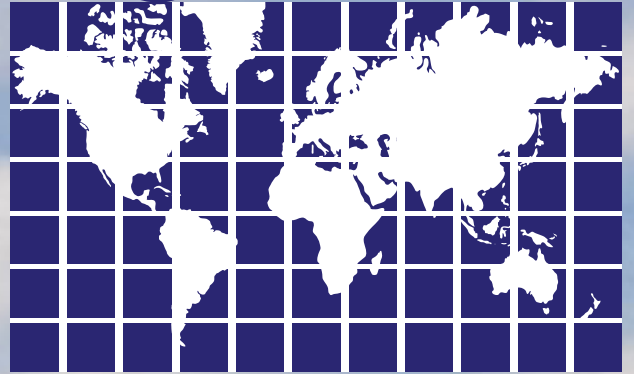


ICIAM



Managing Editor

C. Sean Bohun

University of Ontario
Institute of Technology
Faculty of Science
2000 Simcoe St. North
Oshawa, ON, Canada
e-mail: sean.bohun@uoit.ca

Editor-in-Chief

Barbara Lee Keyfitz

The Ohio State University
Department of Mathematics
231 West 18th Avenue
Columbus, OH 43210-1174
e-mail: bkeyfitz@math.ohio-state.edu

Editorial Board

James M. Crowley

SIAM
e-mail: jcrowley@siam.org

Thierry Horsin

CNAM, Paris, France
Département Ingénierie
Mathématique
e-mail: thierry.horsin@math.cnrs.fr

Pammy Manchanda

Guru Nanak Dev University
Amritsar, Punjab, India
Department of Mathematics
e-mail: pmanch2k1@yahoo.co.in

Roberto Natalini

Consiglio Nazionale delle
Ricerche, Rome, Italy,
Istituto per le Applicazioni
del Calcolo "M. Picone"
e-mail: roberto.natalini@cnr.it

Timo Reis

University of Hamburg
Department of Mathematics
e-mail: timo.reis@math.uni-hamburg.de

Zdenek Strakos

Charles University in Prague
Faculty of Mathematics and
Physics
e-mail: strakos@cs.cas.cz

Reporters

Iain Duff

STFC Rutherford Appleton
Laboratory
Harwell Oxford
Didcot, OX11 0QX, UK
e-mail: iain.duff@stfc.ac.uk

Maria J. Esteban

CEREMADE
Place du Maréchal
Lattre de Tassigny
F-75775 Paris Cedex 16,
France
e-mail: esteban@ceremade.dauphine.fr

Eunok Jung

Konkuk University
Department of Mathematics
1, Hwayang-dong,
Gwangjin-gu
Seoul, South Korea
e-mail: junge@konkuk.ac.kr

Alexander Ostermann

University of Innsbruck
Numerical Analysis Group
Department of Mathematics
Technikerstraße 13/7
6020 Innsbruck, Austria
e-mail: alexander.ostermann@uibk.ac.at

Tomás Chacón Rebollo

Universidad de Sevilla
Departamento de
Ecuaciones Diferenciales y
Análisis Numérico
e-mail: chacon@us.es

The ICIAM Dianoia Vol. 2, No. 3, July 2014

The 2014 ICIAM Scientific Workshop and Board Meeting — <i>Barbara Lee Keyfitz</i>	2
ICIAM 2015 Call for Proposals of Satellite Meetings	3
PRESS RELEASE: Éva Tardos to deliver Olga Taussky-Todd Lecture, ICIAM 2015	3
ICIAM, Past and Future: A Conversation Between Two Former Presidents — <i>Olavi Nevanlinna</i>	5
Call for Nominations for ICIAM Officers: Secretary, Treasurer, Officers-at-Large	7
GAMM Juniors' Summer School	8
Mathematics and the Complexity of the Earth System — <i>Maria J. Esteban</i>	9
Attending the Abel Prize Ceremony 2014 — <i>Barbara Lee Keyfitz</i>	11
ICIAM 2015 Call for Mini-symposia	12
Putting the Dollar Sign back in Mathematics — <i>Barbara Lee Keyfitz</i>	13
Save the Date!	14
Invited Speakers of ICIAM 2015	15
About ICIAM	16

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, announcing events, on-site reports from events and industry news. www.iciam.org
©2013-2014 International Council for Industrial and Applied Mathematics (ICIAM). For reprint permission, advertising requests, potential articles and event notices, please contact: bkeyfitz@math.ohio-state.edu

Cover illustration: The Chinese National Grand Theatre, colloquially known as The Giant Egg, is an opera house located in Beijing, China. Designed by French architect Paul Andreu, the ellipsoid dome, constructed of titanium and glass, holds nearly 5500 people and covers an area of 3 acres (12000 m²).

The 2014 ICIAM Scientific Workshop and Board Meeting

by BARBARA LEE KEYFITZ

The 2014 ICIAM Board Meeting took place on May 17 in Columbus, Ohio. It was preceded by a two-day scientific workshop at MBI (the Mathematical Biosciences Institute) on the Ohio State University campus, which was partially funded by the Institute for Mathematics and its Applications (IMA) in Minneapolis. Both events also received generous support from Ohio State, through research funds of the Mathematics Department. The workshop was well-attended and lively; it featured talks by both ICIAM Board members and local speakers. Many talks are available by video at mbi.osu.edu/video

The Board meeting was also well attended, with 26 delegates present, along with the officers and a number of guests. (Most of us made it into the picture, taken by Tom Mitsui.)

The organizers of ICIAM 2015 are putting finishing touches on the meeting (but note that the call for minisymposia and other contributions is still in full swing), while ICIAM 2019 is completing its preliminary organization. The Board formally approved the choice of Alfio Quarteroni as Scientific Program Committee Chair for the 2019 Congress. The Council's finances appear to be in good shape, with investment of the funds on hand replacing the interest that we had been receiving before last year. A small increase in the annual dues was approved, as was the addition of five new members at the "Associate" level.

