

Annual Report to Members

20
22



Institute of
mathematics
& its applications

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The Institute of Mathematics and its Applications

Meeting our objectives and activities for the public benefit

The Royal Charter sets the IMA's Object(ive)s as:

- to advance mathematics and its applications in all areas including commerce, engineering, finance, health, industry, scientific and other academic disciplines and the public sector and to promote and foster research and other enquiries directed to the advancement, teaching and application of mathematics for the public benefit;
- to seek to establish and maintain high standards of professional conduct for Corporate Members;
- to seek to promote, encourage and guide in the development of education and training in all matters relevant to the advancement of mathematics and its applications for members and all other persons who are engaged in or likely to be engaged in mathematics or its applications.

The activities for the Public Benefit are as set out as Mission and Goals in the Council approved Strategic Review (2018-2023). In particular the Mission is to benefit society through:

- Providing a suite of member focused services commensurate with its position as the principal professional and learned body for mathematics and its applications in the United Kingdom;
- Being a driving force for the use of mathematics in industry and commerce;
- Ensuring that the importance of mathematics is well represented to Government; a major contributor to the promotion of mathematics within the education systems of the United Kingdom, and helping further improve the quality of mathematics teaching, and the supply and support of mathematics teachers;
- Being a major contributor to the promotion of mathematics within the education systems of the United Kingdom, and helping further improve the quality of mathematics teaching, and the supply and support of mathematics teachers;
- Being an influencing voice for the use of mathematics in science, technology, engineering, economics and other fields of endeavour;
- Advancing its reputation as a major contributor to mathematics research initiatives;
- Engaging proactively at all levels with the full spectrum of the media and society for the promotion of mathematics in the UK;
- Adding value to the worldwide mathematics community by providing a range of services, conferences, publications and events that are fulfilling and beneficial for its membership and for mathematics;
- Promoting high standards of professional conduct for members;
- Regulating the Chartered Mathematician and Chartered Mathematics Teacher designations;
- Working with other mathematical organisations to develop a unified voice for mathematics in the UK;
- Collaborating with organisations in other countries to promote mathematics at an international level.

Foreword

This year has been characterised by the return to 'normal' after the lockdowns of the pandemic. We have learnt a lot, and many of our meetings remain either online or hybrid. Establishing a new normal and learning how to act more sustainably is one of the challenges of the coming years. In March I visited Parliament to speak at the award ceremony for the STEM for Britain 2022 prize. It was a delight to see so many early career mathematicians and physicists, and feel the buzz of a live event again. The only downside was that I returned home with Covid!

Some of the new practices following the pandemic have made it easier for people with caring responsibilities to engage with committees and to participate in meetings without spending huge amounts of time on a train or in a car. I am pleased that the IMA has set up an Equality, Diversity and Inclusion Working Group chaired by Dr Snezana Lawrence FIMA to ensure that good practice is embedded in everything that we do and everything we seek to influence.

There have been some important developments in our support of teachers and professional standards. The IMA led a successful bid to renew our involvement with the Mathematics Teacher Training Scholarships Programme. This was a far more complicated process than in previous bids and congratulations go to Vanessa Thorogood and Rosalind Azouzi for putting together such a good case. Thanks are also due to Rosalind, Professor Paul Glaister CBE CMath CSci FIMA and Professor James Davenport CMath FIMA for their engagement with other Learned Societies to establish professional standards in Data Science. As the world changes it is important that we remain at the forefront of new developments in the mathematical sciences. Congratulations to Paul Glaister on the award of a CBE in the 2023 New Years' Honours. It is extremely well-deserved and also a reminder of the calibre and dedication of our members (and I know this was strictly speaking in 2023, but I make no excuse for taking the opportunity to promote the excellence of the IMA and its membership).

The creation of an Academy for the Mathematical Sciences, a body able to influence and lead policy across the whole community, has entered a new phase. A 'proto-Academy' now exists and many of our members are involved in determining its remit and how it will operate. This could be a much needed new voice in the mathematical sciences ecosystem, but we need to make sure it enhances the opportunities that membership of the IMA provides.

I hope you enjoy reading our reformatted Annual Report. Let us know what you think. I hope it will inspire you to join in more of our activities. If there are things you wish we did more of, or less of, or which you think we do so well we should not meddle with them, there will be opportunities in the coming year to comment as part of the Strategic Review.

Thank you for your continued support of the IMA, and have a wonderful 2023.



President Paul Glendinning FRSE FIMA



Introduction

Welcome to our new look Annual Report for 2022, which aims to highlight the key achievements of the Institute over the last year thanks to the tireless efforts of our volunteers and staff in achieving the objectives of our Royal Charter.

2022 saw many changes at the IMA, which, like many organisations, was adapting to the transition to a new 'hybrid' delivery model as official Covid-19 restrictions finally eased. This gave an opportunity to reflect on what had worked well and could be taken into the new era of delivering services to the mathematics community to ensure best use of our resources and sustain the increased engagement and impact of recent programmes. Furthermore, the IMA could not be immune to the significant external factors affecting many charitable organisations such as the challenging economic climate, increasing energy prices and inflationary pressures.

With such headwinds likely to remain, and the IMA five-year Strategy Weekend taking place in 2023, over 2022 we planned early engagement with our boards, committees and wider membership to discuss new ideas and opportunities for development. The inputs so far demonstrate the wonderful support for the IMA from across our network, and that the knowledge and expertise that our members contribute to the organisation goes far beyond their mathematical specialisms.

Thanks to this wide level of support, and fantastic commitment from staff, the IMA is in a strong position to face challenges that come its way and build on the many successes of recent years. Our membership numbers remain healthy while the return of live events has benefitted our conference programme, reuniting mathematicians after lockdown periods and enabling the next generation of mathematicians to experience in-person networking and professional relationship building for the first time.

We enjoyed the opportunity to re-engage with schoolchildren and teachers at events such as the IMA Festival of Mathematics and The Big Bang Fair. We were delighted to bid successfully to lead the Mathematics Teacher Training Scholarships programme on behalf of DfE for another three years. We also helped to lead developments of a new professional standard for Data Science, as part of the Alliance for Data Science Professionals.

With our sincere thanks to our members and supporters, we hope you enjoy reading this report. Please do let us know if you would like to join any of our existing areas of work, or are keen to share your ideas for new and exciting opportunities in the Strategic Review. You can also find more detailed reports, articles and information about our range of activities past and present on the IMA website, as well as a wealth of dedicated careers information and advice and guidance at our MathsCareers website, which continues to attract high visitor numbers year on year.

Rosalind Azouzi
Executive Director

<http://ima.org.uk>

Education and Outreach

The IMA's education and outreach activities are led by the two committees which make up our Education Service Area, along with a dedicated member of staff. The IMA actively promotes the engagement of the Institute's members in mathematics education, including work to share communications online and through our flagship publication Mathematics Today.

For instance:

- notification of the publication of key reports;
- invitations to participate in events and/or contribute to external initiatives;
- opportunity to provide feedback on specific issues;
- invitations to contribute to Institute responses to consultations;
- publication of the Institute's submissions to consultation exercises.

During 2022, our contribution to mathematics education was led by Professor Michael Grove FIMA (Honorary Secretary with responsibility for Education), supported by Professor Nigel Steele CMath Hon FIMA (Deputy Honorary Secretary Education). Professor Andrew Osbaldestin FIMA, IMA Honorary Treasurer, chaired the Higher Education committee and Dr Gordon Laing CMathTeach CMath FIMA, chaired the Schools & FE committees.

The IMA also provides direct support to a number of programmes to support mathematics teaching and learning across the UK and for all levels of education. Furthermore, with the return of live STEM inspiration events in 2022, we took part in major events to showcase mathematics 'in action' to young people, teachers, parents and other key influencers, aiming to overturn stereotypes surrounding mathematics and signpost visitors to further resources such as MathsCareers.org.

Higher Education (HEdSA)

During 2022, HEdSA continued to monitor the quality of the IMA's degree accreditation programme. Other topics of concern for HEdSA were Polymaths, the HE Teaching and Learning Series, Induction Course for new Lecturers, and the postgraduates who teach Mathematics and Statistics workshops. The committee also oversaw the IMA's University Liaison work and the progress of the Levelling Up: Mathematics programmes.

Members of the committee also contributed to the revision of the QAA MSOR Benchmark Statement which "defines the academic standards that can be expected of a graduate in terms of what they might know, do and understand at the end of their studies, and describes the nature of the subject".¹

Degree Accreditation

The Institute's Course Accreditation scheme accredits university degree courses against the educational requirements for the Chartered Mathematician status, helping students make informed decisions about their career choices. Currently, 67 universities have degrees accredited by the Institute.

The up-to-date list of accredited degree courses is available on the Course Accreditation page of the IMA website.

¹ <https://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/subject-benchmark-statement-mathematics-statistics-and-operational-research.pdf>

Polymaths

Polymaths is a part-time open access course validated by the Institute offered by the University of Bolton. Six people were awarded the Polymaths certificate in 2022. Sadly, due to the dwindling size of the cohorts in recent years, the University of Bolton has decided not to continue offering the course. The IMA met with the Polymaths Course Leader at the University of Bolton to discuss lessons learned, their experiences and if there is an alternative future for Polymaths.

HE Teaching and Learning Series

The Higher Education Teaching and Learning Series, provides an opportunity for higher education mathematical sciences departments to request supporting funds for facilitating a teaching and learning related workshop.

During 2022, three workshops from the 2019/20 HE Teaching and Learning Workshop Series took place:

- Cardiff University & University of Bristol - Reflection? Action? Research: Enhancing Mathematical Research and Scholarship
- University of Glasgow - Assessment strategies for mathematical sciences in the digital era
- University of Plymouth - Involving employers in the development of the mathematical sciences curriculum

In 2022, a fourth call for the Higher Education Teaching and Learning Series was released, in partnership with the RSS and LMS.

