburg Konto: 6955 002, BLZ: 680 900 00, IBAN: DE 66 6809 0000 0006 9550 02, BIC: GENODE61FR1.

**Privileges:** Free subscription to *Jahresbericht der DMV* and one of these publications: *Math. Semesterberichte* or *Journal für Mathematik-didaktik*.

**Officers:** Wolfgang Lueck (President), Christian Baer (Vice-President), Juerg Kramer (Treasurer), Guenther Toerner (Secretary).

#### **Edinburgh Mathematical Society\***

**Apply to:** A. D. Gilbert, Honorary Secretary, Edinburgh Mathematical Society, James Clerk Maxwell Building, King's Buildings, Mayfield Road, Edinburgh EH9 3JZ, Scotland; email: [edmathsoc@ed.ac.uk](mailto:edmathsoc@ed.ac.uk);

<http://www.maths.ed.ac.uk>.

**Dues:** U.S. \$20 (£10 sterling) without Society's proceedings.

**Privileges:** The Society's proceedings are available at a concessionary rate directly from Cambridge University Press (journals@cambridge.org): Print only: U.S. \$23 (£15 sterling); Print and online: U.S.\$28 (£18 sterling).

**Officers:** P. J. Davies (President), R. J. Archbold (Vice- President), M. A. Youngson (Treasurer), A. D. Gilbert and T. H. Lenagan (Secretaries).

#### **European Mathematical Society**

**Apply to:** Terhi Hautala, Department of Mathematics and Statistics, P.O. Box 68, F1-00014 University of Helsinki, Helsinki, Finland. email: ems-office@helsinki.fi; <http://www.euro-math-soc.eu>.

**Dues:** 44 euros, payable either via Web or to Terhi Hautala at the above address.

**Privileges:** An AMS member pays 44 euros instead of 88 euros for dues and receives EMS Newsletter.

**Officers:** Marta Sanz-Sol'e (President), Mireille Martin- Deschamps and Martin Raussen (Vice-Presidents), Jouko V'a'an'anen (Treasurer), Stephen Huggett (Secretary)

#### **Gesellschaft fu'r Angewandte Mathematik und Mechanik e.V. (GAMM)**

**Apply to:** GAMM, M. Kaliske, Institut fu'r Statik und Dynamik der Tragwerke, Technische Universit'at Dresden, 01062 Dresden, Germany; email: gamm@mailbox.tu-dresden.de; <http://www.gamm-eV.de>

**Dues:** 60 euros, payable to GAMM, Deutsche Bank 24 Wuppertal, BLZ 330 700 24, Konto-Nr. 2220911, GAMM, IBAN: DE09 3307 0024 0222 0911 00, BIC: DEUTDEDBWUP.

**Privileges:** Regular publications of GAMM and participation in scientific meetings at a reduced rate.

**Officers:** Volker Mehrmann (President), Peter Wriggers (Vice-President), Michael Gu'nther (Treasurer), Michael Kaliske (Secretary).

#### **Glasgow Mathematical Association\***

**Apply to:** Frances Goldman, Treasurer, Glasgow Mathematical Association, Department of Mathematics, University of Glasgow, Glasgow G12 8QW, United Kingdom; email: fhg@maths.gla.ac.uk; <http://www.maths.gla.ac.uk/>.

**Dues:** £7, payable to Glasgow Mathematical Association, at the above address.

**Privileges:** *Glasgow Mathematical Journal* at reduced rate (£45).

**Officers:** A. Craw (President), F. Goldman (Treasurer), L. Moon (Secretary).

#### **Hellenic (Greek) Mathematical Society\***

**Apply to:** Hellenic Mathematical Society, 34, Panepis- timiou Street, 106 79 Athens, Greece; email: info@hms.gr; <http://www.hms.gr/>.

**Dues:** U.S. \$20 payable to Hellenic Mathematical Society at the above address.

**Privileges:** The *Bulletin of HMS*, News-Bulletin (En- imerosi), discounts that are available to all members. Officers: Nikolaos Alexandris (President), George Dimakos and Dionysios Anapolitanos (Vice-Presidents), Evaggelos Eustathiou (Treasurer), Ioannis Tyrllis (Secretary).

**Dues:** U.S. \$15 payable to Irish Mathematical Society, at the above address.

**Privileges:** Free copy of the *Bulletin of the Irish Mathematical Society* (two times per year); free registration at IMS annual conference (September).

**Officers:** James Cruickshank (President), Stephen Wills (Vice-President), Sin'ead Breen (Treasurer), Shane O'Rourke (Secretary).

#### **J'anos Bolyai Mathematical Society\***

**Apply to:** Ildiko R'akoczi, Executive Director, J'anos Bolyai Mathematical Society, F'o utca 68, H-1027 Budapest, Hungary; email: bjmt@renyi.hu.

**Dues:** Are voluntary but should minimally cover duplication and mailing costs; for reciprocity members (residing outside Hungary) suggested fee is 1/8 of 1 percent of the member's net income, payable to Kereskedelmi ES Hitelbank P.T., Account Number 10200830-32310243. Sponsoring members pay at least U.S. \$180 or equivalent per year.

**Privileges:** Upon request, *Matematikai Lapok* (twice a year), *Koz'episkolai Matematikai Lapok* (monthly). If sufficient interest is expressed, a bulletin in English will be available. In addition, the JBMS is negotiating to obtain discounts for its reciprocity and sponsoring members on several serial publications and periodicals appearing in Hungary. Contact the JBMS secretary for more information regarding this and other privileges of membership

**Officers:** Gyula Katona (President), Ildiko R'akoczi (Ex-ecutive Director), Gyorgy Lippner (Treasurer), Andr'as Recski (Secretary General), Tibor Jord'an (Vice Secretary General).

#### **Icelandic Mathematical Society**

Jednota ˇcesk'ych matematiku° a fyziku° Apply to: Ragnar Sigurdsson, Icelandic Mathematical Society, Raunvisindastofnun Haskolans, Dunhaga 3, IS-107 (Union of Czech Mathematicians and Reykjavik, Iceland;

email: islenska.staerdfraedafelagid@Physicists)\*gmail.com; <http://www.staefelag.raunvis.hi.is>

**Dues:** U.S. \$12, payable to Johann Sigurdsson at the above address.

**Privileges:** Reduced subscription rate on *Mathematica Scandinavia* and *Nordisk matematisk Tidsskrift (Normat)*; subscription orders should be sent directly to the journals.

**Officers:** Ragnar Sigurdsson (President), Johann Sigurdsson (Treasurer), Ju'iana Ru'n Indridadottir (Secretary).

#### **Irish Mathematical Society**

**Address for mail:** Shane O'Rourke, Department of Mathematics, Cork Institute of Technology, Rossa Avenue, Bishopstown, Cork, Ireland; email: Shane.ORourke@cit.ie.

**Apply to:** Sin'ead Breen, Department of Mathematics, St. Patrick's College, Drumcondra, Dublin 9, Ireland; email: sinead.breen@spd.dcu.ie.

**Apply to:** Jan Kratochv'íl, Union of Czech Mathematicians and Physicists, Z'itn'a 25, 117 10 Praha 1, Czech Republic; email: jcmf@math.cas.cz; <http://www.jcmf.cz>.

**Dues:** U.S. \$20, payable to Jan Obdr'z'alek at the above address.

**Privileges:** (i) A discount of 20% in the conference fees for conferences, symposia, summer schools, and similar events organized (or coorganized) by the JCMF; (ii) newsletter.

**Officers:** ˇStefan Zajac (President), Eduard Fuchs and Old'rich Lepil (Vice-Presidents), Jan Obdr'z'alek (Treasurer), Petr R'epa (Secretary).

**Jednota slovensk'ych matematikov a fyzikov (JSMF) (Union of Slovak Mathematicians and**

#### **Physicists)\***

**Address for mail:** Secretary of JSMF, FMFI UK Pavilon F1, Mlynsk'a dolina, 842 48 Bratislava, Slovak Republic; email: JSMF@CENTER.FMPH.UNIBA.SK; <http://www.uniba.sk/~jsmf>.

**Apply to:** Hilda Dra'skovi'cov'a, FMFI UK, KATC, Mlynsk'a dolina, 842 48 Bratislava, Slovak Republic.

**Dues:** U.S. \$20, payable to Slovensk'a sporitel'n'a, Z'ahradnicka 93, 8000 Bratislava, Slovak Republic; ˇc.u.: 101848-019/0900 IC`O: 178705.

**Privileges:** A discount of 20% in conference fees for conferences, symposia, summer schools, and similar events organized by the JSMF.

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#### **Koninklijk Wiskundig Genootschap**

**Apply to:** Rob van der Mei, CWI, P. O. Box 94079, 1090 GB Amsterdam, The Netherlands; email: r.d.van.der.mei@cwi.nl; <http://www.wiskgenoot.nl>

**Dues:** 50 euros.

**Privileges:** Free periodical *Nieuw Archief voor Wiskunde*

**Officers:** G. W. Vegter (President), S. Bhulai (Treasurer), R. van der Mei (Secretary).

#### **London Mathematical Society\***

**Apply to:** Susan M. Oakes, London Mathematical Society, De Morgan House, 5758 Russell Square, London WC1B 4HS, United Kingdom; email: membership@lms.ac.uk; <http://www.lms.ac.uk/>.

**Dues:** U.S. \$43.50 payable to London Mathematical Society at the above address.

**Privileges:** *LMS Newsletter*; reduced rates for the *Bulletin*, *Journal*, and *Proceedings of the LMS*; *Nonlinearity*; LMS Lecture Notes; LMS Student Texts; LMS Monographs. (Please write to the LMS for complete details.)

