The April edition of ICIAM Dianoia includes news about ICIAM, announcements about ICIAM 2023, activities of member societies, and initiatives of organizations in which ICIAM participates: the International Science Council and the Standing Committee on Gender Equality in Science. Of particular interest is the announcement of the 2022 ICIAM Board meeting in September. Prize announcements bring news of two major awards to mathematical scientists: the Abel Prize and the Turing Award.

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Letter from the President of ICIAM, Ya-xiang Yuan

Though the Omicron variant of COVID-19 and its new sub-variations are still affecting the world, ICIAM's business is going on smoothly. Thanks to the hard work of the Japanese organizers, the preparation of the 2023 ICIAM Congress proceeds nicely as scheduled. The call for minisymposia is already open, and submissions for minisymposia can now be made at the ICIAM 2023 website (http://iciam2023.org). Due to the great efforts of ICIAM's ISC Committee headed by Maria Esteban, ICIAM has applied to the International Science Council (ISC) for support for its 2022 Board Meeting.
Science Council for changing ICIAM's membership category from affiliate member to full member. The Dianoia Editorial Board Committee chaired by Barbara Keyfitz have done a great job in making ICIAM's newsletters available in PDF files (https://iciam.org/dianoia).

The 2022 board meeting of ICIAM will be held at University of Strathclyde in Glasgow on Sept 3rd, 2022 with a workshop Sept 1-2, thanks to help from IMA and Iain Duff.

I mentioned in my message in the last issue of Dianoia that ICIAM will elect a new secretary this year due to the current secretary, Sven Leyffer, having been elected as the president of SIAM. The call for nominations for secretary has been announced (you can find it in this issue), and the deadline for submissions is June 15th, 2022.

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.

Announcement: The 2022 ICIAM Board Meeting

The 2022 Board Meeting will be held at the University of Strathclyde in Glasgow, Scotland, UK, on Saturday, September 3, 2022. The 2022 Board meeting will be hosted by the IMA and the University of Strathclyde to make up for the 2020 Board meeting that had to be canceled due to COVID-19. The Board meeting will be preceded by a two-day workshop on industrial and applied mathematics, aptly situated in one of the capitals of the industrial revolution, Glasgow, home to the shipyards that built ocean liners such as the Queen Mary and the Queen Elizabeth 2.

More detailed information, including registration forms and an agenda will be posted here in May: https://iciam.org/meeting/2022-board-meeting-glasgow-scotland (https://iciam.org/meeting/2022-board-meeting-glasgow-scotland)
The technology and innovation center, University of Strathclyde
News of ICIAM 2023: April 2022 Update

The 10th International Congress on Industrial and Applied Mathematics, ICIAM 2023, will be held at Waseda University, Tokyo, Japan on August 20-25, 2023 (https://iciam2023.org (https://iciam2023.org)). In principle, the conference format of ICIAM 2023 is hybrid, i.e., a session in a minisymposium may mix on-site and online talks or comprise fully online talks.

We are pleased to announce Calls for Minisymposia and Contributed Talks as follows:

**Call for Minisymposia:**

The call for minisymposia has been announced at the ICIAM 2023 webpage. The submission page for proposals of minisymposia has opened on April 1, 2022.

A minisymposium is composed of one or a few sessions (up to three sessions) of coordinated presentations on a single topic of interest and importance in industrial and applied mathematics. Each session within a minisymposium should include four presentations in two hours. Each speaker should be allotted 25 minutes for their presentation, with an additional 5 minutes for discussion.

We greatly encourage you to propose a minisymposium.

**Call for Contributed Talks:**

The call for contributed talks has also been announced at the ICIAM 2023 webpage. The submission page has opened on April 15, 2022.

Contributed talks in lecture format are invited in all areas consistent with the congress themes covering topics in industrial and applied mathematics. A contributed talk is a 15-minute oral presentation, with additional 5 minutes for discussion. Those intending to participate in a contributed talk at ICIAM 2023 must submit the title of their presentation, together with a brief abstract (not to exceed 75 words), using the online submission form at the ICIAM 2023 webpage.

The photographs show one of the lecture buildings (Building No.3) in the Waseda Campus, Waseda University, where ICIAM 2023 will take place. The second photo is one of the lecture rooms in this building. This building is a reconstructed one keeping the atmosphere of the old one constructed more than one hundred and twenty-five years ago.

