

Annual Report to Members 2016



**Institute of
mathematics**
& its applications

Glossary

ACME — Advisory Committee on Mathematics Education
AMET — The Association of Mathematics Education Teachers
APPG — All Party Parliamentary Group
ATM — Association of Teachers of Mathematics
BAMC — British Applied Mathematics Colloquium
BEIS — Department for Business, Energy and Industrial Strategy
CMath — Chartered Mathematician
CMathTeach — Chartered Mathematics Teacher
CMS — Council for the Mathematical Sciences
DfE — Department for Education
DSAC — Defence Scientific Advisory Council
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
GCSE — General Certificate of Secondary Education
HEdSA — Higher Education Services Area
HEFCE — Higher Education Funding Council for England
HEI — Higher Education Institutions
HoDoMS — Heads of Departments of Mathematical Sciences
ICT — Information, Communications, Technology
InFOMM — Industrially Focused Mathematical Modelling
IT — Information Technology
IMA — Institute of Mathematics and its Applications
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
RCUK — Research Councils UK

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
STEM — Science, Technology, Engineering and Mathematics
UCL — University College London
UCLan — University of Central Lancashire
UKIPG — UK Inter-Professional Group
ULO — University Liaison Officer

INTRODUCTION

2016 was another good year for the IMA.

We ran the Department for Education Mathematics Initial Teacher Training Scholarships scheme for a fourth successful year recommending 112 outstanding applicants for scholarship funds, and were awarded a grant to repeat the process for a fifth year.

Our e-Student undergraduate programme continues to mature. We now have more e-Students than we have traditional members. At December 2016 there were 7,440 e-Students.

Our conference team ran 11 events welcoming 732 delegates.

Our fifth Employers' Forum was hosted by Dstl, with a bonus visit to their Military Vehicles and Equipment Exhibition.

We continued to develop our Mathematics Matters case studies that have been so successful.

We played a leading role with the CMS in the inclusion of mathematics within SET for Britain at Parliament. Our researchers and posters were so strong that we have been invited back for 2017 when it will be STEM for Britain!

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

The IMA MathsCareers website attracted over 400,000 visits during the year (a huge increase) and it has over 5,194 followers on Twitter. We also issued three more editions of our e-16+ newsletter.

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 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 7 March Tim Pedley chaired the panel of CMS judges who selected the 'SET for Britain' mathematics awards (which is now run by the Parliamentary and Scientific Committee). We were very thankful for the generous sponsorship of these prizes by the Clay Mathematics Institute and the Bank of England. This is the largest science event held in the Houses of Parliament annually, with the aim of strengthening dialogue with Parliamentarians.

The Voice of the Future event took place on 1 March 2016 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 28 June at the Houses of Parliament. The theme of the 2016 event was 'Brexit', just a few days after the leave vote.

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

SERVICES TO MATHEMATICS

Big Bang

In 2016, 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 2016. 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 2016” 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.

The Research Committee liaised with the IMA Journals Board of Management regarding increasing the representation of diversity in IMA Journals, particularly highlighting the underrepresentation of female journal authors in citations.

The Research Committee worked with the IMA Higher Education committee on the IMA response to the Government higher education green paper, “Fulfilling our Potential: Teaching Excellence, Social Mobility and Student Choice”.

The Research Committee responded to the EPSRC Balancing Capability Call for Evidence 2016. In particular, the IMA contributed by submitting many of the IMA Mathematics Matters case studies which highlight mathematical sciences research in areas funded by EPSRC.

Consideration was given to the nomination of candidates in response to calls for nominations to

national and international prizes in the mathematical sciences.

The Research Committee responded to the EPSRC call for nominations to fill vacancies on EPSRC Strategic Advisory Teams. Our 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 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 Karcanas, (City) 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 and will be further developed during 2017. This will be 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. The *IMA Journal of Numerical Analysis*, the *IMA Journal of Applied Mathematics*, and the *IMA Journal of Management Mathematics* all increased their impact factor during the most recent assessment period.

