



American Physical Society / (301) 209-3200 / <http://www.aps.org/units/gsc/cm/>

Dates of Interest:

**Deadline for
March Meeting
Abstracts:
November 11, 2011**

**Topical Group
Elections:
Approximately
November 11 –
December 3**

**Deadline for
nominations for
2012 APS Beller
and Marshak
Endowed
Lectureships
November 9,
2011**

See also pages 4
and 5 for
upcoming
conferences

**Individual
Highlights:**

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Message from the Chair

Dear Colleagues

As we approach the end of another year of advance we can look back with pleasure and pride at the achievements of a full and successful year. The last twelve months has seen the largest and the most wide-ranging Topical Group conference held in the vibrant hub Chicago. We thank the organisers Tracy Vogler, Jennifer Jordon and John Borg for their sterling efforts and congratulate again the Duvall award winner Jim Johnson for his seminal achievements in the field.

The conference has widened further the remit of our field, extending the common themes of matter in extremes and recognizing the effects upon condensed matter across length-scales and pressure amplitudes. It differentiates high-energy density physics at the atomic scales, material science at the mesoscale, engineering at the macroscale and geophysics at the planetary scale, all unified by extension of the laws derived from classical behaviour. But further effects on biological systems and applications across engineering have expanded interests across the subjects covered and gathered personnel and funding into our community. We look forward to the joint APS-AIRAPT meeting in mid-July of 2013 in Seattle, and to the gas phase conference of ISSW to be held in Madison, Wisconsin that has been aligned to run directly after. For the first time communities studying solids, liquids and gases under loading extending from in shock to quasistatic compression have been assembled over the same time period and geographically close.

The breadth of our remit is unrivalled across the physical sciences; at the smallest dimensions studying the nature of

interatomic bonding and at the greatest the interaction of volumes and states unrealised under laboratory conditions. The challenges ahead require us to define the mechanisms by which response develops and to refine mathematical description to understand the boundaries of the extreme state and to define the validity of existing mechanics across an area of application where engineering can apply the descriptions constructed. The expansion of interest and application is both exciting and empowering and drives us to find a common terminology to speak across the diverse formalisms and states, which fascinate and drive us to advance.

Wherever the next years take you creatively and scientifically I look forward to hearing of your achievements when we next meet.

Best wishes,

Neil Bourne

Prof. Neil K. Bourne ScD FInstP
Chair, APS Topical group
Shock Compression of Condensed Matter
Distinguished Scientist
Shock and Detonation Physics
AWE Aldermaston
Reading
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News and Events

Endowed Lectureships (Urgent Deadline)

The deadline for nominations for the 2012 APS Beller and Marshak Endowed Lectureships is next week, on Wednesday, 9 November 2011. These lectureships can be used to support invited, international speakers at the APS March and April Meetings. We encourage you to take advantage of these lectureships.

Nominations can be submitted at: <http://ultron.aps.org/forms/aps.cgi?ID=1065>

Please contact Michele Irwin should you have any questions.

Contributed by:

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www.aps.org/programs/international/

Topical Group Elections

- **Tentative voting dates:** 11/11 – 12/3
- **Candidates for Vice Chair:**
Bill Anderson and John Borg
- **Candidates for Member-at-Large:**
Dawn Flicker, Darcie Koller, Kevin Vandersall, and Damien Hicks

Current Officers of Our Topical Group

- **Past Chair** (1/1/2011 through 12/31/2011)
- D. S. Moore (LANL), moored@lanl.gov
- **Chair** (1/1/2011 - 12/31/2011)
- N. K. Bourne, neil.bourne@mac.com
- **Chair-Elect** (1/1/2011 - 12/31/2011)
- D. M. Dattelbaum (LANL), danadat@lanl.gov
- **Vice-Chair** (1/1/2011 - 12/31/2011)
- Tracy Vogler (SNL), tjvogle@sandia.gov
- **Secretary/Treasurer** (1/1/10 - 12/31/12)
- M. D. Furnish (Sandia National Laboratory), mdfurni@sandia.gov

The Members at Large of the Executive Committee are E.K. Cerreta, D.E. Eakins (terms through 12/31/2012) and E. A. Glascoe and S. M. Peiris (terms through 12/31/11).

