

# **Newsletter of the APS Shock Compression of Condensed Matter Topical Group**

**Welcome** to the third issue of the American Physical Society Shock Compression of Condensed Matter Topical Group Newsletter. This quarterly newsletter includes conference announcements, job advertisements, profiles of award winners, obituaries, and articles on the history of the field from the membership. Issues have revolving Lead Editor, with current issue has been compiled by Dr. Bill Proud. Dr. John Borg will serve as the Lead Editor for the November issue, please email him your comments and contributions at wgp1000@hermes.cam.ac.uk.

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## **“Note from the Chair”**

Colleagues:

Fall is fast approaching and as the leaves start to turn, we turn to selection of our leadership for the future. As stated in our by-laws, we must appoint a nomination committee (with one member appointed by Judy Franz at APS) to solicit recommendations from the membership about possible qualified candidates, and to then select the pool of qualified candidates for our fall election, in which we will fill the positions of Vice-Chair and Members-at-Large. The current make-up of the nominating committee (with their end of term identified) is:

Von Whitley, Los Alamos National Laboratory (12/31/2007)

John Borg, Marquette University (12/31/2007)

Jennifer Jordan, AFRL, Eglin (12/31/2008)

Zbigniew Dreger, Washington State University, Chair (12/31/2008)

Suhithi Pereis, DTRA (12/31/2008; APS Selection)

Zbig Dreger, as nominating committee chair, recently sent out guidance to the committee soliciting input for our slate of candidates. The committee has nearly completed their task, and the slate of individuals for our next election is nearly filled. I ask that you participate in the election process. Your vote matters!

I would also like to discuss the Fellowship Committee, and its role regarding “Fellowship” and the “Shock

Compression Science Award”, of which there has been some confusion in the past. From our bylaws: “The Fellowship Committee is composed of the members of the Selection Committee for the Shock Compression Science Award, which is appointed biannually by the President of the Society. It shall evaluate the nominations of candidates for Fellowship and shall report its recommendations to the Executive Secretary of the Society.”

Unfortunately, in the past, the topical group has created two independent committees to perform these functions. Moving forward, we have combined the committees as our bylaws state, with the following membership in effect for selection of our 2008 Fellows and soliciting nominations for the 2009 Shock Compression Science Award:

Ramon Ravelo (Chair; 12/31/2008)

David S. Moore (Vice-chair; 12/31/2009)

Joe Zaug (12/31/2008)

Gerrit Sutherland (12/31/2008)

Dennis Grady (recipient- 2007; 12/31/2009)

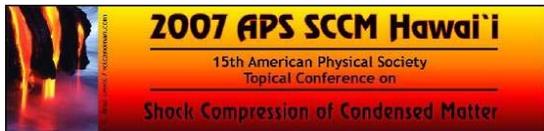
I expect that Ramone will be requesting nominations for Fellows in late winter (February-March timeframe).

Finally, I would like to note that we are making progress on changing the name of the Shock Compression Science Award to the “George E. Duvall Shock Compression Science Award” as recommended by the topical group during the last two conferences. The resolution to change the name of the “Shock Compression Science Award” to the “George E. Duvall Shock Compression Science Award” passed unanimously by the executive committee and David Moore has volunteered to put together the supporting data. Once we have a package together, we will forward it to the APS Council with our official request for the name change.

Dave

David J. Funk, 2007 Topical Group Chair

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The 15<sup>th</sup> American Physical Society Topical Conference on Shock Compression of Condensed Matter met June 24-29, 2007 at the Fairmont Orchid, Hawai'i. The approximately 430 attendees from 16 different countries who met to discuss the latest developments in high-speed compression knew they were in for something special as they passed through the Orchid Hotel portal, where the "APS physics" logo was spelled out in white coral against the black volcanic rocks.

The meeting, organized by Ricky Chau, Jeff Nguyen and Neil C. Holmes of Lawrence Livermore National Laboratory featured special sessions on shock waves in medical devices and isentropic compression of materials, a discussion led by Brad Holian of Los Alamos National Laboratory to examine the quality of interaction potentials essential to atomic-scale calculations of materials under extreme conditions, and a Town Hall meeting led by William Nellis of Harvard University on future directions in dynamic high pressure research. The Shock Science Award was presented to Dennis Grady of Applied Research Associates (Sandia National Laboratory, ret.) who gave a spirited award lecture on "The Shock Wave Profile: Causes and Effects".