Over the next year, some priorities of the officers will be to produce a new web site, as agreed by the Board, as well as to activate our membership in ICSU and to continue to develop the newsletter. There will be no de-

veloping countries support given in 2015, as those funds will be used to support attendance by delegates from developing countries at the Congress; however, applications for events in 2016 will be accepted.

In 2015, the Board meeting will take place at the conclusion of ICIAM 2015, on August 15, in Beijing.



Participants and guests at the 2014 ICIAM Board Meeting. —Image used with permission.

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.



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.

ICIAM 2015 Call for Proposals of Satellite Meetings

by SCIENTIFIC PROGRAM COMMITTEE OF ICIAM 2015

A satellite meeting 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 makes it convenient for ICIAM participants to combine the events into a single trip. Satellite meetings have no official connection to ICIAM beyond a cross listing 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 the meeting
- Estimated number of participants
- Location
- Dates
- Conference webpage (if available)
- Other relevant information, such as scope or content of the meeting, organizing society or affiliate, etc.

Feel free to contact us with tentative information for meetings even if the planning is not complete. This information may be useful to others planning related meetings. A notification of acceptance/rejection of designation as a satellite meeting will be sent to the contributors within two months after submission.

Important Dates

Satellite Conferences

January 1, 2014: Submission opens;

October 30, 2014: Submission Due.

Embedded Conferences (of member organizations)

January 1, 2014: Submission opens;

October 30, 2014: Submission Due.

Conference Registration

January 1–April 30, 2015: Early Bird Registration;

May 1–July 31, 2015: Regular Registration;

August 1–August 10, 2015: Late & On-site Registration.

PRESS RELEASE

Éva Tardos to deliver Olga Taussky-Todd Lecture, ICIAM 2015

The International Council for Industrial and Applied Mathematics has selected ÉVA TARDOS, Jacob Gould Schurman Professor of Computer Science, Cornell University, to deliver the Olga Taussky-Todd Lecture for the upcoming ICIAM 2015. Professor Tardos was chosen for her numerous and deep contributions to the fields of combinatorial optimization, discrete algorithms and algorithmic game theory, and her ability to convey the basic ideas and inspire others to pursue them.

The International Congress on Industrial and Applied Mathematics—ICIAM 2015—will be held in Beijing, August 10 to 14, 2015. It is the most important international event in applied and industrial mathematics, held once every four years under the auspices of the International Council for Industrial and Applied Mathematics.

Éva Tardos received her BA and PhD from Eötvös University in Budapest. Before joining Cornell in 1989

she had a Humboldt Fellowship at the University of Bonn, postdoctoral fellowships at the Mathematical Sciences Research Institute in Berkeley and at the Hungarian Academy of Sciences at Eötvös University, and was a visiting professor at the Massachusetts Institute of Technology. She has written nearly 100 research papers; she has trained 15 PhD students and supervised 10 post-docs.

Éva Tardos is a leading figure in the broad area of algorithmic game theory. It is well known that the selfish behavior of participants can lead to suboptimal outcome. Éva's work quantifies this loss of efficiency, called the price of anarchy, comparing the global optima to the quality of Nash equilibria, stable outcomes of selfish behavior. Her work shows that in many cases the selfish solutions do reasonably well, which diminishes the need for central coordination.

One of her important early results was a strongly poly-

nomial time minimum cost flow algorithm. In another early paper with A. Frank she obtained a surprisingly general result which says, roughly, that among combinatorial optimization problems, polynomial time solvability implies strongly polynomial time solvability. Their method involves an ingenious “diophantine series expansion” technique, which has already found other applications and is likely to find many more. Another field where she produced many excellent results during the earlier part of her career is the theory of matroids and submodular functions. With A. Frank she introduced and studied “generalized polymatroids”, which have become an important class of structures in combinatorial optimization.

Later on her focus shifted to approximation algorithms. She worked on problems in scheduling, facility location, multi-commodity flows, cost-sharing and routing problems in networks. Her work introduced new sophisticated methods in the “rounding” phase of approximation algorithms based on linear programming relaxations. In a recent paper *Network formation in the presence of contagious risk*, she studies the cascade effects of failures, especially relevant after the 2008 economic crisis.



Awards and honors

Éva Tardos’ work has been recognized through several awards and honors. She received the Fulkerson prize of the

American Mathematical Society and the Mathematical Programming Society, and the Dantzig Prize of the Society of Industrial and Applied Mathematics and the Mathematical Programming Society. Further recognition of Tardos’ work includes her participation as invited speaker at the International Congress of Mathematicians in Kyoto (1990), and her election to the National Academy of Engineering of the USA in 2007 and her recent election to the National Academy of Sciences of the USA.

The Olga Taussky-Todd Lecture

The Olga Taussky-Todd Lecture is one of the invited lectures at the International Congress on Industrial and Applied Mathematics, the premier international meeting of applied and industrial mathematicians, held every four years. This honour is conferred on a “woman who has made outstanding contributions in applied mathematics and/or scientific computation”. The lecture is named in tribute to the memory of Olga Taussky-Todd, whose scientific legacy is in both theoretical and applied mathematics, and whose work exemplifies the qualities to be recognized.

The Olga Taussky-Todd Lecture for ICIAM 2015

Lecturers are selected by a committee established by the ICIAM President, with advice from the Association for Women in Mathematics and European Women in Mathematics. Nominations are solicited from the mathematical sciences community. The Committee for the 2015 Lecture consisted of Helena Nussenzveig Lopes, (Chair) IM-UFRJ, Brasil; Douglas N. Arnold, University of Minnesota, USA; Alison Etheridge, University of Oxford, UK; Mythily Ramaswamy, TIFR Bangalore, India; Barbara Wohlmuth, TU München, Germany and Bin Yu, University of California.

