

# **Annual Report to Members 2017**



## Glossary

**ACME** — Advisory Committee on Mathematics Education

**AR** — Academic Representative(s)

**AWE** — Atomic Weapons Establishment

**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

**FE** — Further Education

**FRS** — Fellow of the Royal Society

**FTE** — Full Time Equivalent

**GCHQ** — Government Communications Headquarters

**HEdSA** — Higher Education Services Area

**HEFCE** — Higher Education Funding Council for England

**HEI** — Higher Education Institutions

**HoDoMS** — Heads of Departments of Mathematical Sciences

**ICIAM** — International Council for Industrial and Applied Mathematics

**ICT** — Information, Communications, Technology

**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

**Ofqual** — Office of the Qualifications and Examinations Regulator

**ORS** — Operational Research Society

**OUP** — Oxford University Press

**PSRB** — Professional, Statutory and Regulatory Bodies

**QAA** — Quality Assurance Agency for Higher Education

**QMUL** — Queen Mary, University of London

**RCUK** — Research Councils UK

**REF2021** — Research Excellence Framework 2021

**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

**SKE** — Subject Knowledge Enhancement

**SORP** — Statements of Recommended Practice

**STEM** — Science, Technology, Engineering and Mathematics

**TSST** — Teacher Subject Specialism Training

**UCL** — University College London

**ULO** — University Liaison Officer

**UWE** — University of the West of England

## **INTRODUCTION**

2017 was another good year for the IMA.

We ran the Department for Education Mathematics Initial Teacher Training Scholarships scheme for a fifth successful year recommending 278 outstanding applicants for scholarship funds, and were awarded a grant to repeat the process for a sixth year.

Our eStudent undergraduate programme continues to mature. We now have more eStudents than we have traditional members. At December 2017 there were 8,400 eStudents.

An exciting new initiative in 2017 was the establishment of IMA Academic Representatives in universities which will complement the work of our University Liaison Team. The initiative has begun strongly with Representatives in 56 universities who will 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 welcoming 700 delegates.

Our sixth Employers' Forum was hosted by EDF at its Barnwood site on the topic of Diversity, Inclusivity and Employability.

The Mathematics Matters research cases studies are now in their fifth phase which focuses on the ubiquity of mathematics. It will highlight mathematics research in a wide and surprising variety of applications including the creation of original music, the restoration of paintings and understanding social networks. Papers from the existing phases may be found on the IMA website under Publications.

We played a leading role with the CMS in the inclusion of mathematics within STEM for Britain at Parliament (renamed to highlight the inclusion of mathematics).

The IMA ran the biggest maths stand in the biggest Big Bang ever. 65,000+ students and parents in four days!

With our great thanks to the University of Greenwich

we held the 2017 IMA Festival of Mathematics on 27 and 28 June. 'Greenwich Maths Time' included talks, workshops, hands-on displays and exhibitions, aimed at a broad audience of schools and families, teachers, and practising mathematicians in industry and academia. The Festival was supported by the IMA, the University of Greenwich, the OR Society, and FDM.

The IMA MathsCareers website attracted over 500,000 visits during the year (a huge increase) and it has over 5,930 followers on Twitter. We also issued six more editions of our e16plus newsletter.

Council held a Strategy Review Weekend in July which was reported in the February 2018 issue of Mathematics Today.

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

Council would like to thank John Meeson, Assistant Director, for his enormous contributions over the last eight and a half years, in this, his last full year with the IMA.

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 fifth DfE / NCTL grant to run the Mathematics Teacher Training Scholarships scheme.

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

On 13 March Tim Pedley chaired the panel of CMS judges who selected the Parliamentary and Scientific Committee STEM for Britain mathematics awards. We were very thankful for the generous sponsorship of these prizes by the Clay Mathematics Institute and the Heilbronn Institute. This is the largest science event held in the Houses of Parliament annually, with the aim of strengthening our dialogue with

the aim of strengthening our dialogue with Parliamentarians.

The Voice of the Future event took place on 15 March 2017 at Portcullis House. The event, organised as part of National Science and Engineering Week, was an opportunity for scientists aged 16-35 to put questions to a panel of MPs.

