Newsletter
December 2023

APS Topical Group on Compression of Condensed Matter

Message from the Chair

I think everyone would agree that with the end of this year the pandemic is finally behind us and activities for most of us are back to normal. This includes the recent SCCM 2023 meeting which is now back to the biennial odd-year cadence. The 2023 meeting was a great success and I would like to thank the co-chairs Dayne Fratanduono, Suhithi Peiris and Malcolm McMahon for their hard work in organizing it. In recent years the Topical Group has been sponsoring several sessions at the annual APS March Meeting. These include the "Matter at Extreme Conditions" focus session as well as other related sessions including both static and dynamic compression. I would like to thank the 2023 organizers Matt Lane and Minta Akin (also on the current Executive Committee) for their efforts in making the 2023 March meeting also very successful.

This year our Topical Group selected two new APS fellows, Sarah Stewart of UC Davis and Daniel Dolan of Sandia National Laboratories; join with me to congratulate both. Congratulations also to Bruce Remington of Lawrence Livermore National Laboratory, winner of the 2022 Duvall Award, to Richard Kraus also of LLNL for the inaugural Ashcroft award of 2022 and to Mitchell Wood selected as the 2023 recipient of the Ashcroft Award.

This was an eventful year for the Topical Group. Two years ago the Executive Committee began discussions on the possibility for a formal expansion of the scope of the topical group beyond shock compression more broadly to all areas of compression including static compression and non-shock forms of dynamic compression. These discussions were expanded to a focus group of GSCCM stakeholders followed by well-attended town hall meetings during the SCCM 2022 and SCCM 2023 meetings. The most controversial aspect of the proposal is the removal of the word "Shock" from the name of the topical group. Views expressing both support and opposition to this name change were vigorously articulated. In July this year the proposal was put to the membership in a vote to reject or accept the proposed changes. The response was decisively positive in favor of the expanded scope and the name change.

The Topical Group has deep roots in shock compression science and these will remain in place because dynamic compression techniques continue to play an important role in many branches of compression science. The Topical Group Executive Committee expects that the Duvall Award will continue to be awarded for work carried out in the field of shock compression in honor of the pioneering work of George Duvall and because of the continuing importance of this field. At the same time the Topical Group has taken on the responsibility for award selection of the new early career award, the Ashcroft Award, which recognizes significant contributions in all areas of extreme compression science. I think these two awards epitomize both the historical roots and the future direction of Topical Group.

In many ways the expanded scope of our Topical Group was already developing in recent SCCM conferences as evidenced by participation of many members from the static compression community, especially in recent March Meeting sessions that were sponsored by the Topical Group. The boundaries between static and dynamic compression have become blurred in the last decade, especially in connection with

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Honors and Awards

2023 Neil Ashcroft Early Career Award for Studies of Matter at Extreme High Pressure Conditions Recipient

Mitchell A. Wood
Sandia National Laboratories

Citation: "For the development and application of ground-breaking computational approaches to the study of complex physical processes in materials undergoing dynamic compression, including initiation in energetic materials, strength in metals, and phase change kinetics in compressed diamond."

Background:
Mitchell Wood is a Principal Member of the Technical Staff at Sandia National Labs in the Center for Computing Research. He holds a Ph.D. in Materials Science and Engineering from Purdue University (2016), a B.S. in Physics from Michigan State University (2011) and has been at Sandia first as a postdoc, then a staff member since 2018. His work has focused on multiscale modeling and simulation methods of matter in extreme conditions, and in the utilization of machine learning in predictive simulations where he has been an active developer of widely-used software tools in this area. Key contributions include understanding of non-equilibrium reactions in shock compressed energetic materials, multi-scale treatment of strength in metals and high-pressure phase transformation kinetics of carbon. Other honors include a R&D100 award for his contributions to the LAMMPS molecular dynamics software and finalist for the Gordon Bell Prize from the Association for Computing Machinery.