“ ... *Quelli che si innamorano della pratica senza scientia sono come nocchieri che entrano in naviglio senza timone o bussola, che mai hanno certezza dove si vadano. Sempre la pratica deve essere edificata sopra la buona teoria...* ”

... Those who love practice without science are like sailors who board ship without a rudder and compass and never know where they may cast. Always practice must be built upon good theory... ”

Leonardo da Vinci, 1452-1528

(Translation provided by Pierangelo Marcati and Roberto Natalini)

ICIAM, Past and Future: A Conversation Between Two Former Presidents - Part II

by OLAVI NEVANLINNA

This is part two of a two-part article. Part one appeared in the April issue of DIANOIA.

ON (Olavi Nevanlinna): Back to ICIAM. The second “I” in ICIAM refers to industrial. How much “industrial” activity happened during your term?

RJ (Rolf Jeltsch): In July of 2007 Jose Francisco Rodrigues of the University of Lisbon suggested to our president Ian Sloan that ICIAM and ICMI should do a study on the topic ‘Educational Interfaces between Mathematics and Industry’. Clearly the officers found that this was an important issue. It was of course not easy to bring the two cultures of the researchers from mathematics instructions on all levels together with our community. I was very involved in the process and it was very good and interesting for me to learn from the other group. Unfortunately there had been many delays. The most dramatic one was the one by the volcano Eyjafjallajökull. We had to cancel the EIMI conference in Lisbon at the last minute on Saturday 17 April 2010. Since my wife Marianne and I had flown to Lisbon the day before we got stuck there and Marianne had to take a bus to Paris to get a train to Zurich. I was luckier. We had an officers meeting in Lisbon and by the time this was finished planes flew again. Still it was chaos. Another delay was caused because we wanted to get more contributions from Asia and did therefore an additional workshop in Macau in 2011. By now the ICMI study book has been published. (Educational Interfaces between Mathematics and Industry, A. Damlamian, J.F. Rodrigues, R. Sträker, Eds., Springer, 2013.)

ON: Interaction between different organizations often takes a lot of time as there may not be clear social rules to guide how to go about.

RJ: For the interaction with IMU it was of course helpful that I met IMU presidents and Martin Groetschel usually at the Abel Prize ceremony in Oslo and every three years at a special conference in Hanoi.

ICIAM also endorsed the Mathematics of Planet Earth 2013 which was initiated by Christiane Rousseau of Montreal. ICIAM had joined a grant proposal to ICSU by IMU together with the International Union of Theoretical and Applied Mathematics and the International Union of Geodesy and Geophysics. Due to our new flexibility in granting support for developing countries ICIAM did give some funds for a workshop last summer in Guanajuato in Mexico on modeling of climate change. This workshop was a success and I hope that this joint application for funds of ICSU will continue in the future and grow.

Let me summarize our relation with IMU. The com-

munication with the leaders of IMU has been very good except on issues where a strong faction in the EC opposes a political discussion with ICIAM which then leads to unilateral decisions.

ON: Since 2011 ICIAM is one of the 22 Scientific Associates of ICSU. This provides the formal link—however without voting power. To be a union or not to be—that was a question in 90’s. And, “not to be” won.

RJ: You were involved with ICIAM or rather CICIAM already from the beginning of 1990. Anything you could tell?

ON: To begin with, some of the “founding fathers” of ICIAM conferences really felt that CICIAM was just the site committee for ICIAM conferences and were not comfortable with the idea of CICIAM taking larger roles. Reinhard Mennicken then opened the discussion on strengthening the organization and possibly transforming it into a scientific union. And the current structure is perhaps a “nearly-a-union”.

You mentioned the Mathematics of Planet Earth 2013. ICSU has an active role in a large 10-year long research initiative which has a somewhat similar name: Future Earth.

I feel, I have rather seldom seen mathematicians in active roles in these kind of programs. Am I wrong here?

RJ: I think it is important that applied mathematicians get more involved in these large projects ICSU is setting up. Most of these projects actually do involve mathematics. Already in the preparation phase mathematicians should participate. How to achieve this? I think that ICIAM has only six officers and they have other things to do than reading all the mails from ICSU on Calls to find researchers for a team to create and initiate future projects. You said that you are the chair of the Management Group for European Group of ICSU. It made sense that the ICIAM board approved in Beijing last year a committee which should monitor the activities of ICSU and look for opportunities for applied mathematics to make a contribution. In my opinion this committee should build a network in our community which has the knowledge of all applications of mathematics and knows also in which research center or university the strong applied mathematics in each field is done. I volunteered to be part of the committee and Tom Mitsui is the liaison person to the officers. Up to now I do not know who else is on the committee and I could not find the remit in the public domain of the ICIAM webpage.

ON: Let us discuss a little bit on current problems within our profession, both as scientists in general and in particular as mathematicians.

What do you want to bring up?

RJ: Most issues have been discussed in the two joint committees of IMU and ICIAM and some have been already mentioned before. Let's go back to the problem of the cost of publications which was also part the terms of reference for the 'Working group on Journal Ranking and Pricing'. We have seen a great increase in prices of journals and the bundling makes it even worse. The price issue was then however removed from the remit of the working group. It became very prominent due to the 'Cost of Knowledge' movement. About two years ago Timothy Gowers of Cambridge University criticized the publisher Elsevier for its prices and the bundling in a blog. By now more than 14,487 mathematicians have signed on the webpage thecostofknowledge.com a boycott of Elsevier. There is an intensive discussion going on alternatives to the 'classical' production and business concept.

There are many versions of 'open-access'. Clearly today mathematicians basically use \LaTeX and produce technically very good files. Despite this a publisher has to put some extra work to produce a journal. However certain publishers, and Elsevier is not the only one, just overprice this work. It is unclear how organisations like ICIAM or IMU should react. When I was president of the European Mathematical Society I started a publishing house the EMSph. By now it produces 20 journals. Legally it is a foundation which is governed by EMS. The business model is to employ professionals as the classical publishing houses do. The idea is to produce high quality at reasonable price. If a surplus is created it will go back to the community. By the way due to this very successful blog by the 'Cost of Knowledge' community IMU closed its blog which I mentioned earlier.