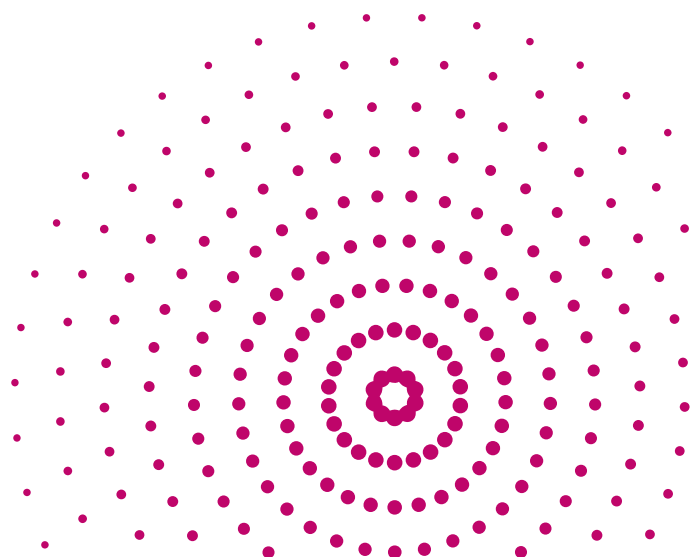
Induction Course for New Lecturers

The Induction Course for New Lecturers took place on 14-15 September 2022 at the Isaac Newton Institute for Mathematical Sciences, Cambridge.

Through a community initiative supported by the IMA, INI and HoDoMS, and endorsed by the RSS and the LMS, The Induction Course for New Lecturers in the Mathematical Sciences has been designed by the mathematics community so that it is ideally suited for anyone who is new to or has limited experience teaching mathematics or statistics within UK higher education.

Postgraduates who Teach Mathematics & Statistics

In partnership with the Isaac Newton Institute for Mathematical Sciences, the Postgraduates who Teach Mathematics & Statistics workshop took place on 4 October 2022. This workshop covers issues such as planning and preparing for teaching, facilitating problem solving classes, encouraging participation and providing support, and assessing student work and providing feedback.



University Liaison

The IMA works closely with universities to increase membership, awareness of and participation with the IMA amongst undergraduate and postgraduate students, and the university community. This is achieved through newsletters to our community of over 6,000 'eStudents', grants to postgraduate and undergraduate student mathematical societies, careers talks for mathematics undergraduates and by supporting careers events and student conferences.

In 2022, the University Liaison Officer (ULO) delivered 27 careers talks, two of which were delivered remotely (due to travel disruption), and supported a careers panel, six conferences, three employer events and the InFoMM camp. Nine issues of the eStudent newsletter were published.

The Tomorrow's Mathematicians Today (TMT) conference was hosted online in March by the University of Greenwich, with over 120 delegates registered across the two days, and 26 student presentations.

During the year we provided £6,000 and €470 in grants to Mathematical student societies in the UK and Ireland. We made Undergraduate awards to societies of the Universities of Aberdeen, Exeter, Glasgow, Lancaster, Middlesex, Newcastle, Southampton, University College London, and Warwick. Awards were also made to the IMA-SIAM Joint Student Chapters of the universities of Cardiff, Dublin, Edinburgh/Heriot-Watt, Nottingham and Sheffield.

We supported Society activities and conferences, competitions, talks and participated in IMA conferences. We provided a grant of £400 for prizes for the Industrially Focused Mathematical Modelling (InFoMM) Graduate Camp and £500 for prizes for the TMT. We supported the SIAM UKIE Student Annual Conference with a grant of £1,000 with an additional £525 for travel awards to support students to attend the conference.

Levelling Up: Mathematics

The IMA continued its role as a partner in the new Levelling Up: Mathematics project working closely with the London Mathematical Society and the project founder. It provides A Level Maths students who have little or no access to additional learning support such as private tuition, with access to tutors recruited from local university maths undergraduates cohorts and dedicated materials to complement the curriculum, developed by LMS. A key aim is to encourage participating students to consider Maths and other STEM degree pathways and foster community partnerships between the institutes, universities and schools.

Additional new university partners for 2022 were Manchester Metropolitan University and the University of Birmingham with more universities expected to join the IMA hub in Spring 2023. We were also delighted to support the launch of the Levelling Up: Maths Black Heritage associated project, backed by Past President Professor Nira Chamberlain OBE CMath CSci FIMA, to provide a programme specifically designed by and for students and tutors of black heritage. Other developments include regional hubs to run the programme in Scotland and Wales.

Schools & Further Education (S&FE)

The LMS's TeMaC initiative was developed to support university mathematics departments in encouraging their students (both undergraduate and postgraduate) to consider a career teaching mathematics. The first in-person meeting for the department contacts was held in June 2022. Dr Gordon Laing CMathTeach CMath FIMA gave a talk on the importance and value of qualified mathematics graduates going on to teaching mathematics in schools.

During 2022, the S&FE Committee discussed the following reports:

- GCSE and A level Mathematics examinations Summer 2022
- A level Mathematics (England) grades 2019-2022
- Attainment figures for 2021/22 of pupils in the 2022 phonics screening check and Key Stage 1 national curriculum teacher assessments, as well as the provisional attainment statistics for Key Stage 2 national curriculum assessments and extends the Key Stage 2: National headlines statistics
- Reformed Functional Skills Mathematics: evaluation of difficulty

Mathematics Teacher Training Scholarships

The IMA, working with LMS, MA, MEI, STEM Learning and RSS, continued our role as lead delivery partner of the Mathematics Teacher Training Scholarships (MTTS) scheme on behalf of the Department for Education (DfE). The Scholarships scheme aims to improve the quality and widen the pool of applicants for secondary teacher training by attracting highly qualified graduates and career-changers who might not normally consider teaching as a career. Successful applicants receive a range of careers support tailored to their needs, including Continuing Professional Development sessions (CPD) and networking opportunities. Previous scholars, 'the Alumni', can also attend some sessions as part of their ongoing professional development.

The 2021/22 (year 10) scheme was announced in October 2021 and opened for applications in January 2022, with a target of awarding 270 Scholarships to those who commence secondary mathematics teacher training in the 2022/23 academic year. We had a good year, receiving 405 applications and awarding 182 Scholarships. Although the number of applications and awards was lower than previous years, this was reflective of overall application numbers to mathematics initial teacher training in the 2021/22 academic year.

The CPD offered to the 2021/22 Maths Scholars included a mixture of online and in-person events, as well as workshops and networking opportunities, including:

- Welcome Webinar, including the NRICH webinar with Dr Ems Lord FIMA
- Using Art to Teach Maths (webinar) - Clarissa Grandi
- Introduction to using Desmos for Teaching Mathematics (webinar) - Tom Button (MEI)
- 'Common Rooms' – five online networking sessions
- Mathemagic! webinar - Michael Anderson and Steve Lyon (STEM Learning)
- Modular Arithmetic webinar * - Dr Vicky Neale (University of Oxford)
- Maths Scholars CPD Workshop 2022 *:
 - Driving is a Risky Business! - Dr Laura Bonnett (University of Liverpool)
 - An example of a Teaching for Mastery lesson for KS3; Starter, Diagnostic, Anchor Task and Guided Practice - Simon Mazumder (NW1 Maths Hub Lead)
 - The Mathematics of an AI Basketball Player - Professor Nira Chamberlain OBE PhD HonDSc CMath CSci FIMA FORS (IMA)

Members of the Maths Scholarships Alumni were also invited to those events listed above marked with a*.

To facilitate online networking, the 'Common Room' was established to provide an informal space where Scholars and Alumni can mingle and share resources in a relaxed but purposeful way.

During 2022, the DfE released an invitation to bid for the next suite of Scholarships programmes with the IMA successful in our application to continue to run the Maths Scholarships for another three years.



Maths Scholars CPD Workshop 2022 - Winning Team

Maths Enrichment

Over 2022, the return of live outreach events saw the IMA outreach teams, consisting of staff, student members and other volunteers, back on the road to provide inspirational maths activities and impartial information, advice and guidance on routes into mathematics to visitors, including young people, teachers and parents.

The Big Bang Fair 2022

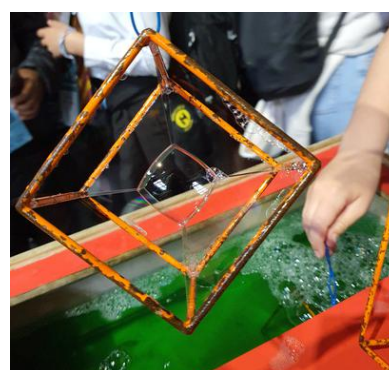
The Big Bang Fair returned for 2022 and took place from 22-24 June at The NEC Birmingham.

With a space 30m^2 named 'Maths in Action', the IMA team ran the following interactive challenges:

- Can you beat the Cube?
- Galton Board
- Soap Bubbles
- Aerofoil
- Bernoulli Blower

We estimate around
1,500
visitors took part in the
Can you Beat the Cube?
Challenge alone!

*Images from the Big Bang
Fair 2022 (IMA)*



IMA Festival of Mathematics and its Applications 2022

Taking place every two years, it was fantastic to see the return of the IMA Festival of Mathematics and its Applications which was hosted this year by Sheffield Hallam University on 4-5 July 2022.

The Festival had a jam-packed programme with over 100 sessions and activities offered and covering applications of mathematics in a huge range of areas, including: art, computing, extreme materials, infectious disease modelling and rocket science.

As part of the workshops, students and teachers met with current students of Sheffield Hallam, as well as alumni, lecturers, maths communicators, and expert researchers in applications of mathematics.