2023 APS Fellows for Compression of Condensed Matter (GCCM)

Daniel Dolan
Sandia National Laboratories

Citation: *"For scientific contributions to understanding phase transitions under dynamic compression, specifically, freezing in water, and for broadly impactful contributions to the field of dynamic compression science in the area of diagnostics and analysis tool development."*

Nominated by: Topical Group on Compression of Condensed Matter

Sarah T. Stewart
Univ. California, Davis

Citation: *"For the development and application of shock physics techniques to explain the origin and evolution of planetary systems."*

2023 Student and Dissertation Award

Linda Hansen
Univ. of Rochester and Sandia National Laboratories

Dissertation: "Exploring the off-Hugoniot phase diagrams of carbon dioxide and magnesium oxide utilizing static and dynamic precompression techniques "

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the recent developments of microscopic probing at x-ray light source facilities. Many of these facilities offer static compression capabilities alongside dynamic compression capabilities. A good example of this is the HPCAT and DCS beam lines at the Advanced Photon Source. Here, the various modes of compression share common x-ray probing techniques and similar data analysis methods. This has led to a rich cross-fertilization of techniques and ideas among researchers working across all forms of compression science. Similar synergies can be found at other light source facilities world-wide. There are increasing numbers of researchers who have trained in one domain (e.g. static compression) and now work using dynamic compression techniques, or vice versa, often as a result of the shared diagnostic techniques.

An expanded Topical Group provides a natural home for the high pressure science community to showcase and communicate their work to their colleagues working in all areas of compression science. I want to thank all of you who participated in the discussions during the town hall sessions, who articulated your views and for expressing your choice by voting. I also want to thank the members of this year's and the two previous year's Executive Committee, who initiated the expansion proposal and who spent many hours deliberating over the scope and planning the process for proposing the expansion. There were many valuable contributions by many members of the current and past executives, too many names to list here. However, I do want to mention and thank Matt Lane, our Secretary/Treasurer, for his tireless work engaging with the APS council and navigating the way through the formalities of the APS rules. As for the future expansion: now that the membership has approved the proposal we have much work to do to communicate our broadened scope to the wider physics community and to attract new young scientists!

Looking forward to future meetings and developments: planning for the SCCM 2025 meeting is well underway. In the aftermath of the pandemic the planning process for meetings has evolved to have a closer interaction with the APS meetings staff and we are still learning the process in this new era. We have a strong team of organizers who have been working hard in conjunction with the meetings staff at APS; we plan to finalize a decision on the venue for SCCM 2025 and make the first announcements early in the new year. Planning for the SCCM 2027 is also well advanced. An opportunity to hold a joint meeting with AIRAPT in 2027 came up this year because the AIRAPT's planning horizon is four years in advance. The Executive Committee took advantage of this opportunity by soliciting proposals for conference planning for both the 2025 and the 2027 meetings with the intent that the 2027 team consider submitting a proposal to AIRAPT for a joint AIRAPT and SCCM meeting. We selected a strong team and their proposal was accepted enthusiastically by the AIRAPT executive during the 2023 AIRAPT meeting held this past summer. As a result the SCCM 2027 meeting will be held jointly with the AIRAPT meeting in Chicago.

I wish you all the best in the coming year and I look forward to a bright future for our Topical Group.

Happy Holidays and Best Wishes,

Peter Celliers

Upcoming Meetings

2024 APS March Meeting

Our GCCM topical group will have a strong presence at the 2024 APS March Meeting. The conference will take place in-person in Minneapolis, Minnesota on March 3--8, 2024. Virtual sessions will also be offered. The GCCM program committee (Marcia Cooper and Matt Lane) organized an Invited Symposium, "Frontiers in Static and Dynamic Compression." This Monday session will highlight the vital compression research at the intersections of our growing community. In addition to these 5 invited talks, we will host another 6 invited speakers, spread across our seven Focus Topic sessions, which range from high pressure superconductivity, to equation of state and dynamic material response. The organizers put primary emphasis on diverse topics in static and dynamic compression for the invited speakers. The "Matter at Extreme Conditions" focus topic sessions will run Mon-Wed and include more than 100 contributed abstracts. Special events and giveaways are planned to showcase our expanded scope and new group name. We hope you will plan to attend.

Upcoming Meetings

The 24th Biennial Conference on the Science of Compression in Condensed Matter will be held in the Washington Hilton in Washington DC, June 22-27, 2025.