**Officers:** E. B. Davies (President), D. G. Larman and F. A. Rogers (Vice-Presidents), N. M. J. Woodhouse (Treasurer), P. R. Cooper (Executive Secretary).

#### **Mathematical Society of Serbia\***

**Apply to:** Milica Babić, Mathematical Society of Serbia, Knez Mihailova 35/IV, p.p. 355, 11000 Belgrade, Serbia; email: [info@dms.org.yu](mailto:info@dms.org.yu); <http://www.dms.org.yu>.

**Dues:** U.S. \$12, payable to DRUŠTVO MATEMATIČARA SRBIJE Acct. No. 250-6498-06, NACIONALNA ŠKOLARINA.

**Privileges:** *Matematički Vesnik*, *Teaching Mathematics*.

**Officers:** Branislav Popović (President), Zoran Kadelburg (Vice-President), Milica Babić (Treasurer), Biljana Babić (Secretary).

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**Apply to:** Marius Irgens, Norsk Matematisk Forening, Department of Mathematical Sciences, NTNU, No-7491, Trondheim, Norway; email: [nmf@math.ntnu.no](mailto:nmf@math.ntnu.no); <http://>

[www.matematikkforeningen.no](http://www.matematikkforeningen.no)

**Dues:** NOK 100, payable to Marius Irgens at the above address.

**Privileges:** All regular membership privileges, including the monthly newsletter *Infomat*.

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#### **Österreichische Mathematische Gesellschaft (OMG)\***

**Apply to:** Robert F. Tichy, Institut für Mathematik, Technische Universität Graz, Steyrergasse 30, A-8010 Graz, Austria; email: [oemg@oemg.ac.at](mailto:oemg@oemg.ac.at); <http://www.Oemg.ac.at/>

**Dues:** 20 euros, payable to ÖMG, Wiedner Hauptstr. 8, A-1040 Wien, Bank Austria-Creditanstalt, IBAN: AT 83 12000229 10389200, BIC: BKAUATWW.

**Privileges:** *Internationale Mathematische*

*Nachrichten* (IMN), reduction of fees at our congresses and meetings. **Officers:** Robert F. Tichy (President), Michael Drmota (Vice-President), Helmut Pottmann (Treasurer), Michael Oberguggenberger (Secretary).

#### **Polskie Towarzystwo Matematyczne**

**Apply to:** Maciej Czarnecki, ZG PTM, ul. Śniadeckich 8, 00-956 Warszawa, Poland; email: [zgptm@ptm.org.pl](mailto:zgptm@ptm.org.pl); <http://www.ptm.org.pl>

**Dues:** U.S. \$22, payable to Polskie Towarzystwo Matematyczne, ul. Śniadeckich 8, 00-956 Warszawa, Poland, KREDYT BANK S.A. 95 1500 1777 1217 7008 4349 0000.

**Privileges:** Members receive one of the following five series of the publication *Annales Societatis Mathematicae Polonae: Commentationes Mathematicae*, *Wiadomości Matematyczne* (in Polish), *Matematyka Stosowana* (in Polish), *Didactica Mathematicae* (in Polish), *Antiquitates Mathematicae* (in Polish).

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#### **Real Sociedad Matemática Española\***

**Apply to:** Ramon Esteban Romero, Secretaria de la Real Sociedad Matemática Española, Universidad Complutense de Madrid, Facultad de Matemáticas, Despacho 525, 28040 Madrid, Spain; email: [secretaria@rsme.es](mailto:secretaria@rsme.es); <http://www.rsme.es>

**Dues:** 25 euros, payable to Real Sociedad Matemática Española at the above address.

**Privileges:** *La Gaceta de la RSME* (Journal; paper and electronic access), 4 issues per year; *Boletín de la RSME* (weekly electronic newsletter).

**Officers:** Olga Gil-Medrano (President), Eduardo Godoy and Raúl Ibáñez (Vice-Presidents), Enrique Artal Bartolo (Treasurer), Ramon Esteban Romero (Secretary).

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Societatea de România, Stiințe Matematice din

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**Apply to:** Tadeas Priklopil, Secretary, at the above address.

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www.matematikersamfundet.org.se.

**Apply to:** Milagros I. Barrios, MAI, Linköping University, SE-581 83 Linköping, Sweden.

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**Dues:** 50 CHF or U.S. \$50 or 34 EUR for residents of Switzerland, 25 CHF or U.S. \$25 or 17 EUR for nonresidents. Payable by bank transfer to Schweiz. Mathemat. Gesellschaft, 3000 Bern, Credit Suisse, Bern, IBAN: CH35 0483 5026 5892 0000 0, BIC: CRESCHZZ30R.

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**Privileges:** *Bulletin of the Iranian Mathematical Society* (two issues per year in English), *Farhang va Andisheh Riazi* (two issues per year in Persian), *Khabarnameh* and *Gozarash* (8 issues per year in

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[Http://www.math.waikato.ac.nz/NZMS/NZMS.html](http://www.math.waikato.ac.nz/NZMS/NZMS.html).

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**DOCTORAL DEGREE CONFERRED 2010-2011 RECENT DOCTORAL THESES****University of Agriculture ,Abeokuta****(a) Department of Computer Science**

S/N	NAMES	QUALIFICATION	DEPARTMENT	YEAR
1.	AWODELE, OLUDELE	Ph.D. (Computer Sc.)	Computer Science	2009
2.	ONASHOGA, SAIDAT ADEBUKOLA	Ph.D. (Computer Sc.)	Computer Science	2010
3.	AJAYI, OLUTAYO BAMIDELE	Ph.D. (Computer Sc.)	Computer Science	2010
4.	VINCENT, OLUFUNKE REBECCA	Ph.D. (Computer Sc.)	Computer Science	2010
5.	ADEKOYA, ADEBAYO FELIX	Ph.D. (Computer Sc.)	Computer Science	2011

**(b) Department of Mathematics and Statistics**

1.	AGWUEGBO, S. O. N.	Ph.D (Statistics)	Statistics	2010
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**Ahmadu Bello University, Zaria**

S/N	Name	Title	Year
1	KAURANGINI, Muhammad Lawan	A study of flow formation inside composite channels	2011

**Federal University of Technology , Akure**

S/N	Name	Title	Year
1	OMOLOFE Babatope	Transverse motions of elastic structures under concentrated masses moving at varying velocities	2010
2	AWODOLA Thomas Olubunmi	dynamic response to moving masses of rectangular plates resting on elastic foundations with stiffness variations.	2010

## Federal University of Technology ,Minna

S/N	Name	Title	Year
1	OCHOICHE Abraham	Development of some new classes of explicit Almost Runge-Kutta (EARK) methods for non-stiff differential equations.	2011
2	DANLADI Hakimi	Development of some deterministic and stochastic mathematical models for decision making in an unbounded horizon.	2011

## Ladoke Akintola University of Technology, Ogbomoso

S/N	Name	Title	Year
1	OLAYIWOLA, Rasaan Oyeyemi	A mathematical model of in-situ combustion as enhanced oil recovery technique in porous media	2011
2	OMOWAYE, Adeola John	Free convection temperature dependent reacting viscous flows on a porous plate in a constant magnetic field	2011

## Obafemi Awolwo University, Ile-Ife

S/N	Name	Title	Year
1	OLOSUNDE Akinlolu Adeseye	Some families of distributions arising from skewing mechanisms	2010

## OBAFEMI AWOLOWO UNIVERSITY ILE-IFE

### Professor Michael Nakamaye's second Visit to Mathematics Department

The idea of requesting for a visiting scientist through "Volunteer Teaching Programme of Developing Countries Strategy Group" ( a gigantic educational project under the International Mathematical Union) was conceptualised by Professor Samuel S. Okoya shortly after the University appointed him as the head of the Department of Mathematics on the 1<sup>st</sup> August 2008. Nobody knew the programme would be a heart warming experience for students and colleagues within and outside the University. It is gladdening enough that Directorate of Linkages and Sponsored Research has embraced the idea and a robust collaboration is in place. As our icon of change that is passionate about the Mathematics students, Professor Michael Nakamaye has used the opportunity of the second visit (Sunday 10<sup>th</sup> - Sunday 31<sup>st</sup> October, 2010) in the company of his postgraduate student, Mrs Martha Byrne to explain that his mission, without any doubt, was to sensitize and stimulate the Mathematics students, Faculty members and a colleague from University of Ibadan.

With this in mind, they had enough energy to be intimate with our students and colleagues at a moment's notice. Today they have made the significant contribution to the well groomed participants with their resources which has enabled them to be involved in capacity building. The duo was in lecture rooms to teach selected topics in MTH 208, MTH 306, MTH 314 and MTH 404. The generosity in terms of 40 relevant books presented to the Department by these volunteers is noteworthy.

Acclaimed American speaker and Professor of Mathematics Michael Nakamaye delivered Faculty and Departmental seminars in which the points he gave will ever remain evergreen in the lives of participants.

Just like the Algebra management committee for Professor Vershinin's visit in May 2010 worked relentlessly for the success of the programme, the members of the Management Committee for Real Analysis, Dr. Gbenga Akinbo (Chairperson), Dr. Olatinwo and Mr. Oyadare also played vital roles, pledging their full commitments to build on the immense impact of Professor Nakamaye's follow-up visit.

The University Television Station under the Department of Educational Technology recorded the lectures and the Department will provide students with the DVD (free of charge). The Committee hope to down load same on the Departmental Computers for the benefit of the students. This unique opportunity will enable the students to play back the video to clarify missed points after the departure of our guest.

