

# ICIAM Dianoia. Volume 10, Issue 3 July 2022

It is July and summer in the Northern Hemisphere. This edition of ICIAM Dianoia is posted to you from the SIAM Annual Meeting in Pittsburgh. The meeting is hybrid, but there are 700 people here, and for many of us it is the first time we have seen so many applied mathematicians since July 2019 in Valencia. A little more than a year from now we hope to meet all of you and many more in Tokyo. The latest news on preparations for ICIAM 2023, and also a reminder of this year's ICIAM Board meeting appear in this newsletter, along with member society news, prize announcements, and reports on the activities of the International Science Council, of which ICIAM is now a proud full member.



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## President's July Letter

Letter from the President:

Thanks to the help from IMA and Iain Duff, the preparations for the 2022 ICIAM Workshop and Board meeting are going smoothly. The Workshop on Applied and Industrial Mathematics will be held at the University of Strathclyde in Glasgow Sept 1-2, 2022, before the board meeting which will be held on Sept 3rd, 2022.

(<https://my.ima.org.uk/item.php?eventid=349> (<https://my.ima.org.uk/item.php?eventid=349>))

ICIAM's application to be a full member of the International Science Council (ISC) was approved by the Governing Board of ISC. Being a full member of ISC, it is expected that ICIAM will play an more important role in the ISC, and that ICIAM's activities can be amplified and promoted through the platform of ISC.

The 2023 ICIAM Olga-Taussky-Todd (OTT) lecture was announced by the ICIAM OTT Lecture Committee chaired by Professor Lisa Fauci of Tulane University, USA. Professor Ilse C.F. Ipsen of North Carolina State University, USA, will deliver the Olga Taussky-Todd Lecture at the International Congress on Industrial and Applied Mathematics, Aug 20-25, 2023, in Tokyo, Japan. (<https://iciam.org/olga-taussky-todd-lecture-iciam-2023> (<https://iciam.org/olga-taussky-todd-lecture-iciam-2023>))

Ya-xiang Yuan  
ICIAM President



### Ya-xiang Yuan

Ya-xiang Yuan is the current President of ICIAM (2019-2023). He is a professor at Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences. His research focuses on optimization.



## ICIAM Reminders: July 2022

Members are reminded to update their Society's information:

ICIAM maintains a self-service membership directory at <http://www.iciam.org/members> (<http://www.iciam.org/members>). Please take this opportunity to check your membership information, and update it if appropriate. Instructions on how to update your entry or to add new information can be found in our membership FAQ, <http://www.iciam.org/faq-members> (<http://www.iciam.org/faq-members>).

Members may also be interested in ICIAM's Conference Support Program for Applied and Industrial Mathematics in Developing Countries:

In addition to in-person meetings, ICIAM currently offers support for virtual meetings, for example by sponsoring waivers of registrations fees for participants from developing countries, or by supporting streaming or recording services. ICIAM encourages conference organizers to apply for support for virtual meetings using the general principles outlined in the announcement. See <https://iciam.org/iciam-conference-support-applied-and-industrial-mathematics-developing-countries> (<https://iciam.org/iciam-conference-support-applied-and-industrial-mathematics-developing-countries>) for details.

Here's a reminder that you can download a PDF file of any issue of ICIAM Dianoia (as long as the editor has remembered to set it up). Clicking on the "Downloads" button at the top of the browser view of the newsletter will bring up a screen that offers you a choice of A4 or US Letter to fit your printer.

Finally, details of the 2022 ICIAM Board Meeting and Workshop are now available. Society representatives can access registration forms, workshop information and the Board meeting agenda at <https://iciam.org/meeting/2022-board-meeting-glasgow-scotland> (<https://iciam.org/meeting/2022-board-meeting-glasgow-scotland>)



### The 2022 ICIAM Officers

Ya-xiang Yuan (President), Wil Schilders (President-Elect), Sven Leyffer (Secretary), Heike Fassbender (Treasurer), Luis Vega and Liliane Basso Barichello (Officers-at-large)



## Nomination Deadline for ICIAM Secretary Extended

ICIAM is soliciting nominations for an ICIAM Secretary to serve from 2022 to 2027, renewable for another four-year term. Nominations, consisting of a short memo from the nominating society, a CV (up to 4 pages), and a brief statement from the candidate (up to one page) should be submitted to the ICIAM Secretary ([secretary@iciam.org](mailto:secretary@iciam.org) (<mailto:secretary@iciam.org>)) by August 1, 2022. The election will take place at the 2022 Board meeting in Glasgow, and candidates are encouraged to attend in-person or virtually.

The ICIAM Secretary keeps a record of all activities, and helps maintain our website, [iciam.org](http://iciam.org), including our membership information. The secretary also drafts the agenda of the Board meetings, and records its minutes. ICIAM provides travel support for the secretary to attend the Board meeting, and typically one in-person Officers meeting. The maintenance of [iciam.org](http://iciam.org) does not require technical skills beyond the ability to edit online documents using a

Graphical User Interface(GUI), as the server is maintained by JSIAM and a consultant. Sven Leafier, the current ICIAM Secretary (secretary@iciam.org (mailto:secretary@iciam.org)), will be happy to answer questions about the job specifications and its rewards!



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## News of ICIAM 2023: July 2022 Update

News for July from ICIAM 2023

- The Invited Lectures and the Olga Taussky-Todd Lecture at ICIAM 2023 have been announced.
- The Registration Fee has been fixed and announced.
- We are waiting for your Proposals of Minisymposia and submissions of Contributed Talks.

For details, please visit the ICIAM 2023 webpage:

<https://iciam2023.org> (<https://iciam2023.org>)

## Shin'ichi Oishi and Takeshi Ogita

Shin'ichi Oishi, Professor at Waseda University, is the ICIAM 2023 Congress Director; Takeshi Ogita, Professor at Tokyo Woman's Christian University (TWCU), is the ICIAM 2023 Local Scientific Program Committee Chair



## The Olga Taussky-Todd Lecture at ICIAM 2023

The International Council for Industrial and Applied Mathematics has selected **Professor Ilse C.F. Ipsen** of North Carolina State University, USA, to deliver the Olga Taussky-Todd Lecture at the International Congress on Industrial and Applied Mathematics, ICIAM 2023, in Tokyo, Japan. This Congress 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.

Ilse Ipsen is an applied mathematician whose pioneering work, from the outset, has been aimed at advancing the foundations and applications of numerical linear algebra. Her publications and presentations are distinguished by crystal clear exposition and exceptional attention to detail.



Ilse Ipsen's early work was at the forefront of designing matrix algorithms for implementation on VLSI special purpose architectures as well as general purpose parallel machines. She has worked on inverse iteration for computing eigenvectors; solution of nonsymmetric linear systems via Krylov methods; perturbation theory for linear systems; and eigenvalue and singular value problems with application to nonlinear problems. She established the class of multiplicative perturbations which have become instrumental in the analysis of high accuracy matrix computations; and established an algorithmic classification that led to the development of high accuracy rank revealing QR algorithms.