The Parliamentary Links Day took place on 27 June at the Houses of Parliament with the theme being 'UK Science and Global Opportunities'.

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

## SERVICES TO MATHEMATICS

### ***Big Bang***

In 2017, the Big Bang Science and Engineering Fair was held in the Birmingham NEC, its now customary venue. 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 both IMA Outreach Kits, the Space Shuttle simulator and the Foam Cube Challenge. All the items proved very successful with visitors. The IMA was fortunate in being supported by enthusiastic students from local universities and also Bath. It is rewarding to record that all of the students who will be available next year, requested the opportunity to support the event again.

The IMA stand was as busy as ever as 65,000 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 2017. 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.

Research Committee nominated a young researcher to participate in the "Voice of the Future 2017" event, which provided a unique opportunity for young scientists and engineers to enjoy a 'Science Question Time' with members of the House of Commons Select Committee on Science and Technology.

Throughout the year, Research Committee submitted evidence to several inquiries and made nominations to various bodies. These activities included:

- responding to the BEIS consultation on the Green Paper, 'Building Our Industrial Strategy';
- submitting evidence to the House of Commons Science and Technology Select Committee inquiry on 'Algorithms in public and business decision-making';
- providing written evidence to the House of Lords Select Committee inquiry on 'Artificial Intelligence';
- making nominations for membership of the Mathematical Sciences sub-panel of REF2021.
- giving consideration to the nomination of candidates in response to calls for nominations to national and international prizes in the mathematical sciences
- responding to the EPSRC call for nominations to fill vacancies on EPSRC Strategic Advisory Teams.

Our President (2016-17), 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 print journals:

- *IMA Journal of Applied Mathematics*  
Editors: Alan Champneys, (Bristol); Yibin Fu, (Keele) 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: Nicos Karcanias, (City), Christophe Prieur, (Gipsa-lab CNRS/Univ. Grenoble), and Sarah Spurgeon, (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, (Newman); Christopher Sangwin, (Loughborough) and Anne Watson, (Oxford).

A new journal, *Transactions of Mathematics and its Applications*, was launched during 2016. This is an entirely online Open Access Journal. The Editor in Chief is Arieh Iserles (Cambridge). All of the IMA journals are fully compliant with the RCUK Open Access Policy.

Five journals currently have impact factors (IF). During the most recent assessment period the IF increased for all journals except *IMA Numerical Analysis* and *IMA Applied Maths*, and these had only small decreases. *Mathematical Medicine & Biology* and *IMA Management Mathematics* both had substantial increases.

## Conferences

The conference programme for 2017 is summarised below:

- *IMA Early Career Mathematicians' Spring Conference 2017*, 4 March 2017, Auto Trader, Manchester
- *IMA Mathematics 2017*, 23 March 2017, Mary Ward House, London

- *IMA and OR Society Conference on Mathematics of Operational Research*, 20 – 21 April 2017, Aston University, Birmingham
- *2nd IMA Conference on Nonlinearity and Coherent Structures*, 19 – 21 June 2017, University of East Anglia, UK
- *16+ School Student Event*, 3 July 2017, Loughborough University
- *IMA Conference on Mathematics Education beyond 16: pathways and transitions*, 10 - 12 July 2017, University of Birmingham
- *IMA Conference on Inverse Problems from Theory to Application*, 19 - 21 September 2017, Isaac Newton Institute, Cambridge, UK
- *IMA Early Career Mathematicians' Autumn Conference 2017*, 21 October 2017, University of Edinburgh
- *5th IMA Conference on Mathematics in Defence*, 23 November 2017, The Royal Military Academy Sandhurst
- *16th IMA Conference on Cryptography and Coding*, 12-14 December, St Catherine's College, University of Oxford

This programme of conferences and meetings was typical of the busy and varied series that the IMA delivers for the community. The majority of feedback was positive. 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.

According to audited accounts, conferences were subsidised in 2017 by the IMA by £66,375. However, excluding overheads, the subsidy was £39,406 against a budgeted ceiling set by Finance Committee of £43,500. Nevertheless, members are urged to explain to critics in some university departments that prices are based on costs and perhaps to note the level of financial support. When we are charged commercial rates by universities we have to pass these on.