Other discussion topics included inelastic deformation, first-principles and molecular dynamics calculations, explosives and reactive materials, geophysics and planetary physics, optical spectroscopy and multiscale and continuum modeling. In the special focus session on isentropic compression, invited speakers Dennis B. Hayes of Sandia National Laboratory, and Raymond L. Smith and Daniel Orlikowski of Lawrence Livermore Laboratory described experiments using three quite different experimental techniques based on the Sandia Z-machine, the University of Rochester Omega laser system, or a microfabricated flying impactor developed at Livermore. The speakers explained that shock compression was a fast irreversible process, and the large entropy rise across the shock front creates high temperatures. Isentropic compression uses a more gradual ramp wave that produces less heating, which makes it possible to achieve higher densities in solid materials such as aluminum and diamond than had been previously observed. Isentropic compression can be achieved over a much greater range of time scales than shock compression. Graduate student Cindy Bolme of the Massachusetts Institute of Technology and Los Alamos National Laboratory described a new technique that uses femtosecond laser-driven shock waves that

produce a wide range of pressures to determine the complete shock equation of state, termed the Hugoniot, not over the weeks or months usually needed but on a single laser shot lasting just 300 picoseconds. Marcus Knudson of Sandia National Lab described hyper-velocity flyer plate with the Sandia Z-machine to study molten diamond, showing excellent comparison of the experiment with state-of-the-art quantum molecular dynamic simulations. William Nellis of Harvard University explained how several common and ordinarily soft materials, when compressed to pressures over one million atmospheres, become far stiffer than diamonds.

The conference will reconvene in two years at the Gaylord Opryland Hotel in Nashville, Tennessee (see below for more details)

*Dana Dlott*

### **The 2007 Shock Compression Award was presented to Dennis Grady**

"For his pioneering contributions into the fundamental principles controlling dynamic failure and fragmentation, developing a large database of the dynamic response of brittle materials, and identifying a universal relationship between shock wave structure and its amplitude."



Dennis Grady is currently an Associate and Principal Scientist with the South West Division of Applied Research Associates headquartered in Albuquerque, New Mexico. He performed Military service from 1958 to 1963, in the U.S. Navy Submarine service. He received his BS in physics and mathematics from Lewis and Clark College in 1967, and a Ph.D. in physics from Washington State University in 1971. Following three years on the research staff of Poulter Laboratory at SRI International he joined Sandia National Laboratories. He retired from Sandia Laboratories as a distinguished member of the technical staff in 1996 and joined the South West Division of Applied Research Associates the same year. He has been involved with the experimental measurement and theoretical description of condensed matter under the extreme pressure and temperature stimulus of shock and high-velocity impact for over 30 years. He has published over 300 technical papers and reports on a range of materials and applications issues in the intense shock environment including experimental methods, electric and magnetic effects, phase transformation, high-pressure equation of state, transient strength, hypervelocity interaction, and dynamic fragmentation. He is a member or past member of the American Physical Society, International Hypervelocity Society, American Geophysical Union, International DYMAT Association, and has served various official roles in these societies.

## REPORTS ON CONFERENCES OF INTEREST

The Society for Experimental Mechanics (SEM, [www.sem.org](http://www.sem.org)) held its annual conference June 4th to 6th in Springfield, Massachusetts. To add to the breadth of research on topics related to Experimental Mechanics discussed at the conference, the society has added a new Technical Division on the Dynamic Behavior of Materials. Eight sessions were held on high strain-rate experimental and applied mechanics, crash worthiness, blast loading and mechanics of energetic materials, dynamic fracture and failure, and experimental methods for dynamic measurements on low-impedance materials. In addition to US participants, several attendees traveled from Canada, Europe, Asia, and South America.

### *Eric Brown*

A technical track on Dynamic Behavior and Failure of Materials was organized by Rebecca Brannon (U. of Utah) and Tracy Vogler (SNL) for the **ASME Applied Mechanics and Materials Conference**. This conference, which is held every four years, was at the U. of Texas at Austin in the first week of June.

Nine sessions of talks were held over three days of the conference and included participants from the DoD, from the DOE labs, and from academia, including several participants from outside the U.S. Although a variety of topics were covered in the various sessions, one area that was particularly well represented was dynamic fracture and fragmentation.

