ICIAM

The ICIAM Dianoia
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The ICIAM newsletter was created to express the interests of our membership and partner organizations and the views expressed in this Newsletter are those of the authors and do not necessarily represent those of ICIAM or the Editorial team. We welcome articles and letters from members and associations, both announcing events, on-site reports from events and industry news. www.iciam.org

Cover illustration: detail from sculpture in lobby of the Mathematics Tower at The Ohio State University, site of the ICIAM Board meeting in May 2014.

Subscribing to the ICIAM Newsletter

The ICIAM Newsletter appears quarterly, in electronic form, in January, April, July and October. Issues are posted on the ICIAM Web Page at www.iciam.org/News. If you would like to be notified by e-mail when a new issue is available, please subscribe to the Newsletter. There is no charge for subscriptions. To subscribe or unsubscribe, visit the webpage given above, or go directly to groups.google.com/group/iciam-news.

By-Law Amendment Adopted

At its May 2013 meeting, the ICIAM Board voted to approve an important amendment to the by-laws. This amendment changes the voting structure of member societies so that the number of votes that any member society may cast is proportional to the dues assessment of that society. In particular, small societies and small associate societies, which had no vote formerly, now have a vote as well as a voice in ICIAM decisions. This is spelled out in Section 3 of the amended bylaws (see www.iciam.org/ByLaws/iciamBylaws.pdf).

The same bylaws (see Section 7) also provide a three-month period following the Board's approval in which member societies may register objections to the voting procedures at the Board meeting. ICIAM is pleased to announce that during that period, which ended August 11, 2013, no objections were voiced, and so the new structure is now approved.

Congratulations, new voters. We hope you will attend Board meetings and exercise your franchise.

International CAE Conference 2013

by Silvia Poles and Giovanni Borzi

The 29th edition of the CAE Conference was held on 21-22 October in Pacengo del Garda, Verona, Italy. This international conference, dedicated to computer-aided engineering (CAE) is the most important event in Italy and one of the most important in Europe on numerical simulation techniques. Once again, the International CAE Conference broke all records with over 900 attendees coming from all around the world to hear talks illustrating the application of software to engineering, mathematical modelling and science. All the attendees, the sponsors and the speakers guaranteed that the event represented a wide range of technology, industry sector and software solutions.

The event was sponsored by EnginSoft and Ansys as Platinum Sponsors, with additional sponsorships coming from Esteco, AVL, Mentor Graphics, BETA CAE Systems, E4 Computer Engineering, HP, NVIDIA, CST, MAGNA, Torino Piemonte Aerospace and many others.

Maurizio Cheli was the special guest speaker in the plenary session of the CAE conference. Maurizio graduated in Aerospace Engineering from the University of Houston and has experience of more than 4,500 hours flight time and approximately 360 hours of space flight experience. In 1992 he was selected by the European Space Agency (ESA) and sent to NASA's Johnson Space Centre where in 1993 he became an astronaut. In 1996 he flew as STS-75 Mission Specialist aboard the Space Shuttle. The same year he joined Alenia Aeronautica and in 1998 he became Chief Test Pilot and worked in the development of the Eurofighter Typhoon. The importance of modelling and simulation in engineering design was put simply by Maurizio in his talk. Maurizio stressed the importance of computer simulation in aerospace and in a wide range of other applications. He discussed the difficulty of visualizing physical phenomena when gravity is missing and asked all engineers to do their best to contribute to re-

ducing the greenhouse gas emissions that are incredibly visible from space.

In addition to the main plenary session, the conference organized five parallel sessions with almost 100 presentations on different industrial applications: Aerospace and Defense, Civil Engineering, Biomechanical and Medical Devices, Energy and Oil & Gas, and Transportation. Particular attention was given to simulations of important structures (for example, bridges, underpasses of motorways, and football stadiums, such as that of the 2010 World Cup in Johannesburg) and to the study of the trajectories of submarine drones. Other talks were related to simulations of the common objects of our daily life, such as the refrigerator, bags for packing food or brakes of our car.

Besides the plenary and parallel sessions, the conference organized several workshops on different software technologies that ranged from finite element analysis (FEA) and computational fluid dynamics (CFD) to less common areas such as material design. Among the technologies presented at the conference, we can mention software such as ANSYS (Mechanical and CFD), Scilab, LS-DYNA, MAGMAsoft, FORGE, modeFRONTIER, and Flowmaster. There were full sessions dedicated to short-training courses or software updates (for example, CST and CETOL6σ), for which attendance was free for all delegates.

As had been the case last year, there was a space dedicated to the creativity of young engineers and scientists, graduate students, researchers and professors from both universities and research centers. EnginSoft promoted and sponsored the "CAE Poster Award", a special competition for students dedicated to the best studies highlighting novel and innovative CAE applications.

The "CAE Poster Award" is part of the EnginSoft CAE Cultural Promotion Program, conceived in order to improve the correct use of mathematical modelling, simulation tools, and to foster the growth of the CAE analysts' community. The best five posters were awarded a tablet.

A very special session was dedicated to Scilab and the use of open source software for computer simulations. Scilab is the open source alternative to MATLAB® and it also includes Xcos (as an alternative to Simulink®) which allows the modelling and simulation of hybrid dynamical systems, such as mechanical, hydraulic, and/or electronic systems. This session hosted attendees from all over Europe and India, from academia and industry, and the speakers presented talks concerning industrial and real-life applications of Scilab.

The Scilab session had the pleasure to host the Mathematical Desk for Italian Industry (sportellomatematico.it), whose mission is that of building a concrete bridge of common interests between the Italian scientific community of applied mathematics and the world of Italian enterprises, focused in particular on the development of industrial research projects, possibly in an international context of European networks. The main objective is to realize an effective and qualified intermediation role in the field of scientific and technological transfer, based on the role of mathematics in particular.

In the afternoon, the Openeering team (www.openeering.com) held a special workshop: the main themes concerned the latest Scilab version, and how Scilab can be used for making significant industrial applications. A topic that was of particular interest to the audience was the return on investment of using Scilab and the comparison with its equivalent commercial product. The workshop lasted for two hours and the attendees took an active part in the discussion, dissecting each topic. The Scilab workshop was also the setting for the official launch of the Scilab Black Belt Course that the Openeering team has carefully designed to cover the full spectrum of Scilab features, keeping it compact and enriching it with meaningful examples.