The ICIAM 2023 webpage is at: https://iciam2023.org (https://iciam2023.org)

We strongly encourage you to join this wonderful event!
Shin’ichi Oishi, ICIAM 2023 Congress Director
Takeshi Ogita, ICIAM 2023 Local Scientific Program Committee Chair

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, is the ICIAM 2023 Local Scientific Program Committee Chair

Reminder: Update Your Society's Information

Update Your Membership Information on iciam.org (https://iciam.org/)

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)

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)
ICIAM Conference Support in Developing Countries

Call for Proposals: ICIAM Conference Support for Applied and Industrial Mathematics in Developing Countries

ICIAM Conference Support for Applied and Industrial Mathematics in Developing Countries

In addition to in-person meetings, ICIAM 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 more details.

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)

Now Available in PDF Format: ICIAM Dianoia

When Dianoia changed its format from a PDF download to an online newsletter, one of the editorial board's goals was to eventually produce a PDF copy to complement the new version. That day has now arrived. With the efforts of ICIAM's web designer, Robert Carr, Director of Cognimatic Limited, readers now have access to a printable version of ICIAM Dianoia (US Letter or A4 page size). This responds to the requests of some ICIAM members, and in addition provides ICIAM with an archive of the newsletter.
Now when you receive an e-mail announcing a new issue, if you click on the phrase "View this newsletter in your browser" and are taken to the ICIAM web page where the newsletter is found, you will see an additional menu option: "Downloads". (See the image below.) If you choose that, you will be given the option of US or A4 format. Clicking on one of those buttons will put a copy of the full newsletter in your browser window. You can read, download, or print it. All the earlier issues have also been formatted this way. You will find them on the "News" page - a link from the ICIAM home page. All issues of the newsletter are listed on right side of this page, and clicking on any of them will bring up that issue of the newsletter, now offering the "Downloads" option.

We have not found a way to produce the elegant covers that our first managing editor, Sean Bohun, designed for the original PDF version. The community is now in the lead-up period to ICIAM 2023, just 16 months away, and Japan is a very picturesque location. The new format cannot do justice to it in the way we attempted for Beijing and Valencia. To see what Tokyo looks like, you will have to visit. But now anyone who wants to read the newsletter in the old-fashioned way will be able to do so.

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.

Call for Nominations for ICIAM Secretary
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) by July 15. 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, 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 does not require technical skills beyond the ability to edit online documents using a GUI (the server is maintained by JSIAM and a consultant). Sven will be happy to answer questions about the job specifications and its rewards!

Sven Leyffer
Sven Leyffer is a senior fellow of the University of Chicago/Argonne Computation Institute. He is the current ICIAM Secretary.

Welcome to New Member Hong Kong Society for Industrial and Applied Mathematics
HKSIAM Joined ICIAM as a full member in 2021

Hong Kong Society for Industrial and Applied Mathematics (HKSIAM) is based in Hong Kong and connects the international community of industrial and applied mathematics. HKSIAM is committed to advancing the application of mathematics and computational science to engineering, industry, science, and society; to promoting research that will lead to effective new mathematical and computational methods and techniques for industrial and scientific applications; and to providing platforms for the exchange of information and ideas among mathematicians, engineers, scientists, and other practitioners. Starting from 2018, the institutional members have increased, now including City University of Hong Kong, Hong Kong Baptist University, Hong Kong University of Science and Technology, The Chinese University of Hong Kong, The Hong Kong Polytechnic University, and The University of Hong Kong. In 2021, HKSIAM has been accepted to be a full member of ICIAM.

Our main purposes are to promote industrial and applied mathematics in Hong Kong and beyond, to build links between the mathematical community and the industry sector, to promote research on various mathematical problems arisen from economic development and technological advancement, and to coordinate planning for Hong Kong meetings on industrial and applied mathematics. HKSIAM continues to strive for intellectual exchanges and has organized series of important activities amid these difficult times of COVID-19. These include IAS online conference on Industrial and Applied Mathematics (The First Bi-Annual Conference of HKSIAM) on January 2021 and Applied Mathematics Seminars for HKSIAM and Hong Kong Universities starting from 2020. HKSIAM has invited many distinguished scholars from all over the world and
representatives from industry to deliver talks on cutting-edge research and industrial applications. These activities not only bring opportunities for young scholars to be exposed to the frontiers of industry and applied mathematics, but also foster collaborations between the researchers in Hong Kong and the world.

