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## Message from the Chair

It has been an honor to serve on the GSCCM executive committee, and as your Chair this past year. I would like to thank all executive board members for their service, and give special thanks to Mark Elert for serving as the Secretary/Treasurer for two consecutive terms over the past six years! With that in mind, the Nomination Committee for the executive board has developed a list of nominees for a Secretary/Treasurer (3-year term), two Members-at-Large (2-year term), and a Vice Chair (4-year term). I encourage everyone to vote in the upcoming election.

The 21st Biennial Conference of the APS Topical group on Shock Compression of Condensed Matter is rapidly approaching, and the organizing team has been working hard to make this conference possible. The conference will be held in Portland, Oregon the week of June 16th, 2019. Please visit the conference website for details, and submit your abstract by February 28, 2019. I want to thank the organizers – Ryan Wixom, David Damm, and Joe Zaug – for their efforts,

and look forward to seeing everyone in Portland in 2019.

### Proposals for the 2021 Shock Compression Conference

Proposals to organize the 2021 Biennial Conference on Shock Compression of Condensed Matter are now being solicited. Potential organizers should submit a brief description of the proposed location along with the names, qualifications, and duties of the organizing team. Conference teams typically have a minimum of three members with at least one member from academia and no more than one member from a particular federal agency such as the Department of Energy. Proposals should be sent to any officer of the executive committee before March of 2019. Because the 2019 meeting will be held in Portland, a site in the Midwest or eastern part of the continental United States is preferred for the 2021 conference.

Best wishes and Happy Holidays,

*Brian Jensen*

## Obituary: Lynn M. Barker

### A Legend in His Time



Lynn M. Barker

The shock compression science research community lost a pioneer and giant with the death of Lynn M. Barker on March 12, 2018. Barker made numerous seminal contributions, which elevated the status of shock wave research. His contributions to the field began with his employment at Sandia National Laboratories (then named Sandia Laboratory) beginning in 1955.

After receiving a BS in physics from the University of Arizona, Barker joined the U.S. Navy and served during the Korean War as a carrier pilot, earning the U.S. Navy Distinguished Flying Cross for his extraordinary service in combat from August to October 1950. After his military service, Barker continued his education at the University of Arizona, obtaining an MS in physics in 1955 before joining Sandia Laboratory. His initial assignment was to develop safe nuclear weapon delivery and escape methods from nuclear weapon bursts. During that time, he invented the first analog computer at Sandia, which he used to perform analyses of nuclear weapon effects on aircraft.

Around 1957, along with C. Donald (Don) Lundergan and Roy (Red) Hollenbach, Barker began research in shock wave physics. Their goal was to develop precision diagnostics for producing and analyzing shock wave response. The three used a cast-off 4-inch diameter military gun that was re-bored for precision flat-plate experiments. This work resulted in the first gas gun facility for precision plate impact experiments in 1958. In their laboratory, coined the “Serendipity Lab,” Barker and Hollenbach made many landmark advances to develop instrumentation techniques. These innovations have established the standards for shock wave research, even to the present.

One particular focus was to invent advanced diagnostics for the direct measurements of time-resolved particle velocity histories during a shock event. Barker and Hollen-

bach’s innovations in the early 1960s included the invention of the slant-wire resistor gauge. The gauge provided accurate real-time histories of shock-induced free-surface displacement that gave good estimates of particle velocity histories by differentiation. Introduction of the Michelson displacement interferometer for shock wave experiments then significantly increased the accuracy of displacement measurements by an order of magnitude in the mid-1960s. Another invention, called the Sandia velocity interferometer, provided the first direct, accurate particle velocity data of metals for shock pressures of around 100 kbars in the late 1960s. This was followed by an ingenious invention by Barker and Hollenbach in 1972 – the Velocity Interferometer System for Any Reflector (VISAR), which can be used for virtually any shock wave experiment. This ground-breaking achievement is why the VISAR is still used in shock physics laboratories worldwide. The VISAR has enabled a wide spectrum of major technical achievements. These include initial techniques for quasi-isentropic loading, highly accurate measurements of the 130- kbar a-e phase transition in iron upon loading and unloading, and shock wave studies of metals under a variety of loading conditions and in extreme pressure and temperature regimes. The VISAR has also allowed researchers even decades later to investigate geological materials and other classes of materials to ultrahigh pressures, to observe experimentally the density-induced metallic transition in molecular deuterium in 2015 that had been predicted theoretically by Eugene Wigner and Hillard Huntington in 1935, to produce combined shock and quasi-isentropic compression experiments to multi-Mbar pressures, and to study the properties of composites and mixtures. The VISAR is indeed a standard diagnostic that has had a profound and lasting influence on shock wave research, as evidenced by the limited list of examples given above

In addition to his myriad experimental accomplishments, Barker contributed significantly to material models and computational techniques. Specific examples include a simple dynamic model that was used extensively for heterogeneous and composite materials in the 1970s and 1980s and a method-of-characteristics computational code, SWAP (Stress Wave Applications Program). SWAP

is still occasionally used for tracking wave propagation in complex one-dimensional experiments.