Conferences

The conference programme for 2016 is summarised below:

- *Early Career Mathematicians' Spring Conference 2016*, University of Birmingham, 5 March 2016
- *Mathematics 2016*, Mary Ward House, London, 17 March 2016
- *8th IMA Conference on Quantitative Modelling in the Management of Health and Social Care (Challenges and Opportunities in a Big Data Era)*, Asia House, London, 21 – 23 March 2016
- *1st IMA Conference on Theoretical and Computational Discrete Mathematics*, The Enterprise Centre, University of Derby, 22 – 23 March 2016
- *IMA Conference on Turbulence, Waves and Mixing (in honour of Julian Hunt's 75th Birthday)*, King's College Cambridge, 6 – 8 July 2016
- *9th IMA International Conference on Modelling in Industrial Maintenance and Reliability (MIMAR)*, Imperial College London, 12 – 14 July 2016
- *4th IMA Conference on Numerical Linear Algebra and Optimisation*, University of Birmingham, 7 – 9 September 2016
- *Early Career Mathematicians' Autumn Conference 2016* University of Warwick, 5 November 2016
- *2nd IMA International Conference on Mathematical Challenges of Big Data*, Mary Ward House, London, 1 – 2 December 2016
- *11th IMA International Conference on Mathematics in Signal Processing*, Austin Court, Birmingham, 12 - 14 December 2016

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 2016 by the IMA by £77,389. However, excluding overheads, the subsidy was £55,963 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

An IMA Lecture for school students, aged 16 – 18, was held at King's College London on 23 June 2016. This successful event was oversubscribed and there are plans to run a similar lecture programme at a Loughborough on 3 July 2017.

The 2016 IMA Lighthill Lecture at the BAMC in Oxford was presented by Martin Bazant. The title of his talk was "Non-equilibrium Thermodynamics Li-Ion Batteries".

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 2016 was £20,000 and the Scheme received 63 applications. The total sum requested was £34,911. Of these requests, 22 have been paid in full, 21 have received partial funding, and 20 have been declined. The total amount awarded during 2016 was £21,418.80 with £1,423.20 received from refunds. The final amount awarded was £19,995.60.

Education

2016 was an extremely active year for mathematics

education. Our contribution was led by Professor David Arrowsmith (Honorary Secretary with responsibility for Education), supported by Professor Nigel Steele (Deputy Honorary Secretary Education), Professor Peter Giblin (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 and the NCETM.

Representatives from the IMA met with Anne White (Deputy Chair, ACME) to discuss:

- The messages in ACME's report *Beginning teaching: best in Class?* (published November 2015), the next steps and how to develop collaborative solutions;
- Chartered Mathematics Teacher (CMathTeach);
- The role of CMathTeach in ACME's view of professional development for maths teachers;
- Support for ACME members to apply for CMathTeach;
- The new Chartered College of Teaching and the relationships between Chartered Teacher and CMathTeach;
- ACME routine work.

Nominated Dr Jennie Golding to be the IMA representative at the All-Party Parliamentary Group (APPG) on Teaching Profession.

Ran a session on training for STEM teachers at The Education Show 2016.

Attended the HoDoMS Annual conference.

Represented on the panel of the Westminster Education Forum Keynote Seminar: Reforming maths qualifications in England - GCSEs, A-Levels, core maths and compulsory courses post-16 by Professor Anne Watson.

Attended ACME's annual conference.

Attended the House of Lords seminar, Teacher Shortages in Focus.

Representatives from the IMA, JMC, ACME, AMET, ATM and MA met with the Head of Recruitment at the NCTL to discuss current NCTL initiatives and future plans on teacher recruitment into mathematics.

Attended the RSS event *Statistics across the curriculum: are we preparing young people for the data revolution?*

Higher Education

Dr Richard Hadji (BAE Systems plc) has joined HEdSA as the Employer Representative.

HEdSA's activities during 2016:

Responded to the following BEIS consultations:

- the green paper, 'Fulfilling our Potential: Teaching Excellence, Social Mobility and Student Choice';
- Teaching Excellence Framework: Year 2 - Technical Consultation.

Responded to the DfE consultation 'Schools that work for everyone'.

Attended the Royal Society PolicyLab meeting on Teaching Excellence.

Attended the QAA/UKIPG PSRB forum on Higher education policy update and current thinking.

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.

During 2016:

- Seven universities had their existing accreditation renewed.
- Five universities underwent the Programme Accreditation for the first time since 2003.
- Two universities, who already had degree programmes accredited, requested that further degree programmes are considered for accreditation.
- Three universities have applied for accreditation and are waiting for the 'Periodic Programme Review' to take place.

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

Schools and Further Education

Professor Paul Glaister joined the S&FE Committee in 2016.

The S&FE Committee's activities during 2016:
Attended the ACME round table discussion to discuss the Ofqual consultation on conditions and guidance for AS and A level Mathematics and Further Mathematics.

Responded to Ofqual's consultations on:

- AS and A Level Reform: Regulations for Maths and Further Maths;
- Regulating use of Calculators in new GCSEs, AS and A levels;
- Resits for legacy GCSE, AS and A levels;
- Marking Reviews, Appeals, Grade Boundaries and Code of Practice;
- Requirements on setting GCSE, AS and A level grade boundaries.