IAS conference on Industrial and Applied Mathematics (The First Bi-Annual Conference of HKSIAM, 2021)

HKSIAM Board & Scientific Committee Meeting is held annually to discuss issues regarding the development of HKSIAM. The current HKSIAM officers include President Prof. Xuecheng Tai, Vice-President Prof. Michael Ng, Secretary-General Prof. Zhonghua Qiao, Treasurer Mr. Alfred Cheung, and Officer at Large Prof. Xiaoping Wang. The current Chairman of Scientific Committee is Prof. Raymond Chan. For more information about HKSIAM, please visit https://www.hksiam.org.hk/ (https://www.hksiam.org.hk/).

IAS conference on Industrial and Applied Mathematics (The First Bi-Annual Conference of HKSIAM, 2021)

Sven Leyffer Named SIAM President-Elect
Sven Leyffer, a senior computational mathematician in the Mathematics and Computer Science (MCS) division at Argonne National Laboratory, has been elected president of the Society for Applied Mathematics (SIAM). In this role he will shadow the current president as president-elect for the next calendar year and serve as president from January 1, 2023, to December 31, 2024.

“I am honored to be selected for the position of SIAM president-elect,” said Leyffer. “SIAM provides a critical bridge between academia and industry, and this is an exciting time for the community as we delve into new areas such as machine learning where optimization may have a decisive impact.”

Leyffer obtained his Ph.D. in 1994 from the University of Dundee, Scotland. After postdoctoral research positions at Dundee, Argonne, and Northwestern University, he joined the MCS division at Argonne in 2002. A world leader in both optimization theory and the development of numerical optimization algorithms and software, he was co-winner of the Lagrange Prize in Optimization in 2006 for his groundbreaking work on filter methods and winner of the 2016 Farkas Prize, awarded to a mid-career researcher for outstanding contributions to the field of optimization. He served as editor-in-chief of *Mathematical Methods of Operations Research* from 2008 to 2014, and he currently is editor-in-chief of *Mathematical Programming B* and on the editorial board of *Computational Optimization and Applications*.

Leyffer has a long record of leadership in the SIAM community. He was named a SIAM Fellow in 2009, as part of SIAM’s first fellowship class. He was SIAM Vice President for Programs from 2010 to 2013, and he has served on the SIAM Committee on Science Policy since 2015. He is on the editorial board of the SIAM Series on Fundamentals of Algorithms, and he was a panelist at the inaugural Mid-Career Panel held as part of the 2019 SIAM Conference on Computational Science and Engineering.

Recognizing the recent challenges raised by virtual and hybrid meetings, Leyffer said he hopes to help SIAM develop new forms of access to its meetings. He also would like to improve SIAM’s global stature; broaden the impact and presence of industry within SIAM’s activities; and expand SIAM’s commitment to diversity, equity, and inclusion.


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**SIAM Press Release**
ISC’s New President, Peter Gluckman, Talks about ISC

In January, the International Science Council arranged an online session for members of ISC societies to meet the new president, Peter Gluckman. In order to accommodate different time zones, two online meetings took place, one on January 26 in the morning and another one on January 27 in the afternoon.

Both meetings started with a quick 15-20 minutes’ presentation by the president, giving his viewpoint about his plans as president, and about what is going on at the moment at ISC.

He stressed the need to work more closely with members, to organize communication better in both directions, and to involve members better in the design and running of initiatives, the choice of experts to involve in different projects and issues, etc. He also presented briefly ISC’s ongoing conversations with some offices of the UN, the launch of a High Commission on science missions for sustainability, with high profile members who will help establishing priorities and help in the design of new structures and management. Last but not least, he mentioned finding ways to attract the new funding that is necessary for developing new activities. He also discussed the need to define the profile of ISC in order to make it more visible among scientists and among decision makers and potential donors. Since the CEO of ISC resigned recently to take a position in her country, a search is going on at the moment to find a new CEO.

Some committees will be formed soon, to address various topics to be defined by the Board. The first will deal with transdisciplinarity. For this committee a coordinator (a philosopher and mathematician from Norway) has already been chosen, and other members, who could add expertise to the discussions, will be found in the various member organizations. On the organizational side, he explained that the ISC Board has transitioned from two meetings per year in person to a monthly online meeting. This allows for more regularity in the discussions and a better follow-up of ongoing projects. Finally, when discussing membership, Gluckman stressed the need to fill some gaps -- for instance in Life Sciences, or Evolutionary Biology. He then outlined plans to build regional offices/units that should help increase the relations between ISC members sharing geography proximity. These regional units will have a new structure and will function differently from the old regional offices inherited from ICSU. Clearly new funding is necessary to make all these plans work.