Barker spent a total of 27 years during three separate periods at Sandia, where he was one of the first group of 50 employees to receive recognition as a Distinguished Member of the Technical Staff. After retiring from Sandia in 1990, he formed his own company, Valyn International,<sup>1</sup> with his wife Valerie Barker. He spent about a dozen years inventing, improving, and marketing new diagnostic tools for the shock wave research community, including the development of a multi-point VISAR, a standard diagnostic now used at many research institutions. From 1974 to 1981, Barker was a Senior Staff Consultant at Terra Tek, Inc. in Salt Lake City. At Terra Tek he developed and marketed an innovative fracture toughness test method, resulting in several patents and recognition for two ASTM standard test methods.

<sup>1</sup> The company began operating on January 1, 2001 as Valyn International Peripherals (Valyn VIP, Inc) under the leadership of their son, Zane Barker, and his wife, Wendy Barker.

In 1996 Barker was elected a fellow of the American Physical Society. He received the 1999 George E. Duvall Shock Compression Science Award “in recognition of his outstanding contributions to the temporal measurement and interpretation of nonlinear physical processes in shock-compressed matter.”

Barker’s scientific genius, innovative talent, entrepreneurial leadership, and exemplary military service have set the standard for scientific excellence and inspired many new researchers entering the shock wave field. His pioneering contributions to the discipline established him as an icon and legend in shock compression science.

Contributors:

*James Asay, Lalit Chhabildas, Jeff Lawrence, and Mary Ann Sweeney  
Sandia National Laboratories*

## Accolade for APS-SCCM Member



*Sarah T. Stewart*

Sarah T. Stewart, a frequent participant in our ZFSP Workshops, received the MacArthur Fellowship for her contributions to new theories of planet formation and evolution, including a new theory of the Moon’s formation. As a planetary scientist, Stewart uses a combination of shock physics experiments, theoretical models

and computational simulations to better understand the formation of planets and the development of their physical, geological and geochemical features. Stewart is a member of the APS Topical Group on Shock Compression of Condensed Matter.

*Mary Ann Sweeney, Ph.D.  
Distinguished Member of Technical Staff  
Pulsed Power Sciences Center, 01600  
Sandia National Laboratories*

## 2018 APS Fellows

**Goldman, Nir**

**Lawrence Livermore National Laboratory**

*Citation: For significant contributions to the development of novel quantum mechanical approaches to processes in shocked organic materials, dense fluids, and chemical reactions related to the origins of life.*

Nominated by: Topical Group on Shock Compression of Condensed Matter

**Jensen, Brian J.**

**Los Alamos National Laboratory**

*Citation: For technical leadership in the physics of materials at high pressures, for technical advances in dynamic x-ray diffraction and phase contrast imaging, and for sustained leadership and service to the American Physical Society and the shock physics community.*

Nominated by: Topical Group on Shock Compression of Condensed Matter

Contributed by:

*Dr. Jennifer L. Jordan, Los Alamos National Laboratory*

## Early Career Award

The 2019 APS GSCCM Early Career Award will be given to recognize outstanding work by either a current graduate student or a researcher within two years of PhD completion. Nominations for the award are invited from the entire community and should include a cover letter, at least two letters of support, an example of recent work (publication, conference proceedings, poster or abstract),

and the nominee's CV. The recipient will be recognized at the conference and will give an oral presentation on their work. The recipient will be chosen from the nominations by a committee of GSCCM members. Nominations should be sent to Cindy Bolme ([cbolme@lanl.gov](mailto:cbolme@lanl.gov)) with the subject line "SCCM Early Career Award Nomination." Deadline for nominations is Friday March 15, 2019.