Ilse Ipsen is well known for her work on the Google PageRank algorithm, often described as "the world's largest matrix problem". In collaboration with physicists, she tackled the notoriously difficult numerical computation of characteristic polynomials, which are required in nuclear lattice simulations and the study of fermions.

More recently, she has been instrumental in introducing probability theory and statistics into numerical linear algebra for: the design and analysis of fast randomized least squares/regression algorithms in the context of large-scale data science problems; statistical roundoff error analysis for realistic bounds in the context of emerging mixed and low precision processors; and probabilistic numeric linear solvers that generate probability distributions for propagating numerical errors through computational pipelines.

Professor Ipsen received a Bachelor's degree from the University of Kaiserslautern, Germany; and a Ph.D. from The Pennsylvania State University, USA, both in Computer Science. After 10 years on the Computer Science faculty at Yale University, she is now a Professor of Mathematics at North Carolina State University, USA.

### Awards and honors

Professor Ipsen is a Fellow of the American Association for the Advancement of Science, and a Fellow of the Society for Industrial and Applied Mathematics.

## 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. 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 series was inaugurated in 2007 with a lecture by Pauline van den Driessche at ICIAM 2007 in Zurich. The lecturers since then have been Beatrice Pelloni (Vancouver, 2011), Éva Tardos (Beijing, 2015), Françoise Tisseur (Valencia, 2019), and Ilse Ipsen (Tokyo, 2023).

## The Olga Taussky-Todd Lecture for ICIAM 2023

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 2023 Lecture consisted of

Lisa Fauci, Chair (Tulane University)

Mirjam Dür (University of Augsburg)

Isabelle Gallagher (Ecole Normale Supérieure)

Suzanne Weekes (Worcester Polytechnic Institute)

Mary Wheeler (University of Texas at Austin)

Guiying Yan (Chinese Academy of Sciences)

## ICIAM 2023 Press Release



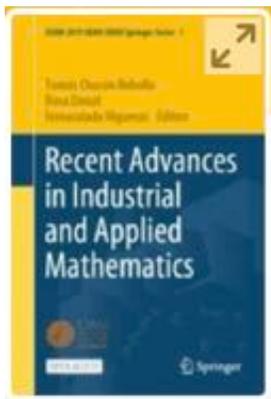
## ICIAM 2019 Proceedings Now Available Open Access

The first volume of the proceedings of the Valencia Congress has been published by Springer Verlag. The title is

# Recent Advances in Industrial and Applied Mathematics

**Editors: Tomás Chacón Rebollo, Rosa Donat, and Inmaculada Higuera**

**Book Description:** This open access book contains review papers authored by thirteen plenary invited speakers to the 9th International Congress on Industrial and Applied Mathematics (Valencia, July 15-19, 2019). Written by top-level scientists recognized worldwide, the scientific contributions cover a wide range of cutting-edge topics of industrial and applied mathematics: mathematical modeling, industrial and environmental mathematics, mathematical biology and medicine, reduced-order modeling and cryptography. The book also includes an introductory chapter summarizing the main features of the congress. This is the first volume of a thematic series dedicated to research results presented at ICIAM 2019-Valencia Congress.



You will find the book at this link: <https://link.springer.com/book/10.1007/978-3-030-86236-7>  
(<https://link.springer.com/book/10.1007/978-3-030-86236-7>)



## ISC News: Governing Board Meeting and Communiqué

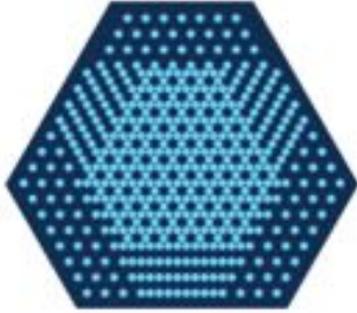
ICIAM is happy to announce that we are now a full member of the International Science Council.

The ISC Governing Board met in Paris, June 7-9, 2022. The full PDF of the Governing Board Communiqué for ISC Members is available here: <https://council.science/wp-content/uploads/2020/06/Governing-Board-Communique.pdf>  
(<https://council.science/wp-content/uploads/2020/06/Governing-Board-Communique.pdf>)



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## Serbian Mathematical Sciences Association

The *Serbian Mathematical Sciences Association* was founded in 2015 as a society that gathers researchers and professors of mathematics at Serbian universities and research institutes. Currently, the Society has around 200 members, and approximately one half are active in the area of applied mathematics. The applied mathematics groups are active at all universities of Serbia as well as at the Mathematical Institute of Academy of Arts and Sciences in Belgrade. The research areas covered by these groups are PDEs, numerical optimization, numerical analysis, numerical linear algebra, data analysis and artificial intelligence, mathematical modeling in pharmacology, finance and insurance, stochastic analysis, operations research etc.

The main aims of the Association are to strengthen mathematical research, promote applications of mathematics in industry and interdisciplinary research, provide support for young researchers, facilitate cooperation with international partners through joint research projects, organize scientific events etc. The Association has the usual structure of professional organizations: the general assembly, the president and vice president, the executive board and the legal representative.

The Association is the umbrella for the national mathematical PhD programs that are organized by four universities together. Furthermore, the members participate in European Industrial Doctorate programs that are part of Marie Skłodowska Curie framework. The Association is active in organizing conferences and supporting research seminars at member institutions.

Supporting young mathematicians is one of the primary aims of the Association. One of the activities is organization of Congress of young Serbian mathematicians, the first one in 2019 and the next one in September 2022.



Caption: A lecture at the first Congress of Young Mathematicians, Novi Sad, October 3-5, 2019

Cooperation with the non-academic sector in answering the challenges of modern world and promoting the role of mathematics as a tool for solving contemporary problems is an important part of our activities. Members of the Association are active in knowledge transfer and industrial projects, in particular in the area of big data and artificial intelligence.

Members of the Association are active in several applied mathematical organizations like European Consortium for Mathematics in Industry (ECMI) and International Society for Analysis, its Applications and Computation (ISAAC). The Department of Mathematics and Informatics at University of Novi Sad, which has over 50 members in the Society, is an ECMI node and a teaching center.

Further details are available at <https://smsa.pmf.uns.ac.rs/#/about> (<https://smsa.pmf.uns.ac.rs/#/about>)



## Stevan Pilipovic

Stevan Pilipovic is Professor of Mathematics at the University of Novi Sad. His research areas are Functional Analysis, Geometry and Topology. He is the current President of the Serbian Mathematical Sciences Association.



