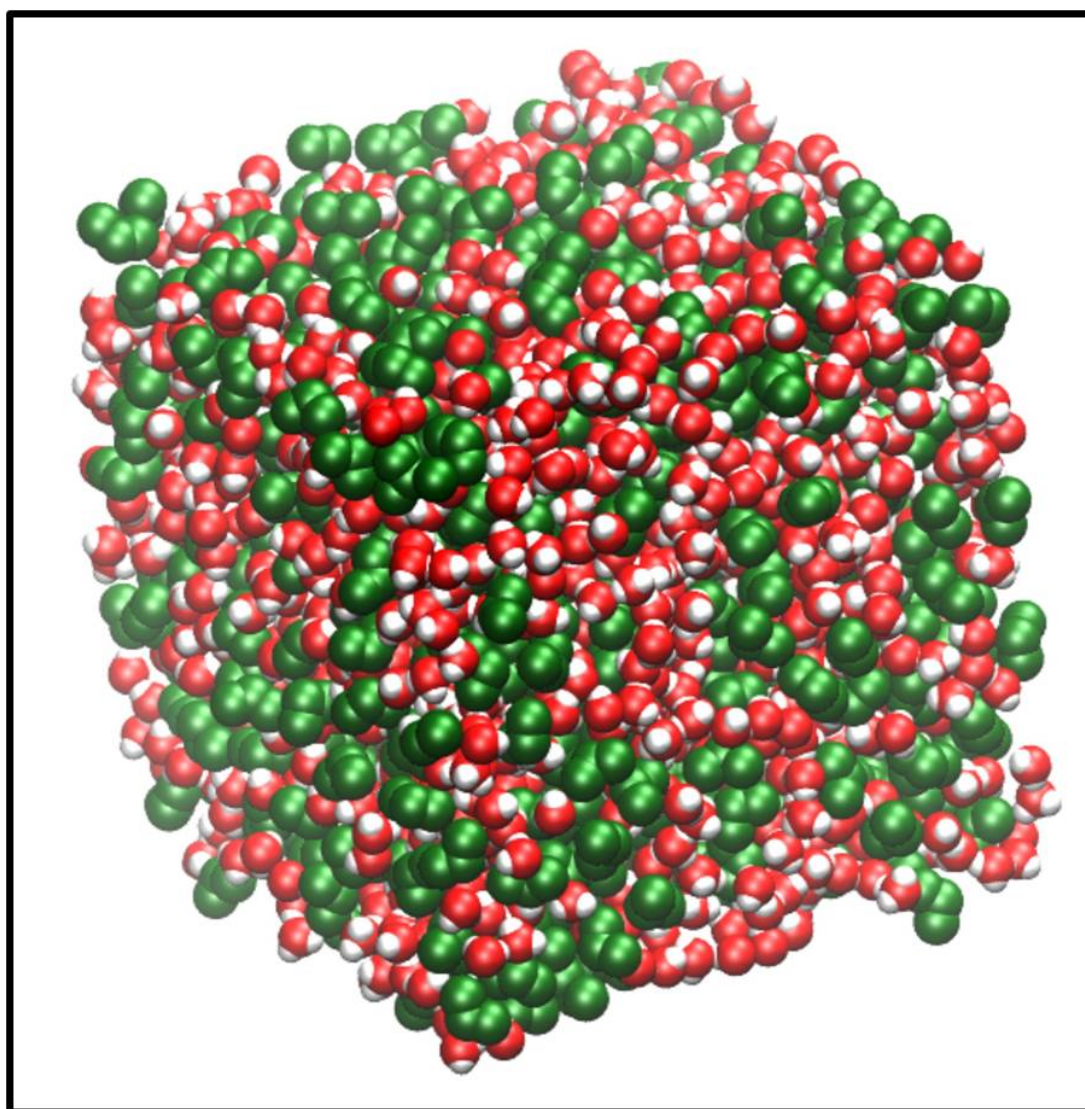


Issue no. 7



*Impact of cryoprotectants on water structure: Neutron diffraction experiments provide structural insight into glycerol (green) and water (red) mixtures (Image: James Towey, Alan Soper and Lorna Dougan, University of Leeds)*

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### Editorial

*In this issue we have reports of two recent meetings and news about two research networks relevant to the group, as well as the Chair's Welcome, information on upcoming conferences and student bursary reports. I hope you enjoy it!*

*Dr Lorna Dougan  
Newsletter editor*

## Chair's welcome

*Neal Skipper*

### Welcome

The Committee of the Liquids and Complex Fluids Group are pleased to welcome you to the Christmas 2012 group newsletter. This newsletter outlines the nature of the group, its interests and relevant activities across the country.