### *Tracy Vogler*

Under the auspices of **DYMAT** a two-day meeting, 6/7 Sept 2007, entitled "*The High Rate Mechanical Properties of Energetic Materials, their Binders or Simulants*" was held at the Cavendish Laboratory, Cambridge. This was a small technical meeting with 45 attendees from the UK, France, Germany, Belgium and a US representative from ONR. The talks dealt with a wide range of subjects but the main focus was on the need for linkage between experiment and modelling efforts. Overall 12 talks were given and a poster session was run on both days. Copies of the conference proceedings can be obtained from [www.dymat.org](http://www.dymat.org) - publications.

### *Bill Proud*

## CONFERENCES TO COME

### CALL FOR PAPERS

**SOCIETY FOR EXPERIMENTAL MECHANICS (SEM) 2008 SEM International Congress & Exposition on Experimental & Applied Mechanics**  
([http://sem.org/PDF/08s\\_CFP\\_web.pdf](http://sem.org/PDF/08s_CFP_web.pdf))

Rosen Plaza Hotel, Orlando, Florida, USA,  
June 2-5, 2008

Symposium on:

### **Shock and High Pressure Response of Materials**

Sponsored by the Dynamic Behavior of Materials technical division as part of the Track 1: Dynamic Behavior of Materials

The objective of the symposium is to discuss recent developments in the understanding and modeling of the shock and high-pressure response of materials. We welcome contributions of basic and applied topics based on experimental, numerical and theoretical approaches. The symposium targets the discussion of recent and current research findings on topics that include, but not limited to,

- Equation of State
- Phase Transitions
- Detonation Properties and Reactive Materials
- Isentropic and Off Hugoniot Loading
- Stress-Strength Measurements
- Spall and Damage
- Static Pressure
- Technique Development

Interested authors should submit a short abstract (200 words or less) by October 16, 2007 through SEM website. Please indicate the session organizers in your submission to ensure inclusion in this session. An earlier response to organizers with the title of abstract will be much appreciated.

### **ORGANIZERS**

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Tracy J. Vogler, Sandia National Laboratory,  
[tjvogle@sandia.gov](mailto:tjvogle@sandia.gov)

## CONFERENCES TO COME

### ASME International Mechanical Engineering Congress and Exposition (IMECE07)

Seattle, Washington – November 10-16, 2007. Abstract deadline March 5, 2007.

<http://www.asmeconferences.org/congress07/>

### Workshop on “Constitutive relations and numerical simulation of industrial dynamic processes”

Metz (France) – November 2007

[rusinek@lpmm.sciences.univ-metz.fr](mailto:rusinek@lpmm.sciences.univ-metz.fr)

### 6th International Conference on Mechanics of Time-Dependent Materials 2008

Monterey, California – March 30 - April 1, 2008.

Abstract deadline March 20, 2007

<http://www.ae.utexas.edu/MTDM08/>

### International Congress on Theoretical and Applied Mechanics

Adelaide (Australia) – August 24-30, 2008

[prandtl.maths.adelaide.edu.au/ictam2008/](http://prandtl.maths.adelaide.edu.au/ictam2008/)

## SCCM 2009

### June 29th - July 3rd 2009 - Nashville

**The City** - Music City, USA. Settled on Christmas Day, 1779. Capitol of the State of Tennessee. Population (2004) City - 595,805, MSA: 1,541,659  
Elevation Lowest: 550 ft (168 m) Highest: 1100 ft (336 m) Central Time Zone. Served by 16 Airlines.



**The Sights** - Outdoor 107 City and County Parks, 7 Municipal golf courses, 9 Greenways, 11 State Parks and 3 National Park Service units within 1 hour. Entertainment, Live music (country, jazz, classical, etc.), Live Theatre, Nashville Zoo. History and Culture - Art Galleries, (Frist Center for the Visual Arts), The Parthenon, Cheekwood Botanical Gardens, The Hermitage (Home of Andrew Jackson), Fort Negley, Stones River National Battlefield

**The Venue** - **Gaylord Opryland Hotel** - Largest non-gaming hotel property in the United States. Completely enclosed and climate-controlled complex includes 9 acres of gardens. 10 Restaurants and bars. Two outdoor and one indoor swimming pools. Next to Opry Mills, a 1.2 million sq. ft. entertainment and shopping complex.