## SBMAC Awards Kepler Prize

### Kepler Prize winning article addressed scenarios for land cover in Brazil

*The study was supported by the Euler cluster, CeMEAI's supercomputer*

The article "Disclosing contrasting scenarios for future land cover in Brazil: Results from a high-resolution spatiotemporal model (<https://www.sciencedirect.com/science/article/abs/pii/S0048969720339991?via%3Dihub>)", which deals with predictive models for future land cover in Brazil and was published by the journal *Science of The Total Environment*, was chosen by the Brazilian Society of Applied and Computational Mathematics (SBMAC (<https://www.sbmac.org.br>)) as the winner of the second edition of the Johannes Kepler Prize (<https://www.sbmac.org.br/premio-kepler/>). The award, instituted in 2020, aims to promote and stimulate national scientific production of excellence in Applied Mathematics with multidisciplinary characteristics.

The study, developed by Arthur Nicolaus Fendrich (ESALQ/USP, Brazil), Alberto Barretto (ESALQ/USP, Brazil), Vinícius Guidotti de Faria (Imaflora, Brazil), Fernanda de Bastiani (UFPE, Brazil), Karis Tenneson (SIG-GIS, USA), Luis Fernando Guedes Pinto (Imaflora, Brazil) and Gerd Sparovek (ESALQ/USP, Brazil), was motivated by the need

to obtain information on the dynamics of changes in land cover, in order to improve practical conservation actions.

According to the article, the political scenario in Brazil, which since 2018 has been experiencing one of the worst economic recessions in history, has caused changes in land cover patterns. With invasive development plans, according to the study, environmental conservation is threatened and the potential effects of this exploitation are still unknown. Thus, in this work, the authors sought to build a model that would assess the consequences of these actions on land cover in near future.

For the development of the work, the authors used the Euler cluster, a supercomputer of the Center for Mathematical Sciences Applied to Industry (CeMEAI (<http://www.cemeai.icmc.usp.br>)), funded by the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP). According to Arthur Fendrich, first author of the article, the equipment was critical for the production carried out.

"Without a doubt, the Euler cluster was fundamental for the elaboration of the work. All the processes involved in the article demanded a very large computation time and also a very significant amount of storage. Therefore, it was and still is very important to be able to count on a infrastructure as advanced, complex, stable and well-managed as Euler. I would even like to say a big thank you to everyone involved in designing, managing and maintaining it for their good work and for their ongoing assistance and support to us and other users," he says.

The author also talked about the motivations for carrying out the study. According to him, Brazil is one of the largest countries in the world, and there is a lot of interest involved in studying its land cover. Fendrich highlights that Brazilian biomes have enormous environmental importance, for example, for the preservation of biodiversity and for the global climate system. In addition, the country is very relevant for the production of food and commodities in the world.

The researcher also points out that there are many works on future land use scenarios in the literature, many of them focusing on very long periods of time - tens or hundreds of years. However, in Brazil, the concern and the range of possibilities are great even in the short term.

"In recent years, for example, the numbers of deforestation and forest degradation have increased a lot, which generates great concern. It was within this context that we went in search of data and methods that could help us build a reference of what may come to be the tomorrow of land cover in Brazil", he adds.

Arthur also spoke about the feeling of winning one of the most important awards in the field of Applied Mathematics. The researcher says that, from the moment the group came up with the idea until the day of publication, it took almost three years to search for new data and methods and carry out numerous tests and experiments.

"This entire long process could be documented in many pages and even the filtering of the results for presentation in the article was the result of a very cautious process. In addition, the research is very multidisciplinary and making the areas talk is always a challenge. It was very gratifying and we were very honored when we received the news that an institution as important and respected as SBMAC had chosen our work for the Johannes Kepler award", he concludes.

Member of SBMAC and also author of the project, Fernanda De Bastiani comments on the feeling of winning the award.

"It is a feeling of satisfaction for the recognition of the fruitful partnership in carrying out this work. It is a joy to know that works with an interdisciplinary character are being recognized in the area of Applied Mathematics and gaining visibility", she celebrates.

### **Johannes Kepler Prize**

The Johannes Kepler Prize, instituted by SBMAC, offers the winners the amount of R\$10,000 and also a certificate by the Society. Scientific articles published in journals with international circulation and with an editorial board of recognized competence, dedicated to topics that require strong interaction between Mathematics and another branch of scientific knowledge, can compete for the award.

In addition, at least one of the authors must work professionally in Brazil and at least two of the authors must have training in different research areas, one of them having a close connection with Mathematics.

In 2022, the winners outperformed other articles published between 2017 and 2021. The judging committee was composed of José Mario Martínez (chair), Pablo Ferrari, André Ponce de Leon Carvalho and Soledad Aronna.

As of the 2022 edition, the Kepler Prize is sponsored by SBMAC's Computational and Applied Mathematics (<https://www.springer.com/journal/40314>) journal.

## SBMAC Press Release



## First Latin American Congress of Industrial and Applied Mathematics, January 2023

The Brazilian Society of Applied and Computational Mathematics (SBMAC), in partnership with the School of Applied Mathematics of Fundação Getúlio Vargas (FGV EMAp), will hold, in 2023, in Rio de Janeiro, the first Latin American Congress of Industrial and Applied Mathematics (LACIAM). The objective is to unify efforts to consolidate and strengthen the advances achieved by Mathematics and its applications around the world, in addition to being a recognition of the growing presence of Applied and Computational Mathematics in different areas of activity.

The event will have the support of several societies, institutions and groups from all over Latin America and will be held between January 30th and February 3rd at the FGV Cultural Center. The program will feature thematic sessions, conferences, poster presentations and panels. In this first edition, the focus will be on the participation of young researchers and the creation of collaborative networks between existing research groups mainly in the region, but also highlighting collaborations with other countries in the world.

Member of the Organizing Committee of the event, Liliane Basso Barichello, professor at the Federal University of Rio Grande do Sul (UFRGS) and Officer-at-Large of the International Council for Industrial and Applied Mathematics (ICIAM), stated that the Congress is meeting the goals of the Council for Latin America.

“Connecting groups and institutions that work with Applied Mathematics in Latin America is one of the objectives of

the event and is very much in line with the ICIAM's objectives for the region, always seeking the development and consolidation of this area and mainly turning attention to the development of Industrial Mathematics”, she analyzes.

Professor at the Federal University of Ceará (UFC), Ana Shirley Ferreira da Silva will be responsible for one of the mini-courses available in the program. She holds a PhD in Mathematics and Informatics from the Université de Grenoble, in France, as well as a Master's and Bachelor's degree in Computer Science from the UFC itself. In addition, she has a Post-Doctorate from Centrum Wiskunde & Informatica (CWI) in Amsterdam, the Netherlands.