Responded to The Public Accounts Committee inquiry on Training New Teachers.

Contributed to the post-16 mathematics review and attended a Post-16 Maths Review Workshop with Sir

Adrian Smith.

Responded to the numerous consultations from The Education and Training Foundation on the Functional Skills Review.

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 2016 the Education Grants scheme received 15 applications; of which eight were awarded grants for the full amount requested, four received a reduced grant and three were declined.

The Education Grants awarded a total of £5,570.45 in 2016.

Applications approved for 2016 are shown from the on the Institute's website.

School Speaker

In 2016 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 28 people were awarded the Polymaths certificate in 2016.

IMA MathsCareers

The IMA MathsCareers website has achieved dramatic audience growth during 2016, and is now regularly receiving over 40,000 visits per month. 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. During 2016 the site received a record 408,212 visits.

Social Media is used to raise the profile of IMA MathsCareers, and it now has 5,194 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. The materials have been reprinted this year, to include stronger IMA and MathsCareers branding.

The MathsCareers sponsorship drive has had some success during 2016. Extended sponsorship was received from EDF.

During 2016 work continued on the cross promotion between MathsCareers and the new National Stem Centre elibrary. Visitors to the elibrary are signposted to MathsCareers and vice versa. This collaboration will continue in 2017. A similar collaboration, between MathsCareers and Chalkdust magazine (a UCL based mathematics magazine aimed at undergraduates and postgraduates) has also been agreed.

IMA Maths Careers Event

In November 2016 the first ‘IMA Meet the Employers’ event took place, hosted by IMA Corporate Affiliate, Tesco. The successful event was targeted at final year undergraduates with a programme comprising talks and activities; IMA representation also highlighted the benefits of membership of a professional and learned society, and of Chartership. Plans are developing for further careers events, aimed at similar target audiences, to be held.

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 2015/2016 scheme was announced, and opened for applications, in December 2015, with a target of awarding 170 Scholarships to those who commence secondary mathematics teacher training in the 2016/17 academic year. From the 446 applications that were received, 112 Scholarships were awarded.

The fifth year (2016/2017) of the Mathematics Teacher Training Scholarships was launched on the 10 October 2016. The Scholarships are now worth £27,500 and 150 are available for Mathematics to those commencing secondary mathematics teacher training in the 2017/18 academic year.

Undergraduate and Postgraduate Liaison

The Postgraduate and Undergraduate Liaison Operation aims to provide networks to students and to increase membership and raise awareness of the IMA amongst students and the university community.

Postgraduate activity was developed significantly this year through the negotiation of a formal understanding with SIAM (the U.S. Society for Industrial and Applied Mathematics) and the establishment of Joint IMA-SIAM Student Chapters. Chapter membership is predominantly though not exclusively postgraduate. 5 Joint Chapters were awarded grants. The Postgraduate Liaison Officer supported 2 conferences.

Undergraduate activity comprises grants to mathematical societies, careers talks for mathematics undergraduates and supporting careers events. In 2016 £11,419 was paid in grants to the Mathematical societies of the Universities of Aberdeen, Aberystwyth, Bath, Birmingham, Bolton, Derby, Dundee, Glasgow, Heriot-Watt, Imperial, Kent, King’s College London, Lincoln, Newcastle, QMUL, Salford, Stirling, Surrey, UCL, UCLan and University of South Wales. This total also includes £400 for prizes for the Oxford Industrially Focused Mathematical Modelling (InFoMM) Camp and 5 Joint Chapter awards to Cambridge, Cardiff, Manchester, Reading and Warwick. Additionally, a further total amount of £2,692 was paid in 2016 to support the Tomorrow’s Mathematicians Today Conference, the Young Researchers in Mathematics Conference, and the MEI Teachers’ Conference.

Society activities supported included networking events, talks and participation in IMA conferences. The University Liaison Officer (ULO) delivered 28 talks & 3 workshops and supported 8 careers fairs, 5 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. 46 universities were visited. The link with the Early Career Mathematicians' group continued with the ULO presenting to the ECM conference at Warwick.

2016 has seen continued growth in the e-Student number to 7,440. The community raises the profile of the IMA and encourages participation in the wider IMA. There has been strong student attendance at the ECM conferences and the Tomorrow's Mathematicians Today conference at Greenwich was a great success. The six 2016 newsletters had careers themes of Meteorology & Environment; Operational Research; Actuarial Work; Sport; Finance; and Mathematical Biology & Health. Some content was shared in the *Mathematics Today* ULO articles.