There was also time for parties and socialising to celebrate Professor Michael Nakamaye as a teacher of teachers, role model and seasoned scholar while Martha had fond memories of her interaction and exchange of knowledge with the students as well as her visit to Idanre hills in Ondo state. The Department also organized a send - forth party in which plaques and gifts were presented to the duo while the Dean, Faculty of Science, Professor V. O. Olarewaju was the chairman and he was assisted by the Vice Dean, Faculty of Science, Dr. V. F. Olaleye. Representatives of the Directors of relevant government parastatal such as ARCSSTE-E and COPINE, among others were also in attendance.

# ALPHABETIC LISTING OF INDIVIDUAL MEMBERS (NMS 2010)

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## INSIDE NMS

### (A) Promotion to Professor

1. Alfred C. Okoroafor of Department Mathematics, Abia State University, Uturu has been promoted to the position of Professor of Mathematics.
2. James N Nnadi of Department Mathematics, Abia State University, Uturu has been promoted to the position of Professor of Mathematics.
3. James Oguntuase, University of Agriculture, Abeokuta

## IMU AO CL 15/2010 :

### Working Group on Journal Ranking and Pricing (WG-JRP)

#### Thoughts about journals and the role of international mathematical organisations

#### 1 Introduction

Despite great gains in efficiency through new technology journal prices are rising (often well above inflation) and in connection with static or decreasing budgets, access to the published mathematical literature is becoming increasingly difficult for many. At the same time in day-to-day work we rely increasingly on preprint servers like arXiv which make current results much quicker available than journals.

Nonetheless journals continue to play a key role. We heavily rely on them as a quality control for papers and we use publication in respected journals as an important criterion in many decisions such as hiring, promotion or distribution of grant money. The trend from the life sciences to evaluate the performance of individuals or institutions based on impact factors of journals or citation counts is likely to enhance the role of journals gatekeepers' for a scientific career.

While one might have thought that the internet would weaken the traditional role of the publisher as now everyone can make material available online and a group of scientists can start a new journal at relatively low cost the opposite seems to happen. The trend to online access seems to favour the very big publishers because they can built up and maintain huge databases of scientific knowledge. Buying journals in big bundles has somewhat reduced costs in the short term, but nowhere near as much as one would have thought. At the same time such bundle-deals in the mid-term increase the dependence on very few, very big publishers. This may make it also more difficult for smaller publishers (e.g. many learned societies) to stay in the market.

#### 2 A thought for the future

Could one not combine the easy availability and existing data structure of big preprint servers like arXiv with the quality control and reputation of a journal? Here is a possible idea. With the submission of a paper to arXiv one has the option (!) to simultaneously submit it to one of several journals which sit on top of the preprint server. The paper is then referred as usual and if it is accepted will get a label 'published in the journal of ...'. If it is rejected it will remain a preprint with no sign of the submission just as in the present system. This feature can be combined with the usually search engines. In particular one can search either among all preprints or just for articles which have been accepted in one of the journals.

What should the structure of these journals be and who should run them? I think it is important that there are many competing journals run by independent boards. Otherwise my proposal is rather conservative. Just as

in the existing print world I think of a multilayer structure of journals, e.g. About two to four top journals which cover all areas of mathematics.

A large group (2040 ?) of journals which are top journals in certain fields of mathematics and would carry a corresponding name.

A larger group of general or specialized journals which define their own profile, just as it is down in the existing print world.

Of course no journal is assigned a specific role ahead of time, but it depends on the wisdom and energy of the board to establish the reputation of the journal. The journals do not all be created at ones but this can be done organically, just as it happened and continues to happen in the existing print world.

Who should run these journals? On a day-to-day basis they would be run by an editorial board/ managing editor pretty much like current journals.

Communication would be done more or less completely electronically through a journal management system which could be the same for all the journals (economy of scales). Some may not like it because it is more impersonal than the old system, but also in the current world publishers are switching increasingly to such a system since it has a lot of advantages for them.

Crucial points are the creation of a new journal and the rare situation that someone needs to exert oversight because a board or managing editor no longer does a good job. In the current situation this done by the publisher who has a commercial interest in the well-being of the journal and the power to make drastic changes. In the proposed model that role could be played by mathematical societies (their name could feature in the title or subtitle of the journal) or universities (in the way Princeton runs the Annals). They could also own the name if there is a need for that (clearly there are a number of other legal issues to be figured out). The idea is not to replace the existing system completely, but to create a feasible competition to the very big publishers, by making good use of our scientific expertise.

### **3 How to get started ?**

In principle the system could grow organically. In practise, however, a certain critical mass and a large initial boost is needed to give the idea visibility and drive. I am very optimistic that one could find very good people to work on the editorial boards of such a new kind of journal.

Of course many things need to be discussed. The system for handling large number of manuscripts is already there and arXive runs efficiently with a small staff. But the software to run a journal is more complicated and costly and more administrative staff is required. Another point is that arXive is currently solely US based. It would certainly be helpful to have a stronger contribution from other continents, too. Many other details (including legal issues) would need to be discussed and sorted out. Also one would need to find a sponsor, at least for an extended start-up period.

Nonetheless I think there are also great opportunities for the whole mathematical community. To get the necessary drive I think that support from ICIAM and IMU is crucial. I thus propose that ICIAM and IMU team up to explore the feasibility of such a proposal.

If the ICIAM board thinks that it is worthwhile to explore the feasibility of this idea then an ICIAM board member could raise this issue at the IMU General Assembly at Bangalore. It could then be perhaps become part of a resolution which asks the IMU Executive committee to explore what can be done with journal prices, in conjunction with ICIAM.

## A.) NEFARIOUS NUMBERS

**Douglas N. Arnold and Kristine K. Fowler**

### 1) Introduction

The impact factor has been widely adopted as a proxy for journal quality. It is used by libraries to guide purchase and renewal decisions, by researchers deciding where to publish and what to read, by tenure and promotion committees laboring under the assumption that publication in a higher impact factor journal represents better work, and by editors and publishers as a means to evaluate and promote their journals. The impact factor for a journal in a given year is calculated by ISI (Thomson Reuters) as the average number of citations in that year to the articles the journal published in the preceding two years. It has been widely criticized on a variety of grounds:

A journal's distribution of citations does not determine its quality.

The impact factor is a crude statistic, reporting only one particular item of information from the citation distribution.

It is a flawed statistic. For one thing, the distribution of citations among papers is highly skewed, so the mean for the journal tends to be misleading. For another, the impact factor only refers to citations within the first two years after publication (a particularly serious deficiency for mathematics, in which around 90% of citations occur after two years).

The underlying database is flawed, containing errors and including a biased selection of journals.

Many confounding factors are ignored, for example, article type (editorials, reviews, and letters versus original research articles), multiple authorship, self-citation, language of publication, etc.

Despite these difficulties, the allure of the impact factor as a single, readily available number not requiring complex judgments or expert input, but purporting to represent journal quality has proven irresistible to many.

Writing in 2000 in a newsletter for journal editors, Amin and Mabe wrote that the "impact factor has moved in recent years from an obscure bibliometric indicator to become the chief quantitative measure of the quality of a journal, its research papers, the researchers who wrote those papers and even the institution they work in." It has become commonplace for journals to issue absurd announcements touting their impact factors, like this one which was mailed around the world by World Scientific, the publisher of the *International Journal of Algebra and Computation*:

"IJAC's Impact Factor has improved from 0.414 in 2007 to 0.421 in 2008! Congratulations to the Editorial Board and contributors of IJAC." In this case, the 1.7% increase in the impact factor represents a single additional citation to one of the 145 articles published by the journal in the preceding two years. Hearty congratulations all around!

Because of the (misplaced) emphasis on impact factors, this measure has become a target at which journal editors and publishers aim. This has in turn led to another major source of problems with the factor. Goodhart's law warns us that "when a measure becomes a target, it ceases to be a good measure" (in the succinct formulation of Strathern).



This is precisely the case for impact factors. Their limited utility has been further compromised by *impact factor manipulation*, the engineering of this supposed measure of journal quality, in ways that increase the measure, but do not add to indeed subtract from journal quality.

Impact factor manipulation can take numerous forms. In a 2007 essay on the deleterious effects of impact factor manipulation, Macdonald and Kam noted wryly that “the canny editor cultivates a cadre of regulars who can be relied upon to boost the measured quality of the journal by citing themselves and each other shamelessly.” There have also been widespread complaints by authors of manuscripts under review, who were asked or required by editors to cite other papers from the journal; given the dependence of the author on the editor's decision for *Douglas N. Arnold is McKnight Presidential Professor of Mathematics at the University of Minnesota and president of the Society for Industrial and Applied Mathematics. Kristine K. Fowler is mathematics librarian at the University of Minnesota. The authors gratefully acknowledge the assistant of Susan K. Lowry, who developed and supported the database used in this study and Molly T. White who assisted with the data collection.* Publication, this practice borders on extortion, even when posed as a suggestion. In most cases, including the one studied below, one can only guess about the presence of such pressures, but overt instances were reported already in 2005 by Monastersky in the *Chronicle of Higher Education* and Begley in the *Wall Street Journal*. A third well established technique by which editors raise their journals' impact factors, is by publishing review items with large numbers of citations to the journal. For example, the Editor-in-Chief of the *Journal of Gerontology A* made a practice of authoring and publishing a review article every January focusing on the preceding two years; in 2004, 195 of the 277 references were to the *Journal of Gerontology A*. Though the distortions these unscientific practices wreak upon the scientific literature have raised occasional alarms, many suppose that they either have minimal effect or are so easily detectable they can be disregarded. A counterexample should confirm the need for alarm.