Let's turn to bibliometric measures. The first report jointly done by IMU and ICIAM is the "Citation statistics". There one treats the counting of citations, the impact factor, the h-index. At that time I did not know the h-index. I was on the mathematics panel of ERC in the odd years. While in 2009 basically no Principal Investigator mentioned the h-index many more mentioned it last year. Many also added that they are "Highly Cited". In some panels it was even a requirement to provide the h-index. I learned now that in Germany contracts with full professors are made where the salary depends on the number of publications published in a year, say four. In China one gets a large sum if one publishes an article in a western journal. It is clear that such rules have an impact on the publishing behavior of a researcher. Instead of doing a long 50 page paper as we did one would create four articles out of the same contents. These are all ways to evaluate researchers. This committee of IMU tries to formulate best practice to evaluate researchers. Clearly the judgment should be made by reading and un-

derstanding the articles a researcher has produced. I was very impressed when I was part of a search committee for a professor position in Finland. Each candidate could submit 10 articles or books and we had to read these. Due to the volume we made that each article was read at least by one committee member. However if one has more than hundred applications for an ERC grant and one should evaluate the research done by each Principal Investigator in the last ten years, then one does not have enough manpower to do this in a reasonable time interval.

Another item is the integrity of researchers, editorial boards and publishers. Due to the pressure to be evaluated using bibliometric measures, impact factors and so on persons involved may have a tendency to manipulate things. Let me just mention an extreme case mentioned in the article 'Nefarious Numbers' by Doug Arnold and Kristine Fowler published in the Notices of AMS in March 2011. Among other things the impact factors of 170 applied math journals are compared. The journal IJNSNS got an impact factor of more than eight while all others have one below four. Clearly this discrepancy is due to manipulation. On the positive side the EMS created an Ethics committee which produced a "Code of Practice" concerning responsibilities of authors, publishers, editors, referees and users of bibliometric data. I think such actions by societies are very important.

ON: During these years you have been doing all kind of voluntary science administration work. How have you managed to find time for all that?

RJ: Olavi you really mention an important point. Probably my highest workload was a few weeks before the ICIAM07 congress and during the congress. I was not only the Congress Director but also the President of GAMM and had to do many extra speeches and events for the GAMM annual meeting which was an embedded meeting.

As mentioned earlier during my presidency I had just the usual support of a professor. Hence I had to do mostly everything by myself. Fortunately the mathematics department allowed me to reduce the teaching. I tried to accept invitations to events of member societies. In recent years I was supposed to monitor the 'cost of knowledge' activity and the ICSU activity. In addition I was still involved in GAMM, EMS and its publishing house. Clearly research did suffer and I also was not able to attend some of the specialized conferences in my field.

I am now very happy that all these activities for societies have come to an end. I enjoyed now teaching at Hong Kong Baptist University last fall semester. I taught the course designed by my successor at ETH, Siddhartha Mishra. I enjoyed the interaction with my ten enthusiastic students. This all reminded me of my lecture at UCLA in 1973. Now as then I had to do the exercises, the exam and correct. The change however was that in those days I wrote the problems on a paper and copied it and now I had to learn \LaTeX . I look very much forward to teaching

at the University of São Paulo in São Carlos and plan to work on a project.

ON: Have a safe trip and best personal regards to your family!

Part one of this article appeared in the April issue of DIANOIA.

Olavi Nevanlinna is currently on sabbatical at University of Cambridge from the Aalto University where he has served as department head. He has served as the Helsinki University of Technology Vice-Rector from 2003–2005, and the president of the International Council for Industrial and Applied Mathematics from 1999–2003.



Rolf Jeltsch is retired from the ETH Zurich where he started his career as a student in mathematics. After a postdoc year in Canada and positions in USA, UCLA and Univ. of Kentucky, he moved to Germany. He was for 10 years a full professor at the RWTH Aachen and director of the IGPM. In 1989 he became full professor at ETH Zurich. He has been the president of SMG, EMS, GAMM and ICIAM. He holds three honorary degrees.

His main interests have

been in the numerical analysis of ODE and later of hyperbolic conservation laws.



Call for Nominations for ICIAM Officers: Secretary, Treasurer, Officers-at-Large

The ICIAM Board Meeting in Beijing (August, 2015) will include elections to fill all the ICIAM officer positions except President/President-Elect (which was filled in 2013): The ICIAM By-Laws state that elections for Secretary, Treasurer and Officers at Large take place on years congruent to 3 mod 4. The terms, which are four years in duration, begin on October 1 of the election year.

The current president is Barbara Keyfitz (USA), and the president-elect is Maria J. Esteban (France), whose term as President will begin October 1, 2015. The other officers are as follows.

- Alistair Fitt (UK), Secretary, will have served two terms in 2015.
NOT eligible for renewal
- Jose A. Cuminato (Brazil), Treasurer, will have served one term in 2015.
ELIGIBLE for renewal
- Taketomo (Tom) Mitsui (Japan), Officer-at-Large, will have served one term in 2015.
ELIGIBLE for renewal
- Mario Primicerio (Italy), Officer-at-Large, will have served two terms in 2015.
NOT eligible for renewal

The duties of these positions are described in the By-Laws as follows.

The **Secretary** maintains the records of the organization in cooperation with the President and in accordance with the decisions made by the Board.

The **Treasurer** is responsible for the funds of the organization and annually presents a report on these funds to the Board.

Officers-at-Large do not have specific duties assigned by the By-Laws. At present Mario Primicerio chairs the membership committee and Tom Mitsui chairs the ICSU committee.