Between 2019 and 2021, she was a member of the Gender and Diversity Commission of the Brazilian Mathematics Society (SBM) and the Brazilian Society of Applied and Computational Mathematics (SBMAC). She has experience in combinatorics and graph theory, working mainly on coloring and variants, computational complexity and also on temporal graphs.

For the lectures, 11 specialists from various parts of the world are already confirmed. Among them, Wil Schilders, President-elect of ICIAM; Alvaro Jose Riascos Villegas, from Universidad de los Andes & Quantil, Colombia; Professor José Luis Aragón Vera, from the Centro de Física Aplicada y Tecnología Avanzada, and Professor Susana Gómez, from the Institute of Applied Mathematics and Systems, both at UNAM, in Mexico; Professor Soledad Villar, from Johns Hopkins University, in the United States. To check the complete list of speakers, just access the LACIAM website (<https://eventos.fgv.br/laciam-2023/speakers-minicourses>).

According to Maria Soledad Aronna, President of the Organizing Committee of the event, in addition to being the first congress of its kind in the area, there will be a great balance of speakers from various sub-areas of Applied and Industrial Mathematics. The FGV EMAp professor also commented on expectations regarding the receptivity of Latin American groups to the event's holding and programming.

“Many groups from various Latin American countries will propose special sessions, which also include colleagues from outside the region, such as France, Italy and Canada. A lot of participation is expected from Ecuador, Chile, Argentina and Mexico, in addition to Brazil,” she says.

Interested parties will be able to apply soon. The dates and registration forms for the event will be published on the LACIAM website and on SBMAC's social networks.

### **Posters and special sessions**

The LACIAM 2023 Organizing Committee will receive, until August 31 of this year, abstracts from those interested in presenting posters at the event. (<https://eventos.fgv.br/laciam-2023/sessions-posters>) Authors will be notified of the approval or not of the work until the 30th of September. As for the submission of proposals for special sessions, the deadline is August 5, 2022. Decisions on the proposed sessions are expected to be taken and communicated by August 31. Proposals and other questions should be sent to [sbmac@sbmac.org.br](mailto:sbmac@sbmac.org.br) (<mailto:sbmac@sbmac.org.br>) with the subject LACIAM/sessions until 8/5/2022. For more details and information, visit the event's website (<https://eventos.fgv.br/laciam-2023>)

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## Obituary: Charles William Gear

SIAM News, June 2022 (Volume 55, Number 05) published this Obituary for Charles William Gear, who was chair of CICIAM (the predecessor of ICIAM) from 1991 to 1995. Reprinted here with permission from SIAM and the authors, Yannis Kevrekidis and Linda Petzold. Original article at ([http://: https://sinews.siam.org/Details-Page/obituary-charles-william-gear](http://https://sinews.siam.org/Details-Page/obituary-charles-william-gear))<https://sinews.siam.org/Details-Page/obituary-charles-william-gear> ([https://urldefense.com/v3/\\_\\_https://sinews.siam.org/Details-Page/obituary-charles-william-gear\\_\\_;!!KGKeukY!y0r3lgGo3xK9GjuAS5eV0iAmmVsOamjoAr5wyXTLR-CUMWJFUydsL5FLacbTXRI3u0YMzAQgoahaZljtmX2zfQ\\$](https://urldefense.com/v3/__https://sinews.siam.org/Details-Page/obituary-charles-william-gear__;!!KGKeukY!y0r3lgGo3xK9GjuAS5eV0iAmmVsOamjoAr5wyXTLR-CUMWJFUydsL5FLacbTXRI3u0YMzAQgoahaZljtmX2zfQ$)). (<http://: https://sinews.siam.org/Details-Page/obituary-charles-william-gear>.)

Charles William Gear—known as Bill Gear to all—passed away on March 15, 2022, in Princeton, NJ. He was 87 years old. Bill was a larger-than-life figure whose research career spanned computer design and architecture as well as numerical analysis and scientific computation. His work on initial value problems for differential equations (particularly stiff differential equations and differential-algebraic equations solved via backward differentiation formulas) underpins much of the contemporary research in computational modeling. Bill possessed wisdom, integrity, humor, vision, a healthy dose of competitiveness, an ingrained sense of service to the profession, and a great joy for life. To the end, he was a mean programmer and he loved a good party.

In 2005, SIAM commissioned a substantial interview (<http://history.siam.org/oralhistories/gear.htm>) with Bill (conducted by Thomas Haigh) that was later donated to the Computer History Museum (<https://www.computerhistory.org/collections/catalog/102746786>) in Mountain View, Calif. It explores Bill's formative years in England with a hardworking father who expected education to provide Bill with an easier life—and never ceased to wonder that Bill kept working hard anyway, since he loved what he did—and who impressed upon him the need to treat people fairly. It also reminds us of the joy of taking apart radios and reveals a fascination with all things electrical that followed Bill throughout his career and was evident in his interest in computer graphics and the “Gear anode.”



Charles William (Bill) Gear, 1935-2022. Photo courtesy of Princeton University.

Bill studied mathematics at the University of Cambridge's Peterhouse College, where his rowing team won "Head of the River" for the first time in 108 years. After graduating from Cambridge and receiving a fellowship to study in the U.S., Bill sailed to New York on the Queen Mary and made his way to the University of Illinois at Urbana-Champaign (UIUC). He ended up staying at UIUC until he completed his Ph.D. in 1960, under the direction of Abraham Taub. The field of computer science proved to synthesize Bill's mathematical skills and instincts for building mechanical things and controlling them electrically.

"Once I started working with computers, I knew that this was what I wanted to do," Bill said in 2005. "There was no doubt about it. This combined all things that I liked: some amount of mathematical analysis, the mechanical stuff of programming, the invention, the design. I'm a cross between a scientist and an engineer." From programming the ILLIAC I (Illinois Automatic Computer) as a first-year graduate student to collaborating with Don Gillies on the ILLIAC II and eventually writing his first paper about the ILLIAC II assembler in 1964, Bill's early research was shaped by computer architecture, assembly-level programming, and creative debugging. This period of his life was also rich with interactions with numerical analysts, such as his classmate Gene Golub and UIUC visitor William "Vel" Kahan. In the meantime, Bill formed new interests in areas like ordinary differential equations as he worked on the ILLIAC II.

This brings us to the Bill Gear with whom many of us on the numerical analysis/scientific computing side are familiar. He is especially remembered for his work on backward differentiation formulas, stiff differential equations, and the DIFSUB subroutine (often referred to as "Gear's method") — which eventually lead to the Livermore Solver for Ordinary Differential Equations (LSODE). Bill's visits to Argonne National Laboratory—and an analog computer programmer's challenge that "I've got the sort of problems you digital guys can't solve"—inspired his interest in problems with conservation laws and differential-algebraic equations. As a result, his paper on the "Simultaneous Numerical Solution of Differential-Algebraic Equations" appeared in 1971 [4]. During this time, Bill also started writing important books: *Computer Organization and Programming* in 1969 [1] (a sabbatical in Nice, France, provided the opportunity for a revised second edition); the now-classic *Numerical Initial Value Problems in Ordinary Differential Equations* in 1971 [3]; and the 1971 *Introduction to Computer Science* [2], which was a truly influential textbook for computer science students for more than two decades.

