The ICIAM Dianoia
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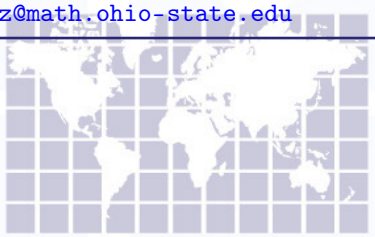


Cover illustration: The Su Buchin Prize was established to provide international recognition of an outstanding contribution by an individual in the application of Mathematics to emerging economies and human development, in particular at the economic and cultural level in developing countries.

Invited Speakers of ICIAM 2015

Bob Bixby
Gurobi Optimization, Inc., USA

Analisa Buffa
Istituto 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 Luo
Academy 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 Sagar
The 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. Sax
Grid 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

Call for parallel sessions: Science conference "Our Common Future Under Climate Change" in Paris 2015

by Anne-Sophie Stevance

A major international conference entitled "Our Common Future Under Climate Change" will take place on 7-10 July 2015 in Paris, ahead of the UNFCCC 21st Conference of the Parties that is expected to adopt a new climate agreement. The science conference will discuss the IPCC findings and new research since the publication of AR5 with a strong focus on solutions, as well as considering climate adaptation and mitigation in the broader context of global environmental change.

A **call for parallel sessions is now open with a deadline to submit proposals on 30 November 2014**. Please see guidelines and template to submit a parallel session here. All submissions should be made on the conference website.

The conference will be structured around four broad themes:

1. State of Knowledge on Climate Change
2. Scenarios Exploring Our Common Future
3. Responding to Climate Change Challenges
4. Collective Action and Transformative Solutions

The conference chaired by Professor Chris Field is organised by a broad partnership of French institutions (CIRED, CNRS, IDDRI, INRA, IPSL, IRD) and international institutions (ICSU, UNESCO, Future Earth). It is expected to bring together over 1,000 scientists and other stakeholders. We would be grateful for you to disseminate this information in your networks.

For more information, please visit the conference website: www.commonfuture-paris2015.org

Contact person: Anne-Sophie Stevance, International Council for Science

Invited Speakers of ICIAM2015: Profiles Part I

Claudia Sagastizábal is an applied mathematician specialized in optimization with interests in both its theory and its numerical aspects.

Claudia Sagastizábal.

After finishing her undergraduate math studies in Argentina, Claudia moved to Paris where she obtained PhD and habilitation degrees at Paris I Panthéon-Sorbonne University. Personal reasons caused Claudia to reverse direction over the Atlantic Ocean about 15 years ago; she now lives in Rio de Janeiro.

Claudia has participated in industrial collaborations since the time of her PhD studies in the 1990s. Her first experience in this area, with Electricité de France (EdF), was so beneficial that it greatly influenced her career: Claudia's theoretical research has been continuously enriched with insight provided by applications.

After graduating, Claudia became a permanent researcher at INRIA, the French Institute for Automatic Control and Computer Science. In Brazil, she had a research position at Eletrobras' Electric Energy Research Center for five years. She has taught optimization at various universities and "Grandes Écoles" and advised many PhD students and post-doctoral fellows in France and Brazil. In parallel with her academic activities, Claudia holds or has held consulting R&D appointments for companies such as EdF, Gaz de France-Suez and Renault in France; Robert Bosch in Germany; and Petrobras, Bovespa and Eletrobras in Brazil.

Claudia participates in numerous synergistic activities. She was elected Council Member-at-large for the Mathematical Optimization Society for the period 2009-2013. She also served on program committees and/or organized thematic clusters on Convex, Nonsmooth and Energy Optimization at the most important conferences in the optimization area. She is an Associate Editor of the journal Energy Systems, has recently ended a five year term as an Editor of Mathematical Methods of Operations Research and will become Editor-in-Chief of the journal Set-Valued and Variational Analysis in 2015.

Claudia is co-author of the book "Numerical Opti-

mization: Theoretical and Practical Aspects," published by Springer. Her research interests lie in the areas of nonsmooth optimization, stochastic programming and variational analysis and are driven by real-life applications.

Claudia Sagastizábal's research is devoted to Mathematical Optimization, in a broad sense that ranges from theoretical Variational Analysis to algorithms and numerical methods. A vast majority of her works, even the most theoretical ones, hinge upon applications.

In Mathematics, the word "application" refers to a model representing some real-life phenomenon whose behavior we want to understand or to predict, or whose operation we want to improve or control. Optimization has been described as the mathematics of the "betterment": when applied to a real-life problem, Optimization deals with deciding values for model parameters to make some kind of improvement in the real-life situation being modeled.

Consider, for example, the problem of managing a mix of power plants generating electricity. An optimizer can build a model that will guide the plant manager in planning how much electricity to produce from each source of energy: hydraulic, nuclear, coal, wind, solar. In doing so, the optimization modeler will first define a goal, such as to "minimize the generation cost", or "maximize the revenue", or "minimize the risk of having a deficit of energy"; this involves optimization of a so-called objective function. Naturally, the manager's choices are limited by the production capacity and physical laws for each technology; these are examples requiring definitions of constraint functions.

Another important request is that demand needs to be satisfied: every time we enter a dark room and switch on the light, we expect electricity to be "waiting" there and the room to be lit. This extremely crucial constraint is difficult to deal with, not only because at planning time the exact amount of (future) demand is unknown, but also because electricity cannot be stored (except for limited amounts in batteries).

Such features can force the modeler to cast the problem in a stochastic framework by incorporating the fact that demand is uncertain.

Once the optimization model is written down, the problem must be solved and here arises an important consideration. For our example, the manager's decisions have an impact on the price of electricity. From the Optimization point of view, such a value is given by a "shadow price", the multiplier associated with the demand constraint.

For the manager, in particular, and society, in general, it is therefore very important to compute those prices with high precision.

. . . but demand is uncertain! What can be done in this situation?

A partial solution is to incorporate in the model as many scenarios of demand as possible, to somehow cover all future outcomes. This makes the optimization problem extremely large, and special solution methods need to be employed.

By combining Lagrangian relaxation and dualization, our power plant model can be reformulated as a nonsmooth optimization problem. In this context, so-called bundle methods are well-known for their robustness and precision. These nonsmooth optimization algorithms can handle very efficiently large-scale stochastic programming problems such as the one described above. Her research focuses on how to exploit structural properties of nonsmooth objective functions arising in this setting, doing so in a manner that accelerates the convergence speed of bundle methods, without losing accuracy in the solution.

Personal Homepage: w3.impa.br/~sagastiz/

J.M. Sanz-Serna.

J.M. Sanz-Serna completed a PhD in Functional Analysis at the University of Valladolid (Spain) in 1977. He studied Numerical Analysis at the University of Dundee (Scotland) in 1977-1978 and most of my publications have been in this latter field. He worked for a while at the University of the Basque Country and, since 1982, he is full professor of Applied Mathematics at the University of Valladolid. In the period 1998-2006 he left mathematics completely as he served for two four-year periods as Rector (President) of the University; this is a full time job since the institution has more than 30,000 students. He has mainly, but not exclusively, worked in numerical differential equations (ordinary or partial), in particular in structure preserving methods (geometric integration) for Hamiltonian problems. In recent years he has become very interested in stochastic issues. At present he chairs the mathematics section of the Royal Academy of Sciences of Spain and is a fellow of SIAM, the AMS and the IMA (United Kingdom).

