

Medical Physics Group Postgraduate Dissertation Prize

The IOP Medical Physics Group (MPG) dissertation prize is awarded annually for the best master's level dissertation, on a topic relevant to medical physics and completed by a student member of the IOP during the previous calendar year. Any dissertation submitted as a part of an MSc programme of study at a university in the UK and Ireland is eligible for consideration. The award, which has a monetary value of £250, will be made to the dissertation that, in the opinion of the MPG Committee, has made the greatest contribution to the advancement of medical physics. It is a condition of the award that the applicant, if not already an MPG member, will join the Group at the time of applying.

The closing date for receipt of applications is 30th January 2016, for dissertations completed in 2015

Applications must contain:

1. A summary of the work undertaken for the dissertation, to include the typical headings of Authorship, Introduction, Theory / Methodology, Results, Discussion, Conclusions, as appropriate. This must be written by the student. (max 1,000 words.)
2. Reflective thoughts written by the student, describing:
 - i. how the applicant has developed scientifically during the course of the project; (max 300 words.)
 - ii. the work's significance and how it may impact patient care in the future; (max 300 words.)
3. A letter of support from the project supervisor / course director, explaining the application's merits.
4. The applicant's IOP membership number.

No more than two applications will be accepted from the same MSc course – applicants are thus advised to liaise with the Course Director prior to submitting an application.

Please send nominations by e-mail to any member of the MPG committee (current MPG officers: dimitra.darambara@icr.ac.uk, K.M.Hampson@bradford.ac.uk and FAGANAN@tcd.ie) who will be happy to provide any further information required.

Winner of This Year's Dissertation Prize

Congratulations to Aoife Ivory for winning the Institute of Physics (IOP) Medical Physics Group dissertation prize. Aoife received the top award for medical physics dissertations in the UK and Ireland with her research project entitled 'Objective noise evaluation in digital mammography, towards image quality tracking of clinical images.'

Aoife's project

was supervised by Dr. Seán Cournane and Colin Walsh, members of the Medical Physics and Bioengineering Dept., St James's hospital, as part of her M.Sc. Physical Sciences in Medicine postgraduate course (Trinity College Dublin). Aoife is currently undertaking her PhD at the Centre for Advanced Medical Imaging (CAMI), Trinity College Dublin/ St James's Hospital.



Aoife Ivory with her supervisor Dr. Seán Cournane

Contents

Medical Physics Group Postgraduate Dissertation Prize	1
Winner of This Year's Dissertation Prize	1
Meeting reports:	
SPIE Photonics West Meeting, San Francisco	2
ISMRM (International Society for Magnetic Resonance in Medicine), Toronto	2-3
65th Annual Conference of the British Microcirculation Society, Manchester	4
Upcoming meetings:	
Up and Coming Techniques in Medical Physics Translated into Clinical Practice	5
IOP Research Student Conference Fund	5
Journal spotlight: IEEE Transactions on Medical Imaging	6
The IPEM Masters Level Accreditation Framework Training Day	7
MSc Accreditation Assessors Wanted	8

Meeting reports

SPIE Photonics West Meeting San Francisco

7th – 12th February 2015

This is the world's leading biomedical optics conference, hence participating and presenting my work at this meeting has been an incredibly valuable experience. Indeed, not only did I have the chance to interact with other researchers to learn more about the work done in the field of brain optical imaging, but I also had very constructive feedback about my research. Furthermore, I was able to have constructive discussions which could result in future collaborations. In particular, I had a very inspiring conversation about my future career with the Vice President of Newport Corporation **Jim Fisher**.

In the BiOS plenary session, I had the chance to hear **Eric Betzig** talk about how he started building his

super-resolution microscope from spare parts in his living room, and how with this microscope he would win the Nobel Prize in Chemistry in 2014. Since I have done much research on optical clearing and in particular on how to apply this to mouse brains, what was very interesting for me was **Francesco Pavone's** talk on his new optical clearing technique, which involves the use of 2,2-thiodiethanol to clear regions of mouse and human brain with high penetration and no photo-bleaching or photodamage. There were a few talks on 3D printing, which I am very interested in since I believe it will revolutionize the modern world. For example, **Patrice Baldeck** presented his work on a new 3D printing technique based on

nonlinear photochemistry. Finally, I was amazed by the Photonics West Exhibition: 1,260 companies exhibited the new techniques in optics and photonics devices and components. In addition to all this, I was awarded a research excellence prize for my work on quantification of light attenuation in optically cleared mouse brains. I look forward to utilising the experience and knowledge gained to positively influence and to further develop my research project here at University College London.