Nominations for all of these positions are solicited, and may be sent to any of the current officers, any time before the 2015 Board Meeting, but preferably before July 10, 2015, so that information may be circulated to the Board in advance. ICIAM Officers serve without remuneration; however, reasonable officer expenses in carrying out their duties are reimbursed from ICIAM funds.

Anyone with an interest in becoming or nominating an ICIAM Officer is invited to discuss the positions with any of the current officers.



GESELLSCHAFT für
ANGEWANDTE MATHEMATIK und MECHANIK e.V.
INTERNATIONAL ASSOCIATION of APPLIED MATHEMATICS and MECHANICS

GAMM Juniors' Summer School

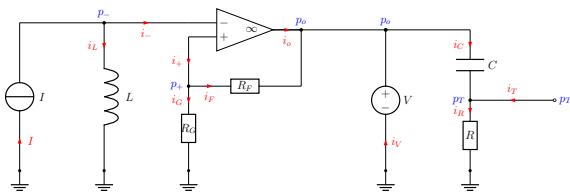
Differential-Algebraic Equations

Modelling, Fundamentals and Control

The topics are Differential-algebraic equations (DAEs). These equations are a powerful tool for modelling and analysis of various problems e.g. in multibody dynamics, economics and electrical circuits. The investigation of DAEs has therefore gained an important spot in mathematics and mechanics.

Homepage: <http://www.tu-ilmenau.de/index.php?id=36300>

The purpose of the SAMM is to support interdisciplinary exchange between young engineers, especially mechanical, and mathematicians, and to help (PhD) students facilitate their entry into the world of research. The SAMM will consist of five days of activities.



The SAMM will take place in **Elgersburg** (Germany) from **September 14–20, 2014**. The cost for the hotel including full board is EUR 500,- for a single and EUR 390,- p.p. for a double room. Due to financial support of the Ernst-Abbe-Stiftung, a limited number of scholarships are available.



Because of the restricted number of such scholarships, we ask students to preferentially use funds available at their home institutions.

The lecturers of the GAMM Juniors' summer school on differential-algebraic equations are



Thomas Berger



Stephan Trenn

Guest speakers on special topics are



Volker Mehrmann:
Optimal Control



Bernd Simeon:
Multibody Dynamics



School on Applied Mathematics and Mechanics

Organizers: Sebastian Schöps (TU Darmstadt) and Karl Worthmann (TU Ilmenau)

Mathematics and the Complexity of the Earth System

 by MARIA J. ESTEBAN

This article aims at presenting a very interesting report prepared by a large consortium in France in the framework of the Mathematics of Planet Earth initiative.

In 2012 a consortium of mathematicians, learned societies and institutes applied for funds to carry out a prospective work about the subject of “Mathematics of the Planet Earth”. After being approved by the National Research Agency, they started working in January 2013 and organized working groups, seminars, media events, conferences and the writing of a final prospective report, all during the 2013 MPE year. They also launched the initiative “one day, one post” which seemed an almost impossible task, but that worked perfectly for all year long. The final report can be found at the address

[mathsmonde.math.cnrs.fr/telechargements/
document.html](http://mathsmonde.math.cnrs.fr/telechargements/document.html)

and I encourage you all to have a look at it, or at least at the synthesis of that long and very interesting report. The work carried out during this year has been enormous and of great quality. It addressed the main issues and discussed many mathematical models and a large variety of mathematical methods to study them.

To give you an idea of what one can find in that text, let me copy large parts of the synthesis of the report as well as list the summaries of some of the main chapters. I hope that reading this will create in you the desire to learn more about this beautiful work.

Mathematics: a multi-present, cross-border discipline

Mathematics is a fundamental discipline that has always been at the heart of important issues relating to the complexity of the Earth and, more especially, the environment. Understanding research issues as well as problems of sustainable management requires the adaptation of mathematical techniques in interaction with other disciplines. However, seeking solutions to environmental problems can also give rise to the development of new mathematical theories. These essential exchanges between disciplines gradually lead to a better understanding of the complexity of the world we live in. This complexity is reflected in the diversity of the topics studied: the applications to concrete problems, relating to the world that surrounds us, from genetic evolution to fluid turbulence. Emphasis is also put on mankind and his interaction with the ecosystem. The report focused on the interactions between different processes and different scales by consider-

ing mathematics as a discipline that cuts across multiple fields of knowledge. Thus, this report does not intend to be exhaustive but rather to demonstrate the diversity of mathematics' role by considering a number of carefully chosen examples. Throughout this synthesis, the report makes references to all the texts written by the different researchers. For those who wish to find out even more, the texts appear in their entirety in the report.

Within this wide-ranging field of interest, the Math-sInTerre project organized different topics according to three themes: Human World, Living World, Fluid World (see below).

Mathematics in the real world focuses on mathematics as a tool for solving environmental problems. Acting as an aid to understanding, forecasting or decision-making, mathematics is like a very practical toolbox. However, it does have some shortcomings: a few mis- or poorly-understood tools lie at the bottom of the box, some are still new because they are unusable, while others still have to be invented. It is therefore important to take particular care in maintaining the links between the real world, theory and computational science.

Some important tasks are the understanding gained by theory, the observation and simulation of non-reproducible phenomena in the laboratory and helping the governance of territories and the sustainable management of ecosystems.

Emerging mathematics focuses on emerging theories. New environmental and societal issues call for a better understanding of numerous complex and highly heterogeneous behaviour patterns. Inspired by these challenges, mathematicians are formalizing new questions and attempting to provide answers by digging deep into their mathematical culture. These answers sometimes require the development of new mathematics.

Addressing heterogeneity needs to consider multi-scale behaviours over time and space; the diffusion of energy; multi-processes; managing randomness; and managing an uncertain environment.