Personal Homepage: www.sanzserna.org

Ludger D. Sax is the owner and Managing Director of the Grid Optimization Europe Ltd., based in Germany & Luxembourg. He studied mathematics, philosophy and theology at the University of Bochum, Germany. His particular interest has been to build a bridge between science/theory and industry/practice. He has achieved success in the past 30 years in leading positions in the gas & water industry in Europe, in particular for Ruhrgas, E.ON and Open Grid Europe.

Among his significant achievements is the initiation

of one of the largest research alliances in Europe in 2008. This research alliance named "ForNe" aims to collaborate in network optimization. Around 10 universities and institutes with more than 30 mathematicians along with more than 10 employees from the gas industry worked together to make use of contemporary mathematics and state-of-the-art solver technology to establish modern mathematical methods in the planning of gas transport networks. Other projects in which he has been active in include the (D)GOR (Gesellschaft für Operations Research) working group "prediction methods" and the BMBF (German Federal Ministry for Research and Education) led working group "strategy mathematics 2020". His latest research project which he initiated in 2014 is the optimization of the control/dispatching of gas grids. He is a member of the Scientific Committee of the Zuse Institute Berlin (ZIB). Since the end of 2013 he has been with his company Grid Optimization Europe and is currently working on a self-developed program "OptiPlan/Russian Version", to optimize the gas grids of Russian regional municipalities and distribution system operators.

Ludger D. Sax.

Info: www.grid-optimization-europe.com

Ian Sloan's current research mainly spans two broad areas of computational mathematics. First, he is centrally involved with modern developments of high-dimensional integration and approximation. This field was once the preserve of number theorists, but in recent decades is attracting wide research interest as tools are developed that can be applied to practical problems. High-dimensional problems (that is problems with the number of continuous variables ranging from ten or twenty to the hundreds of thousands) are increasingly encountered in practice. Some fields in which high-dimensional problems arise include mathematical finance; modeling of disease presentations in a community; and modeling the flow of subsurface water through a complex material considered as a random medium. Many other high dimensional problems occur in molecular physics and chemistry, for example in the Schrödinger equation for a multi-electron system.

A general characteristic of high-dimensional problems is that they are hard! The workhorse for such problems is the Monte Carlo method, which relies on randomness, but while it is admirably robust and flexible, the Monte Carlo rate of convergence is often too slow. A central concern of this area of research might be said to be to devise methods that can be proved to be better than the Monte Carlo method for particular classes of problems.

Ian Hugh Sloan.

Second, he is involved with many aspects of approximation and modeling on manifolds, including polynomial and radial basis function approximations on spheres (including multiscale variants). Problems of this kind often arise in geophysical contexts, given the (approximate) spherical nature of Earth's surface. Special problems arise because many measurements of geophysical importance are made not on Earth's surface but on satellite orbits, raising interesting mathematical questions about mapping the measured data from the orbit to ground level. There are also many interesting questions about numerical integration over spheres and manifolds, not least because for spheres, with a small number of exceptions (e.g. the vertices of Platonic solids) there are NO point distributions on spheres that are convincingly regular. One theme of Ian Sloan's research is the deep relation between quadrature and energy of point distributions on spheres. For instance, is it true (as many surmise) that point sets that have minimal Coulomb energy on the sphere are good point sets for (e.g. equal-weight) numerical integration? (The answer is in general no.)

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.

The IMA Small Grant Scheme

by Iain Duff

As this year is the tenth anniversary of the start of the Small Grant Scheme of The Institute of Mathematics and its Applications, I thought it was appropriate to say a few words about the scheme and its impact on Applied Mathematics in the UK and beyond.

The scheme was started in 2004 with an allocation of £6,000 from the IMA Council. It attracted 17 applications in the first year, 14 of which were funded fully or partially. One of the most remarkable aspects has been the growth in the number of applications over the last ten years. We show in Table 1 the evolution of both applications and grants awarded since the inception of this scheme.

Number of grants applied for and awarded since beginning of scheme.

Year	Number of Grants		
	Applications	Granted	
		Fully	Partially
2004	17	8	6
2005	9	3	4
2006	14	10	4
2007	14	8	3
2008	19	12	6
2009	17	10	4
2010	21	11	5
2011	39	13	7
2012	39	11	12
2013	34	12	9
2014 ytd	45	16	14
Total	268	114	74

The increase in submissions over the last years, in particular since 2010, is in part due to the increased awareness of our scheme within the Applied Mathematics community. However, by a significant amount the biggest increase has been in applications for support to attend a conference overseas. The number of applications in this category increased from four in 2010 to 24 in 2011, accounting for all the increase in that year. The number of applications in this category has remained similarly high since then and is a reflection of the fact that few other bodies now support such an activity. The LMS covers overseas visits but not to conferences while the Royal Society ceased supporting this category of application around 2010.

The categories of activity for which grants can be awarded has remained very similar since the start of the scheme. As is stated on the appropriate page of the IMA website (ima.org.uk), the awards can be used to support all forms of research activity within the remit of the IMA, but the Institute particularly welcomes applications that are used to:

1. provide partial support for workshops and small conferences and symposia;
2. assist with travel costs for overseas visitors;
3. facilitate the advancement and promotion of collaborative research programmes;
4. promote the education and training of students and young mathematicians and scientists;
5. initiate or aid joint research programmes between mathematicians and industry;
6. enable an activity that is not open to funding from other sources.

The success of the programme can be seen not only from the increase in applications but also by the fact that a similar type of grant scheme was started by the Education Committee of the IMA in 2007 and the annual budget for the Small Grant Scheme was increased by the IMA Council to £12,000 in 2008. When this budget was increased, applications in category (1) above could request up to a maximum of £1,200, twice the maximum for applications in other categories. In this 50th Anniversary Year of the IMA (see the article by Rebecca Waters in this issue of DIANOIA) the Council agreed, given the unprecedented number of applications, to allocate an additional £6,000 to the scheme this summer.

The applications are judged by a subcommittee of the IMA Research Committee who can award, reject, or partially fund the application.

The subcommittee takes the following aspects into account when reviewing grant requests:

1. Overall merit of the proposed activity (scientific quality, training, education, wider benefits);
2. The usefulness and effectiveness of the IMA Small Grant in the success of the proposal;
3. Benefit of the activity to the Institute's vision for mathematics in the UK;
4. Other aspects which weight the proposal up or down, such as the promotion of young mathematicians, availability of alternative funding, etc.

When supporting conferences or individual grants, we are increasingly keen to offer our support to those needing it most, for example helping students to attend a conference or support for early-career applications, although a recent grant provided support for a retired but active researcher.

Although the amounts involved are not large, they can make a significant difference to individuals and groups planning meetings or workshops. Indeed, we suggest that the larger grants should only be given when it would enable the event to proceed.

As a condition of the grant, we request a short note about the event or visit being sponsored and sometimes this results in an article that we publish in Mathematics Today, the bimonthly bulletin of the IMA. This has resulted in nearly 50 short contributions and the occasional full length article. A notable recent article concerned the search for signs of life in the stratosphere and showed that Applied Mathematics is indeed rocket science [1]!