Angela d'Esposito

Centre for Advanced Biomedical Imaging
University College London

ISMRM (International Society for Magnetic Resonance in Medicine) Toronto

30th May – 5th June 2015

The ISMRM (International Society for Magnetic Resonance in Medicine) is the main annual conference on MRI-related advances. The conference started with two educational days. I found a particular interest in the molecular imaging session, focused on DNP (Dynamic Nuclear Polarisation). In my PhD research I use SEOP (Spin Exchange Optical Pumping) to hyperpolarize noble gases and image lungs with MRI. DNP is a different hyperpolarization technique; I found it relevant to me as it has some similarities with the technique I use. **Prof. John P. Mugler III** (University of Virginia) presented some useful pulse sequences and acquisition methods such as sparse acquisition and Dixon technique.

I presented my poster at the '*Hyperpolarized Gas Imaging*' traditional poster session and met some major contributors in the field. We discussed my poster and my hypothesis. The outcome of the discussions might help going further in this project. During the electronic poster session, I talked to a PhD student, from the university of Pennsylvania, who is doing DNP on *ex vivo* lungs. His research was pertinent to my research as it is also based on *ex vivo* lungs imaging and the use of a rat pulmonary disease model.

I attended many highly specialized sessions which were not focused on my topic, but the highlight of the conference to me was the '*Pulmonary MRI - Proton & Non-Proton Applications*' scientific session where some researchers from my field were presenting their work. In this

session, I was really interested in **Rohan S. Virgincar's** project (Duke University). He did a longitudinal study of lung cancer in mice with hyperpolarized xenon MRI and classic proton MRI. Indeed, preclinical research is the topic I would like to pursue my academic career on.

Overall, I had the opportunity to meet some valuable people from the scientific public and vendors such as Bruker, an MRI company building scanners for preclinical research. Even though this conference was successful for me, I still prefer smaller and more specialized conferences where I can meet people who are specialists in my field and can easily debate about my projects.

Clémentine Lesbats

Sir Peter Mansfield Imaging Centre
University of Nottingham

ISMRM (International Society for Magnetic Resonance in Medicine) Toronto

30th May – 5th June 2015

This year, ISMRM spanned 7 days, was attended by nearly 6000 attendees, presenters and exhibitors. Downtown Toronto, where the convention centre sits, is a compact financial centre, glass skyscrapers and distinctive industrial 19th century brick; 1960s and '70s concrete (the City Hall and CN Tower); these quickly give way to Lake Ontario in the south east; churches and green spaces to the north east; suburbs and restaurants to the south west, and shopping and the Ryerson University campus to the north west.

I presented two posters, '*Longitudinal Whole-Brain Atrophy Measurement in a Mouse Model of Tauopathy Using the Generalised Boundary Shift Integral*', and '*Tensor-Based Morphometry Reveals Structural Differences Between Down Syndrome and Alzheimer's Disease Mouse Model Brains*', both on Wednesday the 3rd of June. The first detailed the first application of the BSI to a non-human animal model, showing sensitive differentiation between the rates of atrophy in the brains of wild-type and tauopathy (rTG4510 model) mice. The second showed the results of a morphometric analysis of three groups of mouse brains with trisomy

of human chromosome 21 (Down syndrome), APP plaques (implicated in Alzheimer's disease), and a double-cross mutant mice exhibiting both features. All three groups were compared with wild-type littermate controls, enabling differentiation of the phenotypes arising from each condition. The former was awarded 'Magna cum laud' (top 15% of abstracts). '*Comparing In Vivo and Ex Vivo Imaging in an Alzheimer's Mouse Model Using Tensor-Based Morphometry*', a talk I was joint first author for, presented by my colleague Holly Holmes on Tuesday 2nd, was awarded 'Suma cum laude' (top 5%).