**Co-Chairs** Mike Furnish (Sandia National Laboratory), Bill Anderson (Los Alamos National Laboratory), Bill Proud (Cavendish Laboratory, Cambridge).

## And for those of you with money to spare, some recent publications...

**PROCEEDINGS OF THE 13TH DETONATION SYMPOSIUM** has just been published by the Office of Naval Research, Arlington, VA, USA as report number ONR 351-07-01

### HIGH ENERGY DENSITY MATERIALS

Series: Structure and Bonding, Vol. 125

Klapötke, T. M. (Ed.) Publ. Springer,

286 pages, © 2007 Hardcover ISBN: 978-3-540-72201-4

/ Online version available Price \$269

Contents: A.J. Bellamy: FOX-7 (1,1-Diamino-2,2-dinitroethene). R.P. Singh, H. Gao, D.T. Meshri, J.M. Shreeve: Nitrogen-Rich Heterocycles. T.M. Klapötke: New Nitrogen-Rich High Explosives. R.D. Chapman: Organic Difluoramine Derivatives. B.M. Rice, E.F.C. Byrd, W.D. Mattson: Computational Aspects of Nitrogen-Rich HEDMs. S. Zeman: Sensitivities of High Energy Compounds

### ADVANCEMENTS IN ENERGETIC MATERIALS AND CHEMICAL PROPULSION

Kenneth K. Kuo Pennsylvania State University, University Park, PA

Juan de Dios Rivera

803 pages, © 2007 / ISBN 978-1-56700-239-3 Price: \$594.00

Significant advances have been made recently in the areas of synthesis, ignition, combustion, and mechanical characterization of energetic materials. Some of these new energetic materials contain nano-sized ingredients, which exhibit specific advantages for military and commercial applications in the chemical propulsion field. The advancements were achieved through experimental, theo-retical, and computational efforts. In order to promote technical communication and to encourage further advancement in this important area, the International Advisory Committee for the Foundation of International Symposium on Special Topics in Chemical Propulsion decided to conduct the Sixth International Symposium (6-ISICP): Advancements in Energetic Materials and Chemical Propulsion. The materials are presented within the pages of this book and also on CD.

## Final Thoughts

After the SCCM 2007 Ricky Chau, finally had some sleep and a few moments of calm contemplation to bring together his top ten thoughts on SCCM 2007.

(1) The Payoff - A smooth running conference - Thanks for all of the words of encouragement!

*(2) Physicists are attracted to food like moths to a flame. Conference attendees had a hard time meeting conference deadlines but were always 30 minutes early for the food line. A suggestion to the next chair- instead of offering an early registration discount, offer free food.*

(3) Physicists are really dedicated. Rest assured that the laptops got a really good tan by the pool.

*(4) At least the view was good. Paying \$40 for a burger and a drink! At least it was a good burger.*

(5) Avoid random hallway conversations that begin with, "We should organize a conference!" Just turn around and walk away.

*(6) Running a conference is a testament in faith. One needs faith when seeing for the first time how much you are over budget*

(7) A miracle occurred. The number of talks submitted prior to the start of the conference was nonzero. Thanks to those who did submit their talks early.

*(8) Gee, I swore registration started Sunday afternoon!? The large number of attendees at hotel Friday night.*

(9) When in doubt delegate. Just find someone really good to do the hard work. Eternal gratitude to Judy Fox-Goldstein and her staff for pulling this off.

*(10) True or False. A suit is appropriate resort wear.*

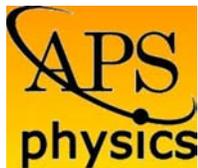
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## The Expanding Shock Community

Jennifer and Chris would like to announce that Juliana Rose Jordan was born Sept. 19th. Weight - 6 lb. 12 oz. 20 3/4" long. (Messages - [jennifer.jordan@eglin.af.mil](mailto:jennifer.jordan@eglin.af.mil))



*Sunset on Mauna Kea (Image - Natalie Barden)*



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**Thanks** to all who contributed to this Newsletter. A lot of goodwill and help was received! **Bill Proud**



*Hawaiian Turtle on black sand beach  
(Image - Natalie Barden)*