After the president’s presentation, the rest of the time was devoted to Questions and Answers. There were a good number of questions and discussions, mainly about the set-up of the future regional offices and about how members could participate better in the activities of ISC. One participant complained about not getting much from ISC membership. Others regretted that most of the people involved in ISC activities were not so young, and said that it would be good to involve younger people, the scientists of the future.

The main answers were the following:

- ISC should be able to help members in capacity building concerning science advice in their countries or communities.
- More young scientists should be associated to the activities of ISC, and apart from members nominating younger people to represent them in ISC meetings and panels, another possibility would be to associate, or accept as members, young academies that already exist in some fields.
- Members should be involved much more in the activities and decisions of ISC. ISC has to make big efforts in this direction.
- Some of the projects of ISC could actually be taken over by one or several members who have the expertise in the corresponding field.
The ISC could act as broker between members, so that members that wish/need expertise in some particular field can get it from other ISC members who have it. But in order for ISC to do this, members who need something from others have to ask explicitly about their needs and wishes. ISC can also provide material and background information for members who want to act as science advisors at the level of their countries.

- The regional presence of ISC must be improved. This could prove very efficient and not expensive to implement.
- Ways have to be found so that members can make their activities more visible to ISC and to all its members.
- Nothing has been done about the anti-science movements, but some commission should plan to discuss this important topic, and how ISC and its members could help in this direction, especially if the effort were coordinated. Maybe a forum has to be created to discuss these topics.

**Maria J. Esteban**

Maria J. Esteban is a senior researcher at CNRS and works at the University Paris-Dauphine. Her research area includes nonlinear partial differential equations, especially variational methods. Her term as President of ICIAM ended October 1, 2019.

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**SCGES Launches Webinar Series with Gender Equality in Mathematics Session**

This spring the Standing Committee on Gender Equality in Science (SCGES) launched a webinar series to raise awareness of gender equality issues in sciences. The inaugural webinar, organized by Marie-Francoise Roy of the IMU and Carol Woodward of ICIAM, was held Feb. 16, 2022 and was on "Gender Equality in Mathematics." The webinar featured a 45 presentation by Colette Guillopé on the results of the Gender Gap in Science project (https://gender-gap-in-science.org) specific to Mathematics and Applied Mathematics. After a discussion period for this presentation, the webinar included a panel session featuring Linda Rothschild and Cathy Kessel, two former Presidents of the Association for Women in Mathematics (AWM) (https://awm-math.org/), and Kathryn Leonard, the current AWM President. The panel focused on the challenges facing women in mathematics and how the AWM has supported women in facing those challenges in the past and currently.

The webinar was streamed to YouTube with peak attendance during the live event of about 125 people. The link to the recording can be found here, https://gender-equality-in-science.org/event/scges-webinar-february-16th-2022/ (https://gender-equality-in-science.org/event/scges-webinar-february-16th-2022/).
The second webinar, on "Women in Global Science Organizations," was held on March 24, 2022. Future webinars will be held every 1-2 months and will feature gender equality issues from many different science domains. Participants are asked to register ahead of time for any webinar they would like to attend live. Registration links will be available on the relevant pages under the main webinar series page at https://gender-equality-in-science.org/scges-webinar-series/.

ICIAM is an active participant in the Standing Committee on Gender Equality in Science. To bring greater attention to activities supporting gender equality, ICIAM has created a web page to collect information about activities its member societies are doing in support of gender equality. The page is located at: https://iciam.org/iciam-activities-support-gender-equality.

If your society has had an event or some news of activities that support gender equality or if you have ideas on topics for future webinars, please send the relevant information to Carol Woodward (woodward6@llnl.gov).

More information about the SCGES can be found here: https://gender-equality-in-science.org/.

Carol S. Woodward
Carol S. Woodward is a mathematician at Lawrence Livermore National Laboratory and is the SIAM Vice President-at-Large. Her research includes portable numerical software, time integration methods, and algebraic solvers.