Early Career Mathematicians' Group

The Early Career Mathematicians' (ECM) Group aims to provide those starting out in the profession with the opportunity to develop their skills and network with peers. Two conferences are held over the course of the year, in the spring and autumn – this year, held at Birmingham and Warwick 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. In order to increase the number of Corporate Affiliates and to ensure such organisations have suitable standing, a more formalised application process has now been developed.

In August, the IMA's license from the Science

Council to award the Chartered Scientist designation was approved for a further five years.

The Employers' Forum scheme has followed successes at EDF Energy, AWE, GCHQ and Rolls-Royce with a fifth event at Dstl, organised by Dr Karen White of Dstl. The topic, Motivating and Rewarding Chartership, attracted around sixty delegates from industry, commerce, and academia. Presentations were made by a number of representatives of Dstl in addition to those by Dr Heather Tewkesbury of the Smith Institute and Professor David Delpy, DSAC. Delegates were also treated to a tour of the fascinating Military Vehicles and Equipment exhibition.

Following the accreditation of their graduate training scheme, MBDA, a multinational aerospace company based in Stevenage, applied to become an IMA Corporate Affiliate in the autumn, using the application process mentioned. This application was approved unanimously by the Professional Affairs Committee at its November meeting.

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, services, and transport.

Mathematics Today

In 2016 IMA members were invited to take a survey about Mathematics Today. The response was very positive, with many readers valuing its diversity and mixture of content. Some readers would prefer more content on areas that interest them and since our authors are volunteers, we encourage readers to continue submitting high quality articles.

This year the Early Career Mathematicians Catherine Richards Prize competition was won by Josué Ortega for his excellent article 'Playing Tennis without Envy', which was published in the December 2016 issue. The Catherine Richards Prize continues to select the best article published each year. The 2016 prize was awarded to Dr Philip Pearce MIMA and Dr Tom Shearer AMIMA for their inspiring outreach article 'Maths in Medicine: How to Survive a Science Fair'.

IMA e-16+ Newsletter

The e-16+ Newsletter published two full editions and a short update edition in 2016. It is designed to inspire and raise interest in mathematics amongst 16 to 19 year olds and has gained 747 subscribers. Changes made during 2016 mean that the newsletter is now sent out via MailChimp. As a result of this we have detailed data available about the readership of the newsletter and the comparative popularity of different articles. This information will be used to develop the Newsletter and to reach more young people.

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 2016. Plans for the 2017 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 Presidential Tour of Branches began in December with a well-attended lecture in Loughborough, organised by the East Midlands branch and supported by Loughborough University.

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 [for example the gender balance on some journal boards has been improved].

MEMBERSHIP

The Membership Committee, chaired by Dr Charles Evans, is delegated, by Council, to assess all individual corporate 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 25 new Fellows, 50 new Members and 23 new Chartered Mathematicians and/or Chartered Scientists. We have also had the great pleasure to welcome over 480 new Associate Members, Students and Affiliates.

Membership figures as at 31 December 2016 are:

Honorary Fellow	17
Fellow	1,227
Member (with Associate Fellow)	1,489
Associate Member	1,362
Affiliate	275
Student	294
Total	4,664

In addition to this the Institute has 7,440 e-Students making our total figures, as at 31 December 2016:

TOTAL	12,104
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This represents a growth of 15% in one year.

Of the above memberships, 1,832 were registered as Chartered Mathematicians and 263 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 44 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 two new members, two re-elected members and one member who was elected following a period of co-option in the 2016 Council election: Dr Danielle Bewsher (re-elected); Professor Chris Breward (elected); Dr Ben Dias (elected following co-option); Dr Catherine Hobbs (elected) and Mr Garrod Musto (re-elected).

Additionally, Noel-Ann Bradshaw took up the role of Vice-President Communications.

Council continued in 2016 to advance the strategy which was agreed following its last strategic review which took place in 2011.

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

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 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.

In January CMS launched at Parliament its report 'Mathematical Sciences: Driving the UK Economy'.

CMS published a statement, following the UK Referendum on Membership of the EU, which supported the sustenance of 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 2016 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.

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 2016 the Chartered Scientist designation has continued to be popular with members with 263 holding the designation.

International

SIAM

In 2016 IMA members who live in the UK received 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.

A list of members who represented the IMA to STEM organisations in 2016 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 Assistant – 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 Lancaster
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
Membership Officer (part-time) – Natalie Stanton
Postgraduate Liaison Officer (part-time) – Daniel Cheng

FINANCE

The final result was a deficit of £12.5k, compared with a budget deficit of £78k.

At the end of 2016 the total assets less current liabilities was £1,005,670. In 2015 the equivalent figure was £1,018,223.

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 2016

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 2017.