Silvia earned her masters degree in mathematics at the Padua University and then she completed a two-year master in "modelling and simulation complex realities" at the International School for Advanced Studies (SISSA) in Trieste. Her research interests cover the fields of multiobjective optimization, industrial optimization, multivariate analysis, approximation methodologies and decision making support.

Giovanni earned his masters degree in electronic engineering at the Politecnico di Milano: he has gained a wide experience in developing web applications, training and competencies management, project management and innovation management. He is a certified PMP (Project Manager Professional). In EnginSoft Giovanni is involved in project management and business development activities.

EU-MATHS-IN initiative to support applied and industrial mathematics

by Zdenek Strakos

As a follow-up of the initiative Forward look Mathematics in Industry supported by the European Science Foundation (www.esf.org/flooks), the promoting institutions European Mathematical Society (EMS, via its Applied Mathematics Committee) and European Consortium for Mathematics in Industry (ECMI) together with six national networks, AMIES (France), KoMSO (Germany), Math-In (Spain), Smith Institute (Great Britain), Sportello Matematico (Italy), and PWN (Nederland), founded on Nov. 26, 2013 in Amsterdam the **Stichting European Service Network of Mathematics for Industry and Innovation (EU-MATHS-IN)**.

As stated in the official press release issued on this occasion, mathematics has become a key enabling technology in all areas of science and applications. The development of new products or production processes today is dominated by the use of simulation and optimization methods that, based on detailed mathematical modeling, support or even replace the costly production of prototypes and classical trial-and-error approaches. The new organization EU-MATHS-IN has been established to increase the impact of mathematics on innovations in key technologies and to foster the development of new modeling, simulation and optimization tools. It aims to become a dedicated one-stop-shop and service unit to coordinate and facilitate the required exchanges in the field of application-driven mathematical research and its exploitation for innovations in industry, science and society. The Executive Committee is formed by: Mario Primicerio (President), Volker Mehrmann (Secretary), Wil Schilders (Treasurer), Maria J. Esteban (for the Applied Mathematics Committee of EMS), and Magnus Fontes (for ECMI).

The following day, Nov. 27, 2013, the Centre for Mathematics and Computer Science (CWI) in Amsterdam hosted the EU-MATHS-IN kick-off meeting attended by 46 participants from all over Europe and one host participant from Japan. The meeting was addressed by the EMS president Marta Sanz-Solé and by the ECMI representative Hilary Ockendon, with the initial contributions given by the board members Mario Primicerio, Volker Mehrmann, Wil Schilders and Maria J. Esteban. The main part of the kick-off meeting consisted of lively and stimulating discussions in which most of the attendees participated. As the outcome, action items were formulated together with establishing the seeds for the associated working groups.

The main focus of the discussions was on the way mathematics and mathematicians should interact with the potential areas of applications and with their partners in science, technology and industry. Without any doubt, mathematics affects, through many commonly used products and services, the everyday life of most people in the whole society. As examples, which are so common that they can be appreciated by all, one can just imagine how using mobile phones, security systems in bank operations and all kinds of transportation would look without the decisive contribution of mathematics and mathematical modeling. Despite this undisputed role, there seems to be a serious and rising concern about the support of mathematics in the EU (as well as in some national) programs supporting science. As a highly disturbing example, mathematics has not been officially considered a *Key Enabling Technology* (KET) in the official documents of the EU program HORIZON 2020, which has negatively affected the year 2014 calls published within this program. When this discrepancy, rooted in the lack of awareness of the role of mathematics, is pointed out, the situation is frequently evaluated by the policy makers as no problem. It is argued that mathematics is supposedly present in many projects, and the projects are to be focused as a rule not on the development of particular disciplines but on facing the emerging challenges in science, technology and society in general.

As discussed at the EU-MATHS-IN kick-off meeting in Amsterdam, such standpoint reflects substantial misunderstandings which need to be addressed in order to prevent rather serious negative consequences in the future. In particular,

- Mathematics cannot be, in general, properly applied without substantial involvement of mathematicians. Mathematical modelling and simulation of the truly challenging real world problems using the mathematics *conserved* in the form of the software packages *used as black boxes* represents a dangerous illusion which will backfire in the form of failures. Even worse, such failures may not be immediately observable. Progress in computing technology alone, no matter how many processors will be involved, is not going to resolve the principal challenges in mathematical modeling and simulation. It can serve as a great tool, but it cannot offer any methodological leadership. A progress in mathematically based methodology is needed as a strict requirement, and this cannot be achieved without the substantial involvement of mathematicians.

- Under the (false) assumption that the challenges which are identified *today* can be addressed by routine applications of the state-of-the-art mathematical results available, it may seem that further development of mathematics as a discipline is not a priority which can be justified by economically measured efficiency. As justified by repeated studies, just the opposite is true. Even more important, without such development, *how will the challenges which will emerge twenty years from now be solved*? Definitely not by black box routine applications of decades old mathematical results, petrified in the form of obsolete software.

Similar situations and the need for explanation of basic misunderstandings about the role of mathematics are reappearing in history again and again. Let us illustrate this by quoting two prominent scientists of the 19th and the 20th century. The first quote is from the lecture of Henri Poincaré given on the occasion of his being awarded the degree of doctor honoris causa by the Université Libre de Bruxelles in 1909 (see J. Mawhin, Notices of the AMS, Vol. 52, No. 9, pp. 1036-1043, 2005). It addresses the interaction of science and its applications, and although it may seem to push the point a bit to the extreme, its essence certainly remains universally valid in our times, characterized by the deadly pushing for an immediate economic profit, more than ever:

> The scientist must not dally in realizing practical aims. He no doubt will obtain them, but must obtain them in addition. He never must forget that the special object he is studying is only a part of this big whole, which must be the sole motive of his activity. Science has had marvelous applications, but a science that would only have applications in mind would not be science anymore, it would be only cookery.

One should recall that Poincaré, like very many other great mathematicians, graduated from École Polytechnique. If one has doubts about the validity of his view, then the best thing to do is to study the really big discoveries which moved science and technology large steps forward. Surely the everyday applied cookery is needed, it should be highly valued and supported. But without science as understood by Poincaré, *no cookery can survive more than a short period*.