## 2.) The case of IJNSNS

The field of applied mathematics provides an illuminating case in which we can study such impact factor manipulation. For the last several years, the *International Journal of Nonlinear Science and Numerical Simulations (IJNSNS)* has dominated the impact factor charts in the “Mathematics, Applied” category. It took first place in each year 2006, 2007, 2008, and 2009, generally by a wide margin, and came in second in 2005. However, as we shall see, a more careful look indicates that IJNSNS is a minor journal, nowhere near the top of its field. Thus we set out to understand the origin of its large impact factor.

In 2008, the year we shall consider in most detail, IJNSNS had an impact factor of 8.91, easily the highest among the 175 journals in the applied math category in ISI's *Journal Citation Reports (JCR)*. As controls, we will also look at the two journals in the category with the second and third highest impact factors, *Communications on Pure and Applied Mathematics (CPAM)*, and *SIAM Review (SIREV)*, with 2008 impact factors of 3.69 and 2.80, respectively. CPAM is closely associated with the prestigious *Courant Institute of Mathematical Sciences*, one of the top applied math institutes in the world, and SIREV is the flagship journal of the *Society for Industrial and Applied Mathematics (SIAM)*, the leading applied math professional society. Both journals have a reputation for excellence.

Evaluation based on expert judgment is the best alternative to citation-based measures for journals. Though not without potential problems of its own, a careful rating by experts is likely to provide a much more accurate and holistic guide to journal quality than impact factor or similar metrics. In mathematics, as in many fields, researchers are widely in agreement about which are the best journals in their specialties. The *Australian Research Council* recently released such an evaluation, listing quality ratings for over 20,000 peer-reviewed journals across disciplines. The list was developed through an extensive review process involving learned academies (such as the *Australian Academy of Science*), disciplinary bodies (such as the *Australian Mathematical Society*), and many researchers and expert reviewers

([http://www.arc.gov.au/era/journal\\_list\\_dev.htm](http://www.arc.gov.au/era/journal_list_dev.htm)). This rating will be used in 2010 for the Excellence in Research Australia assessment initiative, and is referred to as the ERA 2010 Journal List. The assigned quality rating, which is intended to represent “the overall quality of the journal”, is one of four values:

- A\*: one of the best in its field or subfield
- A: very high quality
- B: solid, though not outstanding reputation
- C: does not meet the criteria of the higher tiers

The ERA list included all but five of the 175 journals assigned a 2008 impact factor by JCR in the category “Mathematics, Applied.” Figure 1 shows the impact factors for journals in each of the four rating tiers. We see that, as a proxy for expert opinion, the impact factor does rather poorly. There are many examples of journals with a higher impact factor than other journals which are one, two, and even three rating tiers higher. The red line is drawn so that 20% of the A\* journals are below it; it is notable that 51% of the A journals have an impact factor above that level, as do 23% of the B journals and even 17% of those in the C category. But the most extreme outlier is IJNSNS, which, despite its relatively astronomical impact factor, is not in the first or second, but rather third tier. The ERA rating assigned its highest score, A\*, to 25 journals. Most of the journals with the highest impact factors are here, including CPAM and SIREV, but of the top 10 journals by impact factor, two were assigned an A, and only IJNSNS was assigned a B. There were 53 A-rated journals, and 69 B-rated journals altogether. If IJNSNS were assumed to be the best of the B journals, there would be 78 journals with higher ERA ratings, while if it were the worst, its ranking would fall to 147. In short, the ERA ratings suggest that IJNSNS is not only not the top applied math journal, but its rank should be somewhere in the range 75-150. This remarkable mismatch between reputation and impact factor begs an explanation.

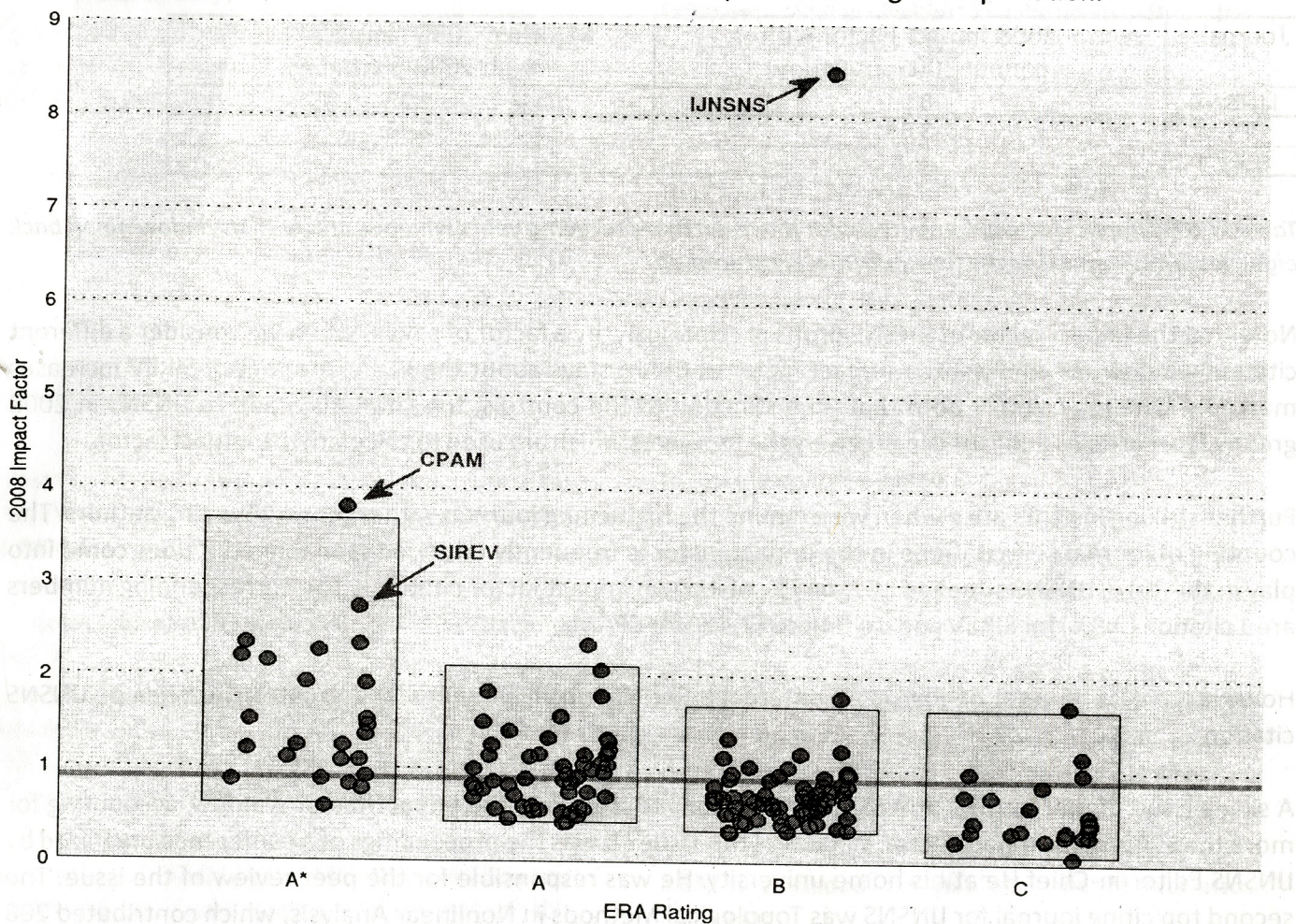


Figure 1: 2008 impact factors of 170 applied math journals grouped according to their 2010 ERA rating tier. In each tier, the band runs from the 2.5th to the 97.5th percentile, outlining the middle 95%. Horizontal position of the data points within tiers is assigned randomly to improve visibility. The red line is at the 20th percentile of the A\* tier.

### 3.) Makings of a high impact factor

A first step to understanding IJNSNS's high impact factor is to look at how many authors contributed substantially to the counted citations, and who they were. The top-citing author to IJNSNS in 2008 was the journal's Editor-in-Chief, Ji-Huan He, who cited the journal (within the two-year window) 243 times. The second top-citer, D.D.Ganji, with 114 cites, is also a member of the editorial board, as is the third, regional editor Mohamed El Naschie, with 58 cites. Together these three accounts for 29% of the citations counted towards the impact factor. For comparison, the top three citers to SIREV contributed only 7, 4, and 4 citations, respectively, accounting for less than 12% of the counted citations, and none of these authors is involved in editing the journal. For CPAM the top three citers (9, 8, and 8) contributed about 7% of the citations, and, again, were not on the editorial board.

Another significant phenomenon is the extent to which citations to IJNSNS are concentrated within the 2-year window used in the impact factor calculation. Our analysis of 2008 citations to articles published since 2000 shows that 16% of the citations to CPAM fell within that 2-year window, and only 8% of those to SIREV did; in contrast, 71.5% of the 2008 citations to IJNSNS fell within the 2-year window. In Table 1, we show the 2008 impact factors for the three journals, as well as a modified impact factor, which gives the average number of citations in 2008 to articles the journals published not in 2006 and 2007, but in the preceding six years. Since the cited half-life (the time it takes to generate half of all the eventual citations to an article) for applied mathematics is nearly 10 years, this measure is at least as reasonable as the impact factor. It is also independent, unlike JCR's 5-Year Impact Factor, as its time period does not overlap with that targeted by the impact factor.

Journal	2008 Impact Factor with normal 2006-7 window	Modified 2008 "impact factor" with 2000-5 window
IJNSNS	8.91	1.27
CPAM	3.69	3.46
SIREV	2.8	10.4

**Table 1: 2008 impact factors computed with the usual two-preceding years window, and with a window going back eight years but neglecting the two immediately preceding.**

Note that the impact factor of IJNSNS drops precipitously, by a factor of seven, when we consider a different citation window. By contrast the impact factor of CPAM stays about the same and that of SIREV increases markedly. One may simply note that, in distinction to the controls, the citations made to IJNSNS in 2008 greatly favor articles published in precisely the two years which are used to calculate the impact factor.

