

Annual Report to Members 2018



Glossary

ACME — Advisory Committee on Mathematics Education

AR — Academic Representative(s)

BAMC — British Applied Mathematics Colloquium

BEIS — Department for Business, Energy and Industrial Strategy

CMath — Chartered Mathematician

CMS — Council for the Mathematical Sciences

DfE — Department for Education

ECM — Early Career Mathematicians

EdMS — Edinburgh Mathematical Society

EPSRC — Engineering and Physical Sciences Research Council

EuMS — European Mathematical Society

EUROMECH — European Mechanics Society

FAcSS — Fellow of the British Academy of Social Sciences

FBA — Fellow of the British Academy

FE — Further Education

FRS — Fellow of the Royal Society

FRSE — Fellow of the Royal Society of Edinburgh

FTE — Full Time Equivalent

HEdSA — Higher Education Services Area

HEI — Higher Education Institutions

HMRC — Her Majesty's Revenue and Customs

HoDoMS — Heads of Departments of Mathematical Sciences

ICIAM — International Council for Industrial and Applied Mathematics

IF — Impact Factor

IMA — Institute of Mathematics and its Applications

InFOMM — Industrially Focused Mathematical Modelling

ITT — Initial Teacher Training

JMC — Joint Mathematical Council of the United Kingdom

LMS — London Mathematical Society

MA — The Mathematical Association

MEI — Mathematics in Education and Industry

MP — Member of Parliament

NANAMIC — National Association of Numeracy and Mathematics in Colleges

NCETM — National Centre for Excellence in the Teaching of Mathematics

NCTL — National College for Teaching and Leadership

ORS — Operational Research Society

OU — Open University

OUP — Oxford University Press

PAC — Professional Affairs Committee

QJMAM — Quarterly Journal of Mechanics and Applied Mathematics

REF2021 — Research Excellence Framework 2021

RS — Royal Society

RSS — Royal Statistical Society

S&FE — Schools and Further Education

SET — Science, Engineering and Technology

SIAM — Society for Industrial and Applied Mathematics

SIAM UKIE — UK and Republic of Ireland Section of SIAM

SORP — Statements of Recommended Practice

STEM — Science, Technology, Engineering and Mathematics

STFC — Science and Technology Facilities Council

UCL — University College London

UKRI — UK Research and Innovation

ULO — University Liaison Officer

INTRODUCTION

The IMA enjoyed another good year in 2018. We ran the Department for Education Mathematics Initial Teacher Training Scholarships scheme for a sixth successful year recommending 235 outstanding applicants for scholarship funds and were awarded a contract to repeat the process to run the Mathematics Teacher Training Scholarships for the next three years.

Our eStudent offer continues to be highly popular, and following a refresh of our eStudent population, we had 6,823 eStudents at the end of 2018.

A second forum event for IMA Academic Representatives was held on 24 January 2018. The Academic Representatives continue to work to strengthen links between their colleagues and students and the IMA, enhancing the promotion and support of mathematics within that sector of the community.

Our conference team ran 10 events, including the first IMA Conference on Knowledge Exchange, welcoming 597 delegates.

The fifth phase of Mathematics Matters Case Studies on the theme of the ‘ubiquity of maths’ was completed. These Case Studies showcase applications of mathematics across a wide range of the economy including: weather forecasting, environment, music, health, psychology and social networks, art restoration, space, retail, architecture, and the movies; covering a wide selection of topics across the whole remit of UKRI.

We played the leading role with the CMS in the inclusion of mathematics within STEM for Britain at Parliament.

The IMA once again ran the maths stand at the biggest Big Bang ever; 80,000 students and parents in four days!

In 2018 we held the third annual 16plus lecture which was hosted at University College London on 28 June. This was a day of interesting talks with interactive elements, which was well-attended by 16-18 year old students and their teachers.

The IMA MathsCareers website attracted over 613,800 visits during the year (another huge increase) and increased its followers on Twitter to 6,573. We also issued six more editions of our e16plus newsletter.

Council continued to work on its strategy development, in particular via the Membership Development Scheme (Communications and Marketing) Task Group which is shaping plans initially informed by the 2017 membership survey and Council Strategy Weekend. In 2018 a Communications and Marketing plan was produced, and a Marketing Officer will begin to advance the plan in January 2019.

And on top of this we ran our regular activities covering branches, education, grants, journals, mathematics consultations and Mathematics Today.

We hope that you enjoy reading the comprehensive details in the rest of this report.

IMA AND GOVERNMENT

Both in its own right and as a member of CMS the IMA has been involved with a wide range of engagement activities in Parliament this year.

We were awarded a sixth DfE / NCTL grant in 2017 / 2018 to run the Mathematics Teacher Training Scholarships scheme. In 2018 we were awarded a similar grant for the following three academic years.

IMA Council members are in regular contact with DfE, BEIS, and UKRI.

On 12 March a panel of CMS judges, chaired by Tim Pedley, selected the Parliamentary and Scientific Committee STEM for Britain mathematics awards. Once again we are very grateful to the Clay Mathematics Institute and the Heilbronn Institute for their generous sponsorship of these prizes. STEM for Britain is the largest science event held in the Houses of Parliament on an annual basis and helps to strengthen our dialogue with Parliamentarians.

The Voice of the Future event took place on 13 March 2018. This is a great opportunity in Westminster for young scientists and engineers to put questions to key political figures.

The Parliamentary Links Day took place on 26 June at the Houses of Parliament on the theme of ‘Science and the Industrial Strategy’.