Numerical mathematics maintains close links with theory. Going from one to the other is a daily sport for some mathematicians. Such mathematicians often focus on problems arising from applications: coupling of processes, model validation, parameterizations, high-performance computing (supercomputing)... Forming a bridge between the abstract and the concrete, numerical mathematics has difficulties in finding its place in the world of research in France.

Proposals for structural action plans

The current state of mathematics research reveals the existence of a substantial community of researchers working on topics related to the Earth system. However, the links with other disciplines are still insufficient for a science related to the Earth that should be tending towards the development of a continuum, where there are no barriers between disciplines or within mathematics itself. Therefore the report proposes some tools for financing research that are aimed at encouraging interaction and for which one of the essential selection criteria is the scientific quality of the mathematics questions addressed.

Some challenges to be addressed

At its conclusion, the report provides some examples of challenges related to Planet Earth where mathematics has an important role to play. It goes without saying that this list is not exhaustive. For a more comprehensive view, it is important to consult the complete report as this provides a more complete list of the challenges.

- **The study of ocean-atmosphere models:** analyze major sets of satellite data; ocean-atmosphere coupling, wind forcing; internal waves; management of multiple scales, better parameterization of sub-grids; representation of sub-mesoscale processes for tracers and vertical transport in the ocean; marine biogeochemistry: new coupling with population dynamics and large number of individuals.

Study morphogenesis. Going from the cellular scale to a continuous model; establishing the laws of scale that characterise the morphology of relief; linking cellular and granular behaviour to a change in macroscopic form.

- **Consider ecosystems and biodiversity models:** analysis of multiple interaction networks in the ecosystems; taking localized interactions into account at the regional to global scale; population and ecosystem dynamics in a changing and uncertain environment; representations of different time scales in evolving eco-dynamics and biodiversity.
- **Study climate models:** land/atmosphere biogeochemical exchanges; parameterization of turbulence and the effect of clouds; studies of sea ice and sudden changes of phase (solid, liquid, etc.) and dynamics; rupture dynamics phenomena (polar ice-caps, landslides, avalanches).
- **Study self-organization:** understanding the disruptive phenomena of embryogenesis (fish, pollutants, etc); importance of social mechanisms in the

reproductive performances of animal populations; characterizing the phenomena of self-organization (granular media, gels, social movements).

- **Study coastal flows:** marine energy forms; resilience of structures to natural hazards; better understanding of shoreline dynamics; better understanding of wave breaking, erosion phenomena and sedimentation.
- **Study river hydrodynamics and agro-ecosystems:** complex rheology flows; better anticipation of natural risks; water quality, infiltration, pollution; coupling of river-stream-ocean models; importance of bottom irregularities and problem of lateral confinement.
- **Study economics and sustainable management of soils and resources:** linking cognitive mechanisms and evolution; reducing the congestion of social, IT and transport networks; management of spatial and temporal variability of energy forms; towards a multi-model approach in the conception of strategies; taking into account decision and anticipation mechanisms in helping decision-making; modelling decision-making cognitive mechanisms and the influence of the environment on behaviour.

I hope that the more detailed description of some of these models and the tools that various groups of mathematicians propose to deal with them is of interest for you. If this is the case, plunge into the real and complete report: mathsmonde.math.cnrs.fr/telechargements/document.html

Maria J. Esteban is research director at CNRS since 1991 and works at University Paris-Dauphine. Her research themes include the study of nonlinear partial differential equations, specially by variational methods; relativistic and nonrelativistic quantum mechanics, with applications to quantum chemistry; fluid-structure interactions, etc. Until recently she was president of SMAI (Société de Mathématiques Appliquées et Industrielles) and cur-

rently she is the chair of the Applied Mathematics Committee of the EMS.



Attending the Abel Prize Ceremony 2014

by BARBARA LEE KEYFITZ

One of the pleasures of being President of ICIAM is being invited to the Abel Prize ceremony, which takes place in Oslo every May. This year was particularly delightful, as I have admired the winner, Yakov Sinai, for many years and have even used some of his work. In addition, I was invited to bring a companion and Marty Golubitsky was able to join me (in his case, on his way around the world to a conference in Guangzhou).

The festivities, which this year took place May 19–21, are hosted by the Norwegian Academy of Science and Letters. The first formal event, a wreath-laying by the Laureate at the Abel Monument, we missed, despite our good intentions, because of airplane delays. However, we arrived in time for the first splendid banquet, at the Academy. Reading about Abel’s short life, saddened by poverty, is a reminder that Norway was, for many years, a relatively poor country. This is something that is easy to forget when being entertained in the magnificent Academy building. And one forgets poverty again when the prize is bestowed (this year by the Crown Prince) in the Aula of the University of Oslo, a beautiful and beautifully decorated room. This took place on the second day, and was followed by the second splendid banquet, this time courtesy of the Norwegian Ministry of Education and Research, at Akershus Castle, a medieval fortress perched high above the harbor. The photo (taken by Marty in the reception hall of the Castle) shows five women who are now serving the mathematics community; from the left, they are Maria J. Esteban, ICIAM President-Elect and member of the Abel Committee; myself; Ragni Piene, Chair of the Abel Committee; Ingrid Daubechies, President of the IMU; and Marta Sanz-Sole, President of the EMS.

On the final day, at the University of Oslo, we heard talks by Gregory Margulis (Yale), Konstantin Khanin (Toronto), Domokos Szász (Budapest) and of course by Sinai himself. The celebrations concluded with a party, less formal but still somewhat overwhelming—it included a musical performance, as well as food and wine—at the Academy.

The Abel Prizes are funded by the Norwegian Government. The first Abel Prize was awarded, to Jean-Pierre Serre, in 2003, and since then there have been 13 additional laureates (this includes two double awards). As well as awards in core mathematics, the Prize has recognized applied mathematics and theoretical computer science, and, given the short time it has existed, it has been awarded in an astonishing variety of fields within the mathematical sciences. The nomination process is open to anyone (except that one cannot nominate oneself) and is simple: provide a CV and a letter, and a list of possible commenters. Its goal is “to recognize contributions of extraordinary depth and influence”. The competition is intense. But several people, knowing that I represented ICIAM, emphasized that they would like to see more nominations in applied mathematics. I left Oslo with the feeling that ICIAM should support the prize by making nominations. For the 2015 prize, nominations are due by September 15.