The second quote comes from the lecture "*Why Mathematics?*" presented by Cornelius Lanczos in Dublin on the occasion of the Annual Meeting of the Irish Mathematical Association in 1966 (see C. Lanczos, Collected Published Papers with Commentaries, North Carolina State University, Raleigh, NC, 1998):

> There is no question that in view of the vastly expanded technology the applications of mathematics have multiplied. But the fields of applied mathematics remained in close contact with the traditional edifice, which is strong enough to serve as the basic superstructure.

Lanczos contributed towards many parts of mathematics as well as physics, and, with no bit of exaggeration, his methods (and the results of developments which are based on them) are used in very many industrial applications *every day*. It is also not without interest that he worked for several years in industry (for the Boeing Aircraft Company in Seattle).

The point is very clear. If the current policy in financing science does not allow for continued building-up of (using the words of Lanczos) the basic mathematical 'superstructure', i.e., if mathematics as a discipline will be severely restricted in its development due to the lack of funding, then *there will not be enough relevant applied mathematical tools ready to face the challenges which are going to be identified in all sorts of applications in the years to come*. Certainly, it is more than healthy (and in no contradiction with the standpoints of Poincaré and Lanczos) that the development of mathematics goes hand in hand with its applications.

A substantial involvement of mathematics and mathematicians in solving challenging application problems in industry and in society *now* will pay off not only through a possible intermediate economical profit, but, even more substantially, it will prepare the tools for *the future*. If such involvement remains limited, the price will be paid by all. The new initiative EU-MATHS-IN aims to contribute towards the positive scenario in several ways. For reaching its goals it is ready to collaborate with similarly focused institutions and initiatives worldwide, in particular with SIAM and ICIAM. The first steps for establishing and fostering such collaboration have already been done.

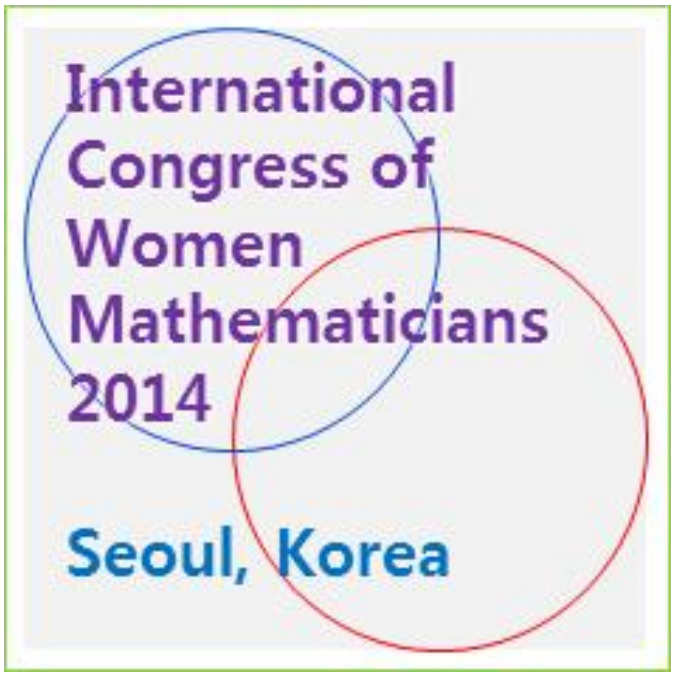
Zdenek Strakos is a Professor at the Charles University in Prague. He received his PhD and DSc in Computer Science and Mathematics from the Academy of Sciences of the Czech Republic. Besides holding various positions at his home country, he spent three years at Emory University, Atlanta. His main research interests include analysis of numerical methods, algebraic matrix computations, Krylov subspace methods and numerical stability. He is a member of the Applied Mathematics Committee of the EMS and of the Householder Committee.

International Congress of Women Mathematicians 2014 (ICWM2014)

ICWM2014 will take place in Seoul on August 12 and 14 2014. The purpose of the ICWM 2014 is to bring together women mathematicians and supporters of women in mathematical sciences from around the world to showcase the mathematical contributions of women, to exchange ideas about supporting and encouraging active careers for women in the mathematical sciences, and to provide opportunity for young women mathematicians to meet and talk with women in the mathematical sciences from around the world.

The ICWM 2014 meeting in Seoul will consist of two days of activities. On August 12, ICWM2014 will take place in Ewha Womans University, which is approximately one hour travel by subway or car from the COEX convention center where the ICM 2014 will be held. ICM2014 opens on August 13, with the ICM welcoming reception on August 12 (transportation will be provided). Hence the program of ICWM2014 on August 14 is partially integrated in that of ICM2014, and occurs at the same place, COEX. The second day of activities is scheduled from 1 pm to 9 pm on August 14th at the COEX convention center. The two-day program includes plenary lectures by distinguished mathematicians: Laura DeMarco, Isabel Dotti, Jaya Iyer, Motoko Kotani, Hee Oh, Gabriella Tarantello and Donna Testerman, a panel session "Mathematics and Women: different regions, similar struggles", a poster session on August 12, and the ICM Emmy Noether lecture by Georgia Benkart on August 14. The banquet is scheduled from 7 pm to 9 pm immediately following the 2014 Emmy Noether Lecture organized by the ICM.

Information and registration are at www.kwms.or.kr/icwm2014. The participation of young female mathematicians is greatly encouraged.



3rd International Conference on Dynamics, Games, and Science

Dates: February 17–21, 2014

Place: University of Porto (Portugal)

Website: www.fc.up.pt/dgsiii/

Description Following the 1st and 2nd International Conference on Dynamics, Games, and Science - DGS I 2008 and DGS II 2013, we invite the Academic Community including MSc and PhD students and researchers to participate and to present their research work.

The 3rd International Conference on Dynamics, Games, and Science 2014 - DGS III 2014 aims to bring together the world's leading researchers and practitioners from the fields of Dynamical Systems and Game Theory and their applications to such areas as Biology, Economics, and Social Sciences.

DGS III 2014 will feature prominent keynote speakers in the main room, with several thematic sessions running in parallel that will address issues related to the main theme of the conference. DGS III 2014 represents an opportunity for MSc and PhD students and researchers to meet other specialists in their fields of knowledge and to discuss and develop new frameworks and ideas to further improve knowledge and science.