### 2012 Group News

This year has been a busy one for the group. We have once again organized the Winter School "Solutions in the Snow", in Edinburgh, and it was very encouraging to see so many graduate students taking part, some for the second or even the third time. Many thanks to Cait MacPhee and her colleagues in Edinburgh, and to the IoP Conferences group, for running this event, and to the speakers for providing such stimulating lectures. The AGM was held on the last day of the School, and Julia Schollick (Oxford University) was elected as student representative on the Committee.

The 2013 School will be held in Weetwood Hall in Leeds from 24 - 27 March 2013, and is now a Spring School (Solutions in the Sleet!). The AGM will be held on the last day of the School, and we are looking for new members of the committee so

please let us know if you would be interested.

I would also like to take this opportunity to remind students of the Research Student Conference Fund, to which all student members of the Group are eligible. Funding of up to £250 is available for eligible students, and applications should reach the Institute by: 1 March, 1 June, 1 September or 1 December. Reports from previous successful applicants can be found later in the newsletter.

Finally, we are seeking nominations for the Group's Early Career Prize, with a closing date for nominations of 28<sup>th</sup> February 2013. Please see the Group webpages for details.

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## Reports from recent group events

### Soft Matter 2012 – a celebration of Bob Evans

*Doug Cleaver*

*Philip Salmon*

*Paddy Royall*

In April 2012, the H.H. Wills Physics Laboratory in Bristol hosted a two-day meeting to mark the distinguished career of Professor Bob Evans, FRS. Bob's standing, as one

of the world's predominant liquid-state theoreticians, was evident from the prodigious list of speakers - virtually all had worked and published with him at one time or another. His leadership, as Head of Department at Bristol, a major figure in the European Liquids community and, of course, founder member of the IoP's Liquids and Complex Fluids Group were also recognised.



The meeting, organised by Paddy Royall, James Annett and Ashraf Alam, comprised 23 academic talks. The density functional theories that Bob pioneered featured in many, particularly those from former students and post-docs of the Bristol theory group (Roland Roth, Andrew Archer, Margarida Telo Da Gama, Pedro Tarazona, Ania Maciolek, Andy Parry, Marjolein Dijkstra, Rene van Roij, Matthias Schmidt, Martin Schoen ...). Long-standing friends and collaborators on liquid-state theory, including Siegfried Dietrich, Christos Likos, Jean-Pierre Hansen, Jens Eggers, Hartmut Loewen, George Jackson, Richard Sear and

Alina Ciach also gave interesting contributions.

Being fundamentally untalented both in the laboratory and at the controls of a simulation would be a problem to most - but not to Bob. Instead, over the years, he has used his considerable powers of persuasion to motivate others to do the dirty work for him. Thus we had presentations from Dirk Aarts, Phil Salmon and Hugo Christenson on experimental work and simulation talks from Nigel Wilding and Gerhard Kahl.

The 24<sup>th</sup> talk of the meeting, from Jim Henderson (for many years at Leeds but now spending his time floating upon liquids rather than thinking about their sum rules) was a critique of a poem published by Bob relating to, inter alia, The White Bear version of density functional theory – Jim's insights, based on extensive shared experience at work and at play, brought home in appropriate poetic style what an inspirational figure Bob has been to the field of liquid state physics. Indeed, poetry has been an integral part of Bob's tremendous involvement in Bristol Physics and the University in general, not least during his time of head of department, as was elegantly described by Jon Keating, the Dean of Science in his welcome address which opened the meeting.