Our Executive Director, David Youdan, has continued to serve as an Advisor to the Parliamentary and Scientific Committee.

SERVICES TO MATHEMATICS

Big Bang

In 2018, the Big Bang Science and Engineering Fair was held in the Birmingham NEC, its now customary venue, with over 80,000 visitors registered. In order to emphasise the importance of qualifications in mathematics to a STEM career, the organisers encouraged activity providers to display the ‘Maths Counts’ logo and discuss the relevance of maths to their activity.

The IMA demonstrated the IMA MathsCareers Foam Cube Challenge which proved very popular with visitors. The IMA was fortunate in being supported by enthusiastic students from local universities and also Bath.

The IMA stand was as busy as ever as with visitors engaged enthusiastically with our maths and the other STEM activities.

Research Committee

Professor Elizabeth Mansfield, Vice President Learned Society, chaired the Research Committee in 2018. The full membership of the Committee can be viewed on the IMA website.

These researchers contribute to our 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. The Research Committee also assess applications for Small Grants.

Throughout the year, Research Committee worked on behalf of the community in many ways, including:

- the nomination of two young researchers to participate in the “Voice of the Future 2018” event, which provided a unique opportunity for young scientists and engineers to enjoy a

‘Science Question Time’ with panels which included several key political figures;

- Professor Philip Bond, author of *The Era of Mathematics, An Independent Review of Knowledge Exchange in the Mathematical Sciences*, was invited to a meeting of the Committee to discuss his Review and its recommendations;
- the Committee formed a working group, which liaised with other IMA Committees, to consider IMA responses to Professor Bond’s Review. A key outcome of the Group’s discussions was the *1st IMA Conference on Knowledge Exchange in the Mathematical Sciences* which took place in Birmingham on 3 and 4 December 2018;
- the encouragement of community members/colleagues to apply to fill the vacancies on the EPSRC Mathematical Sciences Strategic Advisory Team;
- correspondence with the Chair of the Research Excellence Framework (REF) 2021 Mathematical Sciences subpanel, regarding the selection of subpanel members.

Elizabeth Mansfield worked with LMS colleagues to organise a further successful joint IMA-LMS scientific meeting in 2018. On this occasion the theme was a celebration of Emmy Noether, and the meeting marked the 100th Anniversary of Noether’s paper on Conservation Laws.

At the last Committee meeting of 2018, Elizabeth Mansfield was thanked for her work as Committee Chair for her term of four years which finished at the end of 2018. Helen Wilson will take up the Chair of the Committee from January 2019.

Committee Member and IMA Past President, Chris Linton, is a member of the EPSRC Strategic Advisory Network.

Journals

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

- *IMA Journal of Applied Mathematics*
Editors: Alan Champneys, (Bristol), and Demetrios Papageorgiou, (Imperial);

- *IMA Journal of Numerical Analysis*
Editors: Arieh Iserles, (Cambridge) and Endre Süli, (Oxford);
- *Mathematical Medicine and Biology: A Journal of the IMA*
Editors: Oliver Jensen, (Manchester); John King, (Nottingham) and James Keener, (Utah);
- *Information and Inference: A Journal of the IMA*
Editors: Robert Calderbank, (Duke); David Donoho, (Stanford); John Shawe-Taylor, (UCL) and Jared Tanner, (Oxford);
- *IMA Journal of Mathematical Control and Information*
Editors: Christophe Priour (Grenoble); Nicos Karcianas, (City) and Sarah Spurgeon OBE, (UCL);
- *IMA Journal of Management Mathematics*
Editors: Philip Scarf, (Salford); Aris Syntetos, (Cardiff) and Rogemar Mamon, (Western Ontario);
- *Teaching Mathematics and its Applications: an International Journal of the IMA*
Editors: Duncan Lawson, (Coventry); Christopher Sangwin, (Edinburgh) and Cathy Smith (OU).
- *IMA Early Career Mathematicians' Spring Conference* 21 April 2018, Durham University;
- *10th IMA International Conference on Modelling in Industrial Maintenance and Reliability*, 13-15 June 2018, University of Manchester;
- *16+ School Student Event*, 28 June 2018, University College London;
- *6th IMA Conference on Numerical Linear Algebra and Optimization*, 27-29 June 2018, University of Birmingham;
- *New Lecturers' Induction Course*, 10-11 September 2018, Isaac Newton Institute, Cambridge;
- *2nd IMA Conference on Theoretical and Computational Discrete Mathematics*, 14-15 September 2018, The Enterprise Centre, Derby;
- *IMA Early Career Mathematicians' Autumn Conference* 2018, 3 November 2018, University College London;
- *1st IMA Conference on Knowledge Exchange in the Mathematical Sciences*, 3-4 December 2018, Aston University, Birmingham;
- *3rd IMA Conference on Big Data*, 10-12 December 2018, Double Tree West End, London.

Our newest journal, *Transactions of Mathematics and its Applications*, was launched in 2016. This is an entirely online Open Access Journal. The Editor in Chief is Arieh Iserles (Cambridge).

Five journals currently have impact factors (IF). During the most recent assessment period the IF increased for all journals except *IMA Management Mathematics* which had a small decrease. *IMA Journal of Applied Mathematics* had a substantial increase from 0.424 to 1.369.