NEW SCOPE - The members of the APS Topical Group recently voted to rename both the biennial meeting and the group itself. SCCM 2025 will be the first conference reflecting the expanded scope, where we will include and integrate all timescales of compression from static to dynamic and shock.

In 2025, we will bring together the static and dynamic compression communities - for we hope an unforgettable week - in a city close-packed with art, culture and history, and in a beautifully-situated hotel that has witnessed many notable events.

The conference will include familiar themes such as equations of state, energetic materials, strength, spall, and ballistics, while also including new topics and sessions on methods in static compression, reflecting our broader scope.

MASTERCLASSES - Alongside parallel sessions, a range of Masterclasses will be offered to allow you to learn or update in areas including AI/ML, Equation of State, Diamond Anvil Cell techniques, Synchrotron X-ray Diffraction, and Introduction to Shock Wave Science. Masterclasses will run Monday-Friday, ahead of relevant technical presentations, so that you will be able to attend the Masterclass and then apply the material in sessions of invited and contributed talks.

FUN - Social events will include a Reception, a Diversity Lunch, Lunch with a Scientist, a Banquet, and opportunities to network as well as Wednesday afternoon open for visiting landmarks and museums that Washington DC has to offer.

Please feel welcome to contact us if you have questions or ideas, or want to volunteer. Updates will be coming soon!

SCCM 2025 Co-Chairs: (sccm2025@aps.org**)**
Scott Crockett (LANL), Pat Kalita (SNL),
Bill Proud (Imperial College) and Damian Swift (LLNL)

Website:
https://engage.aps.org/gccm/meetings/biennial-2025

Mach 2024 Conference
April 3-5, 2024, Baltimore, MD
https://machconference.org

Gordon Conference on Research at High Pressures
July 14-19, 2024, Holderness, New Hampshire
https://www.grc.org/research-at-high-pressure-conference/2024/

17th International Detonation Symposium
August, 2024 (details tba)
Contact: info@intdetsymp.org

61st EHPRG Meeting
September 1-6, 2024, Thessaloniki, Greece
https://www.ehprg.org/meetings.php

DYMAT 2024
September 8-13, 2024, Zurich, Switzerland
https://dymat2024.ethz.ch

24th Biennial APS Science of Compression in Condensed Matter (SCCM-2025) Conference
June 22-27, 2025, Washington, DC
https://engage.aps.org/gccm/meetings/biennial-2025

Past Meetings

23rd Biennial APS Shock Compression of Condensed Matter Conference

The twenty-third biennial Shock Compression of Condensed Matter conference (SCCM23) was held at the Sheraton Grand in Chicago, Illinois, USA from June 18th to June 23rd, 2023. The conference was attended by 578 in-person and 5 online (virtual) participants from 13 countries, with the United Kingdom contingent of 36 being the largest from outside the US.

SCCM23 included the usual technical areas of Advances in Experimental Techniques and Diagnostics, Data-Driven Modeling and Simulation, Detonation and Shock Induced Chemistry, Energetic and Reactive Materials, Equations of State, First-Principles and Molecular Dynamics, Geophysics and Planetary Science, High Energy Density Physics/Warm Dense Matter, Multi-Scale Modeling and Experiments, Particulates, Composites, and Manufactured Materials, Phase Transitions and Kinetics, Soft Matter, Spalla Ejecta and Ballistics. With special focus sessions on Current & Emerging High-Pressure User Facilities that reviewed emerging high-pressure user facilities throughout the world together with emerging experimental techniques utilizing advanced light sources. The popularity of these sessions was obvious from the over-flowing conference room! In addition, SCCM23 included technical areas of non-shock compression sciences, such as Traditional Diamond Anvil Cell (DAC) work, Mechanics and Engineering at Extremes, Non-Traditional DAC work, Hydrogen and Hydrides, that increased participation from the wider community.

SCCM23 consisted of 5 plenary speakers, 51 invited talks, 400 contributed oral presentations and 78 posters, totaling 533. The conference opened with the George E.