## IMA Lectures

On 3 July a day of mathematics aimed at students in

year 12 was held at Loughborough University. The programme included three excellent talks and a panel discussion which gave students the opportunity to ask questions about maths careers and university entry. There are plans to run a similar lecture programme at UCL in June 2018.

The 2017 IMA Lighthill Lecture at the BAMC in Guildford was presented by Beth Wingate. The title of her talk was “Challenges for climate and weather prediction in the post-Moore’s-Law era of computing”.

### **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.

The budget for 2017 was £20,000 and the Scheme received 55 applications. The total sum requested was £39,587.37. Of these requests, 15 have been paid in full, 26 have received partial funding, and 14 have been declined. The total amount awarded during 2017 was £20,000.

From 2018 the application process will be online via myIMA.

### **Education**

2017 was an active year for mathematics education. Our contribution was led by Mr Michael Grove (Honorary Secretary with responsibility for Education), supported by Professor Nigel Steele (Deputy Honorary Secretary Education), Professor Peter Giblin (Chair, HEdSA), 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 ACME, which has been redefined as a Standing Committee of the Royal Society. Discussions have taken place between The Royal Society, IMA, LMS, RSS and JMC concerning establishing up to four of ‘Contact Groups’ to support the work of ACME.

The *Higher Education Teaching and Learning Series* were established in 2017. This provided 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, nine proposals were received and three were successful. The following three workshops will be held in 2018:

- University of Manchester: *Mathematical Academic Malpractice in the Modern Age*
- UWE: *Alternative approaches to teaching and learning in the mathematical sciences*
- University of Warwick: *Transitions in the Mathematical Sciences*

The Institute wrote to Professor Alison Etheridge (Chair of the Mathematical Sciences sub-panel for the Research Excellence Framework 2021) concerning the mathematics education submissions to the Research Excellence Framework 2021.

The Institute also produced a response welcoming the Smith Review of Post-16 Maths.

### **Higher Education**

Dr Louise Walker (University of Manchester) joined HEdSA.

HEdSA’s activities during 2017 consisted of:

- Attended the Science Council’s Degree

Accreditation Forum, in response to the The Wakeham Review of STEM Degree Accreditation and Graduate Employability

- Responding to the DfE's *Schools that work for everyone Consultation*
- Attended the QAA PSRB Forum, looking at current higher education policy developments, the impact of Brexit for PSRBs, Degree Apprenticeships, data matters and external examiners.
- Attended a meeting on SKE and TSST Courses at The Royal Society.

### **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 57 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**

Three new members joined the S&FE Committee in 2017; Simon Mazumder (Altrincham Grammar School for Girls and NW1 Maths Hub Lead), Nicola Smith (Rochdale Sixth Form College) and Peter Whitehead (Ealing, Hammersmith and West London College)

The S&FE Committee's activities during 2017:

- Responded to the DfE *Functional Skills Consultation*
- Responded to Ofqual's consultation on *Revised Regulatory Requirements for Functional Skills*

### **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 2017 the Education Grants scheme received 26

applications; of which five were awarded grants for the full amount requested, six received a reduced grant and 15 were declined.

The Education Grants awarded a total of £4,816 in 2017.

Applications approved for 2017 are shown from the on the Institute's website.

### **School Speaker**

In 2017 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. Two universities, the University of Bolton and Liverpool John Moores University, continue to offer the Polymaths course. A total of 37 people were awarded the Polymaths certificate in 2017.

### **IMA MathsCareers**

The IMA MathsCareers website has performed well during 2017, regularly receiving over 40,000 visits per month. During 2017 the site received 517,613 visits. The site is one of the top websites of its kind within the STEM community and analysis of visitors shows that it is popular among school audiences as well as undergraduates seeking career advice. Based on audience analysis, new content on the site during 2017 was aimed at undergraduates and post-16 students with a focus on career choices and work experience.

