



SHOCK WAVES AND EXTREME CONDITIONS

Studying the fascinating world of the behaviour of materials outside of the everyday.

Welcome

Welcome to the fourth newsletter for the Shock Wave and Extreme Conditions (SWEC) Group. SWEC brings together parties from both industry and academia with a common interest in novel aspects of high strain-rate and pressure phenomena. This interest encompasses a wide range of disciplines from energetic material behaviour through biomaterials to phenomena such as crashworthiness of structures.

SWEC seeks to facilitate research and discussion in numerous high strain-rate and impact related field, aiming to initiate and develop links between physicists and other researchers in this multi-disciplinary area. We actively welcome all expressions of interest in collaborations with other interested parties.

The committee is currently advertising for several new members as the incumbents come to the end of their tenures. These include the positions of Chair, Secretary and Treasurer as well as a number of Ordinary Members.

As Chair, on behalf of the SWEC committee, I would like to take this opportunity to thank all those who have served and who will be moving into other roles for their support and efforts. Without this we would not be the successful community we have become. In addition, I would like to wish the new committee members well as SWEC develops into the future.

Gareth Appleby-Thomas (Chair)

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Help Needed from Members!

1. **Recruit new members** – spread the word and get your colleagues to join the IOP and SWEC.
2. **Get involved.**
3. **Tell us about your research interests** – we want to hear from you at swec@physics.org

The SWEC Group Committee

The current SWEC Committee members are:

Gareth Appleby-Thomas	Cranfield University	<i>Chair</i>
Glenn Whiteman	AWE	<i>Secretary</i>
Ian Cullis	QinetiQ	<i>Treasurer</i>
James Perry	University of Cambridge	<i>Early Careers</i>
Chris Braithwaite	University of Cambridge	
Kate Brown	University of Cambridge	<i>Equality Diversity and Inclusion</i>
Mark Collinson	AWE	<i>Database management</i>
Daniel Eakins	University of Oxford	
Simon Finnegan	AWE	<i>Awards and Prizes</i>
Michael Goff	AWE	
Craig Hoing	MOD	
Bill Proud	Imperial College	<i>NMH 2020</i>
Steve Rothman	AWE	

Committee News

Several committee members are standing down after their terms of office to allow others to 'have a go' on the committee. For the forthcoming elections we are looking to appoint the following: **Chair, Secretary, Treasurer, Ordinary member/Early careers physicist x 5**. So, if you would like to stand for election to the committee, please look out for the IOP email or contact us at swec@physics.org. The committee has instigated hybrid meetings to allow those living some distance from London to join the meetings remotely. The IT works a treat.

Committee meetings are enjoyable and the work is not onerous!

Please think about giving it a go!

If you are interested in working with the committee, please let Glenn know by emailing swec@physics.org.

Studentships

Do you know someone who might be interested in a DPhil? There's still time to apply for the following Dstl-sponsored iCASE studentship:

[Project: New paradigms for X-ray probing of dynamic failure at the mesoscale](#)

Supervised by Prof Daniel Eakins, Dr David Chapman, University of Oxford

As well as optimising a novel in-house X-ray source, this project would also leverage access to 4th generation light sources (i.e., ESRF-EBS) to interrogate rapidly evolving sub-surface damage in shocked materials in exquisite detail. The project aims to commence Oct 2022 and is open to both Home and Overseas candidates (both fully funded). Follow the hyperlink above for details on how to apply or contact Daniel (daniel.eakins@eng.ox.ac.uk) for more information.

Group prizes

Simon Finnegan has been working hard to establish our first group prize: a video competition. We hope you will find it to be a more exciting challenge than an essay! The prize has now been approved by the IOP. In addition to the prize money, we are aiming to have the winning entry added to the IOP YouTube page.

We have also made the prize more exclusive as the target audience is non-scientists, which will allow anyone to enter. This reflects recent press stories about the perception of physics as a 'hard' subject that deters young people from taking it up as a subject at GCSE and A-level.

There is a separate category for post-graduates who have more knowledge of the field. Subject to final IOP approval, at the end of the competition the finished videos will be available on the SWEC website/social media to advertise the field to members, other IOP groups and non-scientists alike so that with every year we can grow a library of entertaining, short SWEC videos. We are also discussing with the IOP the important issue of safeguarding regarding entries from schools.

So, watch out for the launch of the prize in the coming months and the details of how to enter.

GET YOUR THINKING CAPS ON NOW AND GIVE IT A GO!!

The International Conference on Explosives, being organised by the UK Centre Of Excellence in Energetic Materials (COEEM) was moved, due to the pandemic, to this June. It is being held in the Victory Services Club

in Marble Arch London 22nd -24th June. SWEC has obtained IOP approval to donate a prize of £100 to the authors of the best poster. For those of you interested in 'things that go bang' this should be a very interesting conference and introduction to the current research areas in this field.