From the left: Maria J. Esteban, ICIAM President-Elect and member of the Abel Committee; Barbara L. Keyfritz, ICIAM President; Ragni Piene, Chair of the Abel Committee; Ingrid Daubechies, President of the IMU; and Marta Sanz-Sole, President of the EMS. —Image used with permission.

ICIAM 2015 Call for Mini-symposia

by SCIENTIFIC PROGRAM COMMITTEE OF ICIAM 2015

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 make the first presentation. Each mini-symposium speaker should submit an abstract of at most 75 words. The organizing committee will evaluate mini-symposium proposals. The number of mini-symposia may be limited to retain an acceptable level of parallelism in the conference sessions.

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 collaborator to present your work.

To ensure balance, ICIAM prefers that a single individual 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 if all co-authors of the papers being presented in a mini-symposium 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.

Industrial Mini-symposia

An industrial mini-symposium is quite the same as a mini-symposium in form. The subject must be relevant to gen-

uine industrial problems, 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. The organizing committee will evaluate mini-symposium proposals.

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

Important Dates

Mini-symposia

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-symposium proposals;

December 30, 2014: Submission deadline for accepted mini-symposium abstracts.

Contributed Papers

July 30, 2014: Contributed papers online submission opens;

December 30, 2014: Submission deadline for contributed paper abstracts.

Posters

July 30, 2014: Poster online submission opens;

April 30, 2015: Submission deadline for contributed poster abstracts.

Conference Registration

Early Bird Registration: January 1–April 30, 2015;

Regular Registration: May 1–July 31, 2015;

Late and On-site Registration: August 1–August 10, 2015.

Putting the Dollar Sign back in Mathematics

by BARBARA LEE KEYFITZ

By now you have probably heard the good news: Mathematical Science Research (MSR) adds value. In late 2012, the UK accounting firm Deloitte reported on a study they had undertaken, at the behest of EPSRC (the UK Engineering and Physical Sciences Research Council) to determine the economic benefits of MSR to the UK. Their astonishing conclusion was that MSR contributes 10% of all jobs in the UK, and an amazing 16% of GVA (their term for Gross Domestic Product). For comparison, the figures from similar studies in Chemistry were 3% and 21% respectively, and in Physics 4% and 8.5%.

These figures are intriguing for a number of reasons. Of course “mathematics” is ubiquitous in the economy. There would be no commerce at all without it, and so the study tried to be careful to distinguish between “mathematics” and “mathematics research”, which was what it claimed to be counting. But then, the study also noted that the gestation time for a research contribution might be quite long (although they did not quantify this). However, the study makes clear that a country that wishes to be economically competitive should not rely on “old” mathematics, but needs to keep developing new results.

Flattering as these observations are to our discipline, we should note some of the context. The authors of the study confess that this first attempt at such analysis will benefit from discussion and further refinement. Some of the statements in the study initially invite disbelief, such as “mathematical sciences occupations (MSO) are the majority of jobs in the R&D sector”; but a careful reading of the Appendix, which details the methodology, shows that what is meant by a MSO is simply a job to which mathematics might contribute, and the actual contribution is

in many cases assigned a very small weight. The study also says explicitly that, for the most part, the contributors in MSO do not need to understand or even know the mathematics on which their work is ultimately based. The validity of their approach is backed by some compelling examples. The study points out, for instance, that mathematical weather models allowed airplanes to quickly and safely return to the skies after the 2010 Icelandic volcano eruption.

Another point to note: This report, which is restricted to the UK and, even more precisely, to the UK in 2010, emphasized the high quality of the mathematical sciences research (as measured, for example by the reputation of UK researchers). So a country can’t cheat by encouraging any kind of research; they need to support the best. On the other hand, every country can benefit from research that originates in any country, since it’s all published openly, so there may be an incentive to let other countries’ research agencies fund the work. (This is not stated in the report, but one can draw one’s own conclusions.)

Anyone who has ever tried to commercialize their research—a necessary step to producing the “added value” measured by this report—will know that converting mathematical results into economic value is not at all simple. Study groups, organizations like the Smith Institute in the UK, and offices in many universities promote the essential translation of research into enterprise. Reading this report has increased my admiration this endeavor. The report is available on the internet at www.epsrc.ac.uk



SAVE THE DATE!

August 10-14, 2015

Beijing, China



The Secretariat of ICIAM 2015

Siyuan Building,
No. 55, Zhongguancun East Road,
Beijing 100190,
P.R. China

Email: iciam2015@amss.ac.cn
Tel: 8610-62613242
Fax: 8610-62616840

Conference Registration

Early Bird Registration: January 1 - April 30, 2015
Regular Registration: May 1 - July 31, 2015
Late & On-site Registration: August 1 - 10, 2015

Contributed Papers

Submission Open: July 30, 2014
Submission Due: December 30, 2014

Mini-symposia

Submission Open: March 30, 2014
Early Decisions Notification of Proposals:
August 30, 2014
Submission Due of Proposals:
September 30, 2014
Final Decisions Notification of Proposals:
October 30, 2014
Submission Due of Accepted Mini-symposium Abstracts:
December 30, 2014

Posters

Submission Open: July 30, 2014
Submission Due: April 30, 2015

Satellite Conferences

Submission Open: January 1, 2014
Submission Due: October 30, 2014

Embedded Conferences

Submission Open: January 1, 2014
Submission Due: October 30, 2014



Conference venue: The China National Convention Centre

Invited Speakers of ICIAM 2015

Bob Bixby

Gurobi Optimization, Inc., USA

Analisa BuffaIstituto di Matematica Applicata e Tecnologie
Informatiche, Italy**Gunnar Carlsson**