There was also a public lecture given by Dr James Grime titled 'Bits and Pieces: Secrets of a Digital World'. The lecture covered topics such as: 'How does a film studio know if you are sharing movies illegally?' 'How are messages transmitted from space without mistakes?', and 'How can a scratched CD keep playing?'.

New Scientist LIVE 2022

On 7-9 October 2022 the IMA teamed up with the OR Society to exhibit a Mathematics stand at New Scientist Live, the 'world's greatest festival of ideas and discoveries' at London's ExCel. The show featured four stages: Mind and Body, The Universe, Our Planet and The Future and Friday 7 October was a day dedicated just for schools and home educators. Mathematics Speakers across the weekend included: Agnijo Banerjee, Mathematician; Rob Eastaway, Zeeman Medal Winner 2016, and Junaid Mubeen, Mathematician and Author.

Staff and volunteers engaged with thousands of attendees across the three days, discussing the IMA and its work, all things mathematics education and career pathways. We hosted the foam cube challenge, which proved as popular as ever. The fastest time for completion was an amazing 30 seconds.



Highlights of the IMA/OR Society visit to New Scientist Live 2022

Knowledge and Learned Society

The IMA's learned activities include the work of our Research Committee, which leads the IMA's efforts to support and recognise mathematics research, and our prestigious, peer-reviewed suite of scholarly publications which are overseen by the Journals Management Board (JMB). This work is underpinned by our flagship publication, *Mathematics Today*, which provides our members with the latest news from the IMA and its members, as well as in-depth articles on applied mathematics topics, led by Editor Rob Ashmore CMath CSci FIMA. The IMA also provides a number of learned conferences, workshops and talks, steered by the Conference Committee and individual organising committees, providing fora for knowledge sharing, discussion and debate.

Research Committee

Dr Martine Barons CMath FIMA, Vice President, Learned Society continued in her role as Chair of this Committee in 2022. The full membership of the Research Committee can be viewed on the IMA website: <https://ima.org.uk/roles/research-committee/>

The Research Committee meets three times per year, and is responsible for (among other things) the IMA Hedy Lamarr Prize for Knowledge Exchange.

The Research Committee contribute to the IMA's discussions with the research funding councils and policy makers, and work to promote the benefits of fundamental and applied mathematical research to the economy and to society. They also oversee assessments of Small Grant applications. Throughout the year, the Research Committee worked on behalf of the mathematical community; some of the highlights follow:

LMS / IMA Joint Scientific Meeting 2022

Following the successful 2021 LMS / IMA joint meeting on the theme of Maths in Human Society (the fifth in this series of events), Dr Barons and Professor Brita Nucinkis (Chair, LMS Society Lectures and Meetings Committee) arranged the 2022 event, Women in Astronomy, influenced by the recent receipt by the LMS of a copy of Maria Cunitz's *Urania Propitia* (first published in 1650) as a bequest.

The event took place in London on 16 September 2022

IMA support to the ICIAM Board Meeting 2022

The IMA was a founder member of ICIAM (International Council for Industrial and Applied Mathematics) in 1987 together with GAMM, SIAM, and SMAI. This consortium of mathematical societies now has 54 members from all regions of the world. ICIAM hosts a large congress every four years. The first was held in Paris in 1987 and the IMA hosted one in Edinburgh in 1999. The 2020 Board meeting was cancelled due to the pandemic and rescheduled to 2022. The event was held at Strathclyde University Technology & Innovation Centre (TIC) in Glasgow and the IMA provided a contribution to costs. The one-day meeting was preceded by a two-day conference on applied mathematics.

'Two Mathematicians on the Politics of Climate Change'

In 2022, Dr Barons and Chris Budd OBE CMath FIMA collaborated on an article reflecting on the 'Politics of Climate Change'. The article provides an overview on their contribution and experiences at COP-26 and COP-27, and whether these events are achieving their objectives. The full article was published in the February 2023 edition of *Mathematics Today*.

Journals

The Institute's eight academic journals are published by Oxford University Press (OUP). Three of these are traditional hybrid print journals:

IMA Journal of Applied Mathematics

Editors: Professor Alan Champneys CMath FIMA, (Bristol), and Professor Demetrios Papageorgiou FIMA, (Imperial);

IMA Journal of Numerical Analysis

Editors: Professor Arieh Iserles FIMA, (Cambridge), Professor Endre Süli FRS FIMA, (Oxford) and Professor Charles Elliot FIMA (Warwick);

Teaching Mathematics and its Applications: an International Journal of the IMA

Editors: Professor Duncan Lawson MBE CMath FIMA, (Coventry); Professor Christopher Sangwin FIMA, (Edinburgh) and Dr Cathy Smith AMIMA (OU).

Four are online only hybrid journals:

IMA Journal of Mathematical Control and Information

Editors: Professor Christophe Prieur FIMA (Grenoble), Professor Sarah Spurgeon OBE FR, (UCL) and Professor Joachim Rudolph FIMA (Saarland University);

Mathematical Medicine and Biology: A Journal of the IMA

Editors: Professor Oliver Jensen CMath FIMA, (Manchester); Professor John King CMath FIMA, (Nottingham), Professor James Keener CMath FIMA, (Utah) and Professor Bob Guy (University of California Davis);

Information and Inference: A Journal of the IMA

Editors: Professor Robert Calderbank, (Duke); Professor David Donoho MIMA, (Stanford); Professor John Shawe-Taylor CMath FIMA, (UCL) and Professor Jared Tanner MIMA, (Oxford);

IMA Journal of Management Mathematics

Editor: Aris Syntetos, (Cardiff).

One is an open access only online journal:

Transactions of Mathematics and its Applications

Editor in Chief: Professor Arieh Iserles FIMA (Cambridge) and Professor Dominic Vella FIMA (Oxford);

The IMA journals have had a successful year. Six journals currently have Impact Factors (IF). The IMA journal of Information and Inference was allocated its first Impact Factor, achieving an impressive 3.241. Other IMA journals also saw increases to their Impact Factors, including The IMA Journal of Management Mathematics (2.095) and the IMA Journal of Applied Mathematics (1.146).

Management Mathematics has held several successful webinars to promote their special issues which has increased engagement with the journal. Online use of all of the IMA journals has increased over the last year.

The growth of Open Access publishing has inevitably impacted on the IMA journals. Open Access publishing is where an article is made immediately available to the public upon publication, as opposed to the traditional subscription model. The impact on journal revenue as a result of this change has been ameliorated by Oxford University Press negotiating 'Read and Publish' deals with libraries. These allow authors to utilise funding to publish their articles via Open Access. The most significant UK deal is with JISC, this covers a large number of UK institutions. Various similar deals have been made with other groups worldwide. Our thanks to the Journals Board of Management Chair, Professor Iain Duff CMath CSci FIMA, our Journal Editors and Associate Editors for steering the journals over this transitional period.

Conferences and Events

We have found that offering a range of in-person and online conferences has increased registration and encouraged more diverse attendance.

During 2022 the conferences department carried out a survey to gather data on people's current topics of interest and contacts for future events and the team have been following up on these which will reinforce future event themes.

IMA Conferences attracted over 800 registrations in 2022.

The programme for 2022 was as follows, demonstrating the breadth of our activity, from education and early careers support to showcasing the latest applied mathematics research in fields such as Big Data, Finance and Climate Change and Music.

- Python for A-Level Mathematics and Beyond – Online 21 & 22 January 2022
- IMA Diversity Event- Sponsored by the Early Career Mathematicians – Online 6 April 2022
- ECM Networking Icebreaker at the BAMC - 10 April 2022
- 3rd IMA Conference on Inverse Problems from Theory to Application 3-5 May 2022
- ECM Spring Conference – Online 21 May 2022
- 3rd IMA Conference on Mathematics of Finance (and Climate Change Risk) 8-10 June 2022
- Signal Processing Promo Event - Online 14 June 2022
- IMA 16+ 'What is it like to study Mathematics at University?' – Online 15 June 2022
- Python for Scientific computing and TensorFlow for Artificial Intelligence - Online 20-24 June 2022
- 7th IMA Conference on Numerical Linear Algebra and Optimization 29 June – 1 July 2022
- IMA Maths in Music Conference 13 -15 July 2022
- Python for A-Level Mathematics and Beyond – Summer – Online 9 & 10 September 2022
- 4th New Lecturers' Induction Course – (at the INI) 14 & 15 September 2022
- Women in Astronomy - Joint conference with LMS – in-person & Online 16 October 2022
- 4th IMA Conference on The Mathematical Challenges of Big Data 19 & 20 September 2022
- Black Heroes of Mathematics Conference – Online (with BSHM, ICMS, LMS, INI, ICTP[1] East African Institute for Fundamental Research, African Institute for Mathematical Sciences and the Mathematical Association) 4 & 5 October 2022

We would like to thank every mathematical organising committee for making these events possible and we look forward to delivering a strong 2023 event programme.



Participants at the IMA Maths in Music Conference 13 -15 July 2022

Mathematics Today

The IMA continued to publish six issues of Mathematics Today in 2022, providing refreshing insights into applied mathematics topics, reflections on mathematical achievements past and present along with updates on activities, and news on events and projects led by the IMA and our partners.

In 2022, online access to Mathematics Today was introduced, providing IMA members with greater and more flexible access to the magazine via their myIMA platform and introducing a more sustainable way to access it, with over 200 readers opting for an online-only version to date.

We celebrated the contribution of mathematics to the Covid-19 pandemic in the October special issue guest edited by Dr Ellen Brooks-Pollock OBE FIMA, Edward Hill and Dr Eduard Campillo-Funollet MIMA.

The Graham Hoare Prize 2022 was awarded to Victoria Sánchez Muñoz, IMA Student member for her article 'The Estimation of Wind Speed: Challenging the Insurance Company's Decision' which was published in the December 2022 issue.