Social Media is used to raise the profile of IMA MathsCareers, and it now has 5,930 followers on Twitter including a number of 'verified' followers. The profile of the site, as well as mathematics generally, is raised via the distribution of classroom materials such as posters and cards. These were sent to over 100 schools during 2017.

### **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 National College of Teaching and Leadership. 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 2016/2017 scheme was announced and opened for applications in October 2016, with a target of awarding 150 Scholarships to those who commence secondary mathematics teacher training in the 2017/18 academic year. Year 5 of the Maths Scholarships was our biggest success to date, receiving a record number of applications (685) and awarding 278 Scholarships.

The sixth year (2017/2018) of the Mathematics Teacher Training Scholarships was launched on the 16 October 2017. The Scholarships are now worth £22,000, with two early-career payments of £5,000 each (or £7,500 if teaching in selected local authorities) in their third and fifth year of teaching, if they have taught in a state-funded school in England since completing their ITT course.

There are 269 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 awareness and participation with the IMA amongst students and the university community; leading in the longer term to increased membership.

Liaison activity comprises grants to mathematical societies, careers talks for mathematics undergraduates and supporting careers events and student conferences.

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

2017 has seen the continued growth in the eStudent number to 8,400 and continuing strong student attendance at the ECM conferences in Manchester and Edinburgh and the Tomorrow's Mathematicians

Today conference at Manchester Metropolitan University. The six newsletters had careers themes of Aerospace; Software; Defence and Cyber Security; Business; Teaching and Data Science

In 2017 £9,760 was paid in grants to the Mathematical societies of the Universities of Aberdeen, Aberystwyth, Aston, Bath, Derby, Dundee, Glasgow, Greenwich, Heriot-Watt, Imperial, Lincoln, Newcastle, Oxford Mirzakhani Society, QMUL, Surrey, UCL, Warwick and York. This total also includes 6 Joint Chapter awards to Bath, Cambridge, Cardiff, Manchester, Reading and Strathclyde. Additionally, a further total amount of £2,600 was paid in 2017 to support the Tomorrow's Mathematicians Today Conference, the Young Researchers in Mathematics Conference, the MEI Teachers' Conference, speakers at the SIAM UKIE Conferences and prizes for the Oxford Industrially Focused Mathematical Modelling (InFoMM) Camp. Society activities supported included networking events, talks and participation in IMA conferences. The University Liaison Officer (ULO) delivered 39 talks & 3 workshops and supported 7 careers fairs and 6 conferences including the MEI Teachers' conference, the InFoMM camp and 2 sixth form events. Maths Careers Ambassadors delivered 4 talks and supported 3 careers fairs and 3 conferences. The Postgraduate Liaison Officer supported 3 conferences. 44 universities were visited.

### ***Academic Representatives***

The Institute initiated this scheme in 2017, and has recruited 57 Representatives at 56 universities to date. 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 forum event for Representatives was held on 11 January 2017 which was well attended. During 2017 3 AR Newsletters were sent to help to grow the full membership of students and academics. It is planned that the scheme will develop further throughout 2018.

### ***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 AutoTrader’s Manchester headquarters and Edinburgh respectively. Both conferences were well-attended and 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 younger members and is also highly active on a range of social networking sites.

### **Professional Affairs**

Professional Affairs initiatives are progressing well. The Employers’ Forum scheme has followed successes at EDF Energy, AWE, GCHQ, Rolls-Royce and Dstl with a sixth event, this year returning to EDF Energy. The event was led by Dr Lindsay Worthy at EDF’s facility at Barnwood in Gloucestershire. The topic, Diversity, Inclusivity and Employability, attracted around sixty delegates from industry, commerce, and academia. Presentations were made by representatives from a wide variety of organisations which employ or represent mathematicians including Babcock International, Dstl, AWE, University of Bath, Women in Nuclear and EDF Energy.

In 2017 the Chair of the Professional Affairs Committee, Professor Chris Greenough, stepped down from his role after 14 years of valuable service for which we would like to express our sincere thanks. Dr Nira Chamberlain of Babcock International took over as Chair following Professor Greenough’s departure.