Database of good practices for girls and young women, parents and organizations

One of the main tasks of the "Gender Gap in Science project, how to measure it, how to reduce it?" funded mainly by ICSU/ISC and in which several unions members of ISC participated, among them ICIAM, was the construction of an online database of good practices aiming to reduce the gender gap, especially for girls and young women. Initiatives of this kind exist in many countries, as nowadays everybody is looking for ways to increase the number of girls who want to study scientific subjects and young women who embrace scientific careers. But this database does not aim only to address the gender gap in science, but in all aspects of life. Of course, not all those initiatives are effective, and some of them might be good for some countries and situations, but not for all. This project decided to build a list of initiatives that have been...
verified as effective in one way or another. The database will be evolving in time, and anybody will be able to propose new examples of good initiatives that will have to be carefully checked and verified before being posted.

The website where selected initiatives can be consulted is hosted by the International Mathematical Union, the union which managed the whole Gender Gap project, and it can be found here (https://www.mathunion.org/cwm/gender-gap-in-science-database). There you can currently find sixty-four initiatives listed, and it is very interesting to browse through the list and see the variety of ideas people have had, or the variety of networks that have been built to encourage and empower women, to make their lives and their jobs more pleasant, to help each other, to share experiences, etc. They have been launched in very different countries and continents and it is really worth browsing through them.

For all of them there is information about the name, the year of origin, the region/country, the discipline, the gender objectives, the target audience and the evidence of effectiveness and the impact. But, more importantly, for each of them further details are given, in particular, a good description of the main objectives and the means put in place to reach them.

If any of you has a good story to tell about such an initiative, or know someone who has one, remember that relevant initiatives can be submitted here (https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.mathunion.org%2Fcwm%2Fgender-gap-in-science%2Fform&data=04%7C01%7Cesteban%40ceremade.dauphine.fr%7C2933768102a54cd3d4d908da021d2bc&reserved=0) what you have witnessed will be broadly shared, so that people who want to act can get ideas from what has been tried elsewhere by other people.

Consult the website, use it and share its existence with your networks!

Maria J. Esteban

Maria J. Esteban is a senior researcher at CNRS and works at the University Paris-Dauphine. Her research area includes nonlinear partial differential equations, especially variational methods. Her term as President of ICIAM ended October 1, 2019.

Dennis Parnell Sullivan awarded the 2022 Abel Prize
Dennis Parnell Sullivan has been awarded the 2022 Abel Prize “for his groundbreaking contributions to topology in its broadest sense, and in particular its algebraic, geometric and dynamical aspects”.

The Norwegian Academy of Science and Letters has decided to award the Abel Prize for 2022 to Dennis Parnell Sullivan of Stony Brook University, USA, and the Graduate School and University Center of the City University of New York, USA.

Topology was born in the late 19th century, as a new, qualitative approach to geometry. The field investigates the properties of objects that do not change when they are deformed. So, for a topologist, a circle and a square are the same, but the surface of a sphere and that of a donut are different. Topology has been invaluable throughout mathematics and beyond, with significant applications in fields ranging from physics to economics to data science.

More about Dennis Parnell Sullivan - The 2022 Abel Prize laureate

Like a true virtuoso, “Dennis P. Sullivan has repeatedly changed the landscape of topology by introducing new concepts, proving landmark theorems, answering old conjectures and formulating new problems that have driven the field forwards,” says Hans Munthe-Kaas, chair of the Abel Committee.

He continues: “Sullivan has moved from area to area, seemingly effortlessly, using algebraic, analytic and geometric ideas like a true virtuoso.”

A charismatic and lively member of the mathematics community, Sullivan has found deep connections between a dazzling variety of areas of mathematics. Over the years he has been connected to a number of universities, and during his time in France he made one of his most important breakthroughs: a new way of understanding rational homotopy theory, a subfield of algebraic topology.

Chaos theory

Sullivan began to work on problems in dynamical systems in the late 1970s, the study of a point moving in a geometrical space, a field usually considered far removed from algebraic topology. The ability of computers to iterate functions beyond what was humanly possible had created an explosion of interest in this field, known popularly as “chaos theory”, since many of the dynamical systems exhibited chaotic behaviour.

In 1999 Sullivan and Moira Chas discovered a new invariant for a manifold based on loops, creating the field of string topology, an area that has grown rapidly in recent years.

Changed the field

Among his significant results in topology is his proof of the Adams conjecture, and in dynamical systems he proved that rational maps have no wandering
domains, solving a 60-year-old conjecture. His insistent probing for fundamental understanding, and his capacity to see analogues between diverse areas of mathematics and build bridges between them, has forever changed the field.

Dennis P. Sullivan has won numerous awards, among them the Steele Prize, the 2010 Wolf Prize in Mathematics and the 2014 Balzan Prize for Mathematics. He is also a fellow of the American Mathematical Society.