Conferences

The conference programme for 2018 is summarised below:

- *IMA Mathematics 2018*, 22 March 2018, Mary Ward House, London;

The 2018 programme of conferences and meetings was typical of the busy and varied series that the IMA delivers for the community. The great majority of feedback was positive. In 2018 there were a number of changes to the conference programme. Our planned conferences on 'Mathematics of Robotics' and 'Mathematics in Signal Processing' were postponed. We were able to organise at short notice a conference on 'Knowledge Exchange' in December. In addition there were a number of changes in personnel with the retirement of John Meeson, the re-assignment of Lucy Dunford, and the departure of Lizzi Lake. We are planning to rebuild a more typical conference year in 2019. Members from industry and academics experienced in attending a range of conferences outside mathematics were very pleased with conference prices. Some academic members were not content with our prices. All prices were set following the guidance of Council.

IMA Lectures

On 28 June we held the third annual 16plus lecture day at University College London. The programme included talks by Naomi Ball (HMRC), Melissa Rodd (UCL Institute of Education) and Hasnaa Shaddad (UCL). Helen Wilson (UCL) was the keynote speaker, and popular mathematician Hannah Fry (UCL) attended as a guest speaker. The five lectures were well received by the audience of sixth form students.

The 2018 IMA Lighthill Lecture at the BAMC in St. Andrews was given by Reidun Twarock. Her title was “Geometry as a Key to the Virosphere: New Insights into Virus Structure, Assembly, Evolution & Therapy”.

On 27 June, Alistair Fitt gave his Presidential Address, *My Mathematics Bucket List*, and IMA branches will host Alistair in 2019 as he repeats his address at local branch venues.

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.

In 2018 the application process moved online via myIMA and applications were limited to IMA members only. The budget for 2018 was £20,000 and the Scheme received 47 applications. The total sum requested was £36,023. Of these requests, 16 have been paid in full, 18 have received partial funding, and 13 have been declined. The total amount awarded during 2018 was £17,940. Among the activities funded during 2018 was the creation of a number of Wikipedia profiles of female mathematicians.

Education

2018 was an active year for mathematics education. Our contribution was led by Mr Michael Grove (Honorary Secretary Education), supported by Professor Nigel Steele (Deputy Honorary Secretary Education), Professor Andrew Osbaldestin (Chair, HEdSA), Mr Christopher Chipperton (Chair, S&FE) and Vanessa Thorogood (Education Manager)

together with all our education committee members.

The Education Service Area actively promotes the engagement of the Institute's members in education with its work through communications by email, on the website, and in *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.

Selected highlights from another busy year are shown below:

The Institute continues to be strongly supportive of the work of the Royal Society ACME, which has been redefined as a Standing Committee of the Royal Society. Four Contact Groups have been established to cover: A Levels; Post-16 Pathways; GCSE and Key Stage 3; Early Years and Primary. The Contact Groups have the full support of CMS and JMC, with specific resource to support the four Contact Groups provided by the IMA, the LMS, the RS and the RSS.

The IMA also attended the Royal Society ACME annual conference in July 2018, which looked at how different communities can work together to; strengthen post-16 mathematics pathways, develop data science within mathematics and signal the value of mathematics across all phases of education. The IMA also had a stand to promote its education activities to the delegates.

The *Higher Education Teaching and Learning Series* released its second call for applications in 2018, providing an opportunity for higher education mathematical sciences departments to request supporting funds for facilitating a teaching and learning related workshop. In response to the call for proposals, six proposals were received and three were successful, whilst two were asked to merge as they submitted similar proposals. The following four workshops will be held in 2019:

- University of Liverpool: Developing an

undergraduate mathematics curriculum which is fit for purpose – challenges and opportunities;

- Queen’s University Belfast and Sheffield Hallam University: Assessment in Mathematics;
- Middlesex University: Programming in the undergraduate mathematics curriculum;
- Cardiff University: Feedback.

Workshops from the successful applications to the first call were held during 2018, these were:

- Alternative Approaches to Teaching and Learning in the Mathematical Sciences – University of the West of England;
- Transitions in the Mathematical Sciences – University of Warwick;
- Mathematical Academic Malpractice in the Modern Age – University of Manchester.

Reports from each workshop are available on the IMA’s Higher Education web page.

The Induction Course for New Lecturers took place on the 10 - 11 September 2018 at the Isaac Newton Institute for Mathematical Sciences. This course was 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.

Two one-day workshops for postgraduate students who teach mathematics and statistics took place: 24 September 2018 at the International Centre for Mathematical Sciences (Edinburgh) and 10 October 2018 at the Isaac Newton Institute for Mathematical Sciences (Cambridge). Aimed at postgraduate students who teach mathematics and statistics, these one-day events covered issues such as planning and preparing for teaching, facilitating problem solving classes, encouraging participation and providing support, and assessing student work and providing feedback.

Programme Accreditation

The Institute’s Programme Accreditation scheme accredits university degree programmes from which all its graduates will meet the educational requirements for the CMath designation. A total of 59 universities currently have degrees accredited by

the Institute.

A list of accredited degree programmes can be found on the Programme Accreditation webpage of the Institute’s website.

Schools and Further Education

Two new members joined the S&FE Committee in 2018; Ioanna Georgiou CMathTeach FIMA (St James Senior Girls’ School) and Dr Gordon Bremner Laing CMathTeach CMath FIMA (Edge Hill University).

The S&FE Committee also responded to the DfE consultation *Strengthening qualified teacher status and career progression*.

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 with Responsibility for Education and the chairs of the education committees, decides on each application.