Further striking insights arise when we examine the high-citing journals rather than high-citing authors. The counting of journal self-citations in the impact factor is frequently criticized, and indeed it does come into play in this case. IJNSNS supplied 102, or 7%, of its own impact factor citations. The corresponding numbers are 1 citation (0.8%) for SIREV and 8 citations (2.4%) for CPAM.

However, it was Journal of Physics: Conference Series, which provided the greatest number of IJNSNS citations.

A single issue of that journal provided 294 citations to IJNSNS in the impact-factor window, accounting for more than 20% of its impact factor. What was this issue? It was the proceedings of a conference organized by IJNSNS Editor-in-Chief He at his home university. He was responsible for the peer review of the issue. The second top citing journal for IJNSNS was Topological Methods in Nonlinear Analysis, which contributed 206 citations (14%), again with all citations coming from a single issue. This was a special issue with Ji-Huan He as the guest editor; his co-editor, Lan Xu, is also on the IJNSNS editorial board. J.-H. He himself contributed a

brief article to the special issue, consisting of 3 pages of text and 30 references. Of these, 20 were citations to IJNSNS within the impact factor window. The remaining 10 consisted of 8 citations to He and 2 to Xu. Not a citation wasted!

Continuing down the list of IJNSNS high-citing journals, another similar circumstance comes to light: 50 citations from a single issue of the Journal of Polymer Engineering (which, like IJNSNS, is published by Freund), guest edited by the same pair Ji-Huan He and Lan Xu. However, third place is held by the journal Chaos, Solitons & Fractals, with 154 citations spread over numerous issues. These are again citations which may be viewed as subject to editorial influence or control. In 2008 Ji-Huan He served on the editorial board of CS&F, and its Editor-in-Chief was Mohamed El Naschie, who was also a co-editor of IJNSNS. The entire editorial board of CS&F was recently replaced after a highly-publicized self-citation/self-publication scandal, but El Naschie remains co-editor of IJNSNS.

Many other citations to IJNSNS came from papers published in journals for which He served as editor, such as Zeitschrift für Naturforschung A, which provided 40 citations; there are too many others to list here, since He serves in an editorial capacity on more than 20 journals (and has just been named Editor-in-Chief of four more journals from the newly-formed Asian Academic Publishers). Yet another source of citations which may be regarded as editorially influenced came from papers authored by IJNSNS editors other than He, which accounted for many more. All told, the aggregation of such editor-connected citations, which are time-consuming to detect, account for more than 70% of all the citations contributing to the IJNSNS impact factor.

#### **4.) Bibliometrics for individuals**

Just as for journals, bibliometrics for individuals, papers, and institutions can easily be manipulated. The special issue of Journal of Physics: Conference Series which He edited and which garnered 243 citations for his journal, also garnered 353 citations to He himself. No wonder, then, that He claims a total citation count of over 6,800 and an h-index of 39, and is viewed as a star researcher by those who make such judgments based on citations.

Thomson Reuters, producer of the impact factor, also produces Essential Science Indicators (ESI), with which, they claim "you can rank top countries, journals, scientists, papers, and institutions by field of research." Based on ESI, the Thomson Reuters ScienceWatch.com web site regularly features Ji-Huan He, who is surely the most prominent mathematician on the site. For example, in April 2008, they wrote:

*According to a recent analysis of Essential Science Indicators from Thomson Scientific, Professor Ji-Huan He has been named a Rising Star in the field of Computer Science. His citation record in this field includes 21 papers cited a total of 306 times between January 1, 1997 and December 31, 2007. He also has 25 papers cited a total of 881 times in Engineering, and 16 papers cited a total of 87 times in Materials Science. His citation record in the Web of Science® includes 137 papers cited a total of 3,193 times to date.*

Besides the designation of Rising Star in the field of Computer Science, in 2008 ScienceWatch.com cited He for a "New Hot Paper in Physics," a "Hot Paper in Mathematics," and a "Fast Breaking Paper in Engineering." Together with only a dozen other scientists in all fields of science he was cited for the "Hottest Research of 2007- 8" and again for the "Hottest Research of 2009." These citation-based designations share the impact factor's inherent problems and are likewise no substitute for an informed judgment of quality.

#### **5.) Closing thoughts**

Despite numerous flaws, the impact factor has been widely used as a measure of quality for journals, and even for papers and authors. This has created a strong incentive to manipulate it. As we have demonstrated,

it is possible to vastly increase impact factor without increasing journal quality at all. The actions of a few interested individuals can make a huge difference, yet require considerable digging to reveal. The cumulative result is that impact factor gives a very inaccurate view of journal quality. We primarily discussed one extreme example, but there is little reason to doubt that such techniques are being used to a lesser degree by many journals. While we are not able to estimate how many and to what effect, Figures 1 provides ample reason for concern.

The consequences of this unfortunate situation are great. Rewards are wrongly distributed, the scientific literature and enterprise are distorted, and cynicism about them grows. What is to be done? Just as for scientific research itself, the temptation to embrace simplicity when it seriously compromises accuracy, must be resisted. Scientists who give in to the temptation to suppress data or fiddle with statistics to draw a clearer point are censured. We must bring a similar level of integrity to the evaluation of research products. Administrators, funding agencies, librarians, and others needing such evaluations should just say no to simplistic solutions, and approach important decisions with thoughtfulness, wisdom, and expertise.

## **B.) THOUGHTS TO BE CONSIDERED, A COLLECTION OF SOME PROPOSALS AND ARGUMENTS**

1. "Journal Ranking is a really relevant issue and if IMU and ICIAM finally decide to create such ranking it could have enormous consequences in the world mathematical community. So IMU should be extremely careful."
2. "Scientific evaluation and journal pricing are key issues all over the world, but they are experienced and \*handled\* in different ways in different places. Whatever we come up with must be rather universal, if it is to be significant."
3. "I am very worried and I would find it very dangerous if IMU gets involved in one way or another in an "official ranking" of journals. Let me explain why: I certainly understand (and know) the pressure on large parts of our community to produce "fair and easy" evaluation criteria that could seemingly enable committees made of non-mathematicians to evaluate the quality of our work. But making such an explicit ranking would put IMU in the middle of an immense struggle (precisely because editorial work would mean "official power" of some sort) and conflicts of interests of all sorts that would inevitably have a very negative impact on IMU's federating and unifying role of all mathematics and mathematicians. For instance, journals are connotated with countries or geographic areas (the journal of this small country's math society) or research fields (journal of that relatively isolated research field etc.) or even persons (that person has been editing this journal during the last 30 years) and we would inevitably start mixing science with other more debatable criteria. Also, it would seem to give the IMU's blessing to the inflation of the importance given to publications (with respect to other activities) that is certainly not understood by all members of our community as the most efficient way for mathematics to move forward."

So, I cannot think of any other concrete option for IMU than to just reiterate the "general principles" on this issue that it has already expressed in the past -- but I am maybe lacking some imagination here. Note that the concern that I tried to express here mostly deals with the relation between the "institution IMU" and this ranking issue, not about the ranking, pricing and editorial questions themselves."

4. "We need to create a mechanism bottom-up. In the European Science Foundation, when a new Forward Look is started, the first step is to organize a small workshop inviting experts in the field in order to get inputs. I suggest to organize such a workshop (as a preparatory meeting) which could be organized by the members of the WG. I am thinking in 25-30 persons at most (experts from different

countries and the members of the WG). A second workshop could be organized in some months to present the first findings and suggestions of the WG, and get new inputs."

5. "Ranking of journals has been done in Brazil for over ten years and I believe other countries (Spain ?) have some experience as well. I don't think its more than ten year experience in ranking (and pricing) should be lightly overlooked. In some other places ranking was never deemed to be desirable, and that view would also be useful in this discussion. France is another country, among others, where views on many matters are often different from those in the "monde anglo-saxonique". It is certainly a good thing that the Working Group should seek advice from several people/institutions around the world. This matter is different, and far more delicate than the Citation Statistics study."
6. "I find some missing points in the Terms of Reference: - There are alternative ways to measure the impact of a paper, for instance the number of downloads of a paper. These measures are possible since the dramatic changes due to the use of electronic procedures.  
- Another important issue is the permanence of the electronic files; there are two different aspects here, one concerning the technological formats and, a second one concerning the commercial interest of the publishers (a publisher could decide by strategic reasons- to close a journal if it is no more interesting for them)."
7. "Concerning Arnold paper, my impression is that 2 or 5 years does not make difference for most of the journals. The case of IJNSNS is an exception and not the rule.  
The problem here has been the lack of international reaction, we don't have appropriate mechanics to fight against these misuses."
8. "I read Mueller's proposal, but I think that the plan to combine arXiv and usual journals is just covered by organizations like AMS, SIAM, AIMS, LMS, EMS,...  
Fortunately a large part of the mathematical journals are edited by mathematical societies and universities."
9. A message from the "High Impact Universities Team": "We write to you in recognition of your status as one of world's eminent researchers in your field, as indicated by your inclusion on the very elite ISI list of highly cited people.  
The reason for our communication is to advise you of the launch of a new initiative to gauge the world's high impact universities and to seek your comments in this regard.  
Our study has benchmarked over 1000 universities and 5000 faculties worldwide, and has published the results online. Publication and citation data used in our survey has been obtained from the Scopus database. This study has been performed by our small group which is based in Australia. Our intention with this project is to promote a move towards simplicity, transparency and fairness, at least compared to some of the more well known and recently publicized methodologies, in these inevitable assessments.  
We invite you to visit the web page at [www.highimpactuniversities.com](http://www.highimpactuniversities.com) and browse the results for both the faculties and universities.  
Should have any comments or feedback at all, please write to us at [feedback@highimpactuniversities.com](mailto:feedback@highimpactuniversities.com) as any responses that you give will be much appreciated.  
Please also feel free to circulate this email to staff, colleagues or anyone who you think may be interested.