Before he got ideas above his station, though, the good Professor was brought down to earth at the conference dinner, held for 71 people in the sumptuous setting of the S.S Great Britain – here, we learnt that he is not the only famous Bob Evans in Bristol (the other is the ship's chief steward, a "you-tube" star as it happens). He also found himself the subject of a quiz, devised by Andy Parry.



Whilst he did not present any of his own work at the meeting, Bob's presence dominated proceedings. He chaired every session, giving intimate introductions to the various speakers AND delivering the odd killer question. While the Evans hair has thinned, the intellect has not – certain mannerisms (the protruding bottom lip, the slight squint and twitch of the head) coupled with choice phrases (particularly the classic "I'm not sure you can say that ...") have presaged many a mauling over the years and it was great to witness them being put to good use here.

This meeting served to reinforce the quality, originality and spirit that have characterised Bob Evans' research works – long may these tenets continue to influence and inspire.

### Mighty Bob

Imagine in far-off times  
That a white bear still shines  
And memories of Mighty Bob remain  
in sight  
Revered by publicans and physicists  
alike

His birth from liquid metals forged on  
DFT, sensation!  
Drying, layering and capillary  
condensation!  
Surely, not the poetry of poles,  
instead  
A mighty "\*\*\*\* the colloids" swells the  
head

His sacrifices without bound  
When student troubles were around  
Alcohol and night clubs did the trick  
While lesser mortals slunk home sick

So what, if upon a wider stage  
A dean did sometime rage  
For physicists held no fear  
While Mighty Bob was there.

Sadly, time did set the final test  
And even mighty Bob was laid down  
to rest.  
Peace at last, no more strife,  
Such is life!

Anon (2012)



## **Institute of Physics Liquids and Complex Fluids 6th Winter School, University of Edinburgh, 8 -11th January 2012**

*Julia Schollick*

*University of Oxford*

The IoP Liquids and Complex Fluids group annual winter school for postgraduate research students was held in Edinburgh at the start of this year. The School was a welcome return to thinking about science straight after the Christmas and new year holiday period. Students got a feel for the luxuries of academic life, staying in the stunning Salisbury Green Hotel, an 18th century mansion on Pollock halls campus.



Abden House, Pollock Halls

With bounding enthusiasm for our future lifestyles as academics we turned up at Abden House conference centre only to have our hopes dashed by Wilson Poon. In his opening statement, Poon presented

our first graph of the conference, of salary versus time for various professions, with an academic career hovering at the bottom. It was not all doom and gloom though, as he then proposed the thought provoking question of ‘what would you focus your mind on researching with an unlimited pot of money?’ The discovery of a tasty calorie free chocolate was high up on my list. Since, I have googled this idea and I have discovered that an inhaler was created by Harvard professor David Edwards to release tiny particles of chocolate into one’s mouth, simulating the taste- I think we can all throw away our selection boxes now!

After the welcome talk, a few volunteer students did flash presentations on their work which was good practice in an informal, relaxed environment. The evening’s social events kicked off with a meet and greet bingo game, where students paired up and discussed their research for one minute each; a great way to start networking. After dinner we were treated to a traditional Scottish ceilidh, complete with band, which resulted in further networking opportunities via the medium of dance.

The lecturers this year came from across the UK and should be thanked for their efforts and contribution to this event. They

covered a broad range of topics within the field of soft matter and it was interesting for postgraduates from different scientific backgrounds to hear the range of science and techniques being discussed. Matthew Turner from the University of Warwick started proceedings with his lectures on membranes, the boundaries of cells. Nigel Wilding from Bath University continued with his series entitled 'Simulation of complex fluids' and Erica Eiser from Cambridge University presented an introduction to rheology. Finally Hugo Christenson from the University of Leeds discussed confinement effects on phase behaviour. All were introductory courses which also delved into some current research.

On the final day we toured Edinburgh's streets, popping in at various sites of interest, most non-scientific, though a few lab tours did take place. In the afternoon there was a poster session, which allowed for students to present their work to a friendly and keen audience. The poster prize was won by Michael Juniper from the University of Oxford, whose poster discussed his work on fibrous structure formation in magneto-rheological fluids. This was awarded at the conference dinner, held at the Royal Botanic Garden which was an ecological paradise.