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## Past Meetings

### 8th International Conference on High Speed Forming (ICHSF 2018)

Columbus, Ohio, May 13th -16th, 2018

Organizers: Glenn S.Daehn, A. Erman Tekkaya, and Anupam Vivek

### 15th International Conference on Structures under Shock and Impact

Seville, Spain, June 4th - 6th, 2018

<http://www.wessex.ac.uk/conferences/2018/susi-2018>

Organizers: Wessex Institute, UK and University of Liverpool, UK

### 19th Electromagnetic Launch Technology Symposium (EML)

Saint-Louis, France, June 18th - June 22nd, 2018

<http://www.isl.eu/eml2018>

General Chair: Markus Schneider, French-German Research Institute, Saint-Louis, France

Technical Program Chair: David Wetz,

University of Texas at Arlington, Arlington, Texas

### Mini Symposium: Advances in correlating length scales and ductile failure-13th World Congress on Computational Mechanics

New York City, USA, July 22nd - 27th, 2018

[http://www.wccm2018.org/MS\\_215](http://www.wccm2018.org/MS_215)

### 22nd European Conference on Fracture - ECF22 Loading and Environment Effects on Structural Integrity

Belgrade, Serbia. August 26th - 31st, 2018

<http://www.ecf22.rs/>

### 17th International Conference on Fracture and Damage Mechanics

Seville, Spain, September 4th - 6th, 2018

<http://fdm.engineeringconferences.net/new/>

Organizers: Jaime Dominguezm, Luis Rodriguez, and Ferri M. H. Aliabadi

### Course on Damage and Failure of Materials under Extreme Conditions

International Center of Mechanics Sciences (CISM)

Udine, Italy, October 1st - 5th, 2018

<http://www.cism.it/courses/J1802/>

## Upcoming Meetings

### International Conference on High Energy Density Science (ICHED)

March 31 - April 5, 2019, University College, Oxford, UK  
 Early Registration Deadline: February 8, 2019  
 Registration Deadline: March 21, 2019  
<http://icheds2019.iopconfs.org/home>

### 21st Biennial Conference of the APS Topical Group on Shock Compression of Condensed Matter (SHOCK19) APS Meeting

June 16-21, 2019, Portland, OR  
 Abstract submission deadline: February 28, 2019  
<https://www.aps.org/meetings/meeting.cfm?name=SHOCK19>

### 3rd International Conference on Impact Loading of Structures and Materials (ICILS 2020)

June 23-26, 2020, Trondheim, Norway  
 Abstract submission deadline - January 15, 2020  
<https://www.ntnu.edu/icilsm2020>

The research group SIMLab at the Norwegian University of Science and Technology (NTNU) will host the 3rd International Conference on Impact Loading of Structures and Materials on 23-26 June 2020.

The conference is the third in a series of international

conferences organized by the International Society of Impact Engineering.

The list of topics includes but is not limited to:

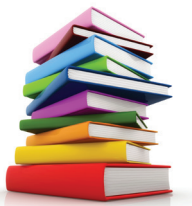
- Impact and failure of structures and materials under impact and blast loading
- Systems for protection and absorption of impact and blast loading
- Terminal ballistics
- Dynamic material behaviour and failure
- Stress waves
- Structural crashworthiness
- High-rate mechanical and forming processes
- Impact, blast and high-rate loading/measurement techniques and their applications

### 18th International Conference on Fracture and Damage Mechanics

Rodos (Rhodes), Greece, September 10th - 12th, 2019  
<http://fdm.engineeringconferences.net/new/>

### 31st International Symposium on Ballistics - 2019

Hyderabad International Convention Center, India  
 November 4th - 8th, 2019  
 Chair: V. K. Saraswat and G. Satheesh Reddy  
<https://www.ballistics.org/>



## Bookshelf

### Books and Proceedings

*Blast Effects: Physical Properties of Shock Waves (Shock Wave and High Pressure Phenomena)*

Editor: Isabelle Sochet  
 ISBN: 9783319708294

*Blast Injury Science and Engineering: A Guide for Clinicians and Researchers*

Editors: Anthony M. J. Bull, Jon Clasper, and Peter F. Mahoney  
 ISBN: 978-3319218663

*Blast Mitigation Strategies in Marine Composite and Sandwich Structures*

Editors: Srinivasan Gopalakrishnan and Yapa Rajapakse  
 ISBN: 9789811071690

*Blast Waves*

Author: Charles E. Needham  
 ISBN: 9783642052873

*Bombing the Marshall Islands: A Cold War Tragedy*  
 Authors: Keith M. Parsons and Robert A. Zaballa  
 ISBN: 9781107697904

*Cambridge University, The First 150 Years*  
 ISBN: 9781908990686

*Chemical Rocket Propulsion: A Comprehensive Survey of Energetic Materials*  
 Editors: Luigi T. De Luca, Toru Shimada, Valery P. Sinditskii, and Max Calabro  
 ISBN: 9783319277462