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## Terms of Reference approved by the ICIAM/IMU leadership on October 19, 2010

### D.) Round Table: The Use of Metrics in Evaluating Research

*Transcription by J.M. Ball, Mathematical Institute, University of Oxford*

The use of metrics for evaluating research is a hotly debated issue. The IMU/ICIAM/IMS report on Citation Statistics [1] highlighted the dangers of uncritical use of impact factors, which play an increasing role in funding, promotions and library purchases. Are impact factors and other such indices good measures of journal quality, and should they be used to evaluate research and individuals? What can be done about unethical practices like impact factor manipulation? Is there a role for metrics in evaluating research? Are there better alternatives?

These were the topics of discussion at the ICM 2010 Round Table on Thursday, 26 August, between 6 and 8 p.m. It was chaired by John Ball, and organized by IMU's Committee on Electronic Information and Communication (CEIC).

This record of the Round Table consists of edited and shortened versions of the presentations by the panellists, together with excerpts from some of the contributions by participants in the discussion.

A complete video is available at the IMU website <http://www.mathunion.org/publications/historic-material>.

## 1. Introduction of the panellists

*John Ball.* Good evening. I'm substituting for the IMU President, László Lovász, who is actually here but has some problem with his eyes that make it difficult to be in front of bright lights. This round table is a sequel to the 2008 Citation Statistics Report, which was a joint report of the International Mathematical Union, the International Council for Industrial and Applied Mathematics and the Institute of Mathematical Statistics. The writing group for that report was chaired by John Ewing, who was then Executive Director of the American Mathematical Society. This report had a very good reception and it drew attention to the dangers of uncritical use of the impact factor as a statistical measure of journal quality. We have a very interesting panel:

**Doug Arnold** is Professor of Mathematics at the University of Minnesota in Minneapolis and currently is President of SIAM.

**Malcolm MacCallum** is the Director of the Heilbronn Institute at the University of Bristol, and was a consultant on the United Kingdom Research Excellence Framework, which is going to be the next evaluation of research in the UK.

**José Antonio de la Peña** was Director of the Mathematical Institute at the National University of Mexico and is a former President of UMALCA, the Mathematical Union of Latin America and the Caribbean, and he is currently Deputy General Director for Science at the National Council for Science and Technology, Mexico.

**Frank Pacard** is Professor of Mathematics at the Université Paris Est-Creteil, and is Scientific Advisor of Mathematics in the French Ministry of Higher Education and Research.

## 2. Presentations by the panellists.

*Doug Arnold.* I will focus mostly on one research metric: the Impact Factor (IF), which is simply the average number of citations made in a given year to a journal's papers from the preceding two years. It is intended as an easily used journal quality measure, but, as I will demonstrate, it is fatally flawed.

The Citations Statistics report found many failings in the IF design as a proxy for journal quality, but I am going to focus on something else: Goodhart's law and IF manipulation. Goodhart's law states that: 'When a measure becomes a target, it ceases to be a good measure'. An example used in economics is that if a nail factory in a centralized economy is judged on the number of nails produced, pretty soon they will figure out they should make lots and lots of tiny nails. If it is judged on the weight of the output, they will start making very big nails. The metric ceases to be an accurate proxy for the more complex attribute, say productivity, which was intended.

How do people manipulate the IF? One way was demonstrated by an editor of *Journal of Gerontology A*. Every January, he would write a review article citing all the articles of the preceding two years, and so acquire 200 impact factor citations, more than most math journals get altogether.

Another approach is that 'the editor cultivates a cadre of regulars, who can be relied upon to cite themselves and cite the journal shamelessly'. Such a bargain between authors and editors is difficult to detect. Citation pressure on authors is usually as well, but the editors of the *Balkan Journal of Geometry and Applications* put



it in their instructions to authors: '[it] is advisable for each accepted paper to contain citations to articles published during 2006-2008 in our journals'.

In order to determine to what extent such manipulation is actually damaging the IF, I compared it to expert opinion, for which I used a journal ranking carried out with broad and careful expert consultation as part of an Australian research assessment exercise. This study [2] demonstrates that many of the bottom class, B and C, journals have higher IF than a significant proportion of the journals that are judged by experts to be the best in their subfield. The grossest anomaly is The International Journal of Nonlinear Sciences and Numerical Simulations (IJNSNS), which has had the highest IF in all of applied mathematics by a large margin for the last four years running, although as a B-rated journal there are roughly a hundred journals in front of it according to the Australian rating. Working with librarian Kristine Fowler, I studied this case in detail.

Which authors gave IJNSNS all those citations? It turns out that 30% of the citations were from just three authors, and these were the Editor-in-Chief, who cited his own journal 243 times in the IF window, and two other editors. (For control we looked at high reputation journals in applied mathematics, and found it is rare to have more than a few citations come from a single author). As a second approach, I looked at the highest citing journals for IJNSNS. First place is a single issue of the Journal of Physics Conference series, which provided 294 citations. This was the proceedings of a conference that the IJNSNS Editor-in-Chief organised and controlled the peer review for. The next highest citer was a special issue of a different journal that was again organised by the Editor-in-Chief of IJNSNS. Similar issues arose with other highly citing journals, so that more than 70% of the citations were under the immediate control of the IJNSNS editorial board. A different sort of check is to look at the citations outside the IF window. With IJNSNS, 72% of their citations are in the two years that count for the IF and only 28% in all the other years. With SIAM Review, for example, it is the very opposite: only 8% fall in the IF window.

Although I have been mainly concerned with journals, the people who make the IF say their citation database 'can rank top countries, journals, scientists, papers and institutions'. Who do they think is the top mathematician? Ji-Huan He, the Editor-in-Chief of IJNSNS! He was named by them as a 'Rising Star' in Computer Science; he had a 'New Hot Paper' in Physics, another one in Mathematics; a 'Fast Breaking Paper' in Engineering. And then in 2007-2008, they named 13 scientists in all of science as 'Hottest Researchers of the Year', and he was the only mathematician, a performance he repeated the next year.

To conclude, there is little doubt that IF is highly flawed as an indicator of journal quality. I showed how a journal which is roughly number 100 in applied mathematics moved itself up to number one. There are certainly many other cases in which journals manipulate the IF more subtly, moving themselves up (and so moving more honest journals down) five or ten places. We cannot expect an easy formulaic fix. If we agree to judge quality by counting citations, Goodhart's law indicates that we will fail. However, there is a need, e.g. for library purchase decisions, for an easily consulted indicator of journal quality. The IMU and ICIAM have discussed this and taken a big step forward this month by resolving to develop a plan for a joint ICIAM/IMU method of rating journals, based on expert opinion. This has the potential of providing truly useful information to those who need it, while returning the process of judgement to us, the experts.

*Malcolm MacCallum.* I think a lot of the discussion is going to centre on impact factors and citation indices. I want first to draw your attention to the other sorts of metric used, in particular in the UK Research Assessment Exercise (RAE). It had three headings: 'Outputs', 'Environment' and 'Esteem'. 'Outputs', essentially papers, and 'Esteem' were assessed by peer judgement. In judging Environment, we had about 20 metrics presented to us, for example the number of Research Assistants per full time equivalent members of staff. There was no sane way to use them all.

Some of them were really input measures, and it is very hard to establish how effectively they had created

output or knowledge transfer. My own suspicion is that the less income you have, the better you use it. Some are outside institutional control. Some are historical: you may be very attracted to where, say, Hardy worked although Hardy died long ago. In fact, I think too many of them are self-perpetuating, rather than reacting to current research quality. Even if you accept them as valid, there are still various ways to use them. For example, in considering the total research income per person against the size of departments, do you reward the department that earned most or the one spectacularly effective with the number of people they have? Kenna and Berche [3] found that in almost all disciplines there is a critical size above which the research quality tails off. Unfortunately this isn't a very useful message for this assembly because while true for applied, it is not true for pure mathematics.

In the UK, they plan to replace 'Esteem' by 'Impact', meaning economic, social or cultural but not scientific impact. That has to do with why a government should fund research at all, which is a very fair question. But I think the specific way that they are intending to answer it is not the right one. The Royal Astronomical Society and the UK Institute of Physics, concluded 'we can't do it' and 'we don't think it's doable' Fabian [4].

Now I want to come back to bibliometric measures. There has been a lot of research on citation data, and the many problems it has, such as consistency, coverage, nationality and gender biases, indexing, 'obliteration', discipline size and citation practice etc. (see e.g. Blustin [5], and for fun [6]). In RAE we specifically did not use bibliometric data. But after I had read and assessed each paper, I looked up its citations. That caused me to change my opinion on only two or three of the 400 papers read. So citation information can be useful, but it has to be interpreted with a knowledge of the sociology of the discipline and an understanding of the mathematical content. For the Expert Advisory Group on the replacement for RAE, there was a pilot of looking at citations of individual papers. The resulting data was given to us to compare with our actual assessments. There was general agreement across all subjects that the bibliometric data could not have been used without some serious injustices.

As a journal editor I find impact factors a useful measure of how we are doing against the competition. But I do not believe one can judge a paper by where it appears: thus I do not agree with Professor Arnold's proposals. In summary, I have two messages.