• The Abel Prize will be presented to Dennis Parnell Sullivan at the award ceremony in Oslo, May 24
• The Abel Prize is funded by the Norwegian government and amounts to NOK 7.5 million
• The prize is awarded by the Norwegian Academy of Science and Letters
• The choice of the Abel laureate is based on the recommendation of the Abel Committee, which is composed of five internationally recognised mathematicians

Photo by John Griffin/Stony Brook University

Press Release

ACM Turing Award Honors Jack J. Dongarra
FROM AN ACM PRESS RELEASE

ACM Turing Award Honors Jack J. Dongarra for Pioneering Concepts and Methods Which Have Resulted in World-Changing Computations

Dongarra’s Algorithms and Software Fueled the Growth of High-Performance Computing and Had Significant Impacts in Many Areas of Computational Science from AI to Computer Graphics

New York, NY, March 30, 2022 – ACM, the Association for Computing Machinery, today named Jack J. Dongarra recipient of the 2021 ACM A.M. Turing Award for pioneering contributions to numerical algorithms and libraries that enabled high performance computational software to keep pace with exponential hardware improvements for over four decades. Dongarra is a University Distinguished Professor of Computer Science in the Electrical Engineering and Computer Science Department at the University of Tennessee. He also holds appointments with Oak Ridge National Laboratory and the University of Manchester.

The ACM A.M. Turing Award, often referred to as the “Nobel Prize of Computing,” carries a $1 million prize, with financial support provided by Google, Inc. It is named for Alan M. Turing, the British mathematician who articulated the mathematical foundation and limits of computing.
Dongarra has led the world of high-performance computing through his contributions to efficient numerical algorithms for linear algebra operations, parallel computing programming mechanisms, and performance evaluation tools. For nearly forty years, Moore’s Law produced exponential growth in hardware performance. During that same time, while most software failed to keep pace with these hardware advances, high performance numerical software did—in large part due to Dongarra’s algorithms, optimization techniques, and production-quality software implementations.

These contributions laid a framework from which scientists and engineers made important discoveries and game-changing innovations in areas including big data analytics, healthcare, renewable energy, weather prediction, genomics, and economics, to name a few. Dongarra’s work also helped facilitate leapfrog advances in computer architecture and supported revolutions in computer graphics and deep learning.

Dongarra’s major contribution was in creating open-source software libraries and standards which employ linear algebra as an intermediate language that can be used by a wide variety of applications. These libraries have been written for single processors, parallel computers, multicore nodes, and multiple GPUs per node. Dongarra’s libraries also introduced many important innovations including autotuning, mixed precision arithmetic, and batch computations.

As a leading ambassador of high-performance computing, Dongarra led the field in persuading hardware vendors to optimize these methods, and software developers to target his open-source libraries in their work. Ultimately, these efforts resulted in linear algebra-based software libraries achieving nearly universal adoption for high performance scientific and engineering computation on machines ranging from laptops to the world’s fastest supercomputers. These libraries were essential in the growth of the field—allowing progressively more powerful computers to solve computationally challenging problems.

“Today’s fastest supercomputers draw headlines in the media and excite public interest by performing mind-boggling feats of a quadrillion calculations in a second,” explains ACM President Gabriele Kotsis. “But beyond the understandable interest in new records being broken, high performance computing has been a major instrument of scientific discovery. HPC innovations have also spilled over into many different areas of computing and moved our entire field forward. Jack Dongarra played a central part in directing the successful trajectory of this field. His trailblazing work stretches back to 1979, and he remains one of the foremost and actively engaged leaders in the HPC community. His career certainly exemplifies the Turing Award’s recognition of ‘major contributions of lasting importance.’"
“Jack Dongarra’s work has fundamentally changed and advanced scientific computing,” said Jeff Dean, Google Senior Fellow and SVP of Google Research and Google Health. “His deep and important work at the core of the world’s most heavily used numerical libraries underlie every area of scientific computing, helping advance everything from drug discovery to weather forecasting, aerospace engineering and dozens more fields, and his deep focus on characterizing the performance of a wide range of computers has led to major advances in computer architectures that are well suited for numeric computations.”

Dongarra will be formally presented with the ACM A.M. Turing Award at the annual ACM Awards Banquet, which will be held this year on Saturday, June 11 at the Palace Hotel in San Francisco.