The last edition took place last year in Lisbon (August, 28 - September, 6, 2013), and comprised around 20 keynote speakers and 30 thematic sessions, for a total of 130 thematic speakers: mpe2013.org/workshop

DGS III 2014 is supported by the International Mathematics Center CIM (www.cim.pt) and is a Mathematics of Planet Earth MPE event (mpe2013.org/meeting/).

Registration If you would like to participate, organize a thematic session, or present your research, please register at:
www.fc.up.pt/dgsiii/registration.html
Hope to see you at DGSIII!

Keynote Speakers

Albert Fisher (University of São Paulo, Brazil)*
Alberto Pinto (University of Porto, Portugal)
Athanassios Yannacopoulos (Athens University of Economics and Business, Greece)
Bruno Oliveira (INESC TEC, Portugal)
Carlos Aragão (UFRJ, Brazil)
Carlos Braumann (University of Evora, Portugal)
David Rand (University of Warwick, UK)
David Zilberman (University of California, USA)
Diogo Pinheiro (Brooklyn College, USA)
Elvio Accinelli (UASLP, Mexico)
Filipe Martins (INESC TEC, Portugal)
Frank Riedel (Bielefeld University, Germany)
Jérôme Renault (Université de Toulouse, France)
João Gama (University of Porto, Portugal)
João Paulo Almeida (INESC TEC, Portugal)
José Martins (INESC TEC, Portugal)
Mohamad Choubdar (University of Porto, Portugal)
Nico Stollenwerk (University of Lisbon, Portugal)
Nigel Borroughs (University of Warwick, UK)*
Onesimo Hernandez-Lerma (IPM, Mexico)
Penelope Hernandez (University of Valencia, Spain)
Rabah Amir (University of Arizona, USA)
Renato Soeiro (University of Porto, Portugal)
Ricardo Cruz (University of Porto, Portugal)
Robert MacKay (University of Warwick, UK)
Rolf Jeltsch (ETH Zurizh, Switzerland)
Saber Elaydi (Trinity University, USA)
Sebastian van Strien (Imperial College London, UK)
Tenreiro Machado (ISEP, Portugal)

*to be confirmed

Call for Satellite Conferences and Embedded Meetings

by Scientific Program Committee of ICIAM 2015

Satellite Conferences

A satellite conference is a meeting that takes place within a few weeks of ICIAM 2015 on a topic of interest to ICIAM attendees in a location that may be convenient for ICIAM participants to combine the events into a single trip. Satellite meetings have no official connection to ICIAM except an announcement on the ICIAM 2015 webpage.
ICIAM does not provide any financial or other support for satellite meetings. Satellite meetings are organized and run by independent organizations or groups.
If you are organizing or considering organizing a meeting that would qualify as a satellite meeting, please contact Prof. Jianhua GUO at jhguo@nenu.edu.cn as soon as possible with the following information:

- Name of meeting
- Estimated number of participants
- Location
- Dates
- Conference webpage (if available)

A notification of acceptance/rejection will be sent to the contributors within one month after submission.

Embedded Meetings

An embedded meeting is a meeting of some other organization that takes place during the week of the ICIAM Conference and that shares resources with the main ICIAM Conference. Participants of an embedded meeting will register as ICIAM2015 participants. Program of an embedded meeting will be organized as ICIAM2015 sessions.
If you are interested in organizing an embedded meeting, please contact Prof. Jianhua GUO at jhguo@nenu.edu.cn as soon as possible with the following information:

- Name of meeting
- Estimated number of participants
- Estimated number of speakers
- Conference webpage (if available)

A notification of acceptance/rejection will be sent to the contributors two months after submission.

For either type of meeting, please include other relevant information, such as scope or content of meeting, organizing society or affiliate. Please feel free to contact us with tentative information for meetings that are in the planning stage. This information may be useful to others planning related meetings.

ICIAM 2015

August 10-14, 2015
Beijing, China

Call for Mini-symposia, Industrial Mini-symposia, Contributed Papers, and Posters

You are invited to contribute a presentation for ICIAM 2015 in one of the following formats.

Mini-symposia

Each mini-symposium consists of at least four 25-minute presentations, with an additional five minutes for discussion after each presentation. In general, mini-symposia will be scheduled as four-presentation sessions. Multiple-session mini-symposia may be submitted. Preference will be given to mini-symposia that list all speakers and talk titles. Prospective mini-symposium organizers are asked to submit a proposal consisting of a title, a description (not to exceed 100 words), and a list of speakers and titles of their presentations.

It is recommended that a mini-symposium organizer gives the first presentation. Each mini-symposium speaker should submit an abstract of at most 75 words. All submitted mini-symposium proposals will be reviewed by the organizing committee.

Participants are normally limited to presenting two talks at most during ICIAM in order to maximize the opportunity for all participants to speak. If you are invited to speak in more than one mini-symposium, we suggest you use the opportunity to nominate a co-author to present your work.

To ensure balance, ICIAM prefers that a single individual will not be the organizer of more than one mini-symposium. In addition, ICIAM discourages mini-symposia in which most of the speakers come from the same organization or in which all co-authors of the papers being presented are from the same organization.

To encourage the submission of more and high quality mini-symposia, a limited number of mini-symposia will be selected by the organizing committee according to the number and diversity of speakers as well as the significance of the topics, and the registration fee of one speaker of these selected mini-symposia will be waived.

March 30, 2014: Mini-symposium online submission opens; August 30, 2014: Early decisions announced for mini-symposium proposals; September 30, 2014: Submission deadline for mini-symposium proposals; October 30, 2014: Final decisions announced for mini-symposiumn proposals; December 30, 2014: Submission deadline for accepted mini-symposium abstracts.

Industrial Mini-symposia

An industrial mini-symposium is the same as a mini-symposium in form. The subject must be relevant to industry, and there should be at least one speaker coming from industry.

Prospective industrial mini-symposium organizers are asked to submit a proposal consisting of a title, a description (not to exceed 200 words), and a list of speakers and titles of their presentations. Each industrial mini-symposium speaker should submit a 75-word abstract. All submitted industrial mini-symposium proposals will be reviewed by the organizing committee.