Tian Tian the giant panda at Edinburgh Zoo

In conclusion, the annual meeting for graduate students gave us all the opportunity to learn, to converse and to network and Edinburgh was a fantastic city to do it all in. Thanks go to Cait McPhee and the IoP conference team -their organisation and planning allowed this event to run smoothly. Thanks also to Alastair Mailer and the Edinburgh students for arranging a lot of the social activities for us in Edinburgh. I'm sure Leeds' Spring School will live up to this next year.

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## News

### Physics of Life Network

*Graham Leggett*

*Sheffield University*

"Understanding the Physics of Life" was one of four themes identified by the Physics Community as Grand Challenges for EPSRC's Physics Programme. Our proposal, "From Molecules to Systems" addresses a

grand challenge that is right at the centre of modern biology: the problem of integrating understanding of biological behaviour across the length scales, from the molecular to the systems level. Biochemists apply reductionist methodology to develop highly detailed understanding of biological systems at the molecular level, and systems biologists are trying to develop approaches to modeling whole systems, but there is no framework to bring the two together in an integrated fashion.

Physicists have an important contribution to make to this, because they have many years experience of tackling similarly difficult cross-length-scale challenges: the integration of quantum theory and general relativity was one of the grand challenges of 20th century science, and statistical mechanics provides a link from molecular scale phenomena to the behavior of large ensembles of molecules. The insights springing from these accomplishments, together with new tools, both experimental and theoretical, can help to solve the problem of integration biological understanding from the molecular to the systems level.

The most important goal of the Network will be to crystallize new partnerships between physicists and biologists, leading to successful

applications to EPSRC. A launch meeting, on April 8, will include a plenary address by Sir Tim Hunt, winner of the 2001 Nobel Prize for Medicine, and will also showcase some of the best work in biological physics in the UK. There will be three plenary meetings, addressing broad cross-length-scale challenges (The Living Cell, July 17/18, 2013; Synthetic Biology September 5/6, 2013; and Multicellularity, January 8/9, 2014), and a larger number of focused workshops, whose themes will be defined by the community. There will be a variety of other activities, including summer schools and other activities designed to train and inspire the next generation of biological physicists.

Please get involved!

For more information, see [www.physicsoflife.org.uk](http://www.physicsoflife.org.uk).

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## **Directed Assembly Network**

*Jenny Woods*

*Bath University*



The Directed Assembly Network is one of EPSRC's three Chemistry 'Grand Challenge' Networks. We promote research into how assembly



processes occur at the molecular and supramolecular levels, and how those processes can be controlled to develop materials with particular properties and function.

Our areas of interest are divided into five themes:

- Controlling the assembly of designed molecular frameworks and hybrid materials with targeted properties
- Controlling nucleation and crystallization processes
- Controlling molecular self-assembly in biological and biomimetic systems
- Controlling surface-based molecular self-assembly for applications in interface science
- The development of optimised chemical processes through intelligent evolution

These should not be seen as 'stand-alone' - in many cases research in a particular theme 'cross-fertilises' with that of others, whilst underpinning measurement and modelling techniques are vital to all five.

The Directed Assembly Network's mission has been divided into two stages. In the first stage, running from Oct 2010 to Oct 2012, we held discussion meetings around these themes to help build new cross-disciplinary research communities. With those communities we identified research priorities & barriers in this

area and presented those to EPSRC as a 'roadmap' for future research. Now, in our second stage until 2016, we are continuing our community-building activities and meetings, but also have funds to support collaborative activities such as travel and small pump-priming projects to assist the network members to take that research roadmap forward.

Any researcher with an interest in our themes, or in the underlying modelling and measurement techniques, is very welcome to join the Network – as are end-users of the research outcomes. We particularly target some of our activities and funding at Early Career Researchers who will drive the research programme in this area in years to come. In this second stage, we also hope to further build our connections with industry and with European researchers via the COST programme.

We welcome suggestions from our members for topics and formats of discussion meetings – we can support everything from intensive workshops for a small number of participants to two-day multi-stream research meetings.