Although both my posters were displayed during the same hour and it was consequently difficult to keep up with all the visitors, I met many people interested both in the specific image processing techniques and the overall mouse morphometry pipeline we have established over the past few years at UCL's CMIC and CABI. This was an excellent opportunity to set up collaborations. A couple of visitors were cautious of the mouse models of Down syndrome and APP – these more critical visitors

are extremely valuable; they help to balance discussion and round out my own thoughts on the work I have done. I have attended one previous ISMRM, in Salt Lake City, in 2013. This year's conference was more relevant and, further on in my PhD, I was able to get more out of it. More preclinical imaging and image processing work was discussed; an inevitable consequence of computing's increasing prominence in science. Because there were so many simultaneous talks, poster presentations and events, good planning and prioritisation were required.

Toronto also afforded many opportunities for networking in the evenings, including a UCL dinner, a 'British Chapter' pub evening; a visit to the Ripleys Aquarium; an ascent of the CN Tower, and a visit to the Royal Ontario Museum – all highly recommended, if you get the chance.

Nick Powell

Centre for Medical Image Computing
& Centre for Advanced Biomedical
Imaging
University College London

Meeting reports

65th Annual Conference of the British Microcirculation Society Manchester

16th – 17th April 2015

The IOP Medical Physics and Optical groups recently sponsored the 65th Annual Meeting of the British Microcirculation Society (BMS), hosted by the University of Manchester at the Royal Northern College of Music. The meeting symposium was 'Imaging the Microcirculation', which is key to our understanding and management of microvascular and cardiovascular disease and a cross-disciplinary approach is essential to bringing about ground breaking change in the imaging of the microcirculation and therefore moving the field of microcirculation forwards.

The aim of this meeting was to highlight the cross-disciplinary nature of microcirculation imaging by bring together engineers, physicists and imaging scientists with those in the life and human sciences. The hope being that this would allow reciprocal understanding of technology developments and future requirements. The symposium showcased a number of currently used, cutting edge and developing technologies and methodologies for imaging the microcirculation and demonstrated both their clinical/life-science applications.

Several leaders in their field gave plenary lectures on a range of imaging modalities. There were two sponsored lectures; **Jean-Luc Cracowski** (Grenoble Alpes University, France, sponsored by Moor Instruments) discussed the application of laser Doppler and associated techniques for 'Assessment of human skin microcirculation function'. **Martin Leahy** (NUI Galway, Ireland, sponsored by the journal Microcirculation) showcased several techniques in his lecture entitled 'Microcirculation imaging with light and sound'. Other presenters included **Rainer Leitgeb** (Center for Medical Physics and Biomedical Engineering, Medical University of Vienna, Austria) who provided insight into OCT for structural and functional imaging of microcirculation in skin.

Speaker sessions were coupled with lively poster presentations, an opportunity to meet trade exhibitors and a fantastic conference dinner at Manchester Town Hall.

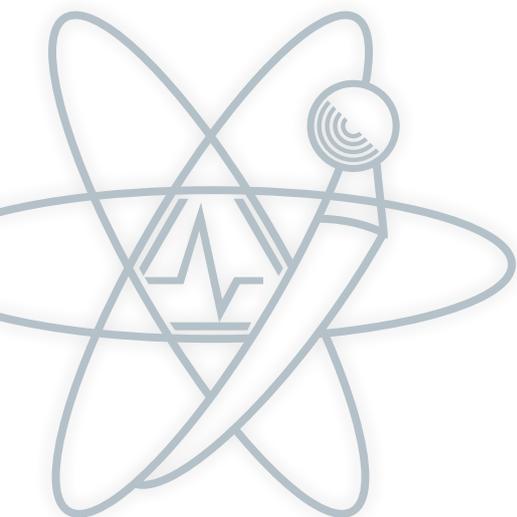
Two of the prizes awarded were for posters showing 'Best application of physics' and were made possible by the generous donation from the IOP Medical Physics and Optics

Groups. The winners were Dr Michael Berks (Manchester) 'A new system for capturing high-magnification video sequences of nailfold capillaries' and Miss Lobo (Bristol) 'Directly imaging endothelial wall shear stress'. Congratulations to them!

www.manchester.ac.uk/bii/bms/

Geo Corner

Bioengineering Research Centre
University of Dundee



Upcoming meetings

Up and Coming Techniques in Medical Physics Translated into Clinical Practice

Institute of Physics

7th December 2015

10:30 – 17:00 (registration & coffee from 10 am)

The aim of the meeting will be to bring together people from diverse areas of Medical Physics to make contacts in the wider community and discuss potential collaboration. Our invited speakers will discuss the translation of new innovative developments in Medical Physics into clinical practice and the processes involved in bringing new technology into clinical use.