We have awarded almost £100,000 in grants since the scheme began thus contributing significantly to the health of British Applied Mathematics and to the the subject in general by the increased involvement of UK participants to conferences at home and abroad and by support for UK based conferences.

I would like to thank Helen Cook of the IMA for her help in obtaining the statistics on which this article is based.

[1] Paul Shepard. A Mathematican's Apogee. *Mathematics Today*, 47(4):166-171, 2011.

Iain S. Duff is an STFC Senior Fellow in the Scientific Computing Department at the STFC Rutherford Appleton Laboratory in Oxfordshire, England. He is also the Scientific Advisor for the Parallel Algorithms Group at CERFACS in Toulouse and is a Visiting Professor of Mathematics at the University of Strathclyde.

His current research interests include numerical linear algebra, sparse matrices, parallel computing, scientific computation, and mathematical software. He has written several books and over 200 papers in these areas, more than half of which have appeared in refereed journals. He is recognized by ISI Thomson as a Highly Cited Researcher.

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.

7th Elgersburg School on Mathematical Systems Theory Elgersburg (Germany) March 1 - 7, 2015

The organizers have the pleasure to announce the "7th Elgersburg School on Mathematical Systems Theory". The school consists of two courses:

Linear Matrix Inequalities and Robust Control

by

Professor Carsten Scherer
(Univ. Stuttgart)

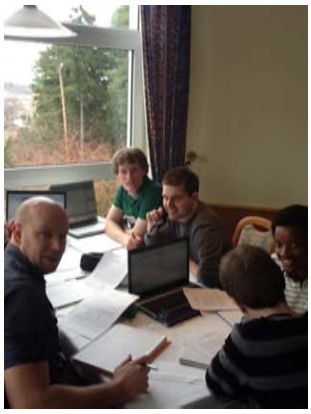
Professor Siep Weiland
(TU Eindhoven)

Model Predictive Control

by

Professor Lars Grüne
(Univ. Bayreuth)

Program
There will be 90 minute lectures on both courses each day, example sheets to be worked on in the afternoon, and example classes in the evening.



Addressees
The school is addressed to postgraduate students or postdocs in control, either in mathematics or engineering, very good graduate students are also welcome. We would be grateful if you could pass on this information to any potential candidates.

Location
The workshop takes place in the "Hotel Am Wald" in Elgersburg (Thuringia).

The cost for the hotel including full board (evening March 1-7, 2015) per person is 500 € for a single room and 390 € for a double room per person. The location has a capacity for 40 students.

Registration
Due to the limited number of places there will be an application procedure for participation at the school. Applicants are asked to provide their CV and a letter of reference from their supervisor. The deadline for applications is November 30, 2014. The organizers will then rank the applications according to excellence and suitability.

Scholarships
There are funds for travel support, accommodation and subsistence for 16 participants.

Further information
Please visit the website

www.tu-ilmenau.de/de/math/forschung/tagungen/elgersburg-schools/elgersburg-school-2015

The Institute of Mathematics and its Applications Celebrates 50 Years

by Rebecca Waters

The Institute of Mathematics and its Applications (IMA) was formed 50 years ago to provide an organisation to promote mathematics and its applications and recognise mathematicians, whether from academia, industry or education. The IMA is the professional and learned society for qualified and practising mathematicians in the UK. It exists to support the advancement of mathematical knowledge and its applications and to promote and enhance mathematical culture in the UK and elsewhere, for the public good.

The IMA is celebrating fifty years with a series of events in 2014 [1]. We were honoured to welcome our Royal Patron for this anniversary year, Her Royal Highness The Princess Royal, to The Royal Society on 14 May. This was the first major event of the year and we held lectures celebrating the many important facets of mathematics that the IMA, and its members, represent. The IMA also launched an excellent book [2]: *50 Visions of*

Mathematics on 14 May.

In early July, The Manchester Festival of Mathematics and its Applications included stands, hands-on activities, and a series of popular talks and workshops given by well-known communicators of mathematics and its applications. At the same time a series of four seminars for mathematicians was presented by prominent members of the community.

The IMA was delighted to hold an inspirational mathematical event, organised together with the Royal Institution of Great Britain, on 7 October. The main lecture was **Eight Great Reasons to do Maths** by Chris Budd (IMA VP Communications).

Anniversary Celebration at the Royal Society

The IMA President, Professor Dame Celia Hoyles, welcomed The Princess Royal, expressed warm thanks to her for agreeing to be our Patron in our anniversary year and for graciously agreeing to attend our event. As Her Royal Highness mentioned, she is not the first member of The Royal Family to be involved with the IMA; His Royal Highness The Duke of Edinburgh was President of the IMA from 1976-1977.

Her Royal Highness presents the IMA MathsCareers Certificate. —Image used with permission.

Her Royal Highness mentioned many of the IMA's activities in glowing terms, including conferences, journals, books, promoting careers, employers' forums, MathsCareers, Mathematics Matters, Maths Teacher Scholars, the Chartered Mathematician designation (which is incorporated by Royal Charter and provides a benchmark for professional mathematicians similar to Chartered Engineer).

After her talk HRH The Princess Royal presented the certificate to the IMA MathsCareers Competition Winner in the 11-13 age group, Miss Laura Guyll. The IMA then made two presentations to Her Royal Highness in commemoration of her Patronage of the IMA in its 50th anniversary year. Dame Celia presented her with an Honorary Fellowship Certificate, and Chris Budd presented her with a copy of the IMA's 50th anniversary book, *50 Visions of Mathematics*.

A fiftieth anniversary celebration would not be complete without looking back at the last 50 years. IMA past-President, Professor John McWhirter spoke about 50 Years of the IMA. The IMA was founded by a group of mathematicians, led by James Lighthill — the first IMA President — in 1964 to represent mathematicians applying mathematics in universities, colleges, industry, government, commerce and schools.

The IMA was created to provide a home for all professional mathematicians. The celebration reflected this with talks covering research mathematics, mathematics in teaching, mathematics in industry and maths for all. The importance of mathematics in all these areas was emphasised throughout, with all the talks highlighting how the maths developed in one area impacts on another seemingly unrelated area.

A Toy Model for a Magnetic Toy: from atomistic to continuum by Professor Alain Goriely, University of Oxford, included videos and demonstrations to show that the behaviour of 'ball-bearing magnets' can be very similar to elastic materials. One example was a circle of magnetic balls which could be compressed (like a bicycle tyre) and would then snap back to the original circular shape. There were two points to take away from Alain's talk. The first is that these magnets are great toys that can be assembled into some amazing shapes for use in maths outreach — see `dotpedia.com` for examples. The second is that current applied mathematics research on the topic, which investigates how the behaviour of the atomistic (discrete) magnets is similar to the behaviour of elastic (continuous) materials, and the well-known mathematics of elastic materials can be used to model the behaviour of the magnets, see [3].

IMA President, Dame Celia, spoke about **50 Years of Maths in Education**. In 1972, the MIT Logo group's early programming language aimed to teach children about mathematics by getting them to write programs. Although the opportunities for this have significantly increased, programming is still alien to many people. It is important that children are taught programming and know that this is an important skill (alongside art) for the digital arts. Most people don't know you can't make a modern animation without mathematics! The IMA seeks to make this information available (without the need to understand the maths in detail) with its Mathematics Matters series of case studies [4].