Bill rose through the ranks at UIUC and became head of the Department of Computer Science from 1985 to 1990. While in this position, he instituted the faculty-sponsored "Friday Extravaganza" for graduate students that continues to this day. He then left the department to pursue an exuberant dream at the NEC Research Institute in Princeton, NJ; NEC recruited him to build its Computer Science Research Division. Bill became president of the institute two

years later and served in that role until his retirement in 2000. After retiring, he developed a new interest in multiscale numerics and made seminal contributions in equation-free multiscale methods with collaborators and students from Princeton. These efforts led to 20 additional years of exceptional productivity, everyday presence, and creative programming.

Bill remained dedicated to the applied and computational mathematics community throughout his entire career, and what follows is a very incomplete sampling of this allegiance. He served SIAM in various capacities over the years, including as Vice President for Publications and a member of the SIAM Council and the Committee on Programs and Conferences. Most notably, he was president of SIAM from 1987 to 1988. Bill was also involved with the Association for Computing Machinery (ACM) and the International Council for Industrial and Applied Mathematics (including a stint as president). He held multiple journal editorships, one of which was for the *SIAM Journal on Scientific Computing* (<https://www.siam.org/publications/journals/siam-journal-on-scientific-computing-sisc>); was a valued invited speaker across the world; retained membership with several National Research Council boards and committees; and advised 22 Ph.D. students. Their memories recount an inquisitive and involved advisor who would return from a seminar and say “An interesting idea — let’s try it ourselves and see what happens!” Bill’s fascination and creativity resurge again and again in their current work.

Bill was recognized with many accolades over the course of his life, including membership in the National Academy of Engineering. He was a Fellow of SIAM, the ACM, the American Association for the Advancement of Science, the Institute of Electrical and Electronics Engineers, and the American Academy of Arts and Sciences. He also received the ACM SIGNUM George E. Forsythe Memorial Award and an Outstanding Civilian Service Award from the U.S. Department of the Army. In 1986, the “GearFest” conference in Albuquerque, NM, was held in his honor. Beyond official recognition, the testimonies to Bill’s wisdom, integrity, good judgement, fairness, joy, humor, and friendship from the people whose lives he made better speak for themselves.

Bill’s interests went well beyond mathematics; in his free time, he regularly attended concerts, operas, and plays. He also enjoyed sailing, tennis, *The New York Times* crossword puzzle, parties, and—above all—travel to destinations around the world.

In addition to Bill’s professional community, he is survived by his wife Ann Lee Morgan, his companion of 50 years; his daughter K. Jodi Gear and son Christopher Gear (both from a previous marriage to Sharon Smith); four grandchildren; and his sister Kate Redding. We will all miss Bill: the world traveler, truly creative scientist, inspiring scholar and collaborator, and the smiling man in the photograph.

As he himself said, “It is the path that is fun — in the end, there is no *there* when you get there.” Bill made many people’s paths fun as a person, teacher, and friend, and he continues to make our paths fun with his contributions to science and mathematics.

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## Yannis Kevrekidis and Linda Petzold

Yannis Kevrekidis is Bloomberg Distinguished Prof, Depts of Chemical and Biomolecular Eng and of Applied Math and Stat, Johns Hopkins Univ. Linda Petzold is Distinguished Prof, Depts of Computer Science and of Mechanical Eng, UC Santa Barbara.



## ICIAM Endorses Science in Exile Campaign

The Officers of ICIAM have approved the endorsement of the initiative *Science in Exile*. ICIAM appears now as one of the endorsers of the global campaign in favor of refugee and displaced scientists at risk. The campaign and its background are detailed at <https://scienceinexile.org/sign-declaration>

([https://urldefense.com/v3/\\_\\_https://scienceinexile.org/sign-declaration\\_\\_;!!KGKeukY!0yiJJLSfKOcA9K6Y7TGvLO-sP-Xd0c0XShwZAow6U8zs7OWtrKjeT-Yhttps://scienceinexile.org/sign-declaration](https://urldefense.com/v3/__https://scienceinexile.org/sign-declaration__;!!KGKeukY!0yiJJLSfKOcA9K6Y7TGvLO-sP-Xd0c0XShwZAow6U8zs7OWtrKjeT-Yhttps://scienceinexile.org/sign-declaration))



## The 2022 ICIAM Officers

Ya-xiang Yuan (President), Wil Schilders (President-Elect), Sven Leyffer (Secretary), Heike Fassbender (Treasurer), Luis Vega and Liliane Basso Barichello (Officers-at-large)

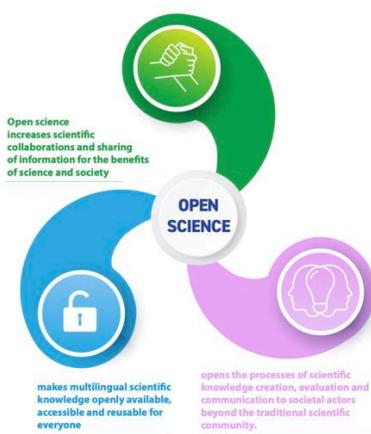


# The UNESCO Recommendations for "Open Science": A Discussion Mediated by ISC

On June 14 and 15, the ISC ran two zoom sessions (to account for different time zones) to introduce the ISC community to an ambitious project that UNESCO is undertaking. In November, 2021, the UNESCO General Assembly formally adopted a 34-page document, *UNESCO Recommendations on Open Science* (English language version at <https://unesdoc.unesco.org/ark:/48223/pf0000379949.locale=en> (<https://unesdoc.unesco.org/ark:/48223/pf0000379949.locale=en>)). The report was written by an Advisory Committee (<https://en.unesco.org/science-sustainable-future/open-science/advisory-committee> (<https://en.unesco.org/science-sustainable-future/open-science/advisory-committee>)). Its members are a mix of science administrators, research scientists, and civil servants.

I attended the second session, ably moderated by Jenice Jean Goveas, a PhD Chemist who now works on Science Policy at ISC's *The Future of Scientific Publishing Project*. A recording of the session is at <https://council.science/events/isc-members-session-on-the-unesco-open-science-recommendation/> (<https://council.science/events/isc-members-session-on-the-unesco-open-science-recommendation/>)

This article is a brief summary of the hour-long session. For a more thorough understanding, both the *Recommendations* document and the recording are useful.