There will be a networking session over coffee during the afternoon, preceded by an 'open mic' style session for attendees to present a short snapshot of their work to stimulate informal discussion. Early-career MPG members are particularly encouraged to participate.

Our invited speakers include:

Dr David Carmichael, Reader in Neuroimaging and Biophysics, University College London

Prospective motion correction in MRI: validation, implementation and demonstration in clinical multimodal imaging

Dr Laura Harkness-Brennan, Lecturer, Department of Physics, University of Liverpool

The ProSPECTus Project: Translating Nuclear Physics Techniques to Medical Physics

Dr Antje-Christin Knopf, Senior Researcher, Division of Radiotherapy and Imaging, Institute of Cancer Research

State-of-the-Art IGRT - Exploring the Potential of High-Precision Dose Delivery and Real-Time Knowledge of the Target Volume Location

Dr Antonis Kalemis, Senior Manager, Clinical Science, Advanced Molecular Imaging, Philips Healthcare

Technological Frog-leaping at a Hospital near you; what's going on and why it matters?

Dr Scott Inglis, Senior Clinical Scientist, NHS Lothian

3D Printing in Healthcare: from Concept to Clinical Practice

Dr Muhammad Sadiq, Researcher and Enterprise Fellow, University of Dundee

Active Needle Technology for Precision Needle Targeting

Registration is £15 for IOP members, £10 for IOP student members, £25 for student non-members, and £40 for non-members. To register please visit:

www.iopconferences.org/iop/829/home

Deadline for registration: Friday 4th December

Look Out Next Year for the Following Meetings:

Medical Applications of Light • February/March

This meeting will be a joint meeting between the Medical Physics Group and the Optical Group.

Public Engagement and Dissemination of Research Results

Spring/Early Summer

This will include talks on the benefit of public engagement and how to approach it, and how to maximise your *h* index when publishing.

Early Researchers Colloquium • September/October

This meeting will be aimed at early career researchers and include talks on how to write a research article and how to get funded.

IOP Research Student Conference Fund

The Institute of Physics provides financial support to research students to attend international meetings and major national meetings. Bursaries are not available for meetings organised by the Institute of Physics including those organised by IOP Groups. The Institute of Physics (IOP) handles the application process but it is the relevant IOP group that makes the decision on whether to award the bursary and its value.

Am I eligible?

Research Student Conference Fund (RSCF) bursaries are available to PhD students who are a member of the Institute and of an appropriate Institute group. For example, if an applicant is a member of the Women in Physics Group only then they could only seek support to attend a conference related to women in physics and not to low temperature physics. To be eligible for that meeting, the applicant would also need to be a member of the Low Temperature Group.

What is the bursary worth?

Students may apply for up to £300 during the course of their PhD. Students may apply more than once, for example they may request the full amount or decide to request a smaller amount and then apply for funding again for another conference at a later stage.

Groups have limited funds to award bursaries and so students may not receive the full amount they have requested. If the full amount is not awarded students may apply again to receive further support for a different conference until they reach £300 overall.

Note that grants will normally cover only part of the expenses incurred in attending a conference and are intended to supplement grants from other sources.

How can I apply?

Please see the website for details on how to apply:

www.iop.org/about/grants/research_student/page_38808.html

RSCF applications are considered on a quarterly basis and should reach the Institute by: 1 March, 1 June, 1 September or 1 December; a decision will be made within eight weeks of the closing date. Your application must reach us by the deadline which is at least **three months** before the conference you wish to attend. We strongly recommend that you submit your application early.

All recipients are asked to produce a report on return from their conference before receiving payment.

Further information

For further information please contact supportandgrants@iop.org

Journal spotlight

IEEE Transactions on Medical Imaging

Background

The **IEEE Transactions on Medical Imaging** publishes papers describing novel imaging methodologies related to image acquisition, formation, display, and assessment. The journal encourages papers from all modalities that are focused on the science and engineering of biomedical imaging but especially those targeting new ways to acquire, extract, and interpret patient information.