Announcing the 2012 APS Outreach Mini Grant Program

The American Physical Society is happy to announce that it will award several grants, up to \$10,000, to encourage the development of new outreach activities. Programs to be funded may include not only the more traditional K-12 outreach but also engaging the general public within physics and informing them about the importance of physics in their daily lives. Innovative ideas and new approaches, particularly if they have the potential to lead to sustained activities beyond the duration of the grant, are particularly encouraged. To find out more information about the program including application procedures, please visit <http://www.aps.org/programs/outreach>

Summary of the 2011 APS Shock Compression of Condensed Matter Topical Conference



The 17th biennial Shock Compression of Condensed Matter (SCCM) conference was held at the Chicago-Renaissance Hotel in the heart of downtown Chicago, Illinois, June 26-July 1, 2011. With over 640 attendees, representing 17 countries, the 2011 conference was the largest SCCM ever. The conference included 6 parallel sessions, 5 plenary talks, including the David Duvall Award Presentation and 40 invited talks. This year's conference featured a special session on post shock turbulence, meso and macro scales as well as a focus session on material strength at high pressure. The program contained 688 papers presented during 90 oral sessions and one poster session. The reviewed proceedings will be

published by the American Institute of Physics (AIP) as a bound volume and an interactive CD-ROM. In addition, for the first time, the proceedings will be freely available on-line. Also for the first time, the conference scientific program and abstracts were easily negotiated with a new smart phone app. With sponsorship support from the Defense Threat Reduction Agency (DTRA), Lawrence Livermore, Los Alamos and Sandia National Laboratories, 44 Student Scholarship awards made, and our corporate sponsors supported the purchase of the conference bags, coffee mugs, and water bottles. The conference included a week long company showcase, which featured several of the premier manufactures of high-speed photography and diagnostic equipment.

The conference included a full program of cultural and tour events including a skyline rooftop reception, a botanical garden tour, chicago trolley and double decker tour, a tour of Argonne National Laboratory's Advanced Photon Source and a twilight city architectural boat tour and fireworks show. The conference week coincided with the world famous Taste of Chicago, the world's largest outdoor food fest, which included free live music all week long.

Conference Organizers: *John Borg (Marquette University), Jennifer Jordan (AFRL, Eglin AFB), and Tracy Vogler (Sandia National Laboratories)*

Contributed by:

John Borg
Marquette University

ISWI Meeting Report

The AWE-supported Institute for Shock Physics (ISP) just recently organized a meeting of the International Shock Wave Institute (ISWI), hosted at the Cavendish Laboratory, University of Cambridge on September 7th – 10th 2010. The meeting drew speakers from the UK, US, Japan, India, Singapore, Russia, France, Romania, and China. Presentations covered a wide range of topics, from modeling at the mesoscale to shocks in laboratory astrophysics. Conference papers

will appear in a special edition of the international journal *Shock Waves*.

2011 George E. Duvall Shock Compression Science Award Recipient



Jim Johnson, Los Alamos National Laboratory (ret.)

Citation: "In recognition of his outstanding contributions to the understanding of crystal anisotropy effects, phase transformations, tensile fracture, and chemical reactions in shock compressed condensed matter."

Background: Jim received a B.S. degree in mathematics and physics from the University of Puget Sound, Tacoma, Washington, in 1961, and a Ph.D. in physics from Washington State University in 1966. Jim then spent a year in post-doctoral study with Prof. George E. Duvall at WSU. He became a member of the technical staff at Sandia Laboratories in 1967 and then joined the research staff at Terra Tek, Inc. in 1973. He remained there until 1976 when he became a staff member in the Theoretical Division at Los Alamos Scientific Laboratory. Jim spent a sabbatical year (1985-86) at the Cavendish Laboratory, Cambridge University, UK. He retired from Los Alamos in 1999, but remained active in shock-wave research through continued affiliations with Los Alamos National Laboratory and the Institute for Shock Physics at WSU. Research interests include rate-dependent plastic deformation, fracture, solid explosive initiation, and shock-induced phase transformations. Awards include: Mathematics Award and Mu Sigma Delta election (UPS, 1960 and 1961), Los Alamos Distinguished Performance Award (with Charles Forest and Pier Tang, 1986), Fellow, American Physical Society (1996), and Phi Beta Kappa election (Alumnus Member, UPS, 2001).

Index of all Shock Conference Proceedings

The index of all shock conference proceedings was updated Jan 2, 2010. Proceedings can be accessed from the Topical Groups web page at:

<http://www.shockphysics.org/>

American Physical Society Public Outreach Grants “Physics on the Road”

The American Physical Society is happy to announce that it will award several grants, up to \$10,000, to encourage the development of new outreach activities. Programs to be funded may include not only the more traditional K-12 outreach but also engaging the general public with/in physics and informing them about the

importance of physics in their daily lives. Innovative ideas and new approaches, particularly if they have the potential to lead to sustained activities beyond the duration of the grant, are particularly encouraged. To find out more information about the program including application procedures, please visit:

www.aps.org/programs/outreach

Contributed by:

Rebecca Thompson, Ph.D.
Head of Public Outreach
American Physical Society

Upcoming Conferences & Meetings



Message to GSCCM members

***APS 2012 March meeting focus session:
deadline Nov 11, 2011***

Dear colleagues,

This is a reminder that the time for submission of abstracts for APS 2012 March meeting focus topic “Simulation of matter at extreme conditions” is fast approaching. Our sessions will include both EXPERIMENT and THEORY talks that will present recent advances in exploring the fundamental properties of matter at extreme conditions, including (1) high-pressure and high temperature synthesis and characterization of novel materials; (2) high strain rate phenomena occurring upon ultrafast energy deposition; (3) properties of matter in the warm dense regime; (4) ultrafast laser-matter interactions; (5) shock-induced and

static high pressure materials behavior, including plasticity, phase transitions, and chemical reactions; (6) dynamic and static properties of energetic materials, including detonation phenomena, (7) new experimental capabilities in ultrafast and ultra-high spatial resolution characterization; and (8) new computational methods including development of interatomic potentials and multi-scale simulations.

The deadline for submission of abstracts is 5 p.m. November 11, 2011. It is very IMPORTANT that you use right SORTING CATEGORY: 16.1.6.

It is very important for the entire GSCCM community to have a good representation at the APS March meeting to promote our area and to ensure allocation of sufficient number of invited talks in the future. Therefore, we encourage you to submit the abstracts to our

GSCCM focus session 16.1.6. Please also spread the news around to make sure that your colleagues are also aware of this important scientific event.

See you all in Boston,

Tim Germann and Ivan Oleynik
The focus topic co-organizers

More Meetings:



2011 Annual Meeting of the California Section of the APS

November 11-12, 2011
SLAC National Accelerator Laboratory (SLAC), Menlo Park, CA



2011 MRS Fall Meeting

November 28 - December 2, 2011
Boston, Massachusetts

<http://www.mrs.org/meetings/>



APS March Meeting 2012

February 27-March 2, 2012
Boston, MA

(Abstract deadline 11/11/11)



APS April Meeting 2012

April 28-May 1, 2012
Atlanta, GA



HVIS 2012

September 16-20, 2012
Baltimore, MD



30th International Congress on High-Speed Imaging and Photonics

Sept. 16 - 21, 2012

Pretoria, South Africa

<http://www.ichsip30.co.za>



16th EML Symposium

May 15-19, 2012

Beijing, China

<http://www.emlsymposium.com>

19th European Conference on Fracture

August 26-31, 2012

Kazan, Russia

<http://www.ecf19.ru>



10th International DYMAT Conference

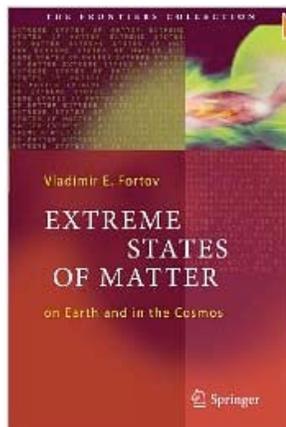
September 2 - 7, 2012

Freiburg, Germany

<http://www.dymat2012.org/>



Book Review



Extreme State of Matter on Earth and in the Cosmos

Vladimir Fortov
Springer Verlag 2011
ISBN 9783642164637

As Kennedy observed, ‘What is objectionable, what is dangerous, about extremists is not that they are extreme, but that they are intolerant’. On the other hand scientists that study extreme states are not narrow-minded but often puzzled by nuances of terminology used by colleagues within the same discipline but studying very different conditions. Thus it is rare that a single author speaks across communities to encompass such immense bounds of pressure, temperature and timescale and to illuminate the subject from ambient conditions to those existing at the time of the Big Bang. Academician Vladimir Fortov is a truly multifaceted physical scientist whose understanding spans this vast and fascinating space, and this volume is a *tour de force* which describes the physics that controls the behaviours observed.

The book’s opening chapters discuss aspects of the phase diagram with example behaviours and applications of states encountered across the space. Many scientists use the word *extreme* to define our interests, but here Fortov discusses states beyond those for which most apply the term since the majority of research in this area is concentrated in engineering structures for use near ambient conditions, ranging in stress from the yield surface to those in materials explosively driven by detonation.

The term ‘high’ applied to stress within vessels containing pressurized fluids or gases for instance, is generally used to refer to states that approach the yield stress of the material. Beyond this threshold the material flows and our specialization extends the concepts of continuum mechanics to describe operating physics. Yet whilst these conditions are extreme, Fortov looks at matter in super-extreme states bounded at their lower threshold where the applied energy density exceeds the binding energy of condensed matter, and at the upper by the limiting concepts of high energy density physics. The lower boundary discussed corresponds to a threshold above which matter attains a universal structural form; in this regime electronic states show different localizations and concepts such as strength lose meaning. This universalizing bound is at around 300 GPa (3 Mbar) for heavy metal atoms, but clearly is lower for some elements.