The Catherine Richards Prize continues to select the best article published each year; Emma L. Fairbanks accepted the 2022 CR Prize for her article 'Modelling Covid-19 Transmission at Universities' published in the October 2022 issue of Mathematics Today.



Grants

The IMA operates two grant funds directly, the Small Grants Scheme and the Education Grants scheme. We also provide occasional support through our special Grants without Portfolio scheme for applications which do not meet the eligibility criteria for the above but demonstrate clear objectives which are aligned to those of the IMA.

We also provide administration on behalf of the QJMAM fund for Applied Mathematics, which exists to support UK research in the broad area of applied mathematics and theoretical mechanics. The fund is administered by the Institute of Mathematics and its Applications, but decisions on the award of grants are made by a panel appointed by the Trustees, chaired by Professor Andrew Norris. Details of these awards can be found on our website.

Small Grants

The IMA's Small Grants Scheme is designed to be flexible, so that it can be used to facilitate any research activity within the scope of mathematics and its applications. Grants are available up to a value of £600 for individuals and up to £1,200 when enabling an event to take place. Applications are limited to IMA members only.

The budget for 2022 was £12,000. In-person events have resumed, leading to an increase in applications. The Scheme received 27 applications during 2022, requesting a total amount of £18,835.20. 15 requests were awarded in full, five were partial awards and seven were declined. Awards for 2022 are shown on the IMA site and include support from helping early career researchers participate in international conferences and workshops to academic research visits and mathematical modelling research.

Education Grants

Individuals in schools, FE and HEIs in the UK can apply for a grant, normally up to a maximum of £600, to help with the costs of running or attending an educational activity relating to mathematics.

The Education Grants Judging Panel, consisting of the Institute's Honorary Secretary - Education and the Chairs of the education committees, decides on each application.

During 2022, the Education Grants scheme received 13 applications and awarded one grant of £600 in contribution towards an interactive public show suggesting how humans' mathematical intelligence is superior to computers - using games, quizzes and card tricks, audiences will explore several principles of mathematical thinking that give humans an edge over computers, such as our ability to estimate, reason, tinker with rules and collaborate.

Other IMA Grants

Two grants were made by the Executive Board from the IMA's Grants without Portfolio (GwP) fund. The first was to Dr Eduard Campillo-Funollet MIMA in contribution to the 2022 European Study Group with Industry (ESGI) working dinner, an annual event at which postgraduate students and industrial scientists work alongside each other on problems of direct industrial relevance. See our case study on the following page from IMA member, Veronica Bitonti, who received the second GwP 2022 grant to attend the August 2022 European Women in Maths General Meeting in Finland.

More details about the IMA's support to university student societies can be found in our University Liaison section.

Case Study: European Women in Mathematics General Meeting 2022

Veronica Bitonti shared her experience of attending the EWM General Meeting 2022 with support from the IMA grants scheme.

European Women in Mathematics (EWM) is an international association for people in the mathematical community who are particularly interested in investigating the reasons why women are underrepresented in mathematics. The core values of the association are to encourage more women to study mathematics by supporting their career, provide networking opportunities through the promotion of highly scientific talks and events and a mentoring programme.

At secondary school, I organised an exhibition to highlight women's achievement called "Women in Mathematics throughout Europe: a gallery of portraits". Studying mathematics at a university level has made me realise more than ever that in order to achieve great results in mathematics it is essential to cooperate with other mathematicians and work with like-minded people who share the same interests and goals. And while the number of female students who decide to read mathematics at higher level is increasing, being part of a community that supports women in mathematics and aims to support gender equality remains essential.

With the support of an IMA grant, I attended the 2022 EWM General Meeting at Aalto University in Finland, composed of lectures and Mini Symposia presented by incredibly talented mathematicians on many branches of mathematics, from algebraic geometry to applications of mathematics in industry. These helped me better understand my personal mathematical interests and the types of research available in particular areas of mathematics. Moreover, the conference confirmed that mathematics continues to offer the chance to uncover many new discoveries.

I also presented my exhibition during the event and met some of the women featured, as well as hearing about similar exhibitions, such as in Australia. Taking part was a true honour. I look forward to future EWM activities to support women in mathematics.

Veronica Bitonti, UCL, member of the IMA Diversity & Inclusion Working Group. Read her full EWM report at www.ima.org.uk



Participants at the EWM General Meeting 2022

Communications and Community Engagement

The IMA seeks to work closely with the community it represents, drawing on expertise from across our networks, as well as through external partnerships and relationships. Dr Peter Rowlett CMath FIMA, VP – Communications, chairs the Institute’s Communications Committee, made up of maths communication experts, and advises IMA staff throughout the year on communications-related matters. The MathsCareers Steering Group, chaired by Dr Alan Stevens CMath FIMA until mid-2022, provides advice on content, topics and competitions for our dedicated careers website which runs separately to the IMA’s corporate site.

The IMA also benefits from six Branches located across the UK, delivering regional engagement opportunities for the local community and beyond following the introduction of hybrid events. Our Early Career Mathematicians committee leads on activities targeted to the needs of the next generation of mathematical talent, contributing to our event programme with themes relating to career progression and personal development. The Institute’s Academic Liaison group advise the IMA on university engagement and student support.

MathsCareers Website

[MathsCareers.org.uk](https://mathscareers.org.uk) is a dedicated website which provides impartial information, advice and guidance on mathematics pathways as well as inspirational case studies from role models from a wide range of professions, and competitions for schools, working with experts from maths education and communication, industry and academia.



During 2022 MathsCareers received **384,739** visits and continued to be one of the top websites of its kind within the STEM community, popular among undergraduates seeking career advice as well as school audiences. Content posted in 2022 included an increased range of articles on GCSE maths topics, as well articles on mathematical modelling, career opportunities for maths graduates, and the growth of data science.

MathsCareers ran two contests during 2022. The spring contest had the theme of ‘Maths in Sport’ and the Autumn contest asked entrants to design a new maths themed logo for the MathsCareers Twitter Account. Competitions are aimed at ages 11-18 with three age groups based on school year (Years 7-8, 9-11, 12-13). MathsCareers poster contests frequently attract between 200 – 300 entries.



Our career profiles continue to highlight diversity among those working in mathematics-based professions, as well as demonstrating the wide variety of roles available to maths graduates. The website also showcases how maths and numeracy is vital in other professions, from law to hairdressing, engineering and science to the environment and health.

Social Media is used to raise the profile of IMA MathsCareers, and it now has 7,774 followers on Twitter. The profile of the site, as well as mathematics generally, is raised via the distribution of eye-catching classroom posters to schools.

IMA e16plus Newsletter

The e16plus Newsletter published six full editions in 2022. It is designed to inspire and raise interest in mathematics amongst 16-19 year-olds and has 1577 subscribers. The regular puzzle feature continues to be popular with readers, and the links in the newsletter are designed to encourage engagement with MathsCareers and the IMA website.

Virtual Maths Teas

Our Virtual Maths Tea series is a collection of online events where members can come together for an informal discussion, much like a coffee morning. Each individual event has its own topic of focus and hosts are hand-picked for their expertise and experience in each topic area. The Virtual Maths Teas (VMTs) began during lockdown in 2020, to keep our members connected when in-person networking and events weren't possible. Due to their popularity, the positive feedback and high demand, we decided to continue them long after lockdown. Many attendees have said the VMTs have provided them with the first opportunity they've had to engage in an IMA event, or mathematical event due to their individual access challenges. Each event is an hour long, attendees can log in from anywhere in the world (and we often do have international attendees). The VMTs are inclusive events, open to all IMA members of all grades, genders, backgrounds, and interests and popular themes include career development, ethics and diversity and inclusion.

In 2022 we hosted seven Virtual Maths Teas with 264 registrations in total:

- January – Ethics in Mathematics: AI & Algorithms
- February – Imposter Syndrome
- March – Women in Maths
- May – Employer input into the curriculum
- June – Programming and Mathematics
- August - Progressing from your PhD into your early career
- November – Shaping the Future of the IMA – inviting attendees to contribute ideas for the Strategic Review

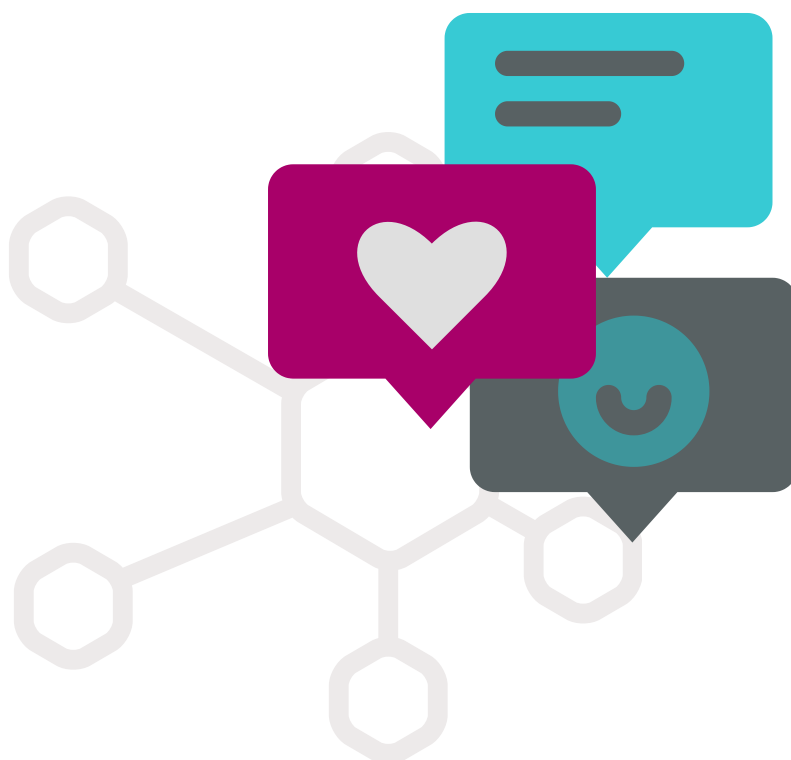
IMA Website and Social Media

The good work the IMA does is mirrored on our social media channels, website and our member exclusive eBulletin. We have a collective of 47,000 followers across our four main social channels Twitter, Facebook, LinkedIn and Instagram, consisting of those interested in the services and work of the IMA and those interested in Mathematics in the wider sense.