The Professional Affairs Committee led the IMA response to the call for evidence into the Review of Knowledge Exchange in the Mathematical Sciences (the ‘Bond Review’).

At present, our Corporate Affiliates include representatives from:

- Defence Science and Technology Laboratory
- EDF Energy
- Government Communication Headquarters
- MBDA
- MEI

- Met Office
- QinetiQ
- Rolls-Royce
- Smith Institute
- Tesco
- Tessella
- Thales Research and Technology (UK) Ltd
- Vodafone

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

In addition, we have over 125 organisations listed on the IMA website as Friends of Mathematics across a range of sectors: aeronautics, consulting, defence, energy, engineering, finance, ICT, manufacturing, pharmaceuticals, research, science and transport.

### **Mathematics Today**

The Catherine Richards Prize continues to select the best article published each year. The 2017 prize was awarded to Alan Champneys for ‘Westward Ho! Musing on Mathematics and Mechanics: Boardmasters’. The ‘Westward Ho!’ series was added in 2017 and is an outstanding addition to the entertaining ‘Urban Maths’, ‘Historical Notes’ and ‘A Doctor Writes ...’ series.

The 2017 Early Career Mathematicians Catherine Richards Prize competition was won by Kristian Kiradjev for his excellent article ‘Exploring Steiner Chains with Möbius Transformations’, which was published in the December 2017 issue.

### **IMA Website and Social Media**

The redesigned IMA.org.uk website was launched on 20 March 2017. This redesign added many features to the IMA website. One of these changes made the website responsive, making it so the website display adapts to correctly display on mobiles and tablets. Another change was for the site to have the ability to display LaTeX.

The IMA’s presence on social media has increased over the year. We have gained just under 2,000 followers on Twitter in the last 12 months. Our

LinkedIn company page has nearly 17,000 likes. The IMA's Facebook group has over 3,500 likes.

### **IMA e16plus Newsletter**

The e16plus Newsletter published six full editions in 2017. It is designed to inspire and raise interest in mathematics amongst 16 to 19 year olds and has gained 891 subscribers. Changes made during 2017 mean that the newsletter has been reduced slightly in length and sent more frequently. It is now sent out six times a year, at the start of every half term. A regular puzzle feature was introduced this year, giving entrants the chance to win a MathsCareers mug. This has proved popular with readers.

### **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 2017 and plans for the 2018 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 circulations are received. The President continued his tour by visiting the remaining active branches, ending with a talk hosted by the West Midlands branch.

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. In addition to a range of improving practice throughout the IMA, Diversity was a key element of

this year's Employers' Forum.

## **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 14 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: 32 new Fellows; 52 new Members; 21 new Chartered Mathematicians and/or Chartered Scientists; and over 770 new Associate Members, Students and Affiliates. We have also had the great pleasure to support over 250 members transferring to higher grades.

Membership figures as at 31 December 2017 are:

Honorary Fellow	17
Fellow	1,398
Member	1,318
Associate Member	1,505
Affiliate	309
Student	420
<b>Total</b>	<b>4,967</b>

In addition to this the Institute has 8,400 eStudents making our total figures, as at 31 December 2017:

<b>TOTAL</b>	<b>13,367</b>
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This represents a growth of 10% in one year.

Of the above memberships, 1,679 were registered as Chartered Mathematicians and 234 as Chartered Scientists.

### **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 47 active Chartered Mathematics Teachers.

## **GOVERNANCE**

Professor Chris Linton, who became IMA President on 1 January 2016, chaired Council as it considered all the issues in this report.

Council was pleased to welcome the following three new elected and two re-elected members in the 2017 Council election: Dr Rachel Bearon (elected), Professor Richard Craster (elected), Professor Paul Glaister (re-elected), Dr Jennifer Macey (re-elected) and Mr Nathan Turner (elected).

Additionally, Dr Nira Chamberlain became Vice President Professional Affairs and Industry, and Mr Michael Grove took up the role of Honorary Secretary with responsibility for Education.

In July 2017, Council and several members of the Secretariat spent a weekend undertaking a strategic review of activities. A report on the weekend was within the February issue of Mathematics Today. Council included £35k in the 2018 budget to advance its key recommendation to advance a Membership Development Scheme using Marketing and Communications as the key themes.