The author focuses on the energy densities above this threshold: *superextreme* states. The facilities capable of achieving them are described including the petawatt plus lasers as well as the Z pinch and nuclear explosion experiments and the resultant phase diagrams are discussed. Advances in high-power lasers offer the route to the holy grail of fusion at the largest facilities and the advances at NIF and the possibilities of net excess energy generation are assessed. But even these states are superseded by experiments using relativistic particle beams such as the colliding 7 TeV proton beams at the LHC; Fortov describes their operation and the implications of the

experiments undertaken for the Standard Model. Announcements in the public domain are already revealing the gaps in fundamental assumptions that these experiments probe.

In a final crescendo Fortov reviews astrophysical aspects of loading ranging from states at the cores of planetary bodies (iron at the centre of our planet is at 360 GPa; 3.6 Mbar, above the threshold discussed) which are in superextreme states, to conditions in the early universe where pressures are estimated at 10^{106} bar. This tour through the massive-, ultra-, super-, peta-, exa-regimes of modern physics only accentuates the paucity of language and definition that exists to describe and then order the physics observed. However, Fortov classifies and guides rather than merely collecting the miscellany of objects that the beautiful illustrations and photographs within the book present and discuss.

The presentation is accessible and erudite from the pen of such an accomplished author. In particular, the illustrations make this book beautiful and place it as a guide to the possible, exciting both the imagination and the intellect. Few books span such a breadth of mechanical states, presented with effortless control and the text's rich and comprehensive referencing does not detract from the easy flow and style of the volume.

The reader comes away from the book with a sketch from Fermi with his predictions for 'matter in unusual conditions'; the reader's appreciation of the enormity of states within the cosmos is expanded, yet the extraordinary diversity of physics required humbles one to even scratch the surface in understanding their origin and effect. Perhaps this accentuates the need to better define the limits and terminologies applied across different subject areas over such diverse states and mechanisms. For instance, such a common language is necessary for units of something as simple as pressure which is thought of in MPa by engineers, GPa for the shock physics community and Mbar by the high energy density physicist. It is only with research that we can explore and understand the behaviours Fortov describes; as our air-forces aspire, *Per Ardua, Ad Astra*.

Contents

1. Introduction.- 2. Matter under Extreme Conditions: Classification of States.- 3. High Energy Densities in Laboratories.- 4. High-Power Lasers in High-Energy

Density Physics.- 5. Relativistic Charged Particle Beams.- 6. Technical Applications of the Physics of High Energy Densities.- 7. Astrophysical Aspects of High Energy Densities.- 8. Conclusion.

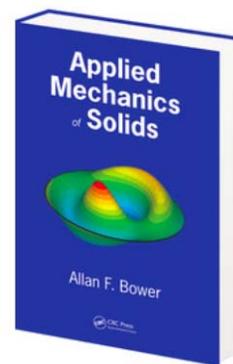
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Neil Bourne
AWE

Recent Literature Releases

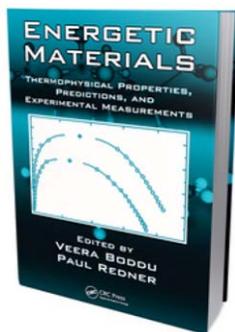
Predictive Modeling of Dynamic Processes: A Tribute to Professor Thoma

Stefan Hiermaier
Springer
ISBN: 978-1-4419-0726-4



Applied Mechanics of Solids

Allen F. Bower
CRC Press
ISBN: 978-1-4398-0247-5



Energetic Materials: Thermophysical Properties, Predictions, and Experimental Measurements

Veera Boddu, Paul Redner

CRC Press

ISBN: 978-1-4398-3513-5

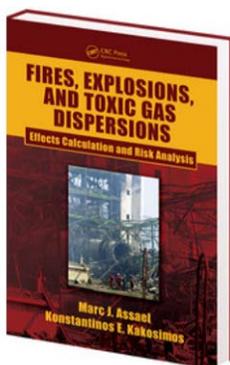


Combustion Synthesis: Novel Routes to Novel Materials

Maximilian Lackner

Bentham Books

eISBN: 978-1-60805-155-7



Fires, Explosions, and Toxic Gas Dispersions: Effects Calculation and Risk Analysis

Marc J. Assael, Konstantinos E. Kakosimos

CRC Press

ISBN: 978-1-4398-2675-1

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We're on the Web!

See us at:

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Eric B. Herbold, LLNL, USA

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newsletter to Michael Furnish, Secretary / Treasurer for
APS/GSCCM, mdfurni@sandia.gov.

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.