Ana Persic, Senior Programme Specialist in the Division of Science Policy and Capacity-Building, Natural Sciences Sector of UNESCO, traced the origin of the project to the UN's *Sustainable Development Goals* (<https://sdgs.un.org/goals>) and the realization that a more comprehensive participation in scientific activity worldwide is needed to achieve any of the goals. She explained the term *open science*, outlined the characteristics of open science, and gave the report's recommendations. Quoting from the report:

*For the purpose of this Recommendation, open science is defined as an inclusive construct that combines various movements and practices aiming to make multilingual scientific knowledge openly available, accessible and reusable for everyone, to increase scientific collaborations and sharing of information for the benefits of science and society, and to open the processes of scientific knowledge*

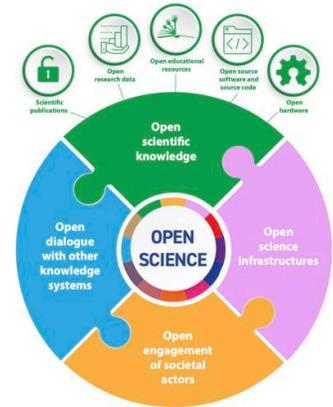
*creation, evaluation and communication to societal actors beyond the traditional scientific community. It comprises all scientific disciplines and aspects of scholarly practices, including basic and applied sciences, natural and social sciences and the humanities, and it builds on the following key pillars: open scientific knowledge, open science infrastructures, science communication, open engagement of societal actors and open dialogue with other knowledge systems.*

The characteristics of open science include open publication, open data, open educational resources, open source software, and open hardware; access to scientific knowledge; open science infrastructure; open engagement of societal actors; and open dialogue with other knowledge systems (the reference here is to the 2001 UNESCO Universal Declaration on Cultural Diversity).

Most of ICIAM's members are traditional scientists; it was reassuring to hear the presentation of the second speaker, Geoffrey Boulton, a glaciologist, former chair of ISC's CODATA project, and a member of ISC's Governing Board, who gave ISC's perspective. He is the author of a recent ISC position paper, *Science as a Global Public Good* (<https://council.science/wp-content/uploads/2020/06/ScienceAsAPublicGood-FINAL.pdf> (<https://council.science/wp-content/uploads/2020/06/ScienceAsAPublicGood-FINAL.pdf>)). Boulton rather skillfully

outlined ways that the current scientific norms (publishing paywalls, reliance on bibliometrics to determine quality, typical peer review, disciplinary silos and so on) fail to advance science. His second point was that science must become both more transdisciplinary and more international if we are to solve the enormous challenges that face humanity and our planet.

The scientific values and principles stated in the *Recommendations* are concrete. Governments, to whom this document is addressed, should be responsible for creating and maintaining the infrastructure needed for optimal scientific discovery and education. Core values are quality and integrity; collective benefit; equity and fairness; and diversity and inclusiveness. The guiding principles are also reassuring. First: transparency, scrutiny, critique and reproducibility. Second, equality of opportunities. Third: responsibility, respect and accountability. The responsibility is on *all open science actors* to respect the guidelines. The guidelines also call for collaboration, participation and inclusion. The *inclusion of knowledge from marginalized communities in solving problems of social importance* falls under this guideline. The guidelines also call for flexibility, realizing that there will be different pathways, and different time-scales for transitioning to open science. And finally, the principles call for sustainability: finding long-term practices and funding models that will ensure these goals, especially of course the inclusion of scientists from less privileged societies and countries.



High-minded principles are of no use unless they can be implemented, and UNESCO is now tackling this. Committees are now working on implementation, including producing fact sheets, analysing funding mechanisms and incentives, sharing best practices and developing a monitoring framework. The recommendation urges action in seven areas; these were condensed to five in the presentation:

- (i) change the conventional science culture
- (ii) build human and institutional capacity
- (iii) provide adequate infrastructure, including reliable internet capacity
- (iv) align incentives and revise criteria for scientific excellence and scientific careers
- (v) address the unintended negative consequences of open science practices.

The third speaker was Christophe Cudennec, Secretary General of the International Association of Hydrological Studies (<https://iahs.info>), a member of ISC. IAHS has already taken steps toward Open Science. For example, since 1956 IAHS has made their principal books freely available by depositing them in libraries around the world, often without charge. They publish an open-access journal at a relatively low cost of 30 Euros per page, and are in the process of digitizing their entire archive. IAHS has also studied the effect of implementing these policies on the dissemination and quality of results, and has published on this.

In the discussion period. Boulton answered a question about implementation. He distinguished between *purpose* and *process*. The purpose ought to be clear: stakeholders will benefit. The list of stakeholders begins with government funding agencies and foundations. Pointing out that their objective is to get the best science at the least cost, he felt that they would support this project. "A more difficult question", he said, "is the universities". He recalled the some of the ridiculous metrics to which universities are wedded (as a side note: Columbia University has just announced that it will no longer participate in the *US News and World Report* annual evaluation of quality of universities worldwide). The third group, of course, is scientists themselves. Many young scientists do not know what open science is. On the other hand, scientists, particularly young scientists, are persuadable by an ethically powerful case.

On the question of implementation in the global south versus the global north, Ana Persic was optimistic. The most important issue is the need to invest in science. Every nation should invest at least one percent of GDP in science. And cooperation means that knowledge and infrastructure can be shared.

On the question of data sharing, Boulton answered that we need to make it easy for scientists to do so. The curating of data repositories is fundamental to the idea of open science and interoperability between disciplines "might take a decade to sort out". Data security is another difficult question.

The final question: how do we persuade scientists that open science is in their best interest? Boulton's answer: The purpose of open science is not to advance the career of a scientist, but to benefit science. He closed with an eloquent statement: "We don't do science to publish yet another ... paper. We do it to communicate with our fellow citizens, we do it to collaborate with each other, we do it to advise policy, and all these things ... are set in the background by the formal demand for publication citations. We've got to stop it!"



### Barbara Lee Keyfitz

Barbara Lee Keyfitz is Professor of Mathematics at The Ohio State University. She has a PhD from New York University, and works in the analysis of partial differential equations. She is a Past-President of ICIAM, and Editor-in-Chief of ICIAM Dianoia.