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 Adrian Smith FRS Hon. FIMA is the Chair of CMS. 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 new chair of ACME.

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

CMS held a reception at Parliament in February on the theme of 'Maths Education'. Speakers included Sir Adrian Smith, CMS Chair, and Frank Kelly (Chair of ACME). The event was attended by MPs, mathematicians, representatives from education, industry and other STEM organisations.

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 2017 we continued to work with the LMS in many areas including research, Mathematics Initial Teacher Training Scholarships and mathematics promotion. The LMS continues to provide the Joint Promotion of Mathematics Unit that the IMA Council supports with an annual grant of £5,000. The unit's work includes responding to the media, initiation of press releases and influencing policy makers concerning the benefits of mathematics.

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 2017 the first joint scientific meeting of the IMA and LMS took place at De Morgan House on the topic of 'Symmetry and Computation'.

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, 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 2017 the Chartered Scientist designation has continued to be popular with members with 234 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 2017 is presented in Appendix B.

### ***SECRETARIAT***

The Institute staffing at the end of the year was:

Executive Director – David Youdan  
Assistant Director – John Meeson  
Administration Officer – Lucy Dunford  
Conference Officer – Lizzi Lake  
Editorial Officer – Rebecca Waters  
Education Manager – Vanessa Thorogood  
Executive Manager – Alison Penry  
Finance Manager – Lynda Jones

Membership Assistant – Melanie Bard  
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  
Postgraduate Liaison Officer (part-time) – Daniel Cheng

## **FINANCE**

The final result was a surplus of £23.6k, compared with a budget deficit of £107.7k.

At the end of 2017 the total assets less current liabilities was £1,029,280. In 2016 the equivalent figure was £1,005,670.

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 2017***

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 2018.

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 2017. 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: [http://www.frc.org.uk/Our-Work/Codes-Standards/Audit-and-assurance/Standards-and-guidance/Standards-and-guidance-for-auditors/Scope-of-audit/UK-Private-Sector-Entity-\(issued-1-December-2010\).aspx](http://www.frc.org.uk/Our-Work/Codes-Standards/Audit-and-assurance/Standards-and-guidance/Standards-and-guidance-for-auditors/Scope-of-audit/UK-Private-Sector-Entity-(issued-1-December-2010).aspx)

### **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 2017 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 2017**

	Unrestricted Funds 2017 £	Restricted Funds 2017 £	Total Funds 2017 £	Total Funds 2016 £
<b>Incoming resources</b>				
Entrance fees	3,665	-	3,665	3,206
Subscriptions	296,948	-	296,948	286,346
Conference and symposium fees - income	167,941	-	167,941	140,443
Publications income and Institutional subscriptions	516,024	-	516,024	504,560
Miscellaneous income	148	-	148	568
Appeal Fund, donations and bequests	3,491	50	3,541	274
Interest received	4,124	1	4,125	9,281
Careers in M & 50th Ann	2,732	-	2,732	2,896
Scholarships & HE STEM	200,035	-	200,035	171,624
	<u>1,195,108</u>	<u>51</u>	<u>1,195,159</u>	<u>1,119,198</u>
<b>Resources expended</b>				
Salaries, pensions and ni	515,882		515,882	515,618
Other staff expenses	15,710		15,710	16,358
Rates, insurance, light and heat	25,180		25,180	26,406
Telephones	6,054		6,054	5,051
General printing, postage and stationery	17,401		17,401	19,302
Office equipment, hire and maintenance	2,589		2,589	2,068
Council and committees	32,888		32,888	32,837
Branches and groups	1,763		1,763	836
Education	12,954		12,954	10,627
Publications (including Maths Today)	67,942	2,038	69,980	74,240
General expenses	8,330		8,330	6,490
Bank charges	5,797		5,797	3,863
Legal and professional	-		-	-
Audit and accountancy	8,233		8,233	8,039
Depreciation & amortisation of property	9,831		9,831	6,423
Overseas activities	532		532	-
Subscriptions to other bodies	11,066		11,066	10,144
Repairs and renewals	1,658		1,658	465
Web-site expenses	6,064		6,064	4,785
Presidential address	212		212	3,719
Conference direct costs	125,942		125,942	118,236
Grants/Networks/Development	57,438		57,438	79,356
Strategy Review Weekend	9,530		9,530	-
Information Technology	3,198		3,198	2,683
I.T. Consultancy	4,193		4,193	2,013
Careers in M & 50th Ann	12,656		12,656	10,458
Scholarships & HE STEM	141,991		141,991	119,335
De Morgan House rental	11,494		11,494	11,421
De Morgan House furnishings	64		64	179
De Morgan House other	4,913		4,913	4,431
18 Nelson Street	8,000		8,000	8,000
Development - Membership Growth	15,618		15,618	-
Development - Database & Web	14,117		14,117	14,570
Development - Services	10,225		10,225	13,783
Decreased stock	46		46	15
	<u>1,169,511</u>	<u>2,038</u>	<u>1,171,549</u>	<u>1,131,751</u>
<b>RETAINED (DEFICIT)/SURPLUS FOR THE YEAR</b>	<u>25,597</u>	<u>(1,987)</u>	<u>23,610</u>	<u>(12,553)</u>