In 2018, the Education Grants scheme received 30 applications; of which 11 were awarded grants for the full amount requested, one received a reduced amount and 18 were declined.

The Education Grants awarded a total of £6,376 in 2018. As £378 was returned due to underspending, the Education Grants spent £5,998.

Applications approved for 2018 are shown on the Institute’s website.

School Speaker

In 2018 requests for School Speakers were handled regionally, where appropriate, by IMA Branches.

Polymaths

Polymaths is a part-time open access course validated by the Institute offered by the University of Bolton. A total of 16 people were awarded the Polymaths certificate in 2018.

IMA MathsCareers

The IMA MathsCareers website has received 613,848 visits during 2018. The site is one of the top websites of its kind within the international STEM community and continues to be popular among undergraduates seeking career advice as well as school and college audiences. New content on the site during 2018 included articles aimed at undergraduates and A level and Scottish Higher students with a focus on university life, career choices, and work experience. Two contests are run every year where entrants submit posters on a mathematical theme.

Social Media is used to raise the profile of IMA MathsCareers, and it now has 6,573 followers on Twitter. The profile of the site, as well as mathematics generally, is raised via the distribution of classroom posters.

Mathematics Teacher Training Scholarships

The IMA, working with LMS, MA, MEI, National STEM Learning Centre and RSS, delivered the Mathematics Teacher Training Scholarships on behalf of the Department for Education. The overall aim of the Scholarships scheme is 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.

The 2017/2018 (year 6) scheme was announced and opened for applications in October 2017, with a target of awarding 269 Scholarships to those who commence secondary mathematics teacher training in the 2018/19 academic year. This was another successful year, receiving 546 applications and awarding 235 Scholarships.

The IMA successfully bid for the contract to run the Mathematics Teacher Training Scholarships for the next three years.

The seventh year (2017/2018) of the Mathematics Teacher Training Scholarships was launched on the 9 October 2018. There have not been any changes to the financial incentives for those going into mathematics initial teacher training for both the

government bursary and the Scholarships. The Maths Scholarship is still £22K tax-free bursary during your initial teacher training year, followed by two later payments of at least £5K (enhanced payments of £7.5K if teaching in specified areas in England) in the 3rd and 5th year of teaching in a state-funded school in England since completing ITT.

There are 270 Maths Scholarships available for individuals commencing secondary mathematics teacher training in the 2018/19 academic year.

Undergraduate and Postgraduate Liaison

The Postgraduate and Undergraduate Liaison Operation increases membership, awareness of and participation with the IMA amongst students and the university community. This is achieved through the eStudent community newsletters, grants to mathematical societies, careers talks for mathematics undergraduates and supporting careers events and student conferences. In 2018 we visited 50 different universities.

Joint IMA-SIAM activity continued this year (the formal understanding was agreed in 2016 with SIAM, the U.S. Society for Industrial and Applied Mathematics).

In August we carried out a refresh of the eStudent population based on newsletter usage data and the newsletters themselves with 7 issues rather than 6. The spring and autumn ECM conferences were held at Durham and University College, London respectively.

In 2018, £10,900 was paid in grants. Undergraduate awards were made to the Mathematical societies of the Universities of Aberdeen, Aberystwyth, Aston, Bath, Birmingham, Cardiff, Dundee, East Anglia, Glasgow, Heriot-Watt, Keele, King's College, London, London Metropolitan, Newcastle and Wolverhampton. 10 awards were made to the IMA-SIAM Joint Student Chapters of the universities of Bath, Cardiff, Edinburgh/Heriot-Watt, Manchester, Nottingham, Oxford, Reading, Strathclyde and Warwick. Sponsorship was also given for prizes for the Oxford Industrially Focused Mathematical Modelling (InFoMM) Camp, a speaker at the SIAM UKIE annual conference and support of the SIAM

UKIE Student annual conference. Society activities supported included networking events, talks and participation in IMA conferences. The University Liaison Officer (ULO) delivered 34 talks and 2 workshops, and supported 8 careers fairs and 12 conferences, including the MEI Teachers' conference, the InFoMM camp and a sixth form event. Maths Careers Ambassadors delivered 6 talks and supported a conference. The Postgraduate Liaison Officer supported 2 conferences.

Academic Representatives

The Institute initiated this scheme in 2017, and has recruited 56 Representatives at 54 universities. Representatives are members of academic staff and it is envisaged that they highlight 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. A second forum event for Representatives was held on 24 January 2018. During 2018 four AR Newsletters were sent to help to grow the full membership of students and academics. It is planned that the scheme will develop further over the next year.

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. Two conferences are held every year, in the spring and autumn – this year they were held at the University of Durham and University College London. Both conferences offered early-career members a varied programme of engaging talks. These conferences were organised with assistance from the Secretariat.

The ECM Group works closely with the University Liaison project to recruit student members and is also highly active on a range of social networking sites.

Professional Affairs

The Professional Affairs Committee (PAC) met three times during 2018.

PAC maintains oversight of the IMA licence to award the Chartered Scientist designation. In March the Science Council Registration Authority

confirmed the renewal of the IMA licence for a further five years, and at its March meeting PAC thanked all staff involved in the review process. IMA good practice recognised by the review included transparency with applications and feedback, the online application system and the Employers' Forums.

In July, the main agenda item was a discussion of the Bond Review report. PAC members shared their organisations' structures to facilitate knowledge exchange and their views of the report and its recommendations. PAC subsequently prepared a commentary on the Bond Review report for the IMA Bond Task and Finish Group and Executive Board.