50 Years of Maths in Industry by Iain Gray (Technology Strategy Board) continued the theme of mathematics hidden from the general public, and more impor-

tantly from the very businesses that stand to gain most from using industrial mathematics. Iain gave a fictitious example of a day in the life of 'Isaac', an ordinary man who doesn't see the maths on which his daily life depends. Isaac used mathematics in his morning coffee, online purchase, vacuum cleaner, Grand Prix viewing, glucose test for diabetes, without realising he had used any maths at all. Iain gave details for each example. I will give only the first — coffee. Coffee bean growers in Rwanda are being aided by an app that provides localised weather and farming recommendations [5].

One amazing piece of mathematics that we now all use is public key cryptography, which uses number theory — an area of core mathematics developed without any application in mind. The IMA Gold Medal Lecture, **(Almost) 50 Years of Public Key Cryptography**, by Dr Clifford Cocks CB, began by explaining that in the late 1960s and early 1970s public key cryptography was a secret technique, but it now finds wide application — in chip and pin cards, mobile phone calls, remote car keys, and on the internet for secure transactions, which all use this extraordinarily powerful technique.

Professor Ian Stewart (University of Warwick) spoke about **Mathematics for the Billion**, focussing on the mathematics that is used by everyone. There are two ways maths is used by everyone. The first is the basic arithmetic we all use when we go shopping, for example. The second is far more interesting — it is the maths used by Iain Gray's 'Isaac'. Ian Stewart gave an example of mathematics that has been both research and school maths. Initially, trigonometry was research mathematics used in Babylonian and Greek times to calculate distances between planets. More recently trigonometry has been the school maths we are all familiar with for calculating the height of trees or mountains. The same mathematics is used to compress images (jpegs) and more recently for fingerprint compression by the FBI (using Daubechies wavelets).

Ian Stewart entertains the audience. —Image used with permission.

Maths is hidden but essential to the UK economy. To learn more about the power of mathematics read the IMA's 50th anniversary book, *50 Visions of Mathematics*, which contains 50 maths images and 50 essays on everything from Arbers to Zebras. The book can be ordered on the OUP website [2].

The Manchester Festival of Mathematics and its Applications

This Festival had something for everyone interested in maths. The fascinating and stimulating talks and displays attracted a wide audience and showed in an engaging way that we live in a mathematical world which influences and enhances the lives of everyone. There was a wide range of applied mathematics to interact with, including cash, cryptography, custard, juggling, music, patterns, pendulums and puzzles.

Non-Newtonian Fluids Exhibit at the Manchester Festival. Photographer: Lenox Green, University of Manchester. —Image used with permission.

In parallel four Challenges for Mathematics seminars were held for mathematicians. The seminar series highlighted four themes that need to be understood if mathematics is to meet the challenges posed by the discipline itself and by society. The themes were each led by two experts:

- **Mathematics Education and Policy** — Dame Celia Hoyles and Nigel Steele;
- **What has mathematics done for us?** — Snezana Lawrence and Peter Rowlett;
- **Mathematics in Industry** — Alan Champneys and Robert Leese;
- **Mathematics in a Changing World** — Peter Grindrod and Robert MacKay.

The influence of mathematics and the surprising applicability of areas once thought of as 'pure' makes it important for all of us to understand the range of problems mathematics can illuminate. Other case studies can be found in the IMA Mathematics Matters series [4].

The highlight of the Festival was a lecture, **Sex, Drugs and Sausage Rolls**, by Professor Sir David Speigelhalter FRS, OBE, Winton Professor for the Public Understanding of Risk, University of Cambridge. David's lecture about comparing risks was aimed primarily at sixth formers, but was enjoyed by all — from primary school children to professors.

David uses micromorts and microlives for comparing different types of risk. One micromort is a one in a million chance of dying — the same chance as a coin toss having 20 heads in a row. Micromorts are for comparing the risk involved in high-risk activities like swimming with sharks, jumping out of planes, taking drugs and also to compare smaller risks like travelling. However, micomorts don't work for chronic risks. David's example is eating fish and chips. Unless you choke on it, it's not going to kill you now, but eat it every day and your life expectancy decreases.

The measure David uses for these chronic risks are microlives. 1 microlife is 30 minutes of your adult life expectancy (1 million half-hours is 57 years), and a habit that reduces your life expectancy by 1 year is like losing a microlife a day [6]. David compared microlives for alcohol (first drink positive, then negative), sausage rolls (negative), 5 fruit and veg (positive), exercise (positive, but benefit reduces after first 20 minutes). A common response to this kind of comparison is: I don't care about an extra year in a nursing home. David suggests we change the metaphor to making yourself older quicker — how many hours you age each day. How about an extra year before you need a nursing home?

For more about risk see David's blog,
understandinguncertainty.org

Eight Great Reasons to do Maths

This final anniversary event, aimed at the general public and mathematicians alike, reflects the diverse areas of mathematics that the IMA supports. The main talks were:

- **50 Visions for Science and Mathematics Education** — Dame Julia Higgins FREng, FRS, Former Vice-President, The Royal Society;
- **Big Data** — Richard Pinch, IMA Vice-President, Professional Affairs and Industry;
- **The Mathematics Manifesto (First Draft)** — Paul Glendinning, IMA Vice-President, Learned Society;
- **Eight Great Reasons to do Maths** — Chris Budd, IMA Vice-President, Communications;
- **The IMA Today and Tomorrow** — Dame Celia Hoyles, IMA President.

The lectures were followed by an excellent reception with the opportunity to see some of the Royal Institute's incredible collections[1] with the Curator of Collections, Charlotte New.

The 50th anniversary has provided an opportunity for reflection and celebration. But it is also a time to consider the future and the next challenges for both mathematics and the IMA. What seems to be certain is that mathematics has an essential part to play in our future. Therefore the IMA continues to have an important role communicating and promoting mathematics, so that mathematics continues to be valued.

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[5] phys.org/news/2014-03-mobile-app-weather-rwandan-coffee.html

[6] Spiegelhalter, D. (2012) Using speed of ageing and "microlives" to communicate the effects of lifetime habits and environment, *British Medical Journal*, vol. 345, e8223.

Rebecca Waters has been the Editorial Officer for Mathematics Today since 2009. She has a BSc in Physics and Philosophy and an MA in Philosophy. Mathematics Today is a bi-monthly mathematics magazine sent to members of the Institute of Mathematics and its Applications.
Photo by Tony Awin.

[1] The archive of the Royal Institue includes 1st editions of works like Kepler's Astronomia Nova and the archive can be seen on request — details at www.rigb.org/about/heritage-and-collections/archive/visiting

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ERC is Supporting Frontier Research in Mathematics

by Pavel Exner & Zdeněk Strakoš

The European Research Council (ERC), set up by the European Union in 2007, represents the first pan-European organization for funding frontier research. Its aim is to stimulate the highest quality research in Europe by funding the very best projects proposed by researchers of any nationality and age. The latter need not be residents of the EU or EU Associate countries,[2] but the dominant part of the supported research has to be performed there. In addition to creating a much needed counterpart to national funding systems of notoriously uneven quality, the ERC strives in this way to attract top researchers from anywhere in the world to come to Europe and realize their most daring ideas there.

