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Dates of Interest:

**SCCM
Conference**
June 26-July 1,
2011
Chicago, IL.

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upcoming
conferences

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Message from the Chair

This is an exciting year to be studying in this vibrant field. With new platforms such as NIF coming on stream the opportunity to study hitherto unrealizable extreme states within condensed matter becomes possible. We are at a time of change. As the amplitude of the loading increases matter becomes warm and dense in a state betwixt solid and plasma, whilst refinements in technique push static loading to ever greater pressures. These maturing connections between dynamic and static loading cement ties across widening communities extending from engineering in extreme environments, to understanding of minerals and morphology on Earth. Mechanical engineers, geophysicists, chemists, materials scientists and condensed matter physicists all come to the same table within our growing discipline.

At this time of change, we should celebrate our diversity. The canvas for our study is the vast array of ordered and disordered, inert and reactive materials in all their states and with all their textures. The palettes include the range of platforms developed to deliver pressures and temperatures over pulse lengths from picoseconds upwards, taking materials from yield to melt. And the brushes include a range of experimental tools to capture the operating mechanisms transforming the microstructure. Let us celebrate the maturation of our field which bridges science and engineering to deliver technologies critical both to

industry and research. But above all (to paraphrase Bragg) the important thing is not so much to obtain new facts as to discover new ways of thinking about them.

Neil Bourne (AWE),
neil.bourne@mac.com
**Chair, APS Topical Group on Shock
Compression of Condensed Matter**

News and Events

Governance of the Shock Compression of Condensed Matter Topical Group

With a new year comes the election of new officers. With special thanks to our outgoing Past Chair, Marcus Knudson, we welcome in our new officers:

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).

2011 APS Shock Compression of Condensed Matter Topical Conference

The abstract deadline for the 2011 APS Topical Conference on Shock Compression of Condensed Matter (***February 18***) is rapidly approaching. This biennial meeting is the premier conference for shock compression, behavior of materials at high pressures and high strain rates, and related areas. We hope you will be able to join us for an outstanding Conference in Chicago, Illinois, June 26 - July 1, 2011. The conference will include oral presentations as well as a poster session.

Abstracts can be submitted through the online system at the conference website, <http://www.marquette.edu/aps2011/>. Additional information about the conference can be found there as well, so please periodically check this website for updates.

Abstracts are solicited for the following planned technical sessions:

Topics from the 2011 Shock Conference:

BG: Biological / Nanomaterials
BL: Ballistic Studies
CP: Composites and Polymers
DC: Detonations and Shock-Induced Chemistry
ED: Experimental Developments:
 (i) Diagnostics – PDV
 (ii) Loading Techniques - ICE
EM: Energetic Materials
ES: Equation-of-State
GS: Geophysics and Planetary Science
HD: High Energy Density Physics/Warm Dense Materials
HS: Special Session on High Pressure Strength
ID: Inelastic Deformation, Fracture, and Spall
MD: First Principles and Molecular Dynamics Simulations
MS: Materials Science
PC: Physics & Chemistry at High Pressure - Static and Low Rate Studies
PM: Particulate / Porous Materials
PT: Phase Transitions
SO: Spectroscopy and Optical Studies
Tu: Special Session on Post-Shock Turbulence Poster Session

As has been done previously, conference proceedings will be published by the American Institute of Physics. These proceedings are included in a number of online databases. For the 2011 conference, all papers in the proceedings will be made open access so that conference papers will be available for free to all on the AIP website.

Some funding will be available to help support student attendance at the conference; additional information on that may be found at <http://www.marquette.edu/aps2011/students.html>. The abstract deadline is February 18 for student abstract submittals as well as all others.

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

Imperial College London Institute for Shock Physics

Meetings

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*.

Courses and Training

A new Masters course in Shock Physics is now underway, organized by ISP academics Bill Proud, Daniel Eakins, and Simon Bland. This is an intensive one-year course structured to give students both a firm grounding in the background and fundamentals of shock physics, along with discussions of current research in high-pressure and shock wave science. Focused discussions will be delivered by guest lecturers from a number of institutions such as Imperial College, University College London, AWE, and LLNL. This course will be offered annually,

with up to 20 places available. More information about the courses, and future placements can be found at:

<http://www3.imperial.ac.uk/shockphysics/courses/msc>

The ISP is also preparing to host a number of short courses over the next several years. The aim of these courses is to provide an opportunity for students and visiting scientists to gain exposure to focused topics from experts in the field of shock physics. The next course, "Time-resolved Diagnostics: Measuring Behavior at High Strain-Rates", will cover a range of measurement techniques, such as embedded gauges, optical interferometric methods, spectroscopy, temperature measurement, x-ray

diffraction, x-ray and photon radiography, and high-speed imaging. The course will be held at Imperial College on February 16th – 18th, immediately following the 2nd Annual ISP Conference. Details on how to register for the course (and future course offerings) can be found at:

<http://www3.imperial.ac.uk/shockphysics/courses>

Facilities Development

The ISP is excited to report that two major equipment projects are nearing completion. The new pulsed-power source MACH (Mega Ampere Compression and Hydrodynamics) was delivered in August, and is currently being assembled. MACH was developed by Ktech



Corp., and is capable of delivering 2 MA to a load in 250 ns, resulting in magnetic pressures of 1-200 kBar. Assembly is nearing completion, with commissioning and first experiments planned for November.

In addition, Physics Applications International (PAI) has nearly completed manufacture of the ISP large-bore gas gun. The new 100-mm bore single-stage gas gun, provided by AWE, has been designed to launch a 4 kg sabot at 800 m/s, with a maximum velocity of 1.4 km/s. The gun is scheduled to arrive at Imperial College in December, with assembly and commissioning to be completed by February.



Contributed by:

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Imperial College, London

**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

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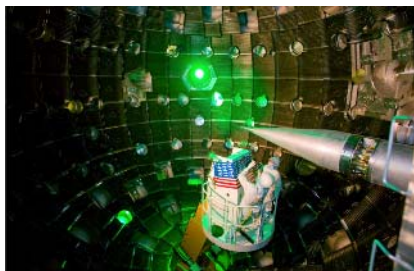
Index of all Shock Conference Proceedings

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/>

**The National Ignition Facility
Lawrence Livermore National Laboratory
Redefining the Limits of Experimental High
Energy Density Science**

The National Ignition Facility (NIF) (G. H. Miller, E. I. Moses, and C. R. Wuest, *Opt. Eng.* **43**, 2841(2004)) ,the world's highest energy laser facility, is located at Lawrence Livermore National Laboratory. It offers a new experimental capability to explore high energy density (HED) states of matter for national security, fusion energy, and fundamental science research, from solid state physics at 10's of Mbar to dense fusion burning plasmas. NIF is designed to perform perhaps the most challenging science and technology achievement in several generations, that of creating an inertially confined plasma in the laboratory that produces more nuclear energy than is put into the fusion target (J. Nuckolls, et al., *Nature* **239**, 139 (1972); J. D. Lindl et al., *Phys. Plasmas* **11**, 339 (2004)). The exquisite laser precision and energy required to produce "ignition" enables a



new generation of experimental physics.

Fig. 1: Inside the NIF target chamber: a 10 meter diameter sphere. A cryogenic target positioned is on the right

A typical inertial confinement fusion experiment is sketched below in Fig. 2, where the 192 laser beams of NIF deliver up to 1.8 million Joules, 500 terawatts of 351 nm light into a gold centimeter-scale cylinder (hohlraum), containing the fuel-holding capsule. The hohlraum

converts the ultraviolet light to x-rays, which uniformly heat and ablate the capsule, creating a rocket like force that compresses the fuel to ignition conditions. The phase, bandwidth, intensity profile, position, and power vs. time are controlled to optimize the conversion of light into x-rays and the efficiency of compressing fusion fuel to ignition conditions. The capsule at the center of the hohlraum consists of an ablator shell of plastic (CH) or beryllium, containing a thin layer of solid heavy hydrogen (equimolar deuterium and tritium, D-T) enveloping D-T gas at the center. During the implosion, which ends when nuclear reactions begin to control the dynamics (the stagnation stage), the gas at the center compresses from 0.3 mg/cc and ~19.3 K to 100 g/cc and 60 million Kelvin (about 5 times hotter than the center of our sun). At the same time, the solid fuel layer compresses from 0.25 g/cc and ~19.3 K to 1500 g/cc (more than 130 times the density of lead) and 600 thousand Kelvin. While 600,000 Kelvin sounds hot, this temperature has to be compared with the Fermi temperature of 20 million Kelvin, so this dense heavy hydrogen is quite degenerate. The ability to achieve these extreme densities of DT is enabled by the high precision pulse shaping of NIF. Once the fuel reaches this configuration, nuclear reactions in the hot spot are expected to ignite a fusion burn wave that propagates throughout the fuel, increasing the temperatures and pressures significantly further.