Stanford University, USA

Jean Michel Coron

Université Pierre et Marie Curie, France

Lisa Fauci

Tulane University, USA

Martin Hairer

Warwick University, UK

Ravi Kannan

Microsoft Research, India

Karl Kempf

INTEL Corporation, USA

Shunlong LuoAcademy of Mathematics and Systems Science,
CAS, China**Volker Mehrmann**

Technische Universität, Berlin, Germany

Gabriel Nguetseng

University of Yaounde I, Cameroon

Yasumasa Nishiura

Tohoku University, Japan

Ricardo Nochetto

University of Maryland, USA

Shige Peng

Shandong University, China

Nancy Reid

University of Toronto, Canada

Mark SagarThe Laboratory for Animate Technologies,
The University of Auckland, New Zealand**Claudia Sagastizábal**Instituto Nacional de Matemática Pura e
Aplicada, Brazil**Laure Saint-Raymond**

École Normale Supérieure, France

Jesús Sanz Serna

Universidad de Valladolid, Spain

Ludger D. SaxGrid Optimization Europe-System Planning
Gas & Water, Germany**Jin-Keun Seo**

Yonsei University, Korea

Zuowei Shen

National University of Singapore

Ian Sloan

The University of New South Wales, Australia

Simon Tavaré

Cancer Research UK, Cambridge Institute, UK

Eric Vanden-Eijnden

Courant Institute, NYU, USA

Barbara Wohlmuth

Technische Universität, München, Germany

Yinyu Ye

Stanford University, USA

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.

The Full Members and their representatives (when known)

ANZIAM (Australia and New Zealand Industrial and Applied Mathematics): Ian H. Sloan

ASAMACI (Asociación Argentina de Matemática Aplicada Computacional e Industrial): Eduardo Adrián Santillan Marcus

CAIMS-SCMAI (Canadian Applied and Industrial Mathematics Society, Société Canadienne de Mathématiques Appliquées et Industrielles): Ian Frigaard

CSCM (Chinese Society for Computational Mathematics): Xuejung Xu

CSIAM (China Society for Industrial and Applied Mathematics): Pingwen Zhang and Guiying Yan

ECMI (European Consortium for Mathematics in Industry): Michael Günther

ESMTB (European Society for Mathematical and Theoretical Biology): Vincenzo Capasso

GAMM (Gesellschaft für Angewandte Mathematik und Mechanik): Peter Benner and Sergio Conti

IMA (Institute of Mathematics and its Applications): Iain S. Duff and David Abrahams

ISIAM (Indian Society of Industrial and Applied Mathematics): Abul Hasan Siddiqi and Pammy Manchanda

JSIAM (Japan Society for Industrial and Applied Mathematics): Shin'ichi Oishi and Hiroshi Kokubu

KSIAM (Korean Society for Industrial and Applied Mathematics): Chang Ock Lee

MOS (Mathematical Optimization Society (formerly Mathematical Programming Society)): William (Bill) Cook

NORTIM (Nordiska föreningen för Tillämpad och Industriell Matematik): Helge Holden

ROMAI (Societatea Română de Matematică Aplicată și

Industrială): Costica Morosanu

SBMAC (Sociedade Brasileira de Matemática Aplicada e Computacional): Helena J. Nussenzveig Lopes

SEMA (Sociedad Española de Matemática Aplicada): Tomás Chacón Rebollo

SIAM (Society for Industrial and Applied Mathematics): Cynthia Phillips and Irene Fonseca

SIMAI (Società Italiana di Matematica Applicata e Industriale): Alessandro Speranza and Giovanni Russo

SMAI (Société de Mathématiques Appliquées et Industrielles): Grégoire Allaire and Alain Damlamian

SPMAC (Sociedad Peruana de Matemática Aplicada y Computacional): Obidio Rubio Mercedes

VSAM (Vietnamese Society for Applications of Mathematics): Lê Hùng Són

The Associate Members and their representatives

AIRO (Associazione Italiana di Ricerca Operativa):

AMS (American Mathematical Society): Don McClure

AWM (Association for Women in Mathematics): Jill Pipher

ChinaMS (Chinese Mathematical Society): Xiaoshan Gao

CMS-SMC (Canadian Mathematical Society, Société Canadienne de Mathématiques): Elena Braverman

DMV (Deutsche Mathematiker-Vereinigung):

EMS (European Mathematical Society): Franco Brezzi

IMS (Institute of Mathematical Statistics): Hans Rudolf Künsch

IMU (Israel Mathematical Union): Edriss S. Titi

LMS (London Mathematical Society): Stephen Huggett

MSJ (Mathematical Society of Japan): Yoichi Miyaoka

ÖMG (Österreichische Mathematische Gesellschaft): Alexander Ostermann

PTM (Polskie Towarzystwo Matematyczne (Polish Mathematical Society)): Łukasz Stettner

RSME (Real Sociedad Matemática Española):

SingMS (Singapore Mathematical Society): Weizhu Bao

SMF (Société Mathématique de France): Bernard Helffer

SMG-SMS (Schweizerische Mathematische Gesellschaft - Société Mathématique Suisse - Swiss Mathematical Society): Jean-Paul Berrut

SMM (Sociedad Matemática Mexicana): Mayra Nuñez-Lopez

SPM (Sociedade Portuguesa de Matemática):

UMI (Unione Matematica Italiana): Pierangelo Marcati

The current officers of ICIAM

President: Barbara Lee Keyfitz, USA

President-Elect: Maria J. Esteban, France

Secretary: Alistair Fitt, UK

Treasurer: Jose Alberto Cuminato, Brazil

Members-at-Large: Mario Primicerio, Italy and Taketomo (Tom) Mitsui, Japan