In contrast to other European funding schemes which stress collaboration, the ERC funds research projects based on applications by *individual* principal investigators. Since its launch, the ERC has funded over 4,500 such projects. The maximal duration of a grant is five years, and the funding limit, which depends on the project category, is up to 1.5-2.5M EUR for standard projects, junior and senior respectively, with a possible extension to 2.0-3.5M EUR in certain cases. Specifically, the ERC Starting Grants are designed to support researchers at the early stage of their career when they are setting up their own independent research team or program; the age brace is defined as 2-7 years after the PhD. The ERC Consolidator Grants, 7-12 years after the PhD, focus on existing independent research teams or programs which may still be in a consolidation stage. Finally, the ERC Advanced Grants are designed to support distinguished principal investigators, irrespective of their age, who have already established themselves as research leaders in their fields. They must demonstrate ideas of ground-breaking nature, ambition and feasibility of their scientific proposals. The portfolio is complemented by the Proof of Concept and Synergy Grants.

Administratively, the ERC consists of an independent Scientific Council and the ERC Executive Agency (ERCEA). The Scientific Council represents the ERC's governing body. It is composed of 22 distinguished scientists and scholars, including the ERC President. They define the funding strategy and methodologies to promote highly original, creative and innovative research throughout Europe. Following the biologist Fotis Kafatos and sociologist Helga Nowotny at the helm of the ERC, the distinguished mathematician Jean-Pierre Bourguignon became the ERC President in January 2014. The ERCEA is responsible for implementing the ERC Scientific Council decisions and for administering its budget which is a component of the new EU research program Horizon 2020, in effect in the period 2014-20. It is led by the Director Pablo Amor.

Applications for ERC Grants are evaluated within 25 panels which cover all areas of science. Physical Sciences and Engineering have 10 panels including, in particular, the *Mathematics* panel (PE1) and the *Computer Science and Informatics* panel (PE6). The proposals in Life Sciences and in Social Sciences & Humanities are evaluated by 9 and 6 panels, respectively. Every panel consists of 12-15 members; the different funding streams described above are served by different panel sets. Thus, each year around one thousand scientists participate in evaluation of the projects. The panel members and chairs are selected by the ERC Scientific Council, which strives to attract the best people worldwide to do the job, many of them from outside Europe.

Mathematics is present within the ERC not only in the PE1 panel just mentioned, in fact the only "disciplinary" one among the twenty five, but grants with very significant mathematical components are funded also within the

[2] About a dozen countries including Israel, Norway, Iceland, Turkey, and most Balkan countries. Switzerland lost that status after the referendum last year but it is presently being renewed.

other panels, in particular, the panel PE6. This reflects the fact that there is a very strong overlap between several mathematical and theoretical computer science disciplines, and that mathematical tools and methodology form a common basis for the development of other scientific disciplines. Besides that, mathematics is directly applied to solving problems in almost all other areas. This is traditionally strong in natural sciences and engineering, but it is becoming increasingly visible also in Social Sciences and Humanities. Here it is important that ERC does not distinguish between theoretical and applied research and tries to avoid disciplinary barriers as much as possible. Excellence is the sole evaluation criterion of the proposals.

This can be very well documented by the statistical data. Within the Mathematics panel PE1, the number of topics which can be considered "more theoretical" is about the same as the number of topics which can be considered "more applied". Here Geometry, Analysis, Algebraic and Complex Geometry, and Number Theory prevail in the first group. Numerical Analysis and Scientific Computing, Partial Differential Equations, Probability and Statistics, Mathematical Physics, Discrete Mathematics and Combinatorics, and Application of Mathematics in Sciences dominate in the second group. Keywords of other panels appear in about 19% of PE1 grants, with most references to the topics covered by the panels PE2 (Fundamental Constituents of Matter), PE6 (Computer Science and Informatics) and SH1 (Markets, Individuals and Institutions).

The success story of the ERC in its first seven years of existence can be illustrated from a mathematician's point of view; for example, by looking at the Fields Medals winners among ERC grantees. They include Stanislav Smirnov and Elon Lindenstrauss, who were awarded the Medal in 2010, in both cases for work related to the topic of their grants. In reverse order, Simon K. Donaldson, who was awarded the Medal in 1986, got an ERC grant in 2009. Finally, during the last ICM in Seoul, two of the four Fields Medals went to ERC grantees, namely to Artur Avila Cordeiro de Melo and to Martin Hairer, again for work directly related to their ERC supported projects.

More information on ERC can be found on the ERC website erc.europa.eu and also in the quarterly newsletter ideas, see erc.europa.eu/newsletters-0 where the most recent issue is titled *Basic research meets industry*.

Born 1946 in Prague, Pavel Exner graduated in 1969 from the Charles University. From 1978 to 1990 he worked in Joint Institute for Nuclear Research, Dubna, where he got his PhD and DSc degrees. Author of three books and more than 200 research papers, cofounder of the QMath conference series. Awarded JINR prize in theoretical physics and Czech Physical Society medal, member of Academia Europaea. He served, in particular, as the President of the International Association for Mathematical Physics and Vice president of the International Union of Pure and Applied Physics, presently he is President Elect of the European Mathematical Society assuming the office at the beginning of 2015.

Zdeněk Strakoš 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.

Press Release: 2015 ICIAM Prizes Announced

The International Council for Industrial and Applied Mathematics (ICIAM) is pleased to announce the winners of the five ICIAM Prizes for 2015.

ICIAM is a worldwide organization for professional applied mathematics societies, and for other societies with a significant interest in industrial or applied mathematics. The aims of the Council are

- to promote industrial and applied mathematics globally;
- to promote interactions between member societies;
- to promote the goals of these members societies;
- and to coordinate planning for periodic international meetings on industrial and applied mathematics.

The ICIAM Congresses, held every four years, are run under the auspices of the Council. The 2015 Prizes will be presented at the next ICIAM Congress, ICIAM 2015, the Eighth International Congress on Industrial and Applied Mathematics, which will take place in Beijing, China, August 10-14, 2015.

The Collatz Prize was established to provide international recognition to individual scientists under 42 years of age for outstanding work on industrial and applied mathematics. It was created on the initiative of GAMM (Gesellschaft für Angewandte Mathematik und Mechanik), and first awarded in 1999. Carrying a cash award of USD 5000, the Collatz Prize is presently funded by GAMM.

The 2015 ICIAM Collatz Prize is awarded to **Annalisa Buffa** in recognition of her spectacular use of deep and sophisticated mathematical concepts to obtain outstanding contributions to the development of computer simulations in science and industry.

Buffa is Director of the Institute for Applied Mathematics and Information Technologies (Pavia-Genoa-Milan section).

In a relatively short amount of time, Buffa has been able to bring fundamental contributions to a number of different aspects of scientific computing, with an incredible range both in the type of applications and in the type of mathematical instruments. The trademark of her work is the use of highly sophisticated mathematical techniques to produce fundamental breakthroughs that are applied to computer simulations in industry.