GSCCM/GCCM Chair Peter Celliers presents the 2022 Duvall Award to Bruce Remington (left). Scene from the Juneteenth Diversity Luncheon (right)

Duvall Shock Compression Science Awardee Bruce Remington (LLNL) speaking on Monday morning. Tuesday's plenary was on the Double Asteroid Redirection Test (DART) Mission by Angela Stickle (JHU-APL), followed by Justin Wark (U. Oxford, UK) on Wednesday, and Dan Casey (LLNL) on Thursday. Friday's plenary was an introduction of the Neil Ashcroft Early Career Award by Russell Hemley (UIC), and the first-ever awardee Richard Kraus' (LLNL) presentation.

In addition to the technical sessions, on June 19th, a Juneteenth lunch was organized with B.J. Evans (U. Mich.) discussing the history of the holiday. Then on Wednesday afternoon while some attendees had a break, 152 attendees were in class, at the three introductory courses taught by John Borg (Marquette U.), Nick Glumac (UIUC) and Dan Dolan (SNL).

– **SCCM23 Co-Chairs,** Dayne Fratanduono (LLNL), Malcolm McMahon (U. of Edinburgh) and Suhithi Peiris (Battelle)

SCCM Early Career and Student Symposium

The Early Career and Student Symposium (ECSS) was held on Sunday, June 18th and attended by 110 members, which was the highest attendance ever. The ECSS23 consisted of 19 oral presentations, 8 lightning talks, and 45 poster presentations, which were all judged. The winners

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Obituaries

Paul Urtiew

1931-2023

Paul Urtiew, a scientist with a long career at LLNL, passed away on Nov. 2, 2023. Paul was an international leader in combustion, detonation, and shock wave science. Much of his career was spent in the LLNL's Energetic Materials Center. He was instrumental in developing gauges that could be embedded in solid high explosives to measure position and time dependent properties in a detonation. This work dramatically advanced the field and led to a much greater understanding of the safety and hazards of explosive systems. Paul made important contributions to the understanding of the shock to detonation transition in many materials, including gas, liquids, and solid explosives. He also advanced the understanding of thermal deposition and relaxation at interfaces after shock loading, in collaboration with Richard Grover.

Later in his career Paul was a critical element of the LLNL and U.S. government's engagement with Russia after the fall of the Soviet Union. His life did a full circle in a sense. Paul was born in Yugoslavia to parents that had to flee Russia during the Bolshevik Revolution. During World War II his parents were forcefully taken to Germany to work in factories. Eventually his mother was successful in getting Paul and his sister to Munich.

In 1950 Paul and his family were able to settle in San Francisco. He attended the University of California, Berkeley, where he obtained a PhD. He then started his career at LLNL, where he spent his entire professional career.

Paul was fluent in four languages. Both his language and technical expertise became invaluable during and after the collapse of the Soviet Union. Paul was part of many U.S. delegations to the Former Soviet Union (FSU) and subsequently to the Russian Federation. Paul served as a highly valued interpreter and host for Russian-speaking scientists visiting international conferences in the US, often for the first time. His service to the American Physical Society Symposium on Shock Compression of Condensed Matter is particularly remembered.

Paul had an incredible life. Those that knew him personally knew him to be a true gentlemen who brought out the best in us.

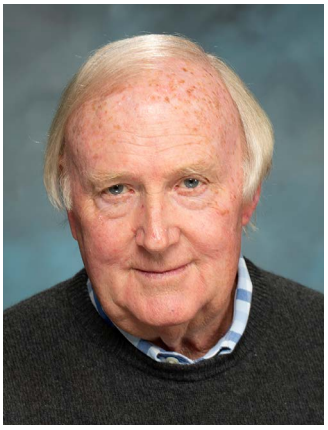
- Larry Fried

Neil Holmes

1948-2023

Neil Holmes passed away in his home with loved ones on Wednesday, October 18, 2023.

Neil was born on September 27, 1948, in Oakland, California. In his early childhood, he developed a love of science, astronomy, photography, music, and the outdoors, passions he nurtured his entire life. After graduating from Caltech with a B.S. in Physics, Neil completed a Ph.D. at Stanford University in Electrical Engineering. He then spent 42 years at Lawrence Livermore National Laboratory researching condensed matter shock physics and contributing to our national security. Neil was an exceptional experimental scientist. He developed novel shock physics techniques and investigated extreme states of matter, as evidenced by his more than 250 publications. Neil was deeply invested in advancing the physics community, generously sharing his time to collaborate with colleagues (both domestic and international), supporting



their career development, and mentoring numerous early career scientists. Neil led the effort to build the Joint Actinide Shock Physics Experimental Research (JASPER) Facility – a pillar of the NNSA stockpile stewardship program. His peers elected him as a Fellow of the American Physical Society in 1998, an honor reserved for 0.5% of the society membership. He was a cherished and deeply appreciated colleague to a multitude of scientists around the world. His research helped keep our world safer while also deepening our knowledge of the matter from which it is made.