Despite efforts to secure a host for an Employers Forum this year, we were unable to do so. Instead, a conference on Knowledge Exchange was held in early December which provided an opportunity to further IMA's Bond related activity. Keynote speakers included Dietmar Hoemberg, Hilary Ockendon, Heather Tewkesbury, Nira Chamberlain and Philip Bond.

The committee thanked Nira Chamberlain for chairing PAC for the past two years, and welcomed Richard Pinch as the new Chair from January 2019.

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.

Mathematics Today

The Catherine Richards Prize continues to select the best article published each year. The 2018 prize was awarded to Alan Champneys CMATH FIMA for his Westward Ho! article, from the December issue, on 'Permutation Poetry and Chaotic Collaboration'.

The Early Career Mathematicians Catherine Richards Prize has been rebranded the Graham Hoare Prize. The 2018 prize was awarded to Kristian Kiradjev for his excellent article 'Connecting the Dots with Pick's theorem', which was published in the December 2018 issue.

IMA Website and Social Media

To foster engagement and raise awareness of the IMA our Communications Committee is encouraging regional branches to record talks, or broadcast to the Internet live when possible. So far two talks have been broadcast via Facebook Live and have received 988 views.

The IMA's presence on social media has increased over the year. We have gained over 2,100 followers on Twitter in the last 12 months. Our LinkedIn company page has over 17,000 likes. The IMA's Facebook group has over 3,800 members.

Google collects demographic information about its users which it partially shares with us via our Google Analytics account. This demographic information extends to age and gender. Demographic information provided by Google Analytics of the visitors to the IMA website has been informative: in 2018 more than half of the visitors to the IMA site have been under 34 years of age (55.34%); and the gender distribution of total visitors is around 61/39 split of male to female (in comparison to the total IMA member split of 77/23 male to female).

IMA e16plus Newsletter

The e16plus Newsletter published six full editions in 2018. It is designed to inspire and raise interest in mathematics amongst 16 to 19 year olds and has gained 1,063 subscribers. The regular puzzle feature continues to be popular with readers, and the links in the newsletter have been redesigned to focus on encouraging engagement with MathsCareers and the IMA website.

Branches

Branches continue to be an important feature of the IMA, providing regional networking opportunities. They are run by committees of local members, with administrative support provided by the Secretariat.

The six active branches have held varied programmes of events for their members during 2018 and plans for the 2019 programme of talks are underway in all areas. Members are encouraged to check the website for the latest branch activities in their region, and update their branch membership on myIMA to ensure that relevant circulations are received. Efforts to

record talks and/or broadcast them via social media are expected to develop over the next year.

Some areas of the UK remain unrepresented by branches; members are encouraged to consider establishing new branches in these areas, for which Secretariat assistance continues to be a high priority. It is hoped that the Irish branch will soon be re-activated.

Diversity

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. By identifying diversity as a cross-cutting theme in all IMA committee meetings many improvements have been identified and achieved. An anonymous diversity survey is planned for 2019.

MEMBERSHIP

The Membership Committee, chaired by Dr Charles Evans, is delegated, by Council, to assess individual membership applications. The Membership Committee is currently made up of 12 Chartered Mathematicians 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.

We have had the privilege to welcome: 26 new Fellows; 56 new Members; 26 new Chartered Mathematicians and/or Chartered Scientists; and over 740 new Associate Members, Students and Affiliates. We have also had the great pleasure to support over 100 members transferring to higher grades.

Membership figures as at 31 December 2018 are:

Honorary Fellow	17
Fellow	1,404
Member	1,327
Associate Member	1,673
Affiliate	348
Student	429
Total	5198

This represents a growth of 231 members in one year.

Of the above memberships, 1,625 were registered as Chartered Mathematicians and 222 as Chartered Scientists.

The Institute has continued to support UK University Mathematics Departments by awarding over 120 IMA Graduate Prize Memberships in 2018.

Chartered Mathematics Teacher

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. Dr Charles Evans, the chair of the Institute's Membership Committee, also chairs the Chartered Mathematics Teacher Registration Authority.

We now have 49 active Chartered Mathematics Teachers.

Membership Development Scheme

We reported last year that in July 2017 Council spent a weekend undertaking a strategic review; and that the key recommendation was to advance a Membership Development Scheme using Marketing and Communications as the key themes. A Task Group was established in May 2018 to oversee and support this initiative. A membership survey was conducted June/July. The survey focussed on the experience and perceptions of IMA members, specifically in relation to member services and activities, and the value members attach to them. The aim of the survey was to inform the membership development strategy and act as a starting point for the Task Group, as reported in the December issue of *Mathematics Today*.

A Communications and Marketing plan was produced in the autumn, with a view to advance these actions with a new external marketing specialist starting in January 2019.

GOVERNANCE

Professor Alistair Fitt, who became IMA President on 1 January 2018, chaired Council as it considered all the issues in this report.

Council was pleased to welcome the following four new elected and one re-elected members in the 2018

Council election: Mr Chris Chipperton (elected), Dr Snezana Lawrence (elected), Professor Andrew Osbaldestin (elected), Dr Serge Plata (elected) and Professor Nigel Steele (re-elected).

Additionally, Miss Karrie Liu was co-opted to Council in March 2018.

Council continued to work on its strategy development, in particular via the Membership Development Scheme (Communications and Marketing) Task Group. Further investment in this area will take place in 2019.