The Lagrange Prize was established to provide international recognition to individual mathematicians who have made an exceptional contribution to applied mathematics throughout their careers. It was created on the initiative of SMAI (Société de Mathématiques Appliquées et Industrielles), SEMA (Sociedad Española de Matematica Aplicada) and SIMAI (Società Italiana di Matematica Applicata e Industriale) and first awarded in 1999. Carrying a cash award of USD 5000, the Lagrange Prize is presently funded by the three member societies SMAI, SEMA and SIMAI.

Andrew J. Majda of the Courant Institute at New York University receives the 2015 ICIAM Lagrange Prize in recognition of his ground breaking, original, fundamental and pioneering contributions to applied mathematics and, in particular, to wave front propagation and combustion, scattering theory, fluid dynamics and atmosphere climate science. His research, which has merged asymptotic and numerical methods, physical reasoning and modeling, and rigorous mathematical analysis, has had an enormous and long lasting impact on modern applied mathematics, science and engineering (geophysics, seismology, weather prediction, combustion, and more) and remains the state of the art today.

Majda is the Morse Professor of Arts and Sciences at the Courant Institute of New York University.

Some of the most fundamental contributions of Majda and his collaborators in the area of wavefront propagation are the identification and study of the absorbing boundary conditions for numerical computations of the wave equation in unbounded domains, which has had major impact in the field over the last 30 years; the existence and stability analysis of multi-dimensional shock waves; a model for detonation, now named for him; and the theory of turbulent combustion.

Majda's work has been honored by the National Academy of Science Prize in Applied Mathematics, the John von Neumann Lecture prize of the Society of Industrial and Applied Mathematics, the Gibbs Prize of the American Mathematical Society and the Wiener Prize of the American Mathematical Society and the Society of Industrial and Applied Mathematics.

The Maxwell Prize was established to provide international recognition to a mathematician who has demonstrated originality in applied mathematics. It was created on the initiative of the IMA (The Institute of Mathematics and its Applications) with the support of the J.C. Maxwell Society, and first awarded in 1999. Carrying a cash award of USD 5000, the Maxwell Prize is presently funded by IMA.

The 2015 ICIAM Maxwell Prize is awarded to **Jean-Michel Coron** of the Université Pierre et Marie Curie for his fundamental and original contributions to the study of variational methods for partial differential equations and the nonlinear control of nonlinear partial differential equations.

Jean-Michel Coron is a Professor in the Laboratoire Jacques-Louis Lions at the Université Pierre et Marie Curie.

Coron has had a deep and profound impact in the study of variational methods for nonlinear partial differential equations. His original work on constant mean curvature surfaces, periodic solutions for nonlinear wave equations, nonlinear elliptic equations with critical Sobolev exponents and harmonic maps for nematic liquid crystals has had a major impact in these fields.

The Pioneer Prize was established for pioneering work introducing applied mathematical methods and scientific computing techniques to an industrial problem area or a new scientific field of applications. It was created on the initiative of SIAM (Society for Industrial and Applied Mathematics), and was first awarded in 1999. Carrying a cash award of USD 5000, the Pioneer Prize is presently funded by SIAM.

The 2015 ICIAM Pioneer Prize is awarded to **Björn Engquist** of the University of Texas at Austin, USA for fundamental contributions in the field of applied mathematics, numerical analysis and scientific computing which have had long lasting impact in the field as well as successful applications in science, engineering and industry.

Engquist is Professor of Mathematics and Computational and Applied Mathematics at the University of Texas at Austin.

He has made fundamental contributions in the field of applied mathematics, numerical analysis and scientific computing which have had long lasting impact in the field as well as successful applications in science, engineering and industry. Some of his most important pioneering contributions include seminal work on absorbing boundary conditions (ABC), first proposed by Engquist and Majda, for numerical computation of wave propagation.

The Su Buchin Prize was established to provide international recognition of an outstanding contribution by an individual in the application of Mathematics to emerging economies and human development, in particular at the economic and cultural level in developing countries. It was created on the initiative of the CSIAM (China Society for Industrial and Applied Mathematics), and was first awarded in 2007. Carrying a cash award of USD 5000, the Su Buchin Prize is presently funded by CSIAM.

The 2015 ICIAM Su Buchin Prize is awarded to Professor **Li Ta-tsien**, Fudan University, Shanghai in recognition of his outstanding contributions to applied mathematics and to the dissemination of mathematical sciences by means of an extensive series of summer schools that have had a profound influence on the development of research and teaching in developing countries.

Li Ta-tsien is a professor in the School of Mathematical Sciences at Fudan University.

He is one of the most renowned specialists, worldwide, in the theory and numerical analysis of nonlinear hyperbolic partial differential equations, a domain where major difficulties abound, as well as a domain of fundamental importance in applications. More recently, Li Ta-tsien was able to obtain the first satisfactory mathematical modeling of "resistivity well-loggings", a method of fundamental importance in petroleum exploitation.

Li Ta-tsien is not only an eminent mathematician. During the past decades, he has been extremely influential in the development of the pure and applied mathematical community in developing countries. More specifically, a very far-sighted initiative was taken in 1998 by Jacques-Louis Lions and Li ta-tsien, who together cofounded ISFMA, the Institut Sino-Français de Mathematiques Appliquées, or Chinese-French Institute of Applied Mathematics.

Five major ICIAM Prizes will be presented at the next ICIAM Congress, ICIAM 2015, the Eighth International Congress on Industrial and Applied Mathematics, which will take place in Beijing, China, August 10-14, 2015.

ICIAM 2015 Mini-symposia — Extended deadlines

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 genuine 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 - EXTENDED

Mini-symposia
March 30, 2014: Mini-symposium online submission opens;
August 30, 2014: Early decisions announced for mini-symposium proposals;
November 30, 2014: Submission deadline for mini-symposium proposals;
December 30, 2014: Final decisions announced for mini-symposium proposals;
February 28, 2015: 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.

Open websites

Financial Support for attendees from developing countries: www.iciam2015.cn/Support
Enquiry: support@amss.ac.cn

SIAM Travel grants for attendees from U.S. institutions: www.siam.org/meetings/iciam15

Call for exhibitors: www.iciam2015.cn/Exhibits
Enquiry: exhibit@amss.cn

Information about hotels will be available on January 1, 2015 when registration starts. Details can be found at the Congress's homepage:
www.iciam2015.cn

COLLATZ

2015 ICIAM Collatz Prize awarded to Annalisa Buffa

The International Council for Industrial and Applied Mathematics (ICIAM) is pleased to announce that the 2015 ICIAM Collatz Prize is awarded to Annalisa Buffa of the Institute for Applied Mathematics and Information Technologies in recognition of her spectacular use of deep and sophisticated mathematical concepts to obtain outstanding contributions to the development of computer simulations in science and industry.

Buffa is Director of the Institute for Applied Mathematics and Information Technologies (Pavia-Genoa-Milan section).


Annalisa Buffa.

The Collatz Prize was established to provide international recognition to individual scientists under 42 years of age for outstanding work on industrial and applied mathematics. It was created on the initiative of GAMM (Gesellschaft für Angewandte Mathematik und Mechanik), and first awarded in 1999. Carrying a cash award of USD 5000, the Collatz Prize is presently funded by GAMM.