We celebrate the successes of our members and the community, and raise the profile of Mathematics across a multitude of celebratory and awareness days promoting inclusivity. We continue to see particularly high engagement and popularity with our campaigns during LGBTQ+ History Month, Women's History Month and Black History Month where we share people's stories, resources and celebrate the successes and triumphs of those who have overcome challenges and biases. We engage in many mathematical days such as Fibonacci Day, International Day of Mathematics, Maths Weeks to name a few as well as other STEM related days and National Numeracy day. The latter is helping raise low levels of numeracy among both adults and children in the UK and promoting the importance of everyday maths skills to the wider public, challenging negative attitudes towards mathematics.

Demographic information provided by Google Analytics of the visitors to the IMA website has been informative: in 2022 more than half of the visitors to the IMA site have been under 34 years of age (54.74%); and the gender distribution of total visitors is around 57/43 split of male to female (in comparison to the current total IMA member split of 74/24/2 male/female/all others*).

Sessions in 2022 to the IMA website are down slightly (-5.6%) versus 2021 but remain significantly up versus 2020 (+34.1%).



*IMA membership data at time of writing: currently 74% male, 24% female, 2% all others which includes those who opt for 'Other', 'prefer not to say' or not set.

Branches

IMA Branch committees are led by local IMA members and volunteers across the UK, offering free talks on mathematics topics to members and non-members.

The Branches are:

- East Midlands
- London
- North West
- Scottish
- West Midlands
- South West and Wales

During 2022, the Branches delivered 13 free talks covering an array of current and interesting topics.



Early Career Mathematicians' Group

The Early Career Mathematicians' (ECM) Group aims to provide those starting out in the profession with opportunities to develop their skills and network with peers and is made up of early career professionals from industry, academia and government. In 2022 the committee was chaired by Nicholas Brusby CMath FIMA.

In 2022 the group organised five events across a varied selection formats such as the IMA Virtual Math Tea, online conferences, and seminars. These events included a dedicated diversity and inclusion event, industry and teaching events, as well as the annual ECM Spring conference. All events were well attended by the ECM membership, with plenty of positive feedback being received about the increased number of small events and the variation in topics. The events were all organised with assistance from the Secretariat.

ECM Group continues to help recruit student members and is also active on social networking sites.

Academic Representatives

The Academic Representatives scheme was established by the Institute in 2017, and we currently have 60 Representatives at 57 universities. Representatives are members of academic staff who support the Institute by highlighting the work of the IMA in the community and beyond, to their students and colleagues, as well as providing feedback on the priorities of academic members.

Professional Affairs and Industry

Mathematicians play a vital role across business, industry and government. Chaired over 2022 by the VP Professional Affairs, Dr Richard Pinch CMath CSci FIMA, the IMA's Professional Affairs Committee (PAC) brings together representatives from IMA Corporate Affiliates and those with expertise in applied mathematics in a variety of industrial and commercial settings. The committee is also responsible for the IMA's Chartered Mathematician (CMath) designation and the IMA professional Codes of Conduct. PAC also oversees the IMA's requirements to the Science Council as a licensed body to assess Chartered Scientist (CSci) applications, including meeting external quality assurance requirements and CPD compliance. More recently, PAC has supported the IMA's contribution to the new Data Science Professional recognition framework.

Details of our Corporate Affiliate members can be found at:

<https://ima.org.uk/affiliates/corporate-affiliates/>

We are very grateful for the involvement of these organisations with mathematics and with the Institute.

Professional Affairs Committee

The Committee met twice during 2022 via remote conference facilities and communicated throughout the year via Basecamp. The key agenda items throughout the year were the progress being made to set up an Academy for the Mathematical Sciences and ensuring industry representation within its remit; the continuing work of the Alliance for Data Science Professionals (AfDSP) and knowledge exchange developments, such as the launch of Connected Centres.

Data Science Professional

The IMA is a member of the Alliance and PAC members provided invaluable feedback to the AfDSP on the Data Science Professional competency framework in the first half of 2022. We also helped support the launch of the Advanced Data Science Professional Standard at a special event on 12 July in London and were delighted to see Dr Sophie Carr CMath CSci FIMA, an IMA Council member, receive certification via the RSS. The IMA's application process was launched online on the same date and a number of applications have been received and our first assessors appointed. IMA is currently offering certification to qualifying existing Advanced Members; and next steps are to promote the standard across our networks. Accreditation of data science related degrees will be the next focus for the AfDSP steering group and the Honorary Secretary – Membership, Professor Paul Glaister CBE CMath CSci FIMA will represent the IMA on this.

Employers Forum

Planning for the return of the IMA's Employers Forum in May 2023 began in earnest during the latter half of 2022, including confirmation of the host venue, the University of Warwick, and forum theme which will focus on providing case studies, live discussions and knowledge exchange interactions between industry and academia as well as bite-sized presentations and networking opportunities.

The IMA also visits employer sites to promote IMA membership, Chartered routes and professional development opportunities to staff and recent graduates and was delighted to participate in the AWE Graduate event in November 2022, our first employer visit since the pandemic.

External relations

Alliance for Data Science Professionals

The IMA joined the AfDSP in 2020 to support the development of professional frameworks for those working in data standards fields.

Other Alliance members are the RSS, ORS and BCS, National Physical Laboratory (NPL) and the Alan Turing Institute.



Dr Rachel Hilliam speaking at the Launch of the Alliance for Data Science Professionals, July 2022

The Alliance is committed to:

- Defining the standards of professional competence and behaviour expected of people who work with data which impacts lives and livelihoods. These currently include data scientists, data engineers, data analysts and data stewards.
- Delivering these standards as data science certifications offered by the Alliance members to their professional members, with processes to hold certified members accountable for their professional status in this area.
- Using these standards as criteria for Alliance members to accredit data science degrees, and data science modules of associated degrees, as contributing to certification.

Council for the Mathematical Sciences (CMS) and the proto-Academy for Mathematical Sciences

CMS is composed of IMA, LMS, RSS, EdMS, and ORS. The current Chair is Professor Alison Etheridge OBE, FRS, FIMA.

CMS continues to receive briefings from Royal Society ACME, which is funded by the IMA and others. A special meeting with EPSRC was also held in December 2022 to discuss mathematics research funding and UKRI strategy.

CMS continued to promote the needs of mathematics to Government Departments. CMS members again agreed to jointly fund the Mathematics Competition at STEM for Britain 2022 and attended the finals event in Westminster in March. CMS also supported research into the negative impact of reduced student numbers on low-tariff entry degrees and possibility development of 'maths deserts' in key parts of the UK.

CMS engaged actively with the proposed Academy for the Mathematical Sciences: this included inviting members of CMS society bodies to an online Town Hall meeting which took place in January 2022. The decision to roll out a proto-academy was taken in Spring 2022 and appointment of an Executive Director, and Executive Committee Chair were swiftly undertaken. The CMS invited member bodies to represent their fields of mathematics among the proto-academy workstreams, with many IMA members and fellows now leading key areas of work. CMS invited the proto-academy Chair to update the board and discuss the next steps for the academy and its relationship with CMS at its November meeting.

London Mathematical Society (LMS)

Throughout 2022 we continued to work with the LMS in many areas including research, Mathematics Initial Teacher Training Scholarships and mathematics education.

Together we award the David Crighton Medal for Services to Mathematics and the Mathematics Community, and the Christopher Zeeman Medal for Mathematics Promotion. We were delighted to hold a joint event at the Royal Society in March to present the 2019 and 2021 Crighton Medals to award winners, Professor Ken Brown and Professor Caroline Series FIMA respectively, following delays resulting from the pandemic.

As documented in the Research Committee section of this report, a well-attended, fifth scientific meeting of the current IMA-LMS series, titled 'Women in Astronomy' took place online and in person on 16 September.

Other UK Mathematics Organisations

We continue to work with the Association of Teachers of Mathematics, the Mathematical Association and NANAMIC in the management of the Chartered Mathematics Teacher Registration Authority.

We also work with many external organisations, Royal Society ACME, NCETM, and the Joint Mathematical Council to promote and support mathematics whenever possible.

UK STEM and Global

The IMA is a member of CaSE and contributed to a roundtable in December 2022 on the role of reskilling, upskilling and lifelong learning in supporting R&D talent, as part of their ongoing work investigating the skills needs of an R&D intensive UK. We also attended the Alan Turing Institute's launch of the new AI Standards Hub which provides access to regulatory requirements for artificial intelligence, sharing details with our members in Mathematics Today. We also joined the 10th anniversary celebrations of the National Numeracy charity in London in October.

Science Council

The IMA is a member of Science Council. In 2022 the Chartered Scientist designation has continued to be popular with members with 201 holding the designation.

EuMS

The IMA is a member of the EuMS offering IMA members access to discounted subscriptions which are paid directly to EuMS.

ICIAM

The IMA has continued its membership and support of the International Council for Industrial and Applied Mathematics and provided a small grant in support of the first in-person workshop since the pandemic, which took place in Glasgow in September 2022.

SIAM

IMA members who live in the UK may receive a discounted SIAM membership fee under our reciprocity agreement. (A reciprocal arrangement exists for SIAM members who live in the US). We have joint promotional campaigns and co-operative activities with SIAM and SIAM UKIE.

A list of members who represented the IMA to external organisations in 2022 is presented in Appendix B.