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

Executive Board

The Executive Board involves all Honorary Officers of the Institute together with Professor Nigel Steele and Dr Alan Stevens, as well as selected staff members from the Secretariat. The Executive Board continues to work very well with a role that is clearly complementary to that of Council.

IMA Committees

Details of leading IMA Committees are shown on the Governance webpages.

EXTERNAL RELATIONS

UK Mathematics Organisations

Council for the Mathematical Sciences (CMS)

CMS is composed of IMA, LMS, RSS, EdMS, and ORS. Professor Sir Ian Diamond FBA, FRSE, FAcSS took over from Professor Sir Adrian Smith FRS as chair of the Council for the Mathematical Sciences in September 2018. Many outside mathematics do not see the need for so many mathematics organisations. Those who only wish to deal with one organisation often deal with CMS.

A number of activities that relate to education and research were advanced together with our sister societies within CMS.

CMS held a series of meetings with the Royal

Society to advance the best framework for ACME, which has now become a fully integrated committee of the Royal Society. CMS was delighted that Professor Frank Kelly is the chair of ACME.

CMS continued to promote the needs of mathematics to BEIS, DfE, UKRI, the House of Commons Science and Technology Committee, the House of Lords Science and Technology Committee, and the Scottish Funding Council.

CMS welcomed the Bond Review Report and is funding a task force to recommend how its recommendations may be advanced.

Following the UK Referendum on Membership of the EU, CMS continued to promote full collaboration in the mathematical sciences with the EU and international partners on an equally open and reciprocal basis.

CMS continued to promote the Deloitte report, "Measuring the economic benefits of Mathematical Sciences Research in the UK", which found that the contribution of mathematical sciences research to the UK economy is estimated to represent approximately ten per cent of all UK jobs (2.8m) and approximately sixteen per cent of total UK Gross Value Added (GVA) (£208 billion).

London Mathematical Society (LMS)

Throughout 2018 we continued to work with the LMS in many areas including research, Mathematics Initial Teacher Training Scholarships and mathematics promotion.

Together we also award the David Crighton Medal for Services to Mathematics and the Mathematics Community, and the Christopher Zeeman Medal for Mathematics Promotion.

In 2018 the second joint scientific meeting of the current IMA-LMS series took place at De Morgan House in celebration of the 100th Anniversary of Emmy Noether's paper on Conservation Laws.

The IMA continues to rent an office at De Morgan House. This facility allows us to maintain an excellent working relationship with the LMS.

The IMA Council continues to affirm that it wishes to fully embrace the concepts and principles of a New Unified Mathematics Society, and hopes that through constructive engagement the LMS and the IMA will be able to achieve this goal jointly at an agreed date in the future.

Other UK Mathematics Organisations

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

The IMA has a representative who is an invited observer to the HoDoMS meetings and activities. The IMA always seeks to develop its higher education strategy in agreement with HoDoMS and the LMS.

UK SET and Others

Science Council

The IMA is a member of Science Council and continues to work cooperatively with Science Council to promote science, including mathematics, to Government.

Throughout 2018 the Chartered Scientist designation has continued to be popular with members with 222 holding the designation.

International

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.

EuMS and Euromech

The IMA is a member of both of these organisations, and IMA members can pay their subscriptions via

Catherine Richards House.

ICIAM

The International Council for Industrial and Applied Mathematics was pleased to have IMA representation at the annual board meeting and industrial mathematics workshop in Valencia, the host for the 2019 conference. We contributed to the nomination of invited speakers for 2019, the election of the next president Yuan Ya-Xiang (a former student of Mike Powell), and the decision to award the 2023 conference to Tokyo.

A list of members who represented the IMA to STEM organisations in 2018 is presented in Appendix B.

SECRETARIAT

The Institute staffing at 1 /1/ 19 was:

Executive Director – David Youdan;

Assistant Director – Alan Peacock;

Assistant Project Manager (Scholarships) – Lucy Dunford;

Conference and Administration Assistant – Cerys Thompson;

Conference Officer – Maya Everson;

Editorial Officer – Rebecca Waters;

Education Manager – Vanessa Thorogood;

Executive Manager – Alison Penry;

Finance Manager – Lynda Jones;

Membership Manager – Caroline Irwin;

Services Officer – Gemma Reeves;

Services Officer – Joanna Baldacci;

Services Officer – Eugene Kidwell;

University Liaison Officer (0.7 FTE.) – Erica Tyson;

Administration Officer (part-time) – Karen Hedderley;

Administration Assistant (part-time) – Debbie Sullivan;

Conference Support Officer (part-time) – Pamela Bye;

Finance Assistant (part-time) – Joanne Neale;

Membership Officer (part-time) – Natalie Stanton.

FINANCE

The final result was a surplus of £56k, including £26k of QJMAM Trustees unallocated grant funding, compared with a budget deficit of £82k. (The IMA administers the QJMAM Trustees grants for an administration fee.)

At the end of 2018 the total assets less current liabilities was £1,085,402. In 2017 the equivalent figure was £1,029,280.

Funds were used to support our charitable aims. There is a clear public benefit in our activities to support education, run educational conferences, to support mathematics to Government, and to regulate the professions of Chartered Mathematician and Chartered Mathematics Teacher.

Members receive a membership publication: Mathematics Today, six times a year. The revenue received from members' subscriptions exceeds the cost of providing membership services. The subscription surplus is spent on meeting our charitable objectives.

Notes to the Financial Statements for the year ended 31 December 2018

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 2019.