**THE INSTITUTE OF MATHEMATICS AND ITS APPLICATIONS  
BALANCE SHEET AS AT 31ST DECEMBER 2017**

	<u>31-Dec</u> <u>2017</u> £		<u>31-Dec</u> <u>2016</u> £	£
<b>FIXED ASSETS</b>				
Freehold Property	110,424		115,024	
Fixtures and equipment	<u>8,149</u>		<u>1,381</u>	
		118,573		116,405
<b>CURRENT ASSETS</b>				
Stocks	1,175		1,222	
Trade debtors	38,313		700	
Prepayments and accrued inc.	38,004		36,924	
Cash at bank and in hand	<u>1,276,431</u>	<u>6,120</u>	<u>1,262,462</u>	
	1,353,923	6,120	1,301,308	
CREDITORS due within 1 year	<u>446,296</u>	3,040	<u>412,043</u>	
<b>NET CURRENT ASSETS/(LIABILITIES)</b>		<u>910,707</u>		<u>889,265</u>
		<u>1,029,280</u>		<u>1,005,670</u>
<b>CAPITAL AND RESERVES</b>				
Income and expenditure account		1,019,857		994,079
Restricted income and expenditure account		5,068		7,055
Revaluation reserve		<u>4,355</u>		<u>4,536</u>
		<u>1,029,280</u>		<u>1,005,670</u>
<b>NOTES</b>				
Creditors due within 1 year				
Trade creditors	39,717		27,156	
Social security and other taxes	63,406		60,108	
Accruals and deferred income	<u>346,213</u>		<u>324,779</u>	
	<u>449,336</u>		<u>412,043</u>	
Income and expenditure account				
Balance as at 1st January 2017	1,005,670			
Surplus for the 12 months	<u>23,610</u>			
Balance as at 31st Dec 2017	<u>1,029,280</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 C. Linton (Loughborough University)  
Professor E. Mansfield (University of Kent)  
Mr D. Youdan (Executive Director)

#### **Heads of Departments of Mathematical Sciences**

Professor D. Arrowsmith (Queen Mary University of London)

#### **Joint Mathematical Council**

Mr C. Chipperton (Alban C of E Middle School)

#### **sigma**

Ms N. Bradshaw (University of Greenwich)

### **UK SET and Others**

#### **Engineering Professors' Council**

Dr L. Mustoe (Loughborough University)

#### **Engineering UK and Engineering Council**

Dr J. Meeson (Assistant Director)

The Institute is a Professional Affiliate of the Engineering Council.

#### **EPSRC**

Professor C. Linton (Loughborough University)  
Professor E. Mansfield (University of Kent)  
Mr D. Youdan (Executive Director)

#### **Science Council**

Dr J. Meeson (Assistant Director)  
Professor E. Stansfield  
Mr D. Youdan (Executive Director)

### **International**

#### **ICIAM**

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