Creating a Diverse and Inclusive Culture

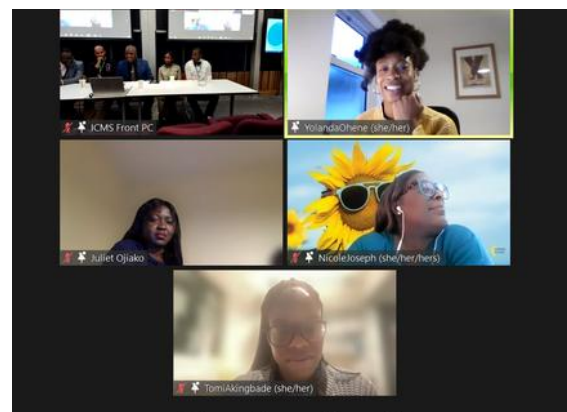
The IMA is a signatory of the Science Council Declaration on Diversity, Equality and Inclusion, and Council has appointed champions to lead the IMA in this important agenda. Dr Snezana Lawrence is thanked for her continued contributions as Diversity Champion during 2022.

By identifying diversity as a cross-cutting theme in all IMA committee meetings many improvements have been identified and achieved. This is reflected in key events and programmes across our portfolio of activities which the IMA has led or partnered in 2022 including:

- Co-sponsor of the online LGBTQ+ STEMinar conference in January
- International Women's Day Virtual Maths Tea event in March
- Joint 'Women in Astronomy' event with the LMS in September
- ECM Diversity Conference 2022
- Grant funding for attendance at the European Women in Mathematics annual conference
- Black Heroes of Mathematics 2022 Conference in October;
- Continued commitment to increasing engagement from underrepresented groups through the e16plus Newsletter, MathsCareers website and social media activities;
- Continued role with the Levelling Up: Mathematics programme to provide extra Mathematics tuition for disadvantaged A-Level students, including supporting the launch of a special programme to provide greater support students of Black Heritage

The IMA also jointly submitted a response to the Diversity and Inclusion in STEM consultation opened by the UK Government Science and Technology Committee in January, with the LMS, RSS and the OR Society.

Our thanks to Dr Lawrence, Professor Sara Lombardo, Dr Martine Barons, Professor Nira Chamberlain OBE and Nicholas Brusby CMath MIMA for their tireless commitment to this work.



I am just a black man trying to tell the truth and help those who are marginalised in the name of love of people, mathematics and justice."
Aris Winger

Quotes and images from the Black Heroes of Mathematics Conference, October 2022

EDI Working Group launch

Over 2022, it was recognised that with greater support for inclusion across the IMA's areas of activities comes an increased need for additional advice and guidance.

Therefore, Council agreed a request to establish an EDI working group which launched in September to support the Diversity Champion. Chaired by Dr Lawrence and supported by the IMA Executive Director, the working group has been meeting regularly to:

- Begin planning the IMA's Diversity and Inclusion Strategy and associated policies
- Monitor the IMA's progress against the Progression Framework developed by the Science Council and Royal Academy of Engineering which provides a maturity model for professional scientific and engineering bodies to set goals and measure progress
- Identify ways to address underrepresentation in mathematics, both directly and via possible partnerships with other organisations
- Provide support and guidance to IMA boards and committees, including identifying suitable EDI training, where appropriate, and other useful frameworks specific to their goals.

A call for Working Group members in Mathematics Today received a fantastic response. Many members from existing boards and committee members also volunteered to join the group ensuring strong representation from Council, PAC, Research Committee, JBM and ECM.

The Executive Director has also joined the Science Council/Royal Academy of Engineering Progression Framework Implementation Group which is made up of the professional scientific and engineering bodies and provides a forum to share experiences, EDI approaches and particular challenges for membership bodies. It also provides an opportunity to help develop future iterations of the Progression Framework.



Recognition and Professional Standards

IMA membership grades are designed to suit every level of mathematical interest, from current students to professional and experienced mathematicians. Advanced Membership offers two grades to recognise professional achievement: Member and Fellow. Applications are overseen by the Membership Committee, chaired by the Honorary Secretary – Membership, Professor Paul Glaister. The Committee also oversees applications for the Chartered Mathematician, Chartered Scientist and Chartered Mathematics Teacher designations.

The IMA, both independently and in partnership with others, also offers a number of medals and prizes which recognise mathematical achievement across a diverse spectrum.

The Institute's Gold Medal is awarded in recognition of outstanding contributions to mathematics and its applications over a period of years, with medals being awarded every two years.

Professional Registration and Membership

The Membership Committee, chaired by Professor Glaister, is delegated by Council to assess individual membership applications. The Membership Committee is made up of Chartered Mathematicians and Scientists who are Fellows of the Institute. They have a background in at least one of the following major areas of employment for mathematicians: academic research and teaching, schools and further education, industry, commerce, finance and IT.

In 2022 we have had the privilege to welcome 719 new members and assist 117 existing members in transferring to a higher grade. We have also recruited 22 new Chartered Mathematicians and/or Chartered Scientists.

Membership figures at 31 December 2022:

Honorary Fellow	17
Fellow	1438
Member	1282
Associate Member	1852
Affiliate	510
Student	492
Total	5591

Of the above memberships, 1,438 are registered as Chartered Mathematicians and 201 as Chartered Scientists.

The Chartered Mathematician (CMath) designation represents high levels of professionalism and competence in mathematics. It is awarded by the Institute of Mathematics and its Applications to practising professional mathematicians who demonstrate, as well as their professional status and competence, a commitment to keep pace with advancing knowledge in mathematics and its applications.

The Institute has continued to support UK University Mathematics Departments by offering over 100 IMA Graduate Prize Memberships in 2022.

Chartered Mathematics Teachers

The Chartered Mathematics Teacher Registration Authority consists of representatives from IMA, Association of Teachers of Mathematics, Mathematical Association, and National Association of Numeracy and Mathematics in Colleges. Professor Paul Glaister CBE, the chair of the Institute's Membership Committee, also chairs the Chartered Mathematics Teacher Registration Authority. At 31 December 2022, we have 42 registered Chartered Mathematics Teachers.

Medals and Awards 2022

IMA Gold Medal 2022

This year, the Council of the IMA were delighted to announce that the award of the IMA Gold Medal 2022 to Professor Philip K Maini FRS FMedSci FIMA of the University of Oxford. The award is in recognition to Professor Maini's profound contributions to mathematics in biology and medicine, for the sustained role he has played in supporting and mentoring researchers in the early stages of their careers, and for the leadership he has shown in the biological mathematics community and the Wolfson Centre for Mathematical Biology (WCMB) in Oxford. Professor Maini will deliver his Gold Medal address in June 2023.

Joint IMA / LMS Christopher Zeeman Medals 2020 & 2022

The Christopher Zeeman Medal is the UK award dedicated to recognising excellence in the communication of mathematics. The 2020 and 2022 Christopher Zeeman Medals were awarded to Professor Matt Parker and Dr Simon Singh MBE Hon FIMA respectively. Following ongoing challenges due to the pandemic, a joint award ceremony has been arranged for March 2023.

Inaugural David Youdan Medal

The IMA David Youdan Medal was established in 2021. The prize is run every two years and awarded to a member of the IMA or its professional staff, for sustained outstanding contribution to the aims and objectives of the IMA.

The inaugural medal was awarded in 2022 to Professor Nigel Steele CMath Hon FIMA, Emeritus Professor of Mathematics, Coventry University whose outstanding contribution to the IMA, for over 25 years is second to none. Nigel became IMA Honorary Secretary – Education shortly before his retirement from paid employment in 2004 using this as an opportunity to devote even more time to this voluntary role and furthering the aims of the IMA in relation to mathematics education policy and practice, dedicating his time to improve mathematics education for the sake of learners and society.

Certificates of Service

The following Certificates of Service were awarded at the Presidential Address in November 2022.

Dr James Christian CMath FIMA	Academic Representative, University of Salford, Committee Member, North West Branch, and contributor to Mathematics Today
Dr Francisco de Melo Virissimo AMIMA	Chair, Vice Chair and Immediate Past Chair, Early Career Mathematicians Committee and Council Member.
Dame Celia Hoyles DBE CMath FIMA	Past President
Dr Gordon Hunter CMath FIMA	Committee Member and Treasurer, London Branch
Dr Gordon Laing CMathTeach CMath FIMA	Academic Representative, Edge Hill University
Dr Stephen Lynch FIMA	Committee Member & Chair, North West Branch; and Academic Representative, Manchester Metropolitan University
Dr Thomas Wicks MIMA	Senior Vice Chair, East Midlands Branch
Joanna Baldacci	Staff member. Seven years valuable service and contribution to the Institute

In addition to the above, David Youdan was presented with an Honorary Fellowship of the IMA, in recognition of 19 years dedicated service to the Institute as Executive Director.



Looking Ahead: 2023

2023 will be an important year for the IMA as we develop our five-year Strategy for 2023-2028. We will be working closely with our Council, Executive Board, committees and members to review current successes, ensure our resources and infrastructure can meet the needs of new engagement models and incorporate new ideas to take us forward, including possible new revenue streams. Planning will also begin for celebrations in 2024 which will mark both the IMA's 60th anniversary and the 100th anniversary of the birth of the Institute's founding president, Sir James Lighthill.

Following continued demand, particularly from ECM members, we are reviewing online mentoring platform options and aim to introduce a new mentoring scheme during the year.

Membership development will be a key focus. Following the retirement of our University Liaison Officer, we are delighted to have created a new role within the Secretariat which has increased focus on community and member engagement, to build our links with academia and industry.

We are undertaking a full review and update of the existing policies and frameworks which guide day-to-day IMA operations, including responding to Charity Commission requirements around social media and safeguarding.