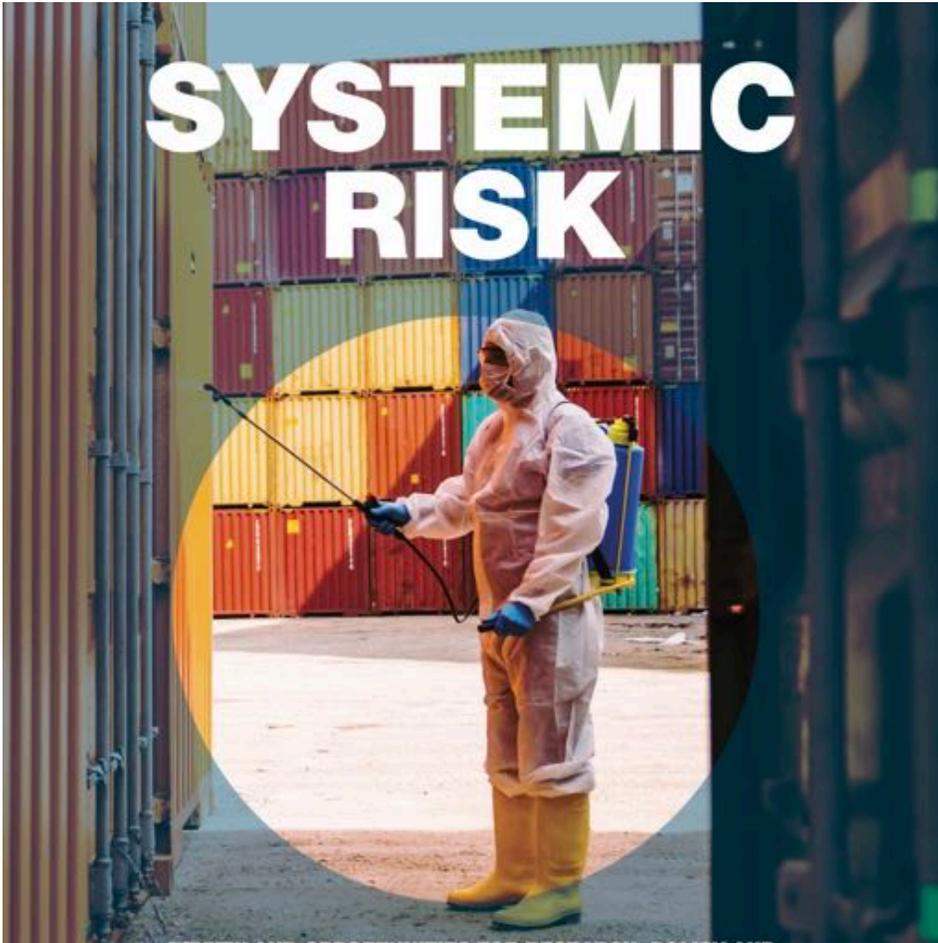


## ISC Publication: Briefing Note on Systemic Risk

Brief notes on a *Briefing Note*

I have been asked to comment on the *Briefing Note on Systemic Risk*, a 36 page document recently released jointly by the International Science Council, the UN Office for Disaster Risk Reduction, and an interdisciplinary network of decision makers and experts on disaster risk reduction that goes under the acronym RISKKAN.[1] (applewebdata://82D9F9BC-7D10-4E5A-BD11-F56D59044302#\_ftn1) The importance of the document lies not so much in the concrete subject-matter knowledge (of which in fact there is rather little) that an interested reader can take away from it, but more in how it serves as a commitment from the three organizations to take the various challenges associated with systemic risk seriously, and to work on our collective ability to overcome these challenges and to reduce the risks.

So what is systemic risk? A first attempt at a definition could involve requiring a system consisting of multiple components, and a risk that cannot be understood in terms of a single such component, but which involves more than one of them (perhaps the entire system) and arises not just from their individual behavior but from their interactions. But more can be said, and an appendix to the *Briefing Note* lists definitions offered by 22 different organizations and groups of authors, including the OECD, the International Monetary Fund and the World Economic Forum. Recurrent concepts in these definitions include complexity, shocks, cascades, ripple effects, interconnectedness and non-linearity. The practical approach here is probably that we give up on the hope for a clear set of necessary and sufficient conditions on what constitutes a systemic risk, and accept that the concept has somewhat fuzzy edges.



Cover Illustration from *Briefing Note on Systemic Risk*

A central theme in the *Briefing Note* is the need for good data. A system with many components will typically also have many parameters, and in order to understand it well enough to grasp its systemic risks we need to estimate its parameters. Without good data that cannot be done. A good example is the situation the world faced in early 2020 as regards the COVID pandemic. We were very much in the dark about key parameters such as  $R_0$  (the basic reproduction number) and the IFR (infection fatality rate), which are properties not merely of the virus itself, but also of the human population that it preys upon, our social contact pattern, our societal infrastructures, and so on – in short, they are system parameters. In order to get a grip on these parameters it would have been instrumental to know the infection's prevalence in the population and how that quantity developed over time, but the kind of data we

had was so blatantly unrepresentative of the population that experts' guesstimates differed by an order of magnitude or sometimes even more. A key lesson to be remembered for the next pandemic is the need to start sampling individuals at random from the population to test for infection as early as possible.

Besides parameter estimation within a model of the system, it is of course also important to realize that the model is necessarily incomplete, and that system risk can arise from features not captured by it. At the very least, this requires a well-calibrated level of epistemic humility and an awareness of the imprudence of treating a risk as nonexistent just because we are unable to get a firm handle on it.

Early on in the *Briefing Note*, it is emphasized that while studies of systemic risk have tended to focus on “global and catastrophic or even existential risks”, the phenomenon appears “at all possible scales – global, national, regional and local”. While this is true, it is also true that it is systemic risk at the larger scales that carry the greatest threat to society and arguably are the most crucial to address. An important cutoff is when the amounts at stake become so large that the risk cannot be covered by insurance companies, and another one is when the very survival of humanity is threatened. As to the latter kinds of risk, the recent monograph by philosopher Toby Ord gives the best available overview and includes a chapter on the so-called *risk landscape*, i.e., how the risks interact in systemic ways.[2] (applewebdata://82D9F9BC-7D10-4E5A-BD11-F56D59044302#\_ftn2)

Besides epidemics, the concrete examples that feature the most in the *Briefing Note* are climate change and financial crises. These are well-chosen due both to their urgent need to be addressed and their various features typical of systemic risk. Still, there are other examples whose absence in the report constitute a rather serious flaw. One is AI risk, which is judged by Ord (correctly, in my view) to constitute the greatest existential risk of all to humanity in the coming century. A more abstract one, but nonetheless important, is the risk of human civilization ending up more or less irreversibly in the kind of fixed point – somewhat analogous to mutual defection in the prisoners' dilemma game but typically much more complex and pernicious – that Scott Alexander calls Moloch and that Eliezer Yudkowsky speaks more prosaically of as inadequate equilibria.[3] (applewebdata://82D9F9BC-7D10-4E5A-BD11-F56D59044302#\_ftn3) [4] (applewebdata://82D9F9BC-7D10-4E5A-BD11-F56D59044302#\_ftn4)

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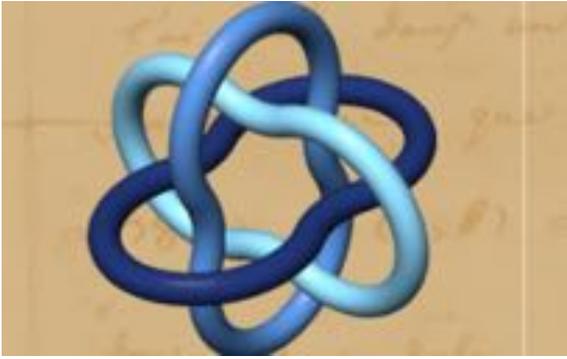
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## Olle Häggström

Olle Häggström is a professor of mathematical statistics at Chalmers University of Technology, a member of the Royal Swedish Academy of Sciences, and the author of five books including *Here Be Dragons: Science, Technology and the Future of Humanity*.