*Chondrules: Records of Protoplanetary Disk Processes*  
 Editors: Sara S. Russell, Harold C. Connolly Jr., and Alexander N Krot  
 ISBN: 9781108418010

*Collision Phenomena in Liquids and Solids*  
 Authors: Alexander L. Yarin, Ilia V. Roisman, and Cameron Tropea  
 ISBN: 9781107147904

*Crystal Indentation Hardness*  
 Editors: Ronald W. Armstrong, Stephen M. Walley, and Wayne L Elban  
 ISBN: 9783038429678

*Dynamic Behavior of Materials, Volume 1: Proceedings of the 2017 Annual Conference on Experimental and Applied Mechanics*  
 Editors: Jamie Kimberley, Leslie Elise Lamberson, and Steven Mates  
 ISBN: 9783319629551

*Dynamic Behavior of Materials, Volume 1: Proceedings of the 2018 Annual Conference on Experimental and Applied Mechanics*  
 Editors: Jamie Kimberley, Leslie Elise Lamberson, and Steven Mates  
 ISBN: 9783319950884

*Emerging Energetic Materials: Synthesis, Physicochemical, and Detonation Properties*  
 Authors: Dabir S. Viswanath, Tushar K. Ghosh, and Veera M. Boddu  
 ISBN: 9789402411997

*Fundamentals of Materials Modelling for Metals Processing Technologies: Theories and Applications*  
 Author: Jianguo Lin  
 ISBN: 9781783264964

*Foundations of High-Energy-Density Physics: Physical Processes of Matter at Extreme Conditions*  
 Author: Jon Larsen  
 ISBN: 9781107124110

*Impactful Times: Memories of 60 Years of Shock Wave Research at Sandia National Laboratories (Shock Wave and High Pressure Phenomena)*  
 Authors: James R. Asay, Lalit C. Chhabildas, R. Jeffery Lawrence, and Mary Ann Sweeney  
 ISBN: 9783319333458

*Managing Dismounted Complex Blast Injuries in Military & Civilian Settings: Guidelines and Principles*  
 Editors: Joseph M. Galante, Matthew J. Martin, Carlos J. Rodriguez, and Wade Travis Gordon  
 ISBN: 9783319746715

*Materials Engineering: Bonding, Structure, and Structure-Property Relationships*  
 Authors: Susan Trolier-McKinstry and Robert E. Newnham  
 ISBN: 9781107103788

*Multi-layer Pavement System under Blast Load*  
 Authors: J. Wu, H. Wu, H.W.A. Tan, and S. H. Chew  
 ISBN: 9789811050008

*Proceedings of the 30th International Symposium on Shock Waves 1 ISSW30 – Volume 1*  
 Editors: Gabi Ben-Dor, Oren Sadot, and Ozer Igra  
 ISBN: 9783319462110

*Proceedings of the 30th International Symposium on Shock Waves 2 ISSW30 – Volume 2*  
 Editors: Gabi Ben-Dor, Oren Sadot, and Ozer Igra  
 ISBN: 9783319448640

*Proceedings of the 14th Hypervelocity Impact Symposium (HVIS 2017)*  
 Editor: M. J. Burchell  
 ISBN: 9781510850040

*Selected Values of the Crystallographic Properties of the Elements*

Author: John W. Arblaster  
 ISBN: 9781627081542

*Shock and Materials (Engineering Materials)*

Author: Stepan S. Batsanov  
 ISBN: 9789811078859

*The Imagineers of War: The Untold Story of DARPA, the Pentagon Agency that Changed the World*

Author: Sharon Weinberger  
 ISBN: 9780385351799

*The Kolsky-Hopkinson Bar Machine: Selected Topics*

Editor: Ramzi Othman  
 ISBN: 9783319719177

*The Last Man Who Knew Everything: The Life and Times of Enrico Fermi, Father of the Nuclear Age*

Author: David N. Schwartz  
 ISBN: 9780465072927

*Theory of Dislocations, 3rd Edition*

Authors: Peter M. Anderson, John P. Hirth, and Jens Lothe  
 ISBN: 9780521864367

*Ultracondensed Matter by Dynamic Compression*

Author: William J. Nellis  
 ISBN: 978-0521519175

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

**Special thanks to Nancy Bennett-Karasik of APS Communications.**

**The APS Topical Group on Shock Compression of Condensed Matter (GSCCM)** was founded in 1984 to promote the development and exchange of information on the dynamic high-pressure properties of materials. The Topical Group sponsors biennial technical meetings on shock compression and detonation physics research, including experimental, theoretical and computational studies, and new experimental methods and developments.