A strong programme of conferences and events is lined up and we are particularly excited to be working with the OR Society on the 2023 OR and Applied Mathematics Conference taking place in Birmingham and for the return of the Employers Forum in May. There will be a mix of hybrid and in-person events led by the Conference team, Branches and ECM.

We will continue to support the Levelling Up programme with three new universities due to join the scheme in 2023. The focus will be on organising virtual community engagement meetings to share best practice and experiences of participating universities and evaluate the programme's success to date. We also hope to exhibit at The Big Bang Fair 2023 and are looking forward to participating in the University of Greenwich's 'Greenwich Maths Time' outreach event in the Autumn. Applications will also open for the bids to become the host venue for the Institute's Festival of Mathematics 2024.

A number of HE Teaching and Learning Series workshops will continue in 2023, including at the Universities of Edinburgh, Glasgow, Greenwich, Birmingham, Nottingham and Sheffield. The eleventh year of the Mathematics Teacher Training Scholarships opens in January 2023. Once again, there will be up to 270 Maths Scholarships available for individuals commencing secondary mathematics teacher training in the 2023/24 academic year, while our programme for existing scholars and alumni will continue with a combination of online and in-person visits and CPD sessions.

The joint event to celebrate the 2020 and 2022 Christopher Zeeman Medal winners will take place at the Royal Society on 22 March 2023. We will also announce the winners of the 2023 IMA John Blake University Teaching Medal, IMA-LMS David Crighton Medal and IMA Hedy Lemarr Medal during the year.

For further details of IMA news, events and programmes, [please visit the IMA website](#) and our social channels throughout the year.

Finance and Governance

Governance

Professor Paul Glendinning, who became IMA President on 1 January 2022, chaired Council as it considered the content of this report.

Dr Peter Rowlett's term as Vice President with responsibility for Communication was extended for two years, and will now end on 31 December 2023.

In 2022, Councillor nominations did not exceed vacancies, so a ballot was not held. Council was pleased to welcome the following members:

Professor Chris Budd OBE (elected member); Eduard Campillo-Funollet (elected, formerly co-opted member); Mr Declan Bays (elected member); Professor Tim Phillips (elected member).

Additionally, Nicholas Brusby, Chair of the Early Careers Mathematicians Committee, was co-opted to Council immediately following the AGM.

Throughout the year, in addition to the standing agenda of Council, focus was given to preparation for the IMA's Strategy Review in 2023, which will take place at 'Conference Aston' on 15-16 July 2023.

All who sit on Council are the Trustees who approved this report. A full list of Council can be seen on the Governance web page.

Executive Board

The Executive Board includes all Honorary Officers of the Institute together with Professor Nigel Steele, and the Diversity Champion, Dr Snezana Lawrence. Selected staff members from the Secretariat are invited to attend as required.

IMA Committees

Details of leading IMA Committees are shown on the Governance webpages at <http://ima.org.uk>.

Secretariat

At 31 December 2022, the IMA employed a total of 18 members of staff, including six part-time employees. The Secretariat is led by the Executive Director and provides a number of functions in support of the IMA's aims and objectives. A full list of the 2022 team is provided in the References and Glossary section.

Finance

The 2022 budget was set as an unrestricted deficit of £5,660. The outcome was an unrestricted surplus of £36,241.

The main reason for the positive movements were unanticipated donations and better than expected performance in journal income.

At the end of 2022 the total assets less current liabilities is £1,454,608 of which £73,548 is in relation to restricted reserves. In 2021 the equivalent figure was £1,478,154 of which £133,335 was in relation to restricted reserves.

Funds were used to support our charitable aims. There is a clear public benefit in our activities to support education; to run educational conferences; to support mathematics to government; to regulate the profession of Chartered Mathematician; to contribute to the advancement of research initiatives; to be an influencing voice for the use of mathematics across STEM, industry and commerce; and to promote mathematics across media and society in the UK.

Members receive a membership publication. The revenue received from member subscription exceeds the value of direct membership services. The subscription surplus is spent on meeting our charitable objectives.

Finance Committee, which reports to Council, sets the pay and remuneration of the charity's personnel.

Notes to the Financial Statements for the year ended 31 December 2022

The accounts given in Appendix A represent an extract from the full formal financial statements, and should be read in conjunction with the 'accompanying notes'.

This Annual Report was approved by the Trustees at the Council meeting of March 2023.

The IMA Trustees

Appendix A

INDEPENDENT AUDITORS' REPORT TO THE TRUSTEES OF THE INSTITUTE OF MATHEMATICS AND ITS APPLICATIONS

OPINION

We have audited the financial statements of The Institute of Mathematics and its Applications (the 'charity') for the year ended 31 December 2022 which comprise the statement of financial activities, the balance sheet, the statement of cash flows and the notes to the financial statements, including a summary of significant accounting policies. The financial reporting framework that has been applied in their preparation is applicable law and United Kingdom Accounting Standards, including FRS 102 "The Financial Reporting Standard applicable in the UK and Republic of Ireland" (United Kingdom Generally Accepted Accounting Practice). In our opinion the financial statements:

- give a true and fair view of the state of the charity's affairs as at 31 December 2022 and of its incoming resources and application of resources for the year then ended;
- have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice; and
- have been prepared in accordance with the requirements of the Charities Act 2011.

BASIS FOR OPINION

We have been appointed as auditors under section 144 of the Charities Act 2011 and report in accordance with regulations made under section 154 of that Act. We conducted our audit in accordance with International Standards on Auditing (UK) (ISAs (UK)) and applicable law. Our responsibilities under those standards are further described in the Auditor's responsibilities for the audit of the financial statements section of our report. We are independent of the charity in accordance with the ethical requirements that are relevant to our audit of the financial statements in the UK, including the FRC's Ethical Standard, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

CONCLUSIONS RELATING TO GOING CONCERN

In auditing the financial statements, we have concluded that the trustees' use of the going concern basis of accounting in the preparation of the financial statements is appropriate.

Based on the work we have performed, we have not identified any material uncertainties relating to events or conditions that, individually or collectively, may cast significant doubt on the charity's ability to continue as a going concern for a period of at least twelve months from when the financial statements are authorised for issue. Our responsibilities and the responsibilities of the trustees with respect to going concern are described in the relevant sections of this report.

OTHER INFORMATION

The other information comprises the information included in the annual report other than the financial statements and our auditor's report thereon. The trustees are responsible for the other information contained within the annual report. Our opinion on the financial statements does not cover the other information and, except to the extent otherwise explicitly stated in our report, we do not express any form of assurance conclusion thereon. Our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the course of the audit, or otherwise appears to be materially misstated. If we identify such material inconsistencies or apparent material misstatements, we are required to determine whether this gives rise to a material misstatement in the financial statements themselves. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact.

We have nothing to report in this regard.

MATTERS ON WHICH WE ARE REQUIRED TO REPORT BY EXCEPTION

We have nothing to report in respect of the following matters in relation to which the Charities (Accounts and Reports) Regulations 2008 require us to report to you if, in our opinion:

- the information given in the financial statements is inconsistent in any material respect with the Trustees Annual Report; or
- sufficient accounting records have not been kept; or
- the financial statements are not in agreement with the accounting records; or
- we have not received all the information and explanations we require for our audit.

RESPONSIBILITIES OF TRUSTEES

As explained more fully in the Statement of Trustees' responsibilities in the preparation of financial statement, the trustees, who are also the directors of the charity for the purposes of company law, are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view, and for such internal control as the trustees determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error. In preparing the financial statements, the trustees are responsible for assessing the charity's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the trustees either intend to cease operations, or have no realistic alternative but to do so.

AUDITORS' RESPONSIBILITIES FOR THE AUDIT OF THE FINANCIAL STATEMENTS

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance but is not a guarantee that an audit conducted in accordance with ISAs (UK) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

We design procedures in line with our responsibilities, outlined above, to detect material misstatements in respect of irregularities, including fraud. The extent to which our procedures are capable of detecting irregularities, including fraud, is detailed below.

THE EXTENT TO WHICH THE AUDIT WAS CONSIDERED CAPABLE OF DETECTING IRREGULARITIES, INCLUDING FRAUD

Irregularities, including fraud, are instances of non-compliance with laws and regulations. The objectives of our audit are to obtain sufficient appropriate audit evidence regarding compliance with laws and regulations that have a direct effect on the determination of material amounts and disclosures in the financial statements, to perform audit procedures to help identify instances of non-compliance with other laws and regulations that may have a material effect on the financial statements and to respond appropriately to identified or suspected non-compliance with laws and regulations identified during the audit.

However, it is the primary responsibility of management, with the oversight of those charged with governance, to ensure that the entity's operations are conducted in accordance with applicable laws and regulations and for the prevention and detection of fraud.

In identifying and assessing risks of material misstatement in respect of irregularities, including fraud, the audit engagement team:

- obtained an understanding of the nature of the charity, including the legal and regulatory framework that the charity operates in and how the charity is complying with the legal and regulatory framework;
- inquired of management, and those charged with governance, about their own identification and assessment of the risks of irregularities, including any known actual, suspected or alleged instances of fraud; and
- discussed matters about non-compliance with laws and regulations and how fraud might occur including assessment of how and where the financial statements may be susceptible to fraud.

As a result of these procedures we consider the most significant laws and regulations that have a direct impact on the financial statements are:

- FRS 102 The Financial Reporting Standard applicable in the UK and Republic of Ireland (United Kingdom Generally Accepted Accounting Practice);
- The Statement of Recommended Practice applicable to charities preparing their accounts in accordance with the Financial Reporting Standard applicable in the UK and Republic of Ireland (The FRS 102 Charities SORP);
- The Charities (Accounts and Reports) Regulations 2008; and
- The Charities Act 2011.

The audit engagement team identified the risks of transactions with unidentified related parties and management override of controls as the areas where the financial statements were most susceptible to material misstatement due to fraud.