Scope

IEEE TRANSACTIONS ON MEDICAL IMAGING (T-MI) encourages the submission of manuscripts on imaging of body structure, morphology and function, and imaging of microscopic biological entities. The journal publishes original contributions on medical imaging achieved by various modalities, such as ultrasound, X-rays (including CT) magnetic resonance, radionuclides, microwaves, and light, as well as medical image processing and analysis, visualization, pattern recognition, and related methods. Studies involving highly technical perspectives are most welcome. The journal focuses on a unified common ground where instrumentation, systems, components, hardware and software, mathematics and physics contribute to the studies.

2014 – 2015 Highlights: Most viewed papers

- Menze, B, Reyes, M, Van Leemput K. et al., "The Multimodal Brain Tumor Image Segmentation Benchmark (BRATS)" IEEE Trans Med Imaging. 2014 Dec 4. [Epub ahead of print]
- Zhao Y, Rada L, Chen K, Harding S, Zheng Y. "Automated Vessel Segmentation Using Infinite Perimeter Active Contour Model with Hybrid Region Information with Application to Retina Images," IEEE Trans Med Imaging. 2015 Mar 5. [Epub ahead of print]
- Wu P, Liu Y, Li Y, Liu B. "Robust Prostate Segmentation Using Intrinsic Properties of TRUS Images," IEEE Trans Med Imaging. 2015 Jan 7. [Epub ahead of print]
- Sotiras A, Davatzikos C, Paragios N. "Deformable Medical Image Registration: A Survey," IEEE Trans Med Imaging. 2013 Jul;32(7):1153-90. doi: 10.1109/TMI.2013.2265603. Epub 2013 May 31. Review
- Weissler B, Gebhardt P, Duppenbecker P, et al. "A Digital Preclinical PET/MRI Insert and Initial Results," IEEE Trans Med Imaging. 2015 Apr 29. [Epub ahead of print]

Andrew J Fagan

Centre for Advanced Medical Imaging (CAMI), SJH/TCD
Dublin

Notable figures for 2014/15

Impact Factor	3.39 (2014 only) 4.29 (2009-2014 5-yr average)	Articles published per year (2014)	184
Publication times – (averages 2014)	Receipt to first decision time: 44 days Accept to first published online: 3 days	Articles published per year (est 2015)	200
Acceptance rate (YTD 2015)	18%	Articles downloaded per year	309,262 Total Usage (2014) PDF Downloads: 301,352 HTML Views: 7,910
Proportion of articles from UK authors (2014)	7%	First issue	July 1982
Proportion of articles from EU authors (2014)	45%		

Physics in Medicine & Biology

The leading international journal of biomedical physics
Fast publication • Worldwide visibility • High impact

Editor-in-Chief: S R Cherry, University of California, Davis, USA

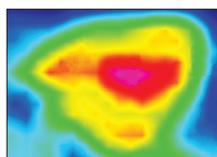


Image: Reconstructed image for a human dynamic Tc-99m-sestamibi cardiac SPECT study. G T Gullberg et al 2010 Phys. Med. Biol. 55 R111

If you are working in any of the following areas then we would like to invite your submissions:

- all areas of radiotherapy physics
- radiation dosimetry (ionizing and non-ionizing radiation)
- biomedical imaging (e.g. x-ray, MR, ultrasound, optical, nuclear medicine)
- image reconstruction and kinetic modelling
- image analysis and computer-aided detection
- applications of nanoparticles in imaging and therapy
- therapies (including non-ionizing radiation)
- biomedical optics
- radiation protection
- radiobiology

For more information, visit iopscience.org/pmb or e-mail us at pmb@iop.org

The IPEM Masters Level Accreditation Framework Training Day

UCL, London, 26th May 2015

Last year, the Institute of Physics and Engineering in Medicine (IPEM) launched a new accreditation scheme for UK masters courses in medical physics and biomedical engineering, which is now being adopted by a growing number of universities. More information can be found about the framework at the following website:

www.ipem.ac.uk/CareersTraining/MastersDegreeAccreditation.aspx

On 26th May 2015, the accreditation panel held its first training day for assessors at UCL, which was attended by 17 academically-minded medical physicists and biomedical engineers from 15 UK universities, in addition to others being trained remotely through live teleconference. The day featured talks on the accreditation framework structure and operation, educational aspects of conducting accreditation assessments and a question and answer session from the four framework authors (shown during that session are **Jamie Harle**, **Liz Parvin** and **Dick Lerski**, with Tony Evans also presenting but out of frame).