To encourage this format, the organizing committee will provide financial support to organizers of the accepted industrial mini-symposia.

March 30, 2014: Industrial mini-symposium online submission opens; August 30, 2014: Early decisions announced for industrial mini-symposium proposals; September 30, 2014: Submission deadline for industrial mini-symposium proposals; October 30, 2014: Final decisions announced for industrial mini-symposium proposals; December 30, 2014: Submission deadline for accepted industrial mini-symposium abstracts.

Contributed Paper

Contributed presentations in lecture format are invited in all areas consistent with the conference themes. A lecture format has a 15-minute oral presentation with an additional 5 minutes for discussion. Accepted lectures will be grouped into two-hour sessions based on the subjects of the lectures. Each contributor must submit a title and a brief abstract not to exceed 75 words.

July 30, 2014: Contributed papers online submission opens; October 30, 2014: Early decisions announced for accepted contributed speakers; December 30, 2014: Submission deadline for contributed paper abstracts; January 30, 2015: Final decisions announced for contributed lecture submissions.

Posters

Contributed presentations in poster format are invited in all areas consistent with the conference themes. A poster format consists of the use of non-electronic visual aids for mounting on a poster board of 120 cm height and 80 cm width. Each contributor must submit a title and a brief abstract not to exceed 75 words. A notification of acceptance/rejection will be sent to the contributors within one month after submission.

July 30, 2014: Poster online submission opens; April 30, 2015: Submission deadline for contributed poster abstracts.

Academic Publishing and the Challenge of Open Access

by Nicholas Kevlahan

The past two years have seen a remarkable revolution in academic publishing. This revolution was sparked on January 21, 2012 when University of Cambridge Fields Medalist Tim Gowers declared on his blog that he would "refuse to have anything to do with Elsevier journals from now on." This declaration led directly to the the "Cost of Knowledge" boycott that has attracted over 14,000 signatures (including 3914 mathematicians and computer scientists). It led indirectly to Elsevier withdrawing its support for the Research Works Act in the USA (which would have banned Open Access mandates, like that of the NIH) and to the UK government deciding that government funded research should be published in a freely accessible form. The EU has also adopted an Open Access requirement for EU funded research, and the Canadian tri-councils are currently formulating a Canadian Open Access policy.

This is not the first time academics have rebelled against the harm done to our community by commercial publishers of journals. An even larger petition thirteen years ago led to the formation of the highly successful Open Access PLOS (public library of science) journals. Mathematicians and computer scientists have often been at the vanguard of the fight against abusive practices by commercial publishers (e.g. the mass resignations of the editorial boards of Topology in 2006 and K-theory in 2007 and the campaign by Donald Knuth, the developer of TEX). However, previous rebellions failed to change the fundamental structure of academic publishing: the business model of most journals still requires restricting access to published research to those readers whose institutions have paid subscription charges.

Why are things changing now?

Until about 20 years ago academic publishers and researchers enjoyed a mutually beneficial relationship. Researchers needed publishers to communicate their research results to a wide audience, since this communication relied on printing and distributing physical journals. Every stage was expensive and required expert skills: typesetting (especially mathematical) was a time-consuming job that could be done only by experts, printing and binding were expensive and incurred a cost for each copy printed, and shipping vast amounts of paper around the world was the only way to disseminate the final papers. Academic libraries handled the costs of archiving, and researchers themselves handled editing (apart from some minor copy editing) and peer review and provided the content. Researchers donated editing, refereeing and the manuscript itself as a service to the community. Authors often transferred copyright to the publishers to make it easier to produce collected works, or to simplify requests to reprint parts of papers. As a token of appreciation most good journals would provide a few dozen high quality reprints for the authors to distribute as they wished.

As in most areas, computers and the internet have democratized academic communication. Academics no longer need publishers to make their work widely available, and the internet and electronic typesetting programs (like the freely available TeX system used by almost all mathematical publishers) mean that authors themselves now do much of the "penalty" technical typesetting. Repositories like the arXiv and HAL in France allow researchers to archive their own work and make it instantly available to anyone in the world free of charge. The peer review system has been simplified by using email and peer review management systems (like the open source PKP Journal management systems).

However, at the same time as the cost of managing, producing and distributing journals has plummeted, the costs of subscriptions to university libraries and page charges to authors have skyrocketed to the point that the chief librarian at Harvard declared recently the costs are now unsustainable.

Profits margins at the four biggest academic publishers are commonly above 40%, making academic publishing the most profitable industry around. Academic publishing is the only industry where automation and outsourcing work (to the customers!) has led to much higher prices and very little innovation. Most academic journals are basically electronic versions of the old paper journals with a few hyperlinks added. As Tim Gowers and many other academics have realized, the current system is one where commercial publishers are parasitic on the academic community. Publishers use the brand names of the journals they control to convince researchers to donate their research and time, and they then put this research behind a paywall and sell it back to the same community of researchers who donated their time and content in the first place. Elsevier, in particular, has claimed that it "owns" the research published in its journals and that researchers "work" for Elsevier.

All this has been known for some time, but since researchers typically don't pay the exorbitant subscription charges themselves, and they feel they must publish in certain high ranked journals, the system has continued long after the costs began to outweigh the benefits. Libraries must sign secrecy agreements with publishers that forbid them from telling their researchers how much they pay for journals, further reducing researchers' ability to take cost into account.

What has changed is that the funding agencies, starting with NIH in the USA, began to realize that the results of publicly funded research should be available to the pub-

lic. They have also woken up to the fact that paying an average of about $3000 per article directly to the shareholders of commercial publishers is not a very good use of public money! Most researchers are, quite naturally, more concerned about their careers than about accessibility or cost. But if their funding agencies require that their research results be publicly available (either in Open Access journals or in repositories like PubMedCentral), they will comply by shifting to Open Access journals. Publishers will have to adapt their business models.

The primary result of this revolution is that all published research results will be freely accessible, which is an unambiguously good thing for both researchers and the general public. The question now concerns the new business model for academic publishing.

Two models for providing Open Access currently coexist. "Gold" Open Access means that the paper is freely accessible in the journal itself as soon as it is published. In hybrid journals Open Access and non-Open Access papers appear side by side and the publisher continues to charge (unreduced) subscription fees. In fully Open Access journals all papers are freely accessible and authors retain their copyright. "Green" open access means that the paper, after final review, is placed in a freely accessible online repository (usually after an embargo of six months to two years). Strangely, Elsevier forbids deposition of final versions of papers that appear in its journals if such deposition is mandated by the funding agency or university.