SELECT TECHNICAL CONTRIBUTIONS

For over four decades, Dongarra has been the primary implementor or principal investigator for many libraries such as LINPACK (https://en.wikipedia.org/wiki/LINPACK), BLAS (http://www.netlib.org/blas/), LAPACK (https://en.wikipedia.org/wiki/LAPACK), ScaLAPACK (https://en.wikipedia.org/wiki/ScaLAPACK), PLASMA (http://www.netlib.org/utk/people/JackDongarra/PAPERS/toms-plasma-2019.pdf), MAGMA (https://www.icl.utk.edu/files/publications/2012/icl-utk-1212-2012.pdf), and SLATE (https://dl.acm.org/doi/10.1145/3295500.3356223). These libraries have been written for single processors, parallel computers, multicore nodes, and multiple GPUs per node. His software libraries are used, practically universally, for high performance scientific and engineering computation on machines ranging from laptops to the world’s fastest supercomputers.

These libraries embody many deep technical innovations such as:

**Autotuning:** through his 2016 Supercomputing Conference Test of Time award-winning ATLAS (http://www.netlib.org/utk/projects/atlas.0/) project, Dongarra pioneered methods for automatically finding algorithmic parameters that produce linear algebra kernels of near-optimal efficiency, often outperforming vendor-supplied codes.

**Mixed precision arithmetic:** In his 2006 Supercomputing Conference paper, “Exploiting the Performance of 32 bit Floating Point Arithmetic in Obtaining 64 bit Accuracy,” Dongarra pioneered harnessing multiple precisions of floating-point arithmetic to deliver accurate solutions more quickly. This work has become instrumental in machine learning applications, as showcased recently in the HPL-AI benchmark (https://www.olcf.ornl.gov/2021/06/28/benchmarking-mixed-precision-performance/), which achieved unprecedented levels of performance on the world’s top supercomputers.

**Batch computations:** Dongarra pioneered the paradigm of dividing computations of large dense matrices, which are commonly used in simulations, modeling, and data analysis, into many computations of smaller tasks over blocks that can be calculated independently and concurrently. Based on his 2016 paper, “Performance, design, and autotuning of batched GEMM for GPUs,” Dongarra led the development of the Batched BLAS Standard (https://dl.acm.org/doi/10.1145/3431921) for such computations, and they also appear in the software libraries MAGMA and SLATE.

Dongarra has collaborated internationally with many people on the efforts above, always in the role of the driving force for innovation by continually developing new techniques to maximize performance and portability while maintaining numerically reliable results using state of the art techniques. Other examples of his leadership include the Message Passing Interface (MPI) the de-facto standard for portable message-passing on parallel computing architectures, and the Performance API (PAPI), which provides an interface that allows collection and synthesis of performance from components of a heterogeneous...
system. The standards he helped create, such as MPI, the LINPACK Benchmark, and the Top500 list of supercomputers, underpin computational tasks ranging from weather prediction to climate change to analyzing data from large scale physics experiments.

**Biographical Background**

Jack J. Dongarra has been a University Distinguished Professor at the University of Tennessee and a Distinguished Research Staff Member at the Oak Ridge National Laboratory since 1989. He has also served as a Turing Fellow at the University of Manchester (UK) since 2007. Dongarra earned a B.S. in Mathematics from Chicago State University, an M.S. in Computer Science from the Illinois Institute of Technology, and a Ph.D. in Applied Mathematics from the University of New Mexico.

Dongarra's honors include the IEEE Computer Pioneer Award, the SIAM/ACM Prize in Computational Science and Engineering, and the ACM/IEEE Ken Kennedy Award. He is a Fellow of ACM, the Institute of Electrical and Electronics Engineers (IEEE), the Society of Industrial and Applied Mathematics (SIAM), the American Association for the Advancement of Science (AAAS), the International Supercomputing Conference (ISC), and the International Engineering and Technology Institute (IETI). He is a member of the National Academy of Engineering and a foreign member of the British Royal Society.

About the ACM A.M. Turing Award

The A.M. Turing Award ([https://amturing.acm.org/](https://amturing.acm.org/)) was named for Alan M. Turing, the British mathematician who articulated the mathematical foundation and limits of computing, and who was a key contributor to the Allied cryptanalysis of the Enigma cipher during World War II. Since its inception in 1966, the Turing Award has honored the computer scientists and engineers who created the systems and underlying theoretical foundations that have propelled the information technology industry.