1. **To bureaucrats:** no metric is safe for use without human interpretation. You have to be very careful to realise that correlation does not imply causation. One of my colleagues claimed that the UK ranking of institutions was very tightly correlated with the number of gardeners they employed!
2. **To those entirely opposed to metrics:** they can be a useful sanity check, providing you don't try to use too many or make them too complex.

*Frank Pacard.* I wanted to say something about the situation in France concerning the use of citations and metrics to evaluate mathematical research, either by the government or by the universities. First of all, there have been some changes in the French higher education and research system and, to understand how citations and metrics are used, it is very important to understand how the money supporting research is now distributed. In France almost all the money for mathematics comes from the Ministry of Higher Education and Research but it travels through many different channels before it reaches mathematicians. As far as the assessment of research is concerned, the government has created some evaluation agency to this effect. So far, the evaluations from this agency are not based on the use of metrics and complicated impact factors, there is though a definition of an 'active researcher' which depends on the number of publications. Therefore, everything seems to be going smoothly in France with a very limited use of statistics in the assessment of research.

However, looking closer you find that there is also an institution whose work is to provide statistics based on

the number of publications and citation. Even though these statistics are not used officially to evaluate a research department, they are becoming more and more popular to measure for example the strength, weakness and evolution of the different fields in a given part of France (for example, all sciences in the south west of France). These data are also available to all actors of the research system. These statistics can be very precise and can cover very different scales : at a scale of a whole country up to the scale of a research department.

For example, in my own university, statistics about the number of publications of the mathematics department (which is a small department) are received and, as you can imagine, interpretation of the data can be rather controversial at such a small scale. French universities are now autonomous and have more freedom in their scientific policy. In particular, to some extent, they can decide to give more support to department A rather than to department B and the government does not provide them with any guide on how to distribute the money among departments. As a consequence, there is more and more pressure to make use of metrics in order to distribute the money as best as possible, using possibly some very complicated mathematical formula.

Even though French mathematics is very strong, it is fair to say it only corresponds to a very tiny subset of the French research system. What is true at a national level is also true at the level of a university where mathematics departments are now in direct competition with other departments of other sciences whose weights are much bigger and for which the use of metrics seems more natural.

This is where I see that there is some danger for mathematics in France. My experience shows that there is a strong temptation to use metrics not necessarily coming from the top of the research evaluation system but also coming from the bottom of the evaluation system, because metrics are a rather quick and convenient way to compare people or departments from different fields!

On the other hand, the use of metrics at a large scale (say the scale of a country like France) is probably worth considering and, carefully analysed and complemented, can give some interesting insight on the strength and weaknesses of a given field. For example, the relative share of publications of French mathematicians in the world has decreased over the past years slightly faster than expected.

This is an interesting piece of information but unfortunately, since there is no further analysis of this information, it might be improperly used. Also, people in charge of building the statistics based on publications are well aware that some indices used are not adapted to mathematics (for example, the number of citations in the two years after publication is not very meaningful in mathematics) and they would be very interested in having some more meaningful formula.

To conclude, I would say that the situation concerning the use of metrics in France is still not completely clear. There is some pressure to use them and we have to be very careful in the next years to protect ourselves from improper intensive use.

José Antonio de la Peña. Citation indices, originally designed for information retrieval purposes, are increasingly used for research evaluation. The concern that the consideration of these indices is distorting the evaluation of the individual work has passed, in the last few years, from corridors to main stream journals.

In the developed countries, at least since the second half of the 20th century, science is accepted as a social, cultural and economic asset. Although the relevance of scientific work has been evaluated from decades back, current evaluation practices have a recent history that respond not only to academic needs, but to conceptual changes of political, economic and social character.

In evaluating scientific work, the criteria used are expected to have universal validity (as much geographic, as thematically), to be objective, to be simple to measure and to determine, as far as possible, the quality of the work. The criteria used so far show many limitations and misinterpretations.

Notably, the use of impact factor of journals as a measure of the quality of the science published and, still worse, the quality of the individual papers published in those journals, is an extended practice without a solid support. Even Eugene Garfield has warned against some abuses: 'It is absurd to make comparisons between specialist journals and multi-disciplinary general journals like Nature'.

To check the evaluation practices in Latin American countries, we asked friends from Argentina, Brazil, Colombia, Chile, Mexico and Venezuela. Here I quote just a few answers to illustrate the discussion:

*Q1. Are indices (such as number of papers, number of citations, impact factor of journals, h-number, etc) used for the evaluation of mathematicians in your country? If yes, which indices are preferred?*

Chile: In general no. Up to now the committees of mathematics agree on the quality of the journals to evaluate the research projects or CV. Sometimes they use, as complementary information in the analysis, some citation indices.

Colombia: In the public universities, the salary of the professors depends on the numbers of papers.

Venezuela: Yes, in some cases. At research institutions, the tendency is to use all those indices to evaluate researchers, but not so much at universities.

*Q2. Who promotes the use of these indices (the administration, scientists in general, mathematicians in particular)?*

**Everybody:** the administration, in first place; scientists of other fields, as second.

*Q3. Is it considered that the use of indices provides a more: efficient, scientific, fair, objective way of evaluation? Who thinks so?*

Most: I guess that some groups of scientists look for efficiency and some kind of 'fairness'.

*Q4. In your opinion, what is the effect of the use of these indices?*

Most: I believe they do add value to the evaluation, if used carefully and in combination with other parameters.

**Argentina:** the use of indices is helpful to discriminate between real scientists and those who pretend to do scientific work but have no impact whatsoever.

**Chile:** I do not know the effect for all areas, perhaps in some of them the systematic use of indices could be useful (but, at the end the prevalence of indices would mean that the work of specialists is not necessary). A systematic use of indices in mathematics will constitute a big catastrophe for its development (an enormous deformation that could affect quality for a long time).

*Q5. Could you give an idea of the general feeling of dissatisfaction concerning evaluation among the scientists (in particular, mathematicians) in your country?*

**Brazil:** The general feeling is actually very positive, among mathematicians and among scientists in general. This is perhaps because the scientific community itself is directly in charge of the evaluation.

Chile: People that have been part of the local evaluation committees say that there is mutual dissatisfaction between mathematicians and other groups of scientists.

Comparing the use of impact factors to measure quality of research with the story of the measuring human intelligence by means of the IQ, we point out the misunderstanding of thinking that a person is intelligent

because they have a high IQ. Similarly, we are pushed to believe that a scientific paper is good because it is published in a journal of high impact factor. This is my last argument: I would call it the mismeasure of science, to keep the parallelism with the situation described by Stephen Jay Gould. It is a complete misconception to transfer the value, whatever the impact factor measures, from journals to articles. It should be made in the converse way; after all, a journal is not more than a collection of papers. The only meaningful definition for the impact factor of a journal is the mean value of the impact factor of the papers it publishes. If this is so, it is the impact of a scientific article which should be discussed: is it possible to give a sound definition?

### 3. General Discussion

*Doug Arnold.* While we're waiting for someone to pluck up their courage, let me respond to just one misimpression which may have arisen from Malcolm's talk. He said one cannot judge a paper by where it appears and for that reason didn't like my proposal. So I want to make clear that I agree 100% with Malcolm that one cannot and should not judge a paper by where it appears. In fact in some cases it might be wise to choose a lower impact journal for an excellent paper, for example to help strengthen the journal. My proposal to rate journals is in no way aimed at judging individual papers, and any report that comes out of it would clearly state that. It is a way to get a sense of a quality of a journal for reasons like library purchase decisions, helping the editorial board to know how their work is going and so forth.

*George Andrews, Penn State University, USA.* I'd like to ask Prof MacCallum, since you say you do not accept Doug Arnold's proposals, I wonder if you are not disturbed by, not the manipulations and outliers, that were in the graph, but the discrepancy that he described between the top level journals, as people assess them, having a lower impact factor than really badly ranked journals. Any solution is going to have problems, but aren't the problems mitigated somewhat by Doug's proposal?

*Malcolm MacCallum.* I think that there are certain problems that would be mitigated but what worries me are the ways in which this is likely to be used, and the degree to which it seems to be going along with the idea that you can make judgements by where something appears. I think we should simply be opposing use of data on journals for this kind of purpose. What was shown in the comparison you refer to doesn't surprise me because different journals appeal to different sub communities or accept papers with a different kind of angle or approach.

*Doug Arnold.* So I just want to repeat again that there was never any suggestion that one should use the journal quality, no matter how carefully measured and determined, as a way to rate papers, or what you call products of research. I know you have been very involved with rating products of research and you may think that is what this proposal is for. The proposal is to rate roughly, to give a rough idea of what we all know as mathematicians, to put down what we all know about the quality of journals.

Why do we want to do this? We want to do this, for instance, because people must make a decision on which journal their libraries are going to subscribe to. If they don't have enough local expertise in the area then the library must make a decision based on data. Right now they are making such decisions based on seriously flawed data, and we were hoping to replace that with reasonable data which reflects the expert opinions of the people who look carefully at the journals. You can say that people might misuse that, but in fact people are misusing a highly flawed database. We can create one that is less flawed and with clear instructions of what it can be used for and what its limitations are. The fact that somebody might refuse to honor those or do something foolish, is not a reason not to do anything, particularly because what is being done now is much worse.

*Lászlo Lovász, Budapest, Hungary.* So first of all thank you, John, for being out there instead of me.

The second remark is that I am a bit envious of Prof Arnold that he lives in a country where it's still the librarians who decide which journal to subscribe to; in many countries it is by bulk subscription by some government agency for all universities in that country, especially for the electronic versions.