Although Neil made major scientific contributions, those

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Past Meetings

(continued Meeting Summary from page 5)

were Vatsa Gandhi (CalTech) for Best Oral Presentation; Jet Lem (MIT) for Best Lightning Talk, Melia Kendall (CU Bolder) and Jacob Diamond (Johns Hopkins) for Best Poster Presentations. The symposium also had a keynote address by Staci Brown (NNSA) and a Networking and Career Advancement Workshop.

– **ECSS23 Chairs**, Belinda Pacheco Johnson (LANL) and Sakun Duwal (SNL)

Student presentation award winners at ECSS 2023

Material Data Compendium Workshop

We held a workshop at the last SCCM conference to discuss a community effort to assemble and maintain a new compendium of high-pressure material data, including shock but also ramp and isothermal (quasistatic) measurements. There was broad support for this idea. We suggested that it might make most sense to manage the compendium under the aegis of the Topical Group because of the close alignment with the membership's interests.

Since the SCCM conference, we have reached out to other communities including AIRAPT, APS-DPP, and APS-DCMP to see whether there are related efforts in data curation. While there are smaller maintained or legacy databases, there is no other broad initiative as proposed here. Encouraged by members of the GCCM Executive Committee, we are forming a data management committee as a focus for community feedback and management of content, structure, tools etc. We are keen to engage anyone interested from the high-pressure community, and we intend to make sure that stakeholders involved in acquiring and using high-pressure data, or sponsoring this work, have a voice. We have also extended the prototype datasets demonstrated at the conference to include almost everything from previous compendia as well as some data from more recent experimental papers.

We plan to set this data management process in operation, and act on advice for refining and extending the prototype compendium, but it is otherwise in a reasonable shape for use at least as a repository. The data compendium will be part of the Data Science workshop at the 2025 SCCM Meeting.

The raw data are maintained on github, currently with limited access; we will provide access to other interested members soon. We will provide other functionality via a web portal at https://www.highpressuredata.org. The email address for related communications is highpressuredata@groups.io

– Markus Daene, Rick Kraus, Sarah Stewart, and Damian Swift

(continued Holmes Obituary from page 6)

around him often remarked on his passions outside the laboratory. He was an avid photographer, poet, music lover, and chef. He shared his talents with friends (personal and professional) and enriched the lives of all who had the honor of knowing him. A visit with Neil wouldn't be complete without listening to some records, a few quotes from Shakespeare, Rumi, or Rilke, and some cookies for the road. His second home was camping under the stars. He loved the shape of trees, rocks, and flowering dogwood. He lived life fully and passed along his joy to those around him, including his daughter, Laura, and his granddaughters, Alanna and Selena.

If you wish to honor his memory, consider donating to the San Francisco Symphony, wondering about the stars, drinking tea, or listening to birdsong while walking someplace beautiful and wild.

- William Evans

Community News

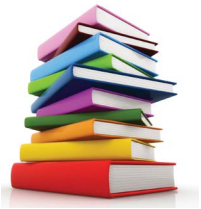
Evan Reed Memorial Symposium

Evan J. Reed was an outstanding computational physicist and materials scientist. Evan was a frequent presenter at the American Physical Society Shock Symposium on Condensed Matter and made many significant contributions to shock wave science. Evan was a faculty member in the Department of Materials Science and Engineering at Stanford University when he passed away after a battle with cancer in 2022.

In remembrance of Evan's unique contributions, Stanford University held the Evan J. Reed Memorial Colloquium on April 5, 2023. Evan's PhD advisor, Prof. John Joannopoulos, gave the inaugural Evan J. Reed Computational Materials Science Lecture, "Working at the Speed of Light". Evan's contributions to the understanding of shock waves in photonic crystals was highlighted by Prof. Joannopoulos. This work has continued to have a deep influence on current research in the Joannopoulos group.