IOP Joint group meetings

The Committee continue to work on joint group meetings and have potentially identified joint meetings with the Applied Mechanics, Structural Condensed Matter, Combustion, Food, and Materials and Characterisation Groups.

Once again if you are also a member of another group and have ideas for cross-correlation of meetings we would very much like to hear from you. We can also help you with the organisation.

We are aiming to organise between 1 and 3 events each year. Watch out for our calling notices!

Group sponsored events

The committee are always interested in sponsoring meetings related to the SWEC area. If you are interested in organising a workshop or training activity, then please contact a member of the Committee.

The PETER/NMH conference, held last year, was sponsored by SWEC. The conference brings together scientists, engineers and interested group who wish to understand, model, and predict the behaviour of materials under dynamic loading. The conference is open and has an international scientific and organising committee, Bill Proud, a SWEC committee member, was one of the organisers.

The conference, one of an ongoing series, is held on average once every two years, with previous locations being in London (United Kingdom), Pardubice (Czech Republic) and Saint Malo (France). The 2021 conference was originally planned for Montenegro but took place in the newly popular location of 'on-line' due to the difficulties of travel and the wisdom of a large international group meeting in a confined space for an extended period.

The took place over 3 days and was a mix of invited and contributed talks; most of these talks produced a written article which can be found in the proceedings, currently with IOP publishing. After each contribution there was time given for questions and discussion, which probably helped make the task of the reviewers so much simpler.

The meeting was considered a great success and helped pave the way for the development of hybrid conferences to enable those unable to travel to still attend important conferences virtually., so if you have an interest in dynamic processes and material behaviour under shock conditions make a note to catch up with the

proceedings. Bill reported that the expertise and facilities of the Institute of Physics conference teams and publishing arm were invaluable in making this conference an engaging, friendly, and intellectually stimulating place to be.

We have continuing to explore holding/sponsoring several potential workshops and we would be very interested to hear from you if you had a topic you would like to learn more about.

Watch out for future events on the IOP and SWEC calendars.

SWEC Speakers

The online SWEC seminar series has been successful, attracting 30-60 attendees to each of the four held to date. The recent ones hosted by the IOP have been recorded and we are working to have the YouTube links shared on the SWEC website.

Gareth is exploring streaming, ideally via an official IoP link so it can be recorded for the group website, a talk at Cranfield's Shrivenham campus from a visiting Professor (John Spray) who has a significant interest in high strain-rate physics. Professor Spray is a member of the Planetary and Space Science Centre at the University of New Brunswick, Canada and his talk is entitled "The use of Ceramics in protective systems: Past, present and future."

In addition, the launch of a new 'Consortium for organotypic research on ageing and microgravity', focused on research into tissue behaviour in extreme conditions, being established between Birmingham and Cranfield University's is being sponsored by SWEC. This hybrid event is running at the IoP and online on Friday the 20th of May. It is envisaged that the associated talks will be recorded and hosted on the SWEC website.

Kate Brown, one of our committee members, suggested that as climate change can be considered to fit nicely within the 'extreme conditions' area we should have a talk on an aspect of this complex problem. If you are interested in giving a talk on climate change or know someone we could approach, then please get in touch with the committee.

We are very conscious of the number of undergraduates in the SWEC membership and hope the topics of our talks will enable them the active research areas and the courses available for postgraduate study to help with the development of career paths.

If you would like to offer a talk for our list, then please get in touch with a member of the committee or email swec@physics.org with 'Speaker' in the subject line.

Early Careers (EC)

James is continuing to work up Early Careers events and their format. Like everything else the pandemic resulted in a loss of momentum. James is keen to co-ordinate SWEC activities with other IOP groups to avoid any overlap.

Please email James at jip24@cam.ac.uk (with "SWEC EC" in the subject line) and confirm that you would like to be included in discussions of SWEC-specific early-career events.

Any thoughts and suggestions for activities would also be very welcome, and if you are keen to get involved in organising things then please let James know!

Diversity and Inclusion

This is an increasingly important issue for the IOP, other professional bodies, companies, and government. Kate is our committee member responsible for this area and is coordinating any SWEC centred activities with the IOP focus. She will keep you up to date with progress and ideas.

Kate has further sought out engagement with the Cavendish D&I groups, who are also looking into real mentoring schemes, the like of which don't exist in the IOP. Kate will continue to report back on this at future meetings.

Case Study

Back to normal: The return to normal after the pandemic as expected is occurring at varying rates under different national protocols around the world. The decision to attend a conference or meeting is therefore not always straightforward. We thought you might like to hear about the experience of Chris and his colleagues from Cambridge when they attended the New Trends in Energetic Materials (NTREM) Conference.

Back in early April a group of us from Cambridge went across to Pardubice in the Czech Republic to attend the New Trends in Energetic Materials (NTREM) Conference. Normally this would not be an unusual occurrence, and certainly unlikely to be worthy of an article for a newsletter. However, this was the first time that many of us had travelled abroad since the start of the pandemic and would for all of us be the first conference that we had attended in person for over two years.