Buffa graduated in Computer Engineering at the University of Pavia in 1996, and got her PhD in Mathematics at the University of Milan, in 2000. In 2004 she became Research Director at the Institute for Applied Mathematics and Information Technologies (Pavia-Genoa-Milan), before becoming (overall) Director of the Institute in 2013. She has received important grants, including an ERC Starting Grant in 2008, and prestigious awards, including the Bartolozzi Prize and the John Todd Fellowship Prize in 2007.

In a relatively short amount of time she has been able to bring fundamental contributions to a number of different aspects of scientific computing, with an incredible range both in the type of applications and in the type of mathematical instruments.

One of her major achievements is the characterization of traces of vector fields for Sobolev spaces relevant in electromagnetics: in a series of fundamental papers with Patrick Ciarlet she produced a complete characterization of the traces on the boundary of polyhedral domains. This has been a breakthrough for the understanding of the integral equation formulation of electromagnetic scattering.

Another masterpiece was the construction, together with Snorre Christiansen, of an optimal preconditioner for electromagnetic integral equations. This problem was open for a long time, and the result finally came thanks to the combination of mathematical knowledge and engineering conception that she had acquired over the years. The preconditioner is already widely used in industrial practice.

More recently, with Giancarlo Sangalli she initiated research activity on the mathematical understanding of isogeometric analysis, where she played a fundamental role in providing a mathematical foundation. She studied the mathematical structure of non-tensor-product extensions of multivariate splines addressing deep theoretical questions which will impact enormously the development of adaptive isogeometric methods. She extended the theory of exterior calculus to splines, showing how this leads to unexpected schemes for several important problems, and she has also promoted the development of free software which is now widely used in the isogeometric community.

In brief, the trademark of her work is the use of highly sophisticated mathematical techniques to produce fundamental breakthroughs that are applied to computer simulations in industry. For this she can be considered as a worthy recipient of the 2015 Collatz Prize.

LAGRANGE

2015 ICIAM Lagrange Prize awarded to Andrew J. Majda

The International Council for Industrial and Applied Mathematics (ICIAM) is pleased to announce Andrew J. Majda of the Courant Institute at New York University as the recipient of the 2015 ICIAM Lagrange Prize in recognition of his ground breaking, original, fundamental and pioneering contributions to applied mathematics and, in particular, to wave front propagation and combustion, scattering theory, fluid dynamics and atmosphere climate science. His research, which has merged asymptotic and numerical methods, physical reasoning and modeling, and rigorous mathematical analysis, has had an enormous and long lasting impact on modern applied mathematics, science and engineering (geophysics, seismology, weather prediction, combustion, and more) and remains the state of the art today.

Andrew J. Majda is the Morse Professor of Arts and Sciences at the Courant Institute of New York University.

The Lagrange Prize was established to provide international recognition to individual mathematicians who have made an exceptional contribution to applied math-

ematics throughout their careers. It was created on the initiative of SMAI (Société de Mathématiques Appliquées et Industrielles), SEMA (Sociedad Española de Matematica Aplicada) and SIMAI (Società Italiana di Matematica Applicata e Industriale) and first awarded in 1999. Carrying a cash award of USD 5000, the Lagrange Prize is presently funded by the three member societies SMAI, SEMA and SIMAI.

Andrew J. Majda.

Majda was born in East Chicago, Indiana on January 30, 1949. He received a B.S. degree from Purdue University in 1970 and a Ph.D. degree from Stanford University in 1973. He began his scientific career as a Courant Instructor at the Courant Institute from 1973-1975. Prior to returning to the Courant Institute in 1994, he held professorships at Princeton University (1984-1994), the University of California, Berkeley (1978-1984), and the University of California, Los Angeles (1976-1978). He is a member of the National Academy of Sciences and the American Academy of Arts and Science. His work has been honored by the National Academy of Science Prize in Applied Mathematics, the John von Neumann Prize of the Society of Industrial and Applied Mathematics, the Gibbs Prize of the American Mathematical Society and the Wiener Prize of the American Mathematical Society and the Society of Industrial and Applied Mathematics. Some of the most fundamental contributions of Majda and his collaborators in the area of wavefront propagation are the identification and study of the absorbing boundary conditions for numerical computations of the wave equation in unbounded domains, which has had major impact in the field over the last 30 years; the existence and stability analysis of multi-dimensional shock waves, which is the only available complete and general result to date about multi-dimensional systems; a model for detonation, now named for him, which has served as an important testing ground for both theoretical and numerical studies of detonation waves; and the theory of turbulent combustion, which has led to a new understanding of the effect of the environment in reaction-diffusion-combustion phenomena.

Majda has worked extensively in the general theory of fluid dynamics, where, together with his collaborators, has made important and far-reaching contributions. Among them are the celebrated Beale-Kato-Majda theorem; a necessary and sufficient condition for the regularity of solutions to the 3-D Euler equations; an extensive analysis of the behavior of the advection and diffusion of a passive scalar by incompressible velocity fields whose statistical description involves a continuous range of excited scales; a mathematically rigorous equilibrium statistical theory for three-dimensional nearly parallel vortex filaments and the by-now-classical two-dimensional surface quasigeostrophic flow model which is used to predict the formation of sharp fronts between air masses in the atmosphere.

Majda has also made further revolutionary contributions to the development and analysis of mathematical models in atmosphere and ocean sciences. These include the multi-scale modeling and analysis of moist fluid dynamics in the atmosphere and, in particular, the tropics; the development of filtering methods for nonlinear chaotic systems; novel mathematical strategies for prediction and data assimilation in complex multi-scale systems, including new techniques for super-parametrization; reduced stochastic and statistical modeling for climate; and the development and exploitation of statistical physics methods in geophysical problems.

MAXWELL

2015 ICIAM Maxwell Prize awarded to Jean-Michel Coron

The International Council for Industrial and Applied Mathematics (ICIAM) is pleased to announce that Jean-Michel Coron of the Université Pierre et Marie Curie is the winner of the 2015 ICIAM Maxwell Prize for his fundamental and original contributions to the study of variational methods for partial differential equations and the control of nonlinear partial differential equations.

Jean-Michel Coron is a Professor in the Laboratoire Jacques-Louis Lions at the Université Pierre et Marie Curie.

The Maxwell Prize was established to provide international recognition to a mathematician who has demonstrated originality in applied mathematics. It was created on the initiative of the IMA (The Institute of Mathematics and its Applications) with the support of the J.C. Maxwell Society, and first awarded in 1999. Carrying a cash award of USD 5000, the Maxwell Prize is presently funded by IMA.

Coron was born in Paris in 1956, received an undergraduate Engineering degree from the École Polytechnique in 1978 and a graduate Engineering degree from the Corps des Mines in 1981. He received the Doctor of Mathematical Sciences degree from the Université Pierre et Marie Curie in 1982.

Jean-Michel Coron has had a deep and profound impact in the study of variational methods for nonlinear partial differential equations. His original work on constant mean curvature surfaces, periodic solu-

tions for nonlinear wave equations, nonlinear elliptic equations with critical Sobolev exponents and harmonic maps for nematic liquid crystals has had a major impact in these fields. This work was crucial to the understanding of the equilibrium behavior of liquid crystals, and to research on the dynamical behavior of harmonic mappings and liquid crystals.