Confusingly, there is no connection between the type of journal and its business model. About 75% of non-Open Access journals charge authors fees of some sort (in addition to subscription fees to libraries), while about 65% of Open Access journals charge no fees at all (costs are covered by learned societies, scholarly communities, universities or funding agencies). It is important to remember that the choice of business model is separate from the question of whether or not a journal is Open Access.

Open Access is a hugely positive change that presents both challenges and opportunities. The challenge to the academic community is to ensure that this new system is sustainable and that quality is maintained and improved. The breakdown of the old system also provides an opportunity to develop new more effective modes of academic communication that take full advantage of the new media. It also means that we can rid ourselves of the more pernicious practices of some commercial publishers: the promotion of journal "impact factors", coercive citation (where authors are required to cite papers from the journal to raise its impact factor), and the proliferation of new low-quality journals (both paywalled and Open Access) whose only goal is to make money for the publishers.

Academic publishing should become a service, not a product. We should choose which services are essential (e.g. archiving, editing and peer review), and who should provide them. A freer market in Open Access journals is already driving down costs (peerJ charges just $99 for one peer-reviewed publication per year) and it is certain that Open Access should be far cheaper to the research community than the current system.

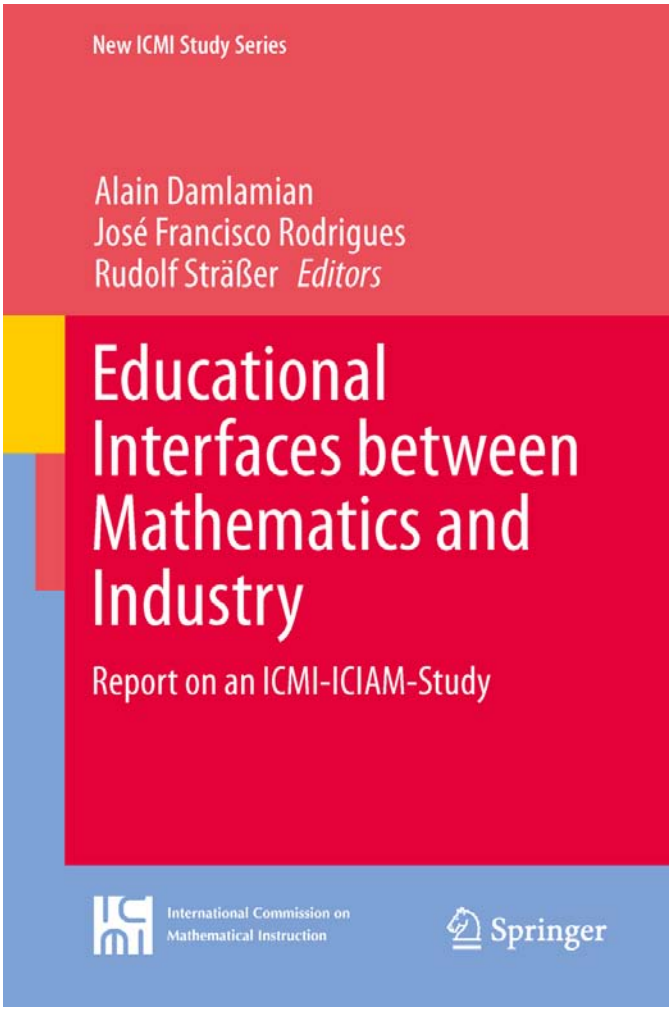
As mathematicians and scholars we should recognize the importance of free dissemination of our research results by supporting the "Berlin Declaration on Open Access". We should also reform our research funding, hiring, tenure and promotion processes to ensure that we evaluate the impact and research quality of papers themselves, rather than relying on flawed proxy measures like journal impact factors. And we must be sure not to penalize younger colleagues for not publishing in pay-walled journals. Counting publications (weighted by impact factors) is a lazy and ineffective way of measuring the impact and quality of research and we should not accept it.

Finally, many of us recognize that the peer review system itself is collapsing under the avalanche of papers now being produced. Peer review no longer necessarily weeds out bad research, and it often fails to recognize good innovative or interdisciplinary research. We should be exploring new ways to raise the effectiveness of research communication and ensure that our time is used most efficiently. Perversely, in the current system the worst papers often consume the most peer reviewing resources as they move down the hierarchy of journals, getting rejected repeatedly before inevitably finding a home. Rationing publication is a holdover from paper printing, and we should separate "publication" of research from "evaluation" of research. Indeed, there are good reasons to evaluate research and measure its impact *after* it is published. The new Forum of Mathematics (in Pi and Sigma flavours), the arXiv overlay Episciences-Math, and the Polymath open math blog are all initiatives in this direction.

Please encourage your colleagues to publish in ways that help, rather than harm, the research community and the general public who fund our research.

Nicholas Kevlahan did his BSc in the Physics Department at the University of British Columbia, his PhD at the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge and was a Marie Curie Post-Doctoral Fellow at the Laboratoire de Météorologie Dynamique at École Normale Supérieure. He is currently a professor at the Department of Mathematics and Statistics at McMaster University. His research is centred on the theory and computation of turbulence and geophysical fluid dynamics..

Educational Interfaces between Mathematics and Industry



2013, XV, 466 p. 62 illus., 50 illus. in color. —Image used with permission.

A. Damlamian, J.F. Rodrigues, R. Sträßer, Universität Gießen, Gießen, Germany (Eds.)

Educational Interfaces between Mathematics and Industry

Report on an ICMI-ICIAM-Study

Series: New ICMI Study Series, Vol. 16

The only book to contain results of ICMI Study 20

Highlights comprehensive collaborative research from the joint ICMI and ICAM Meeting

Original Plenary Papers from the joint ICMI-ICAM Meeting are included

This book is the "Study Book" of ICMI-Study no. 20, which was run in cooperation with the International Council for Industry and Applied Mathematics (ICIAM). The editors were the co-chairs of the study (Damlamian, Sträßer) and the organizer of the Study Conference (Rodrigues). The text contains a comprehensive report on the findings of the Study Conference, original plenary presentations of the Study Conference, reports on the Working Groups and selected papers from all over the world. This content was selected by the editors as especially pertinent to the study, each individual chapter representing a significant contribution to current research.