Based on the results of our risk assessment we designed audit procedures to identify fraud or non-compliance with such laws and regulations identified above. The relevant audit procedures performed included but were not limited to:

- obtaining the trustees' register of interests and corroborating entries by reviewing entries on the Charities Commission website;
- inspecting minutes of Trustees' meetings;
- maintaining vigilance throughout the audit work to identify all related parties;
- identifying and reviewing unusual accounting transactions and journal entries;
- discussions with management including consideration of known or suspected instances of non-compliance with laws and regulations and fraud; and
- performing a detailed review of the completeness and accuracy of disclosures.

A further description of our responsibilities is available on the Financial Reporting Council's website at: <https://www.frc.org.uk/auditorsresponsibilities>. This description forms part of our auditor's report.

James Robert Marchant FCCA (Senior Statutory Auditor)

For and on behalf of Croucher Needham (Essex) LLP Date: 30th March 2023

Chartered Certified Accountants
Statutory Auditor

Market House
10 Market Walk
Saffron Walden
Essex
CB10 1JZ

THE INSTITUTE OF MATHEMATICS AND ITS APPLICATIONS

STATEMENT OF FINANCIAL ACTIVITIES FOR THE YEAR ENDED 31 DECEMBER 2022

	Unrestricted Funds 2022 £	Restricted Funds 2022 £	Total Funds 2022 £	Total Funds 2021 £	Notes
Income and endowments from:					
<i>Donations and legacies</i>					
Appeal Fund, Donations and Bequests	16,878	0	16,878	15,055	
<i>Charitable activities</i>					
Member Entrance fees	2,401	0	2,401	3,949	
C. Math/C Math Teacher Member Entrance fees	709	0	709	709	
Member Subscription fees	338,339	0	338,339	334,168	
Conference and symposium fees	75,132	0	75,132	39,411	
Publications income and Institutional subscriptions	555,280	0	555,280	546,198	
Sundry	2,728	0	2,728	887	
Scholarships	103,579	0	103,579	119,920	
<i>Investment Income</i>	4,347	70	4,417	4,770	16
Total	1,099,393	70	1,099,463	1,065,067	
Expenditure on:					
<i>Charitable Activities</i>					
Branches and groups	10,212	0	10,212	11,552	
Conferences	136,861	0	136,861	80,171	
Education	23,277	0	23,277	27,475	
Grants/Donations	75,772	0	75,772	75,867	1a
Promoting Mathematics	320,754	0	320,754	144,818	1c
Scholarships	79,641	0	79,641	112,153	1c
Mathematics Today	180,479	0	180,479	185,512	
Membership	105,236	0	105,236	137,577	
Professional development	35,788	0	35,788	43,018	
Other publications	39,925	59,857	99,782	59,471	
<i>Governance</i>	55,205	0	55,205	121,546	1d
Total	1,063,149	59,857	1,123,006	999,160	1a
Net movement in funds	36,241	(59,787)	(23,546)	65,907	
Reconciliation of funds					
Total Funds brought forward at 1 January 2022	1,344,819	133,335	1,478,154	1,412,247	
Total Funds carried forward at 31 December 2022	1,381,060	73,548	1,454,608	1,478,154	

No separate Statement of Total Recognised Gains and Losses has been presented as all such gains and losses have been dealt with in the Statement of Financial Activities.

The net movement in funds arises from the charity's continuing operations.
The detailed Income and Expenditure Account (2022) is attached (Appendix 1a).

THE INSTITUTE OF MATHEMATICS AND ITS APPLICATIONS

BALANCE SHEET AS AT 31 DECEMBER 2022

	2022 £	2021 £	Notes
FIXED ASSETS			
Intangible fixed assets	0	0	2
Tangible assets	<u>93,538</u>	<u>103,186</u>	3
	<u>93,538</u>	<u>103,186</u>	
CURRENT ASSETS			
Stock	4,842	4,843	4
Debtors unrestricted	40,920	339,217	5
Cash at bank and in hand restricted	73,478	133,335	
Cash at bank and in hand unrestricted	<u>1,657,691</u>	<u>1,370,707</u>	
	<u>1,776,931</u>	<u>1,848,102</u>	
LIABILITIES			
Amounts falling due within one year unrestricted	<u>415,860</u>	<u>473,134</u>	
	415,860	473,134	6
NET CURRENT ASSETS			
	<u>1,361,070</u>	<u>1,374,968</u>	
TOTAL ASSETS LESS CURRENT LIABILITIES			
	<u>1,454,608</u>	<u>1,478,154</u>	
FUNDS			
Restricted funds	73,548	133,335	
Unrestricted funds	<u>1,381,060</u>	<u>1,344,819</u>	
	<u>1,454,608</u>	<u>1,478,154</u>	

The Financial Statements on page 6 to 16 together with the Trustees' Annual Report (2022) in Appendix 2 were approved and authorised for issue by the Council on 29 March 2023 and signed on their behalf by

PROFESSOR ANDREW OSBALDESTIN Honorary Treasurer

PROFESSOR PAUL GLENDINNING President

Appendix B

References and Secretariat

IMA Staff Team

The Institute staffing in 2022 was:

Executive Director – Rosalind Azouzi;
Operations Director – Alan Peacock;

Administration Assistant – Debbie Sullivan;
Administration Officer – Karen Hedderley;
Administration Officer – Charlotte Smith (May-August 2022) / Emma Emmerton (from November)
Conference and Administration Assistant – Catherine Marshall (until July/recruitment paused until 2023)
Conferences and Administration Officer – Pamela Bye;
Conference Officer – Maya Everson;
Editorial Officer – Rebecca Waters;
Education Manager and Project Manager, Scholarships – Vanessa Thorogood;
Executive Manager – Alison Penry (retired February 2022)
Governance Manager – Emma-Jane Wheal (effective March 2022)
Governance & Diversity Officer – Gemma Reeves until November / Stacie Lang (from November)
IT & Systems Executive – Eugene Kidwell;
Marketing Officer – Nikki Barnes;
Membership Assistant – Sabeen Hansraj;
Membership Officer – Natalie Stanton;
Membership Manager – Caroline Irwin;
Special Projects Officer – Joanna Baldacci;
University Liaison Officer – Erica Tyson.

The IMA continues to work with many organisations in Mathematics, Science and Engineering. The Institute's representatives were:

UK Maths

CMS

- Professor Paul Glendinning FRSE FIMA (IMA President, University of Manchester)
- Dr Martine Barons CMath FIMA (IMA Vice President, Learned Society, University of Warwick)
- Dr Richard Pinch CMath CSci FIMA (IMA Vice President, Professional Affairs and Industry)
- Rosalind Azouzi (Executive Director)

Heads of Departments of Mathematical Sciences

- Professor Michael Grove FIMA (IMA Honorary Secretary, University of Birmingham)

Joint Mathematical Council

- Professor Paul Glaister CBE CMath CSci FIMA (IMA Honorary Secretary, Membership University of Reading)

sigma

- Professor Duncan Lawson MBE CMath FIMA (Coventry University)

UK STEM and Others

Alliance for Data Science Professionals

- Professor Paul Glaister CBE CMath CSci FIMA (IMA Honorary Secretary, Membership University of Reading)
- Rosalind Azouzi (Executive Director)

EPSRC

- Professor Sara Lombardo FIMA (Herriot-Watt University)

Science Council

- Rosalind Azouzi (Executive Director)

International

ICIAM

- Professor I. David Abrahams CMath FIMA (Isaac Newton Institute for Mathematical Sciences)
- Professor Iain Duff CMath CSci FIMA (STFC)

Glossary

ACME – Advisory Committee on Mathematics Education
AMS – Academy for Mathematical Sciences
AfDSP – Alliance for Data Science Professionals
BCS – British Computing Society, the Chartered Institute for IT
BSHM – British Society for the History of Mathematics
CBE – Commander of the British Empire
CMath – Chartered Mathematician
CMS – Council for the Mathematical Sciences
CPD – Continuing Professional Development
DfE – Department for Education
ECM – Early Career Mathematicians
ED – Executive Director
EdMS – Edinburgh Mathematical Society
EPSRC – Engineering and Physical Sciences Research Council
EuMS – European Mathematical Society
FE – Further Education
FRS – Fellow of the Royal Society
HE – Higher Education
HEdSA – Higher Education Services Area
HEIs – Higher Education Institutions
HoDoMS – Heads of Departments of Mathematical Sciences
ICIAM – International Council for Industrial and Applied Mathematics
ICMS – International Centre for Mathematical Sciences
ICTP – International Centre for Theoretical Physics
IF – Impact Factor
IMA – Institute of Mathematics and its Applications
InFOMM – Industrially Focused Mathematical Modelling
INI – Isaac Newton Institute for Mathematical Sciences
KE – Knowledge Exchange
KS2 – Key Stage 2
KS3 – Key Stage 3
LMS – London Mathematical Society
MA – The Mathematical Association
MEI – Mathematics in Education and Industry
MSOR – Subject Benchmark Statement for Mathematics, Statistics and Operational Research
NANAMIC – National Association of Numeracy and Mathematics in Colleges
NCETM – National Centre for Excellence in the Teaching of Mathematics
OBE – Order of the British Empire
OR – Operational Research
ORS – Operational Research Society
OU – Open University
OUP – Oxford University Press
PAC – Professional Affairs Committee
QAA – The Quality Assurance Agency for Higher Education
RSS – Royal Statistical Society
S&FE – Schools and Further Education
SIAM – Society for Industrial and Applied Mathematics
SIAM UKIE – UK and Republic of Ireland Section of SIAM
STEM – Science, Technology, Engineering and Mathematics
STFC – Science and Technology Facilities Council
UKRI – UK Research and Innovation



<http://ima.org.uk>