Find out more about our activities at our website [www.beyondthemolecule.org.uk](http://www.beyondthemolecule.org.uk) from which our research roadmap, details

of funding awards and other useful information can be downloaded, or contact the Network Coordinator Jenny Woods [j.woods@bath.ac.uk](mailto:j.woods@bath.ac.uk) for further details.

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**Forthcoming Group Events**

**Advanced School in Soft Condensed Matter: Solutions in the Spring**

24th-27th March, 2013  
 Leeds, UK

**Conferences of Interest**

**Biophysical Society Annual Meeting**

2nd-6th February, 2013  
 Philadelphia, USA.

**Physics and Chemistry of Liquids, Gordon Research Conference**

4th-9th August, 2013  
 New Hampshire, USA.

**Faraday Discussions  
 Self assembly of biopolymers (#166)**

18th-20th September, 2013  
 University of Bristol, UK.

**Faraday Discussions**

**Mesostructure and dynamics in liquids and solutions (#167)**

16th-18th September, 2013  
 University of Bristol, UK.

**International Soft Matter Conference**

16th-19th September, 2013  
 Rome, Italy.

**Directed Assembly Meeting**

“Directed assembly of functional nanomaterials: design, control and manufacture”  
 12<sup>th</sup>-13<sup>th</sup> June, 2013  
 University of Strathclyde

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**Student reports**

*James Towey*

*University of Leeds*

*Gordon Research Seminar and Conference Water and Aqueous Solutions August 2012, New Hampshire, USA*

I would like to thank the Liquids and Complex Fluids group for the funding which enabled me to attend this highly interesting conference. The conference was split into 5 topics named, Molecular Water Ballet, Charges on the Edge, Coming to Life, When Oil and Water Mix, and, Exotic Flavours of Water. Of particular interest to me was a talk explaining the use of reverse micelles

to create an aqueous environment to encapsulate proteins. This could allow the study of protein structure in the aqueous environment. It was a personal highlight for me to hear the lively debate regarding the nature of water in the supercooled “no man’s land” region within the “Exotic Flavours of Water” sessions. These sessions included comments on previous experimental work as well as cutting edge techniques aimed at accessing the “no man’s land” region of the water phase diagram.

I presented a poster on my work (Molecular Insights into the Origin of the Non-Ideal Behaviour of a Cryoprotectant Solution). This generated a lot of interest and valuable feedback and ideas, with many people asking questions and challenging my methods and results so far. Many of the conferees presented posters (about 120 in total), which allowed me to talk to researchers of all levels about their work. This opportunity to network with those from other institutions from all around the world was highly enjoyable.

At the Gordon Conferences there is an emphasis on presenting and discussing new work and ideas, with all attendees encouraged to ask questions and provide feedback on oral and poster presentations. Therefore, I would strongly endorse

the GRC conferences for researchers of all stages, especially early phase researchers, as the organisation and ethos encourages you to interact with all the other attendees. The size of the conference allows you to attend all the oral presentations and poster sessions. As such, the strength of the GRC on Water and Aqueous Solutions is the encouragement of scientific progress through communication between researchers from different backgrounds and institutions. This would not be possible without the diversity of the experience and research areas of the attendees.

*Natasha Rhys*

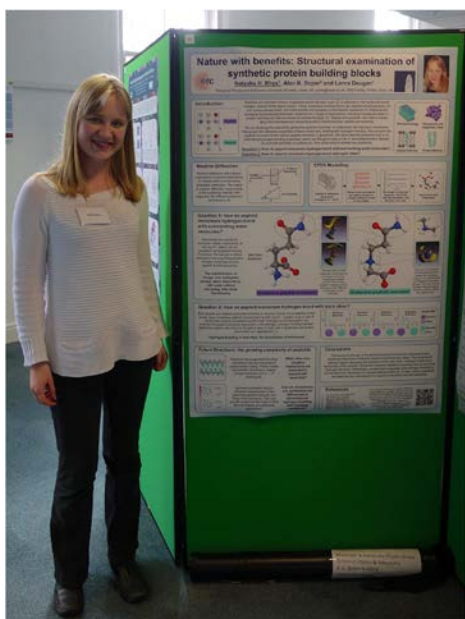
*University of Leeds*

*Gordon Research Seminar and Conference Water and Aqueous Solutions August 2012, New Hampshire, USA*

The Gordon Research Seminar and Conference on Water and Aqueous Solutions are biennial events that bring together international researchers of all levels to discuss ongoing, cutting-edge science. Both are small, focused events, with the main conference bringing in ~160 participants.