Jean-Michel Coron.

Jean-Michel Coron is probably best known for his original work on the control of nonlinear partial differential equations. His work on the global controllability of the two-dimensional Euler equations of incompressible fluids represents a brilliant interplay of techniques that he developed for control along nonsingular trajectories and the stabilization of finite dimensional control systems. One of the main underlying ideas is that although the linearization of the Euler equations around the trivial solution is not controllable, it is possible to construct a non-trivial trajectory such that the corresponding linearized system is controllable. He has also produced major results on the global controllability of Navier-Stokes equations for incompressible viscous fluids, the Korteweg-de Vries equations, the Saint-Venant equations, and Schrödinger models in quantum control. His work on the controllability of the Euler and Navier-Stokes equations is widely hailed as one of the most original results on the controllability of nonlinear partial differential equations.

SU BUCHIN

2015 ICIAM Su Buchin Prize awarded to Li Ta-tsien

The International Council for Industrial and Applied Mathematics (ICIAM) is pleased to announce that Professor Li Ta-tsien of Fudan University in Shanghai is awarded the 2015 ICIAM Su Buchin Prize in recognition of his outstanding contributions to applied mathematics and to the dissemination of mathematical sciences by means of an extensive series of summer schools that have had a profound influence on the development of research and teaching in developing countries.

Li Ta-tsien.

Li Ta-tsien is a professor in the School of Mathematical Sciences at Fudan University.

The Su Buchin Prize was established to provide international recognition of an outstanding contribution by an individual in the application of Mathematics to emerging economies and human development, in particular at the economic and cultural level in developing countries. It was created on the initiative of the CSIAM (China Society for Industrial and Applied Mathematics), and was first awarded in 2007. Carrying a cash award of USD 5000, the Su Buchin Prize is presently funded by CSIAM.

Professor Li Ta-tsien is one of the most renowned specialists, worldwide, in the theory and numerical analysis of nonlinear hyperbolic partial differential equations, a domain where major difficulties abound, as well as a domain of fundamental importance in applications. These include in particular nonlinear elasticity and gas dynamics. Guided by the objective of acquiring a better understanding of the theory and physics of shocks that occur in gas dynamics, Li Ta-tsien developed a theory of local existence for classical and discontinuous solutions of the most general quasi-linear hyperbolic systems in two variables, posing them as problems where a free boundary occurs. In this fashion, he was able to specify the local structure of discontinuous solutions. This pioneering work initiated new directions for research in the subject.

In another series of fundamental contributions, Li Ta-tsien established the existence of classical solutions for the Cauchy problem for general quasi-linear hyperbolic systems, with sufficiently small initial data. This work constitutes a double achievement: First, it provides optimal estimates of lower and upper bounds for the life-span of a classical solution; second, it can be applied to the system of nonlinear elastodynamics. Jean Leray, one of the most famous mathematicians of the twentieth century, commented, "The work of Li Ta-tsien provides precise and elegant answers to manifold questions raised by many researchers".

More recently, Li Ta-tsien was able to obtain the first satisfactory mathematical modeling of "resistivity well-loggings", a method of fundamental importance in petroleum exploitation. This work led him to introduce a new family of boundary value problems, called "boundary value problems with equipotential surface". He then studied such problems, both theoretically and numerically, in particular by successfully applying homogenization theory to the modeling of an electrode composed of many parts. It is a measure of the success and power of his approach that it is currently used in more than ten petroleum fields over the world!

Li Ta-tsien is not only an eminent mathematician. During the past decades, he has been extremely influential in the development of the pure and applied mathematical community in developing countries. More specifically, a very far-sighted initiaitive was taken in 1998 by Jacques-Louis Lions and Li ta-tsien, who together cofounded ISFMA, the Institut Sino-FranΠais de Mathematiques Appliquées, or Chinese-French Institute of Applied Mathematics. Thanks to his tireless efforts, this Institute, which is beautifully housed on the campus of Fudan University, organizes every year highly successful Summer Schools, with the support of CIMPA (International Centre for Pure and Applied Mathematics in Nice, France) and other organizations. These Summer Schools regularly attract students coming from Asian countries, such as China, Thailand, Vietnam, Malaysia, Indonesia, and others. At each Summer School, the lecture notes are edited by Li Ta-tsien and published. The summer schools and their proceedings have had a profound influence and impact on the dissemination of contemporary research in the targeted countries. They have also contributed greatly to the training of countless teachers from the universities in these countries.

Through his far-sighted leadership and broad vision, Li Ta-tsien has considerably contributed to the promotion and development of "modern" pure and applied mathematics in developing countries.

PIONEER

2015 ICIAM Pioneer Prize awarded to Bjorn Engquist

Bjorn Engquist.

The International Council for Industrial and Applied Mathematics (ICIAM) is pleased to announce that the 2015 ICIAM Pioneer Prize is awarded to Bjorn Engquist of the the University of Texas at Austin for fundamental contributions in the field of applied mathematics, numerical analysis and scientific computing which have had long lasting impact in the field as well as successful applications in science, engineering and industry.

Engquist is Professor of Mathematics and Computational and Applied Mathematics at the University of Texas at Austin.

The Pioneer Prize was established for pioneering work introducing applied mathematical methods and scientific computing techniques to an industrial problem area or a new scientific field of applications. It was created on the initiative of SIAM (Society for Industrial and Applied Mathematics), and was first awarded in 1999. Carrying a cash award of USD 5000, the Pioneer Prize is presently funded by SIAM.

Bjorn Engquist received his PhD from Uppsala University in 1975. He has been Professor of Mathematics at UCLA, and the Michael Henry Stater University Professor of Mathematics and Applied and Computational Mathematics at Princeton University. He was Director of the Research Institute for Industrial Applications of Scientific Computing and of the Centre for Parallel Computers at the Royal Institute of Technology, Stockholm.

Bjorn Engquist has made fundamental contributions in the field of applied mathematics, numerical analysis and scientific computing which have had long lasting impact in the field as well as successful applications in science, engineering and industry. Some of his most important pioneering contributions include seminal work on absorbing boundary conditions (ABC), first proposed by Engquist and Majda, for numerical computation of wave propagation. These boundary conditions can be used at the boundary of the computational domain to reduce the artificial reflection of waves effectively. Owing to its simplicity and efficiency, it has been one of the most successful and widely used numerical techniques in the past 30 years and has had significant impact in practical applications such as geophysics, seismology and petroleum industry.

In a second direction, Engquist, with his collaborators, is responsible for the development and analysis of shock capturing methods for nonlinear hyperbolic conservation laws, including the well-known essentially non-oscillatory (ENO) method. These numerical methods have been widely used in computational fluid dynamics, aerospace engineering, combustion and other applications.

For the past twenty years, Engquist has been a leader in the field of multi-scale modeling and analysis, where his contributions include numerical homogenization, and the heterogeneous multi-scale method (HMM), among other results.

SAVE THE DATE!

August 10-14, 2015

Beijing, China

The Secretariat of ICIAM 2015

Siyuan Building,
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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:
Extended to November 30, 2014
Final Decisions Notification of Proposals:
Extended to December 30, 2014
Submission Due of Accepted Mini-symposium Abstracts:
Extended to February 28, 2015

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

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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