Nir Goldman and Larry Fried, former collaborators of Evan Reed from Lawrence Livermore National Laboratory, also gave remembrances of Evan's contributions to cometary impact chemistry and molecular simulation of explosives, respectively. A number of Stanford faculty, including David Barnett, William Chueh, Aaron Lindberg, Andrew Spakowitz, and Michael McGeehe (U. Colorado) gave moving testimonials to the ways in which their interactions with Evan influenced their research and personal lives. Evan's family and former students gave sometimes entertaining and often emotional presentations on Evan's unique history, personality, and mentorship. Evan will continue to be remembered through the Evan J. Reed Computational Materials Science Lecture at Stanford.

-Larry Fried



Bookshelf

Books and Proceedings

The Bookshelf is curated by member Stephen Walley. His database of recent and historical shock papers can be found on the GCCM website. Member authored/edited works are highlighted.

Apollo Remastered
Author: Andy Saunders
ISBN: 9780241508695, Particular Books, 2022

Blast Injury Science and Engineering: A Guide for Clinicians and Researchers
Editors: Anthony M.J. Bull, Jon Clasper and Peter F. Mahoney
ISBN: 9783031103544, Springer Cham, 2023

Escape from Model Land
Author: Erica Thompson
ISBN: 9781529364873, Basic Books, 2022

Equity for Women in Science: Dismantling Systemic Barriers to Advancement
Author: Cassidy R. Sugimoto and Vincent Larivière
ISBN: 9780674919297, Harvard Univ. Press, 2023

Force: What It Means to Push and Pull, Slip and Grip, Start and Stop
Author: Henry Petroski
ISBN: 9780300274134, Yale University Press, 2023

Inheriting the Bomb: The Collapse of the USSR and the Nuclear Disarmament of Ukraine
Author: Mariana Budjeryn
ISBN: 9781421445861, Johns Hopkins Univ. Press, 2022

Law, Ethics and Emerging Military Technologies: Confronting Disruptive Innovation
Author: George Lucas
ISBN: 9781032227283, Routledge, 2023

Micromechanics of Fiber-Reinforced Laminae
Author: Andreas Ochsner
ISBN: 9783030940904, Springer Cham, 2022

(Bookshelf continued from page 8)

Nano and Micro-Scale Energetic Materials: Propellants and Explosives
Editors: Weiqiang Pang and Luigi T. DeLuca
ISBN: 9783527349814, Wiley-VCH GmbH, 2023

Not Just for the Boys: Why We Need More Women in Science
Author: Athene Donald
ISBN: 9780192893406, Oxford Univ. Press, 2023

Nuts and Bolts: Seven Small Inventions That Changed the World (in a Big Way)
Author: Roma Agrawal
ISBN: 9781529340082, Hodder & Stoughton, 2023

Soil to Foil: Aluminum and the Quest for Industrial Sustainability
Author: Saleem H. Ali
ISBN: 9780231204484, Columbia University Press, 2023

Handbook of Damage Mechanics: Nano to Macro Scale for Materials and Structures
Editor: George Z. Voyiadjis
ISBN: 9783030602413, Springer Cham, 2022

Mischievous Creatures: The Forgotten Sisters Who Transformed Early American Science
Author: Catherine McNeur
ISBN: 9781541674172, Basic Books, 2023

Dynamic Behavior of Materials: Fundamentals, Material Models, and Microstructure Effects
Editor: Mikko Hokka
ISBN: 9780323991537, Elsevier, 2023

How to Expect the Unexpected
Author: Kit Yates
ISBN: 9781529408676, Quercus Books, 2023

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Please send any questions, corrections or comments about the newsletter to any of the editors.

The APS Topical Group on Compression of Condensed Matter (GCCM) was founded in 1984 to promote the development and exchange of information on the shock and dynamic high-pressure properties of materials. In 2023, the scope of the group was expanded to all high-pressure compression (static, dynamic and shock). The Topical Group sponsors biennial technical meetings on the Science of Compression in Condensed Matter (SCCM) which showcase and promote research in static, dynamic and shock compression and detonation physics research - including experimental, theoretical and computational studies, and new experimental methods and developments.