In this new post-pandemic world, there was a significant amount of additional admin to be completed before departure, including ensuring vaccination certification was up to date and making sure that all of the correct forms had been completed. However, on landing, things took on a more familiar feel, and we soon discovered that the remaining restrictions in Czechia were not being adhered to by anyone who lived there. This meant that while masks were required on public transport, the ticket collector on the train was the only person wearing one. From a restrictions point of view, this was very much the last that anyone was concerned about it. We had already been told that the conference would not require masks, and while some people chose to wear them, this was the only difference that one would have detected (from a COVID point of view) from the normal conference experience.

The conference itself was a successful return to the in-person format as far as I was concerned, and something that I think that many of my fellow delegates agreed with. While there are some occasions and circumstances where Zoom is incredibly useful, there is something about the personal interaction from face-to-face meetings that is very beneficial. It allows for example the question at the end of the talk to be asked again at the break because there was a confusion about what was actually being asked. It allows for the question that you didn't want to ask in front of people (because it seemed a silly one) to be asked later, quietly. It allows you to reconnect with old friends and to make new ones in a way that is very tricky over a computer screen. One sad caveat to the conference this year was that some old acquaintances were unable to be renewed. The conference has a strong Eastern European attendance, but owing to events in Ukraine, Russian and Belorussian delegates were prevented from taking part. Given the nature of this conference, this was an entirely justified the course of action, and one which served to reinforce that the things that we have often taken for granted in terms of interaction with fellow scientists are in fact quite fragile.

The scientific programme was very well presented, it was clear that people had not spent the past two years sitting idly. There were several talks on chemical synthesis that, as is often the case, were baffling to me as a physicist, but it was good to see that those who spend their time mixing things from one bottle with those from another bottle in an attempt to make something new are still doing so! There were also talks about new diagnostics and experimental techniques, as well as some of hazard testing and mechanical properties of energetic materials. One emerging trend seems to be an increased use of machine learning methods to try and make predictions or to analyse large(ish) data sets. There are some very interesting research programmes in this area, but it does seem to me that this new direction is one which should be treated with some caution. In places it didn't seem clear that the approach was being applied to a problem that it was actually possible to solve using such an approach, and in others that the dataset might be too restricted to be able to learn much in

the way of new information. It will be interesting to see how these approaches develop over the next few years, and how transformative (or not) they are to the way in which all of us conduct research going forwards.

Overall, returning to in-person conferences was a good experience as far as I was concerned, I already have tickets booked for the SCCM conference in Anaheim in July!

Case Study: Although we do not feature a case study in this edition of the Newsletter, we are still very interested in receiving short articles on your research work and any interesting behaviours you have observed.

If you have a case study you would like to publish in future newsletters, then please let us know at swec@physics.org.

Please note we now also have a twitter account: [@ShockGroup](https://twitter.com/ShockGroup)

Events diary

As things are getting back to normal after Covid cancelled meetings and conferences are being rescheduled. The list below is not meant to be exhaustive but provides an indication of what is happening in the next few months.

Dates	Event	Location	Website	Notes
13-17 June, 2022	3 rd International Conference on Impact Loading of Structures and Materials	Trondheim, Norway	https://www.ntnu.edu/icilsm2022	
22 June – 24 June, 2022	International Explosives Conference 2020	London, UK	https://www.coeem.org	
June 26 – July 1 2022	Gordon Conference: Energetic Materials	Southern New Hampshire University, New Hampshire, USA	https://www.grc.org/energetic-materials-conference/2022/	June 26 – July 1 2022
July 11–15, 2022	22nd Biennial Conference of the APS Topical Group on	Marriot ~ Anaheim, California USA	https://hadlandimaging.com/2021/06/11/22nd-biennial-	Postponed from 2021.

	Shock Compression of Condensed Matter (SHOCK21)		conference-of-the-aps-topical-group-on-shock-compression-of-condensed-matter-shock21/	
16-17 July 2022	Gordon Conference: High Pressure Physics	Holderness, New Hampshire, USA	https://www.grc.org/research-at-high-pressure-grs-conference/2022/	
5 – 8 September 2022	59 th European High Pressure Research Group Meeting on High Pressure Science and Technology (EPHRG2022)	Uppsala, Sweden	www.ephrg2022.org	Virtual meeting
11 – 14 September 2022	Dynamic Behaviour of Additively Manufactured Structures & Materials DYMAT 2022	Freiburg, Germany	www.dymat2021.org	
18 – 22 September 2022	Hypervelocity Impact Symposium (HVIS) 2022	Alexandria, Virginia	www.hvis2022.jhuapl.edu	

If you have any additional events to add to the diary, then please let us know at swec@physics.org.