The day was designed to train assessors from participating HEIs so that they could contribute in future to its peer review system of programme assessment, where a trained assessor from an independent HEI is joined by a member of the accreditation panel on a site visit of a university MSc or MEng programme in medical physics or biomedical engineering. This site visit has the aim of assessing the HEI's programme against the new published Masters Level Accreditation



Framework (MLAF) standard, through either its physics or engineering track, as appropriate. The training day was additionally video recorded, and will be made into an online training portal to support the induction of more assessors from new HEIs in the future. Each newly accredited programme is asked to contribute one suitable individual to the pool of assessors who would, if not in attendance at this training event, undergo the online training.

This day marked the completion of a long process began in November 2012, when a stakeholder meeting of 17 HEIs in York agreed that there was strong demand for a new accreditation process for Masters courses to replace a previous system made obsolete by changes to the NHS training scheme. The new framework offers a more interdisciplinary and flexible approach for HEIs, accepting students from a range of academic backgrounds, providing that additional defined taught content is delivered for

each intake group. The framework also offers HEIs some freedom to deliver specialist content beyond its compulsory elements in order to exploit local research strengths and encourage research-informed teaching. The framework also recognises the wide range of diverse employment destinations for graduates of MSc/MEng programmes that teach physics and engineering applied to medicine, be that employment in industry, healthcare or academic environments. A number of accreditation visits are planned in the months ahead.



MSc Accreditation Assessors Wanted

The accreditation committee is still keen to recruit more expert assessors who are willing to contribute one day per year to undertake a site visit. The assessor will be paid travel expenses, receive online training and can use this

work as part of their professional body CPD activity.

For more information about the Masters Level Accreditation Framework, please email Dr Jamie Harle, j.harle@ucl.ac.uk.

IPEM and IOP extend partnership to create book programme

The Institute of Physics and Engineering in Medicine (IPEM) and IOP Publishing (IOP) have been journal-publishing partners for more than 40 years.

The organisations announced on 6 November an exciting new development in their partnership. Together, IPEM and IOP will create a new ebook programme specifically designed for the medical physics and biomedical engineering communities.

Professor David Brettell, President of IPEM said: "IPEM is committed to the advancement of physics and engineering applied to medicine and biology – this new programme of books by experts in the field of medical physics will be a fantastic new way to do this. We are very pleased to be working with our long-standing partner IOP to bring this initiative to members, and to the international medical physics community."

Pernille Hammelsoe, Associate Director, Journals, at IOP said: "We are extremely delighted to further our long-standing partnership with IPEM. As a society publisher, we share IPEM's mission to communicate science and support its members worldwide to get recognition for their work."

"Combining our experience in ebook publishing with IPEM's expertise and reputation in medical physics and biomedical engineering, we will develop the strongest book programme for these growing communities."

The new series will begin publication in 2018. It will be supported by a specially selected editorial advisory board who will identify key areas of interest for IPEM members and the wider community, including physicists, clinical and biomedical engineers, and technologists working in medicine and biology.

Through IOP's award-winning ebooks programme, the new books will be available in HTML, PDF and EPUB 3 format. This means that books will be available to read on different devices and with the option for multimedia and mathML. Content will be without digital rights management, therefore allowing unlimited concurrent usage.

The new book series will be hosted on IOPscience alongside the two IPEM journals published by IOP, Physics in Medicine & Biology and Physiological Measurement, providing all content to researchers in one place.

This newsletter is also available on the web and in larger print sizes.



The contents of this newsletter do not necessarily represent the views or policies of the Institute of Physics, except where explicitly stated.

The Institute of Physics,
80 Portland Place, W1B 1NT, UK.

Tel: 020 7470 4800
Fax: 020 7470 4848

The Medical Physics Group is now on LinkedIn!



To join:

- Firstly, make sure you are a member of the Medical Physics Group (MPG) of the IOP by logging on to MyIOP.org and adding the Medical Physics Group as one of your selected groups
- Next, simply search for the 'Medical Physics Group of the Institute of Physics' through your LinkedIn account and click 'join'.

Call for content

If there is anything you would like to see in future editions of the newsletter then email k.m.hampson@bradford.ac.uk or any other committee members.