## The IMU Announces 2022 Medals and Prizes

On 5 July 2022, the IMU held the **IMU Award Ceremony 2022** as a live event in Helsinki, Finland at Aalto University (Runeberginkatu 14–16, Aalto Töölö, 00100 Helsinki). Here the winners of the Fields Medals, IMU Abacus Medal, Chern Medal Award, Carl Friedrich Gauss Prize and Leelavati Prize were announced, and the awards handed over. The event was streamed live.

### The recipients of the IMU Awards 2022 for mathematical achievement

**Fields Medal** (<https://www.mathunion.org/imu-awards/fields-medal/fields-medals-2022>)

**Hugo Duminil-Copin**, a professor at the University of Geneva, Switzerland, and a permanent professor at the Institut des Hautes Études Scientifiques, France, is recognized “for solving longstanding problems in the probabilistic theory of phase transitions in statistical physics, especially in dimensions three and four.”

**June Huh**, a professor at Princeton University, is recognized for his work in “bringing the idea of Hodge theory to combinatorics, the proof of the Dowling–Wilson conjecture for geometric lattices, the proof of the Heron–Rota–Welsh conjecture for matroids, the development of Lorentzian polynomials, and the proof of the strong Mason conjecture.”

**James Maynard**, a professor at the University of Oxford, United Kingdom, is recognized “for contributions to analytic number theory, which have led to major advances in the understanding of the structure of prime numbers and in Diophantine approximation.”

**Maryna Viazovska**, a professor and chair of number theory at the École Polytechnique Fédérale de Lausanne, Switzerland, is recognized “for the proof that the  $E_8$  lattice provides the densest packing of identical spheres in 8 dimensions, and further contributions to related extremal problems and interpolation problems in Fourier analysis.”

**Abacus Medal** (<https://www.mathunion.org/imu-awards/imu-abacus-medal/abacus-medal-2022>)

Mark Braverman, a professor at Princeton University, won the inaugural Abacus Medal (<https://www.mathunion.org/imu-awards/imu-abacus-medal>) “for his path-breaking research developing the theory of information complexity, a framework for using information theory to reason about communication protocols. His work has led to direct-sum theorems giving lower bounds on amortized communication, ingenious protocol compression methods and new interactive communication protocols resilient to noise.”

**Gauss Prize** (<https://www.mathunion.org/imu-awards/carl-friedrich-gauss-prize/carl-friedrich-gauss-prize-2022>)

Elliott H. Lieb, a professor of mathematics and Higgins Professor of Physics (emeritus) at Princeton University, won the Gauss Prize (<https://www.mathunion.org/imu-awards/carl-friedrich-gauss-prize>) for “deep mathematical contributions of exceptional breadth which have shaped the fields of quantum mechanics, statistical mechanics, computational chemistry and quantum information theory.”

**Chern Medal** (<https://www.mathunion.org/imu-awards/chern-medal-award/chern-medal-award-2022>)

Barry Mazur, the Gerhard Gade University Professor at Harvard University, won the Chern Medal Award (<https://www.mathunion.org/imu-awards/chern-medal-award>) for “his profound discoveries in topology, arithmetic geometry and number theory, and his leadership and generosity in forming the next generation of mathematicians.”

**Recipient of the mathematical outreach prize**

**Leelavati Prize** (<https://www.mathunion.org/imu-awards/leelavati-prize/leelavati-prize-2022>)

Nikolai Andreev, the head of the Laboratory of Popularization and Promotion of Mathematics at the Steklov Institute, Russia, won the Leelavati Prize (<https://www.mathunion.org/imu-awards/leelavati-prize>) for “his contributions to the art of mathematical animation and of mathematical model-building, in a style which inspires the young and the old alike, and which mathematicians around the world can adapt to their varied uses as well as for his indefatigable efforts to popularize genuine mathematics among the public via videos, lectures and a prize-winning book.”

Read more about all the prizes and winners (<https://www.mathunion.org/icm/imu-award-ceremony-2022>) on the IMU website.

From the IMU Webpage



## **CIMPA-School "Data Science and Stochastic Optimization" had ICIAM Support**

The CIMPA-School "Data Science and Stochastic Optimization" was held in the City of Sciences in Tunisia between 16 May and 27 May 2022. The organizers of this scientific event are:

- Hédi Nabli, Professor at the University of Sfax – Tunisia, as coordinator
- Nikolaos Limnios, Professor at the University of Compiègne – France, as co-coordinator.

The CIMPA Scientific officer is Sophie Dabo, Professor at the University of Lille – France.

The topics of this school are varied:

- Kernel Methods for Data Science (Sophie Dabo & Abderrazek Karoui)
- Markov chains and Simulated Annealing Method (Hédi Nabli)
- Statistical methods for classification (Khalil Masmoudi & Afif Masmoudi)
- Controlled Markov Processes (Nikolaos Limnios)
- Some supervised classification methods for data science (Jean-François Dupuy)
- Bagging, Boosting, Model Combination, Deep Learning (Valérie Monbet)
- Particle swarm optimization (Sameh Kessentini)



The coordinators of the Summer School: Nikolaos Limnios and Hédi Nabli

Mornings were reserved for theoretical courses and afternoons for practical sessions (Python, R and Matlab), except Wednesday afternoon which was reserved for cultural visits. For more details, see <https://www.cimpa2022.univ-sfax.tn/> (<https://www.cimpa2022.univ-sfax.tn/>). ([https://www.cimpa2022.univ-sfax.tn](https://www.cimpa2022.univ-sfax.tn/)) At the end of this school, guided visits to the planetarium, the dinosaur center and many other centers of the “Cité des Sciences” took place.

The scientific committee received 111 applications from 18 countries and only 53 were accepted. All participants, organizers and speakers were entirely satisfied; the atmosphere was friendly and enjoyable. This scientific event was actually a very successful school in terms of mathematical developments, mathematical applications and also in terms of relationships.

The nine ICIAM Fellows are shown in the photograph:



## Hédi Nabli

Hédi Nabli is Professor of Mathematics at the University of Sfax, Tunisia. His research interests include Markov processes and applications on computer and communication networks. He has a PhD in Applied Probability from the University of Rennes.

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