The IMA Trustees

TRUSTEES' RESPONSIBILITIES IN THE PREPARATION OF FINANCIAL STATEMENTS

The Trustees (Council members) are responsible for preparing the Trustees' Annual Report and the Financial Statements in accordance with applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

The Royal Charter of Incorporation and the law applicable to charities in England & Wales requires the Trustees' (Council members) to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the Institute and of the incoming resources and application of resources of the Institute for that period. In preparing these financial statements, the Trustees (Council members) are required to:

- select suitable accounting policies and then apply them consistently;
- observe the methods and principles in the Charities SORP;
- make judgements and estimates that are reasonable and prudent;
- state whether applicable accounting standards have been followed, subject to any material departures disclosed and explained in the financial statements and;
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the Institute will continue in business.

The Trustees (Council members) are responsible for keeping proper accounting records that disclose with reasonable accuracy at any time the financial position of the Institute and to enable them to ensure that the financial statements comply with the Charities Act 2011, the Charity (Accounts and Reports) Regulations 2008 and the provisions of the Royal Charter of Incorporation. They are also responsible for safeguarding the assets of the Institute and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

ACCOUNTING POLICIES

The financial statements have been prepared in accordance with Accounting and Reporting by Charities: Statement of Recommended Practice applicable to charities preparing their accounts in accordance with the Financial Reporting Standard in the UK and Republic of Ireland (FRS102) (Charities SORP (FRS102)) as updated by the Charities SORP (FRS102) update bulletin 1, and the Charities Act 2011 and applicable regulations.

Stock is valued at the lower of cost and net realisable value. Net realisable value is based upon estimated selling price less further costs expected to be incurred to completion and disposal. Provision is made for obsolete and slow moving items.

Fixed assets include properties valued by Chartered Surveyors on an existing use/open market basis. Other fixed assets are stated at historical cost. No fixed asset under £250 is capitalised.

Depreciation is provided on all tangible fixed assets other than freehold land at rates calculated to write each asset down to its estimated residual value evenly over its expected useful life, as follows:-

Freehold buildings	2%
Fixtures, fittings and equipment	15%
Computer equipment	33%

All leases are "operating leases" and the annual rentals are charged to the Statement of Financial Activities on a straight line basis over the lease term.

Turnover represents the net amount charged to members and other customers net of Value Added Tax, for subscriptions and other services.

The Institute operates a defined contribution scheme. The amount charged to the Statement of Financial Activities in respect of pension costs and other post-retirement benefits are the contributions in the year.

APPENDIX A

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

We have audited the financial statements of The Institute of Mathematics and its Applications for the year ended 31 December 2018. The financial reporting framework that has been applied in their preparation is applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted Accounting Practice).

This report is made solely to the charity's trustees as a body, in accordance with the Charities Act 2011. Our audit work has been undertaken so that we might state to the charity's trustees those matters we are required to state to them in an auditor's report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the charity and the charity's Trustees as a body, for our audit work, for this report, or for the opinions we have formed.

RESPECTIVE RESPONSIBILITIES OF TRUSTEES AND AUDITOR

As explained more fully in the Statement of Trustees' responsibilities set out on page 14 the trustees are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view.

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. Our responsibility is to audit and express an opinion on the financial statements in accordance with applicable law and International Standards on Auditing (UK and Ireland). Those standards require us to comply with the Auditing Practices Board's (APB's) Ethical Standards for Auditors.

SCOPE OF THE AUDIT OF THE FINANCIAL STATEMENTS

A description of the scope of an audit of financial statements is provided on the Financial Reporting

Council's website:

<https://www.frc.org.uk/auditors/audit-assurance/standards-and-guidance/2016-auditing-standards>

OPINION ON FINANCIAL STATEMENTS

In our opinion the financial statements:

- give a true and fair view of the state of the charity's affairs as at 31 December 2018 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.

MATTERS ON WHICH WE ARE REQUIRED TO REPORT BY EXCEPTION

We have nothing to report in respect of the following matters where the Charities Act 2011 requires us to report to you if, in our opinion:

- the information given in the Trustees' Annual Report is not consistent with the financial statements; or
- the charity has not kept sufficient accounting records; or
- the financial statements are not in agreement with the accounting records and returns; or
- we have not received all the information and explanations we require for our audit.

Croucher Needham (Essex) LLP
Statutory Auditor
Market House
10 Market Walk
Saffron Walden
Essex
CB10 1JZ

Note: Croucher Needham (Essex) LLP is eligible to act as an auditor in terms of section 1212 of the Companies Act 2006