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)).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 2016. 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 2016 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 2016

	Unrestricted Funds 2016 £	Restricted Funds 2016 £	Total Funds 2016 £	Total Funds 2015 £
Incoming resources				
Entrance fees	3,206	-	3,206	2,777
Subscriptions	286,346	-	286,346	284,147
Conference and symposium fees - income	140,443	-	140,443	126,026
Publications income and Institutional subscriptions	504,560	-	504,560	582,503
Miscellaneous income	568	-	568	573
Appeal Fund, donations and bequests	274	-	274	84
Interest received	9,278	3	9,281	5,436
Careers in M & 50th Ann	2,896	-	2,896	5,064
Scholarships & HE STEM	171,624	-	171,624	184,380
Education	-	-	-	3,000
	<u>1,119,195</u>	<u>3</u>	<u>1,119,198</u>	<u>1,193,990</u>
Resources expended				
Salaries, pensions and ni	515,618		515,618	486,869
Other staff expenses	16,358		16,358	17,615
Rates, insurance, light and heat	26,406		26,406	26,781
Telephones	5,051		5,051	4,420
General printing, postage and stationery	19,302		19,302	21,260
Office equipment, hire and maintenance	2,068		2,068	2,507
Council and committees	32,837		32,837	33,501
Branches and groups	836		836	1,554
Education	10,627		10,627	14,763
Publications (including Maths Today)	74,240		74,240	75,147
General expenses	6,490		6,490	4,422
Bank charges	3,863		3,863	2,949
Legal and professional	-		-	997
Audit and accountancy	8,039		8,039	7,548
Depreciation & amortisation of property	6,423		6,423	6,893
Overseas activities	-		-	1,323
Subscriptions to other bodies	10,144		10,144	9,076
Repairs and renewals	465		465	989
Web-site expenses	4,785		4,785	4,258
Presidential address	3,719		3,719	384
Conference direct costs	118,236		118,236	98,600
Grants/Networks/Development	79,356		79,356	60,110
Strategy Review Weekend	-		-	-
Information Technology	2,683		2,683	2,223
I.T. Consultancy	2,013		2,013	3,845
Careers in M & 50th Ann	10,458		10,458	18,837
Scholarships & HE STEM	119,335		119,335	129,294
De Morgan House rental	11,421		11,421	11,407
De Morgan House furnishings	179		179	-
De Morgan House other	4,431		4,431	5,122
18 Nelson Street	8,000		8,000	8,000
Development - web and conferences	14,570		14,570	5,918
Development - Marketing	13,783		13,783	-
Decreased stock	15		15	38
	<u>1,131,751</u>	<u>-</u>	<u>1,131,751</u>	<u>1,066,650</u>
RETAINED DEFICIT/SURPLUS FOR THE YEAR	<u>(12,556)</u>	<u>3</u>	<u>(12,553)</u>	<u>127,340</u>

THE INSTITUTE OF MATHEMATICS AND ITS APPLICATIONS
BALANCE SHEET AS AT 31ST DECEMBER 2016

	<u>31-Dec</u> <u>2016</u> £	£		<u>31-Dec</u> <u>2015</u> £	£
FIXED ASSETS					
Freehold Property	115,024			119,624	
Fixtures and equipment	<u>1,381</u>			<u>3,204</u>	
		116,405			122,828
CURRENT ASSETS					
Stocks	1,222			1,238	
Trade debtors	700			2,262	
Prepayments and accrued inc.	36,924			38,888	
Cash at bank and in hand	<u>1,252,367</u>	<u>10,095</u>		<u>1,288,816</u>	
	1,291,213	10,095	1,301,308	1,331,204	
 CREDITORS due within 1 year	 <u>409,003</u>	 3,040	 412,043	 <u>435,809</u>	
NET CURRENT ASSETS/(LIABILITIES)		<u>889,265</u>		<u>895,395</u>	
		<u>1,005,670</u>		<u>1,018,223</u>	
 CAPITAL AND RESERVES					
Income and expenditure account		994,079		1,006,454	
Restricted income and expenditure account		7,055		7,052	
Revaluation reserve		<u>4,536</u>		<u>4,717</u>	
		<u>1,005,670</u>		<u>1,018,223</u>	
 NOTES					
Creditors due within 1 year					
Trade creditors	27,156			45,156	
Social security and other taxes	60,108			61,011	
Accruals and deferred income	<u>324,779</u>			<u>329,642</u>	
	<u>412,043</u>			<u>435,809</u>	
 Income and expenditure account					
Balance as at 1st January 2016	1,018,223				
Deficit for the 12 months	<u>(12,553)</u>				
Balance as at 31st Dec 2016	<u>1,005,670</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).