About ACM

ACM, the Association for Computing Machinery ([https://www.acm.org/](https://www.acm.org/)), is the world's largest educational and scientific computing society, uniting educators, researchers and professionals to inspire dialogue, share resources and address the field's challenges. ACM strengthens the computing profession's collective voice through strong leadership, promotion of the highest standards, and recognition of technical excellence. ACM supports the professional growth of its members by providing opportunities for life-long learning, career development, and professional networking.

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**ISC Statement on Ukraine and Related Actions**
On February 28, the ISC issued a statement, reprinted at the bottom of this article. Since then, their efforts have continued, as follows.

The ISC continues to collect statements on the conflict in Ukraine, and resources to assist our community that are available at the following link: https://council.science/current/news/statements-international-scientific-community-conflict-ukraine/

(https://urldefense.com/v3/__https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Flink.council.science%2Fclick%2F1ncn9O9EFuu8CX.JHLjak56Fwpwy%2F2FbbZlPARn%2F2F3s%2Ffcouncil.s-international-scientific-community-conflict-ukraine%2F2F&data=04*7C01*7Cesteban*40ceremade.dauphine.fr%7C7C45f7b6dca26640b575da08da1956248f*7C81e7c4)

Please find below additional updates from the International Science Council and the ISC community.

1. ISC President, Peter Gluckman, article in Nature: "Together we must help refugees thrive"

For ISC Members and your networks

"Countries could coordinate to adapt current research institutes or set up new ones to incorporate refugee scientists", says ISC President, Peter Gluckman, in the latest edition of Nature. Read "Together we must help refugees thrive" (https://urldefense.com/v3/__https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Flink.council.science%2Fclick%2F1ncn9O9EFuu8CX.JHLjak56Fwpwy%2F2FbypmzyNm%2F2F3s%2Ffcouncil.s-content%2Fuploads%2F2020%2F06%2Fd41586-022-00863-4.pdf&data=04*7C01*7Cesteban*40ceremade.dauphine.fr%7C7C45f7b6dca26640b575da08da1956248f*7C81e7c4
ds)

2. Join the launch of the Science in Exile Declaration on 20 April

For ISC Members and your networks

On 20 April 2022, the Science in Exile initiative will launch a Declaration, ‘Supporting at-risk, displaced and refugee scientists: A call to action’, which outlines key commitments necessary at global level for both immediate and long-term support and protection to scholars and scientists.

During this online event, internationally renowned advocates for science and peace, displaced scientists and organizations supporting at-risk, displaced and refugee scholars will present the Science in Exile Declaration and discuss its six Articles of Commitment.

Register here and please share with your networks: https://council.science/events/science-in-exile-declaration-launch/

(https://urldefense.com/v3/__https://eur03.safelinks.protection.outlook.com/?url=https%3A%2F%2Flink.council.science%2Fclick%2F1ncn9O9EFuu8CX.JHLjak56Fwpwy%2F2FTyhkVgXP%2F2F3s%2Ffcouncil.s-in-exile-declaration-launch%2F2F&data=04*7C01*7Cesteban*40ceremade.dauphine.fr%7C7C45f7b6dca26640b575da08da1956248f*7C81e7c4)

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Paris, France

Monday 28 February 2022

The ISC expresses its deep dismay and concerns regarding the military offensives being carried out in Ukraine. This conflict has already generated a grave humanitarian crisis.

Science has proven to act as a platform for dialogue even in times of war, and therefore is a resource on which to capitalize to avoid further loss of life and disruption including that to scientific research and infrastructures. The ISC counts members in all countries involved in this conflict.

At a time when the demand and the potential for science to provide actionable knowledge to our global challenges on multiple fronts – climate change, the COVID-19 pandemic, and growing inequalities – are greater than ever, the current conflict in Ukraine and its
consequences will hamper the power of science to solve problems when we should be harnessing it.

The ISC also warns against the severe outcomes that conflict will have on the research and academic community. Our capacity to work collaboratively on global challenges, and on cutting edge research such as Arctic and space research, is only equal to our capacity to maintain strong collaboration amidst geopolitical turmoil. Ultimately the isolation and exclusion of important scientific communities is detrimental to all.

The ISC and its partners are committed to assisting the global scientific community in welcoming and protecting scientists who have been placed at-risk or become displaced by this conflict, by providing them opportunities to continue their work.

The ISC is committed to continue advancing the equal participation and collaboration between scientists in all countries in its activities and the principle of the free and responsible practice of science which is enshrined in its statutes.

Press Release

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

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