THE INSTITUTE OF MATHEMATICS AND ITS APPLICATIONS

**DETAILED INCOME AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED 31 DECEMBER 2018**

	Unrestricted Funds 2018	Restricted Funds 2018	Total Funds 2018	Total Funds 2017
	£	£	£	£
Incoming resources				
Entrance fees	4,348	-	4,348	3,665
Subscriptions	306,275	-	306,275	296,948
Conference and symposium fees - income	101,274	-	101,274	167,941
Publications income and Institutional subscriptions	575,787	80,000	655,787	516,024
Miscellaneous income	1,970	-	1,970	148
Appeal Fund, donations and bequests	397	-	397	3,541
Interest received	10,390	2	10,392	4,125
Careers in M & 50th Ann	1,144	-	1,144	2,732
Scholarships & HE STEM	191,803	-	191,803	200,035
	<u>1,193,388</u>	<u>80,002</u>	<u>1,273,390</u>	<u>1,195,159</u>
Resources expended				
Salaries, pensions and ni	552,136	-	552,136	515,882
Other staff expenses	17,524	-	17,524	15,710
Rates, insurance, light and heat	29,071	-	29,071	25,180
Telephones	6,803	-	6,803	6,054
General printing, postage and stationery	18,285	-	18,285	17,401
Office equipment, hire and maintenance	2,669	-	2,669	2,589
Council and committees	29,032	-	29,032	32,888
Branches and groups	2,203	-	2,203	1,763
Education	11,015	-	11,015	12,954
Publications (including Maths Today)	84,473	53,745	138,218	69,980
General expenses	9,094	-	9,094	8,330
Bank charges	5,230	-	5,230	5,797
Legal and professional	-	-	-	-
Audit and accountancy	8,167	-	8,167	8,233
Depreciation & amortisation of property	12,570	-	12,570	9,831
Overseas activities	1,848	-	1,848	532
Subscriptions to other bodies	12,799	-	12,799	11,066
Repairs and renewals	1,140	-	1,140	1,658
Web-site expenses	4,680	-	4,680	6,064
Presidential address	2,918	-	2,918	212
Conference direct costs	78,017	-	78,017	125,942
Grants/Networks/Development	55,069	-	55,069	57,438
Strategy Review Weekend	-	-	-	9,530
Information Technology	2,381	-	2,381	3,198
I.T. Consultancy	4,287	-	4,287	4,193
Careers in M & 50th Ann	13,268	-	13,268	12,656
Scholarships & HE STEM	140,462	-	140,462	141,991
De Morgan House rental	12,909	-	12,909	11,494
De Morgan House furnishings	473	-	473	64
De Morgan House other	4,825	-	4,825	4,913
18 Nelson Street	8,000	-	8,000	8,000
Development - SRW	5,224	-	5,224	-
Development - Membership Growth	11,175	-	11,175	15,618
Development - Database & Web	9,745	-	9,745	14,117
Development - Services	5,830	-	5,830	10,225
Decreased stock	201	-	201	46
	<u>1,163,523</u>	<u>53,745</u>	<u>1,217,268</u>	<u>1,171,549</u>
RETAINED (DEFICIT)/SURPLUS FOR THE YEAR	<u>29,865</u>	<u>26,257</u>	<u>56,122</u>	<u>23,610</u>

APPENDIX A

**THE INSTITUTE OF MATHEMATICS AND ITS APPLICATIONS
BALANCE SHEET AS AT 31ST DECEMBER 2018**

	<u>31-Dec</u> <u>2018</u> £		£	<u>31-Dec</u> <u>2017</u> £	£
FIXED ASSETS					
Freehold Property	105,824			110,424	
Fixtures and equipment	<u>12,291</u>			<u>8,149</u>	
		118,115			118,573
CURRENT ASSETS					
Stocks	974			1,175	
Trade debtors	38,292			38,313	
Prepayments and accrued inc.	62,304			38,004	
Cash at bank and in hand	1,299,386	34,366		1,282,551	
	<u>1,400,956</u>	<u>34,366</u>	1,435,322	<u>1,360,043</u>	
CREDITORS due within 1 year	<u>464,995</u>	3,040	468,035	<u>449,336</u>	
NET CURRENT ASSETS/(LIABILITIES)		<u>967,287</u>		<u>910,707</u>	
		<u>1,085,402</u>		<u>1,029,280</u>	
CAPITAL AND RESERVES					
Income and expenditure account		1,049,902		1,019,857	
Restricted income and expenditure account		31,326		5,068	
Revaluation reserve		4,174		4,355	
		<u>1,085,402</u>		<u>1,029,280</u>	
NOTES					
Creditors due within 1 year					
Trade creditors	40,759			39,717	
Social security and other taxes	64,796			63,406	
Accruals and deferred income	<u>362,480</u>			<u>346,213</u>	
	<u>468,035</u>			<u>449,336</u>	
Income and expenditure account					
Balance as at 1st January 2018	1,029,280				
Surplus for the 12 months	<u>56,122</u>				
Balance as at 31st Dec 2018	<u>1,085,402</u>				

APPENDIX B

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

UK Maths

- **CMS**

Professor A. Fitt (Oxford Brookes University)

Professor E. Mansfield (University of Kent)

Mr D. Youdan (Executive Director)

- **Heads of Departments of Mathematical Sciences**

Mr. M. Grove (University of Birmingham)

- **Joint Mathematical Council**

Mr C. Chipperton (Formerly Alban C of E Academy)

- **sigma**

Mr M. Grove (University of Birmingham)

International

- **ICIAM**

Professor I.D. Abrahams (Isaac Newton Institute for Mathematical Sciences)

Professor I. Duff (STFC)

UK SET and Others

- **Engineering Professors' Council**

Professor C. Hobbs (University of the West of England)

- **Engineering UK and Engineering Council**

Dr J. Meeson¹ / Mr A. Peacock² (Assistant Director)

The Institute is a Professional Affiliate of the Engineering Council.

- **EPSRC**

Professor A. Fitt (Oxford Brookes University)

Professor E. Mansfield (University of Kent)

Mr D. Youdan (Executive Director)

- **Science Council**

Dr J. Meeson¹ / Mr A. Peacock² (Assistant Director)

Mr D. Youdan (Executive Director)

¹ Until 30 April 2018

² From 1 May 2018