2014 ICIAM Scientific Workshop

THE OHIO STATE UNIVERSITY

A two-day workshop, May 15-16, 2014, preceding the 2014 ICIAM Board meeting (May 17) will take place at The Ohio State University.

Location: The Mathematical Biosciences Institute, Jennings Hall, 1735 Neil Avenue, Columbus, OH 43210

Organizing Committee: The ICIAM Officers, Barbara Keyfitz (chair), Jose Alberto Cuminato, Maria J. Esteban, Alistair Fitt, Tom Mitsui and Mario Primicerio.

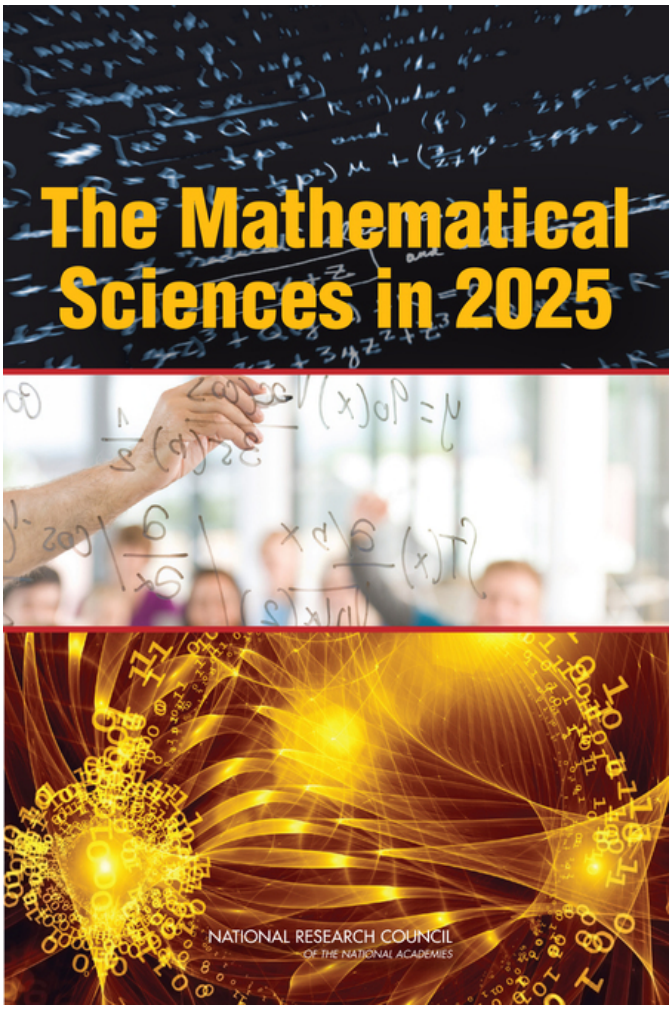
Speakers: All representatives of member societies who are attending the meeting are invited to speak. An additional selection of speakers from the local community will be made by the organizing committee.

Local Arrangements: Thanks to a grant from the Mathematics Research Institute (OSU), accommodation for all participants will be covered. Participants will stay at the Crowne Plaza Hotel, 33 East Nationwide Blvd, Columbus (where the Board meeting will take place).

Mathematics: Important Enough to be left to Mathematicians?

by Barbara Keyfitz

Review of: National Research Council. The Mathematical Sciences in 2025. The National Academies Press, Washington, DC.



The Mathematical Sciences in 2025 —Image used with permission.

Clemenceau's famous theme—that war is too important to be left to the generals—has been echoed recently in the scientific community with regard to the teaching and utilization of mathematics. For example, a 2012 report by the US President's Council of Advisors on Science and Technology (ENGAGE TO EXCEL: PRODUCING ONE MILLION ADDITIONAL COLLEGE GRADUATES WITH DEGREES IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS) recommends an experiment in "college mathematics teaching and curricula developed and taught by faculty from mathematics-intensive disciplines other than mathematics" (and a similar experiment in teacher preparation). Elsewhere in this issue of DIANOIA, the article by Zdenek Strakos on EU-MATHS-IN discusses a perception in European research funding circles that mathematics does not belong among key enabling technologies, which in fact means that mathematicians' input is not considered important in applying mathematics in other disciplines.

The book under review (often known by its acronym, MS2025) provides a welcome antidote, backed with authoritative evidence, for such prescriptions. This 200-page volume, produced by a committee of US-based mathematical scientists charged with examining the current state of the mathematical sciences in the US and with recommending how the field should evolve to "produce the best value for the country by 2025", is effusive in its praise for the vitality of the mathematical sciences enterprise and explicit in its conclusion that the people creating and doing mathematics need to be out there in the community, interacting with the people using, and being trained in disciplines that use, mathematics. In fact, a striking conclusion of the committee, which was not specifically asked to examine applied mathematics, is that "Distinctions between 'core' and 'applied' mathematics increasingly appear artificial". There were enough core mathematicians on the committee that such a statement in the report means that the idea is now widely accepted by mathematicians. This is good news.

The report is both descriptive and prescriptive. A long chapter, tellingly titled "Vitality of the Mathematical Sciences", gives thumbnail sketches, each a page or two long, of 14 recent developments, ranging from the proof of the three-dimensional Poincaré conjecture to compressed sensing. Browsing the list, and reading the well-written synopses, one sees that "this is not your grandmother's (or grandfather's) applied mathematics". The forward-looking applied mathematics society's annual meeting is going to look more and more different from its past emphasis as we move into the twenty-first century.

However, there comes a difficulty at the other end. We may agree that one can no longer tell when core mathematics stops and applied mathematics begins, but the report stumbles, somewhat amusingly, when it tries to define "the mathematical sciences" themselves. The authors begin with a statement that this reviewer rather likes:

> The mathematical sciences aim to understand the world by performing formal symbolic rea-

> soning and computation on abstract structures.

And they continue with another attractive point:

> Researchers in the mathematical sciences bring special perspectives and skills that complement those brought by mathematically sophisticated researchers with other backgrounds.