This is a situation which is a separate question but I just wanted to mention that this is also a very serious concern as far as I can see. My second remark is that I like very much Malcolm's remarks, essentially that the peer review system and numerical data should complement each other. In case there is a discrepancy then it should probably be more carefully looked at. We all know examples where the numerical data gives an entirely false impression, but I have also seen the peer review system run amok, with somebody who was by personality not so well liked or had one enemy in the system, and it has produced very strange results. So I think in that case numerical data should have corrected the procedure at some point. So I think the question to look at is which numerical data and how can we use it? Now I am talking about evaluating people not about evaluating journals, these are two different issues.

*R. C. Cowsik, Mumbai, India.* In India we have journals which publish only to the writers of papers in that journal no other copies are ever sold. And we also have departments where everybody works in the same subject, a narrow part of mathematics. They quote each other so the citations would be large for them. We have a journal called Annals of Mathematics, India, and India is in small print!

*Daya-Nand Verma, formerly at TIFR, Mumbai, India.* My question to the entire panel is, isn't there some sort of a parallel between the life of research papers and life of individuals? Educationalists know that all children are not equal, in the same way as you have been pointing out that all research papers are not equal. So sometimes some research paper goes unnoticed, or maybe with very, very few exceptional references by a few people, and has not been referred to for 40 years, 100 years perhaps.

Is there a way of devising a system which can pick up these exceptional, high calibre youngsters, so by that I mean the exceptional papers which go unnoticed, just as many high calibre children go not only unnoticed but get punished by the system.

*Malcolm MacCallum.* As mathematicians we like to have absolute objective truth. One area where there will not be an objective truth is in assessment of papers. It is a human activity and we're inevitably going to make mistakes. I don't think we can do anything but accept that and try to minimise its extent.

*Doug Arnold.* I would add that I certainly agree with what Malcolm just said. The most we can do is try to be careful when it comes to assessing and the way you assess a paper is to read it. Counting the citations, no matter how carefully you count them, is not very helpful. You brought up the very good point that great papers in mathematics often go uncited for a long period. One of the wonderful facts about mathematics is you often see papers that are very highly cited many years after they are written. And another point is that citations come from all sorts of reasons. If a paper has a mistake and there are criticisms and retractions published, those cite the paper and boost its quality according to a foolish, citation-counting viewpoint.

*Malcolm MacCallum.* In fact I would say if you really want to be highly cited quickly the best way to do it is to write a paper that is just subtly wrong, so that lots of people pitch in to tell you why.

*Garth Dales, Leeds, U.K.* I would like to ask about possible political action, perhaps particularly addressed to Prof Arnold. I share your doubt about citation indices and I entirely agree that they are seriously flawed, but I see a lot of use in them, and it seems that the IMU and mathematicians don't like this and they are inclined to try to protest against this or do something. But I regret to say that political realities are that mathematicians are a small group in the overall scheme of things, and my experience is that however cogent and powerful our arguments are that impress us, they have very limited impact on our government and agencies and so on. And I wonder what your assessment is. It seems to be that the only possibility of changing the culture in this particular respect is to find allies in the much bigger subjects of engineering, biology, physics and chemistry. Unless we have allies and friends in these subject areas, we'll have no impact whatsoever on the governments and agencies, or in particular private publishers that make money out of publishing these statistics. So what is your assessment of our chances of finding allies among these subject areas?

*Doug Arnold.* Well I think that's a very good point and one that has to be raised and thought about quite a lot. I'll make a couple of comments. First of all my comments are limited to impact factor as a journal quality proxy. I am not taking on the bigger question of an individual or departments.

If we limit ourselves to pointing out, as many have pointed out, and many will continue to point out, that impact factor is highly flawed, we will go unheard. That has already been done and is basically a proven proposition. It is not only mathematicians who are complaining about this. Many, many groups are complaining about it. I feel that because we are a fairly small community with a great devotion to our literature and some coherence that by providing an alternative we have a realistic chance to say: 'Well you know there is an alternative that you can use instead. It is much, much better but just as easy to use. It has the imprimatur of the major math organisations in the world and there is all this evidence that it is better.'

This won't be used for comparing mathematics journals to say geophysics journals, which is meaningless, but for the purposes where you need to make an evaluation and judgement on journals of mathematics. I think this has a chance to come about. I think there is a possibility that people will say 'you know these mathematicians have some integrity and they really are doing this right, and maybe we should see about doing something like this.' As far as building up allies, recently I travelled to Singapore, to the World Conference on Research Integrity. They were 350 delegates including people from ministries of science and so forth. Out of the 350 delegates only I was a mathematician. I spoke a little bit about this proposal and I saw lots of allies and got lots of support. People are actually looking forward to seeing what we are going to be able to do in this area.

*José Antonio de la Peña.* Well I think it's important that mathematicians take a position with respect to the indices, and maybe propose new ways to measure the impact of journals. But even what is done now, which is very bad, very flawed for mathematics, like measuring the impact factor of journal using this two years window which is completely no significant for mathematics, could be changed. For example, why not calculate the impact factors not using the two years window but using the full history of the journal? Just simply that. That can be much more significant for all sciences: why is this not done? I had an opportunity to speak with some high-ranking person from Thomson Reuters and the answer was 'of course we calculate this, we don't publish these results but we do calculate them'. So this means there is a completely different agenda, there's a hidden agenda why they calculate the indices in this way: maybe it is an economic agenda.

*Chandan Dalawat, Harish-Chandra Research Institute, Allahabad, India.* I just want to know if this new measure or classification on the quality of journal that's been proposed, has it actually been tested and could we look at the results that it gives?

*Doug Arnold.* No. The situation is the following. First of all, I am the President of SIAM which publishes these journals, so it is not my place to personally set down the mechanics of rating the journals. The proposal, which is brand new, just passed by the IMU General Assembly, is to establish a committee to try to design the best possible system, and then consider the question of how difficult it will be to implement. I can just give you just a rough idea of at least what I have in mind, although other people may well change this. This is something akin to the program committee and panels that chose the invited speakers of this congress. That is many people, between 100 or 200, that were carefully chosen to cover many areas of mathematics. There will be a fairly small number of rating tiers, a few tiers or, perhaps, a matrix with separate tiers for journals that are tightly concentrated on one sub discipline and broad journals, and so forth. Then these experts would review the journals and try to determine where they place them. Maybe there would be a time for public comment.

There would be some rule against conflict of interest. Once they present the results, we will get the opportunity to test them. They will need to be renewed every 4 years or something like that. That's what I have in mind.

*John Ball.* To amplify that a bit, the committee would consider what would be the best way to create such a ranking system, then decide whether to implement that system, and in particular consider some of the issues surrounding such a system, maybe legal implications, whether there would be the involvement from the community to sustain such a system, and what the knock on affect of such a system would be.

*Zhiming Ma, China.* Several years ago in China this problem was really very serious. For example in China if you apply for a promotion or for a prize you have to submit a document with citations.

You maybe have to pay money to an agency or a library and then the agency (library) will type the citations, and then you submit it. This was several years ago; now the situation is getting better because many people complained about this. In China we mathematicians say that maybe people in other disciplines such as biologists will use this but for mathematics it's not the case. We always ask the agencies or government to distinguish between subjects, so in this way we get some improvement.

Now in China (at least in CAS) when mathematicians apply for a promotion or a prize, we will not follow the general rule of metrics. In this sense we are improving.

*Martin Grötschel, Berlin, Germany.* Somebody said before that we have no influence. This is absolutely not true; I think mathematicians are heard. Here is an example. The 2002 IMU General Assembly endorsed a document about best practices of journal publishing, advice to authors and so on, and open access in particular. This document was taken up in 2003 by the Max-Planck-Gesellschaft in Germany, Germany's top research organisation. MPG and other institutions finally formulated what was then called the 'Berlin Declaration' on open access. IMU's influence was clearly visible in this activity. Hundreds of research organisations worldwide signed this declaration, and mathematicians were the forerunners of this effort.

One can come up with many ways of classifying journals. Of course, targets have to be formulated together with reasons why we want to classify, why we want to sort journals, or people, or departments by quality. Even if we have reasonable arguments for the organization of the system of our journals, we must not only provide information about scientific quality but also about the way authors are handled, the turnover times and all the things that are important for journal publishing. Making available a broad spectrum of relevant information may be an alternative to just addressing the current crude measurements.

The panel addressed totally different targets, for example, whether we rank a paper, a journal, a department, or an individual, or how we compare mathematics to other sciences. We can't handle all these issues in the same way. I personally think that we mathematicians have to simply declare how we would like us and our work be judged; we then have to discuss the evaluation system with our peers in science and in administration. After that we can negotiate with them the way we are in fact judged. Most of the ideas presented here today are good, and our task is to find a reasonable combination of these measurements. My main field is optimisation and what we see in front of us is a multi-objective optimisation problem. There is something like a Pareto set that we have to target for, and which point on the Pareto curve is chosen will depend on local circumstances. We should simply be aware of this fact and spell it out.

Something I was really puzzling about is one of Frank Pacard's arguments. Everyone is happy about being free to make decisions. Now the French government seems to give financial support to the universities and the freedom to distribute it. I think that everywhere in the world you would be happy to have such a situation: you just have to elect a good president and good deans. They ought to have good insight and will determine who is doing good research. Do you really want the bureaucracy to give rules? I think it is better to have good people with good judgement distributing the money.

*Frank Pacard.* I agree with you, but in France we are passing from a system in which everything was decided at the top to a system in which a lot is decided at a local level. This takes time. Assessment of research is not an easy thing to do at the level of a university. Also, I think that the importance of the use of metrics really