Preceding the conference was the one-day the Gordon Research Seminar. The seminars are a relatively new innovation and are

meetings specifically for graduate students and postdocs. Participants (~60) can present and discuss research with peers and mentors in an informal and interactive environment, and gain the confidence to participate in the main conference. This seminar was the first to run for the water and aqueous solutions field, and consisted of two talk and two poster sessions.



I was invited to give a talk at the seminar, within the session focused on aqueous solutions. It was the first time I had given a scientific talk and was great to have the opportunity practise at giving this kind of presentation, without the pressure and formality that can be associated with conferences. My talk received a lot of interest and I was asked many insightful questions. The seminar ended with a panel discussion specifically organised for early career

scientists on career and research development. This seminar was highly successful in preparing students and postdocs for the main conference.

The talks were highly beneficial in describing new areas of water research. I was also able to present a poster on my research at a further two poster sessions. These sessions alone results in useful feedback and ideas for future work. With all participants will typically present a poster or a talk, there were many an opportunity to discuss other areas of research with those of all stages. The smaller size of the conference and the sense of community that comes as a result means engaging in any kind of discussion is very easy to do. These events are successful in engaging a wide-audience at different stages in their careers. It is particularly suited to those at the start of their research career in encouraging involvement and providing multiple opportunities to present. I hope to be able to attend these events regularly in the future.

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### Group Prize

Liquids and Complex Fluids Early Career Award

The prize is awarded biannually to an exceptional scientist, in the early stages of their career, working in the broadly defined area of Liquids and



Complex Fluids. Those eligible for IoP awards should be members of the Institute and should have made a substantial contribution to the development or reputation of physics in the UK or Ireland.

The Liquids and Complex Fluids Group committee define “Early Career” as those individuals with no more than five years postdoctoral experience (allowing for career breaks) following the award of a PhD.

For more information please see the group website at:  
<http://www.iop.org/activity/groups/subject/lcf/index.html>

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## Group committee

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## What is the Liquids and Complex Fluids Group?

The Liquids and Complex Fluids Group aims to advance research into the liquid state of matter, complex fluids, and soft condensed matter by fostering collaborations between experimentalists, theorists and computer simulators working in these fields. Its scope encompasses both structure and dynamics from microscopic to mesoscopic and macroscopic length scales in systems ranging from simple liquids to all kinds of complex fluids and soft materials such as polymers, emulsions, gels, foams, colloids, liquid crystals, and their biological counterparts. The group correspondingly enjoys close links with the Polymer Physics and Biological Physics Groups of the IoP.

Other topics covered include liquid mixtures and solvation phenomena, liquids and glasses under extreme conditions, confined liquids and fluids at interfaces, the glass transition and arrested states of matter (including the structure of glasses and amorphous solids), crystal growth in liquids, and self-assembly from solution.

This highly interdisciplinary field has industrial links to the pharmaceutical, petroleum and plastics, food and personal care industries, among others. The physical realisation of many ideal model systems is of interest to physicists interested in statistical mechanics, liquids, elasticity, flow behaviour and rheology, and non-equilibrium phenomena. Nevertheless, liquids and complex fluids are topics that are poorly covered in the traditional undergraduate curriculum so a distinctive aim of the group is postgraduate education, for example, via graduate schools aimed at the exposition of basic ideas that cut across the sub-disciplines of the field.

Another aim is the development of new instrumentation for work on liquids and complex fluids at UK supported X-ray and neutron sources together with sophisticated data interpretation tools. The Group therefore benefits from interactions with the Neutron Scattering Group

where appropriate. Collaboration with other liquid matter researchers is strengthened through links with the Faraday Division of the Royal Society of Chemistry (the interests of many physical and theoretical chemists encompass the topics covered by our group) and through co-operation with

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the Liquids Board of the European Physical Society.

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

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