But then they quail:

> . . . there is no clear line to separate research efforts into those that are part of the mathematical sciences and those that are part of computer science or the discipline for which the modeling and analysis are performed.

In the real world we inhabit, this is an invitation to turf warfare. The report makes two recommendations here: that the US National Science Foundation gather data on interactions between mathematics and other disciplines, particularly in the cohort of researchers currently being trained, and that all the US funding agencies expand their funding for "mathematical sciences", even if we cannot quite figure out what we mean by that.

Overall, the report's enthusiasm for applied and interdisciplinary work is very encouraging for the ICIAM community, and the report's recommendations can be seen as urging us to continue to do what ICIAM's statement of purpose commits us to doing: "advancing the applications of mathematics in all parts of the world". Particularly useful is a statement, intended for the US community but relevant worldwide, that the mathematical sciences would be of even greater value to the nation if there were more mathematical scientists with a specific set of characteristics, worth stating completely:

- They are knowledgeable across a broad range of the discipline, beyond their own area(s) of expertise;
- They communicate well with researchers in other disciplines;
- They understand the role of the mathematical sciences in the wider world of science, engineering, medicine, defense, and business; and
- They have some experience with computation.

In fact, the entire summary chapter is full of quotable recommendations and will reward close reading. One that will resonate with people following the EU-MATHS-IN initiative is that "Mathematical scientists should be included more often of the panels that design and award interdisciplinary grant programs . . . even the validity of many projects depends on the early involvement of mathematical scientists".

Beyond these overarching themes—that "mathematics" has now become "mathematical sciences" for essentially everyone who practices it, and that the currently prominent areas of application have changed almost beyond recognition in a generation—the report weighs in on a number of other topics. Some will not raise any eyebrows: The importance and value of a postdoctoral experience have increased, and the increasing numbers of mathematical science institutes have had an enormous impact on the culture. Another trend that emerges as one reads through the report is the greater attention that our community will be expected to pay to Statistics, and the need for greater integration of Mathematics and Statistics education in the future.

On the other hand, some of the committee's recommendations appear odd to this reviewer, and some seem both counterproductive and wrong. For example, the report regards the teaching of calculus to college students as "not appropriate for many students". Here let me quote Keith Devlin's monthly online column from May 2001 (www.maa.org/external_archive/devlin): "calculus was the major intellectual discovery of the seventeenth century that made possible the scientific revolution and all of modern science, technology, and medicine". Surely the folks who suggest that students merely "learn enough to calculate maxima and minima" are missing something here, particularly after their point about mathematical scientists being comfortable with abstract structures. In fact, many of their comments about education, at all levels, do not seem well-informed or well-reasoned. The committee is critical of the college curriculum; this is fair enough, but up to this time no stable alternatives have emerged. It is certainly too soon to propose that MOOCs might do a better job. What is clear, at least in the US, is that the traditional college structure in which elementary mathematics is taught by tenured faculty is disappearing or has disappeared from research universities, accompanied by a reduction in the size of mathematics departments. However, the committee appears not to be overly concerned with how this has impacted the teaching of college mathematics, and merely recommends that departments adapt to "keep pace with the evolving academic environment".

On the issue of the apparent poor state of K-12 education in the US, and its relation to the undersupply of mathematically literate US workers, the committee wisely refuses to recommend actions. However, their decision to blame the problem on "poor teachers" (feeling, it appears, that a student cannot learn anything that their teacher does not already know) ignores the conclusions of Diane Ravitch and Robert Reich, among others, that poor student performance is more strongly correlated with childhood poverty than with any other cause. It is even farther beyond the ability of the MS 2025 committee to effect any intervention here than it is to improve teacher education, but it would have been satisfying to see the responsibility placed where it belongs, instead of, as so often happens, accusing teachers who have merely had the misfortune not to get positions in more attractive school districts.

The treatment of this topic is, of course, particular to the US; our colleagues from other countries will read it with some bewilderment.

The report is also weak on another topic the committee chose (or perhaps was requested) to tackle: attracting more women and "underrepresented minorities" to the mathematical sciences. The committee itself had several successful women scientists as members (3 out of 18, or 17%) and this reviewer can only imagine that if it had thought about the difficulties it might have encountered in trying to make that percentage larger it would have come up with some advice better than the pablum it dished out. Where was the Board of Mathematical Sciences (the organization that charged this committee) when Larry Summers made his infamous remarks, less than a decade ago, on the inability of women to excel in mathematics? We are living in a country where political considerations dictate that people (Summers is not alone here) with these views attain positions of prominence and influence, and "providing timely information to students" is never going to counterbalance prevailing societal views. To be fair, the report does include a list of interventions that promote inclusiveness, and it is to be hoped that, for readers of the report, evidence of the success of some of these programs will inspire further such efforts.

Despite these criticisms, this reviewer found herself reading the report with increasing excitement. It is thrilling to read that "the opening years of the twenty-first century have been remarkable ones for the mathematical sciences", and that "much of twenty-first century science and engineering is going to be built on a mathematical science foundation, and that foundation must continue to evolve and expand". It is exhilarating to read a report that comments favorably about both "big data" and the "fundamental lemma", and gratifying to receive the recommendation that "mathematical sciences departments should play a role in seeing that there is a central home for computational research and education at their institutions". Like many reports of this type, "The Mathematical Sciences in 2025" will be referenced by many people who have not read it. That is fine, but if you do get a chance to read it, it will repay the effort.

Barbara Lee Keyfitz is the Dr Charles Saltzer Professor of Mathematics at the Ohio State University. She has a PhD from New York University, and works in partial differential equations. She is the current President of ICIAM.

About ICIAM

The International Council for Industrial and Applied Mathematics (ICIAM) is a worldwide organisation for professional applied mathematics societies. Its members are national and regional societies dedicated to applied and industrial mathematics, and other societies with a significant interest in industrial or applied mathematics.

The Council works

- to promote industrial and applied mathematics globally;
- to promote interactions between member societies;
- to promote the goals of these member societies;

and to coordinate planning for the ICIAM Congresses, held every four years, on industrial and applied mathematics.

ICIAM is governed by a Board comprising representatives of its member societies. Programs run by ICIAM, and the bylaws of the organization, can be found on the ICIAM web page, www.iciam.org.

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