The facility requirements built into NIF to achieve the extreme conditions required for ignition also enable a new generation of experiments exploring solids at several 10's of Mbar, hydrogen at densities and temperatures where the interatomic spacing is comparable to the deBroglie wavelength, and dense nuclear burning plasmas.

To accurately diagnose the implosion kinematics, shock wave properties, roundness, hydrodynamic stability, fuel assembly, fuel adiabat, nuclear yield, burn dynamics, etc., a broad suit of tuning campaigns and advanced

Upcoming Conferences & Meetings



140th TMS Annual Meeting & Exhibition
February 27-March 3, 2011
San Diego Convention Center
San Diego, CA

<http://www.tms.org/meetings/annual-11/AMI1home.aspx>

XIII Khariton's Topical Scientific Readings International Conference on Extreme States of Substance, Detonation, Shock Waves, March 14 - 18, 2011, Sarov, Russia. Contact: Tat'yana S. Palenova
E-mail: root@gdd.vniief.ru



APS March Meeting 2011
March 21-25, 2011
Dallas, TX.

<http://www.aps.org/meetings/march/index.cfm>

Society For Biomaterials 2011 Annual Meeting & Exposition. April 13 - 16, 2011
Orlando, Florida, United States

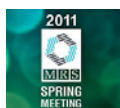
<http://2011.biomaterials.org/>



International Conference on Computational & Experimental Engineering and Sciences (ICCES'11)

April 18- 21, 2011, Nanjing, China

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



2011 MRS Spring Meeting
April 25 - 29, 2011. Moscone West and San Francisco Marriott
San Francisco, California

http://www.mrs.org/s_mrs/sec.asp?CID=21379&DID=246341



APS April Meeting 2011
April 30-May 3, 2011
Anaheim, CA

<http://www.aps.org/meetings/april/index.cfm>



Phononics 2011 (International Conference on Phononic Crystals, Metamaterials & Optomechanics)

May 29 - June 2, 2011

Sharm El-Sheikh, Egypt

<http://www.phononics2011.org>

SEM Annual Conference & Exposition on Experimental and Applied Mechanics

June 13 - 15, 2011

Mohegan Sun, Uncasville, CT

<http://www.sem.org/CONF-AC-TOP.asp>



The 12th World Conference on Titanium (Ti-2011)

June 19 - 25, 2011

Beijing, China

<http://www.ti-2011.com/>

16th International Conference on Composite Structures (ICCS/16)

University at Porto, Porto, Portugal, June 28-30 2011.

<http://paginas.fe.up.pt/~iccs16/index.html>



17th Biennial International Conference of the

APS Topical Group on Shock Compression of Condensed Matter

June 26-July 1, 2011

Marriott Renaissance Hotel, Chicago, IL

<http://www.marquette.edu/aps2011/>



**22nd European
Conference on Diamond,
Diamond- Like Materials,**

Carbon Nanotubes, and Nitrides

September 4 - 8, 2011

Bavaria, Germany

<http://www.diamond-conference.elsevier.com/>



**International Conference on
Silicon Carbide and Related
Materials 2011**

September 11 - 16, 2011

Cleveland, Ohio, United States

<https://icscrm2011.org/>



**10th International
Conference on Technology
of Plasticity (ICTP) 2011,**

Aachen, Germany

September 25th – 30th, 2011

www.ictp2011.com



**Joint Fall 2011 Meeting of the
Texas Sections of the APS,
AAPT, and Zone 13 of the SPS**

October 6-8, 2011

Texas A&M University-Commerce

Commerce, TX

<http://www.tamu-commerce.edu/physics/2011-APS-Texas-Commerce.html>



**Annual Meeting of the Four
Corners Section of the APS**

October 21-22, 2011

University of Arizona, Tucson, AZ

<http://www.aps.org/meetings/meeting.cfm?name=4CF11>

**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

APS April Meeting 2012

April 28-May 1, 2012

Atlanta, GA



10th International DYMAT Conference

Sept. 2 - 7, 2012

Freiburg, Germany

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



**Hypervelocity Impact
Symposium**

September 16-20, 2012

Baltimore, MD

<http://www.hvis2010.org/>



Materials under Extreme Loadings:

Application to Penetration and Impact

George Voyiadjis, Eric Buzaud, and Loan R. Lonescu
John Wiley & Sons Inc.
ISBN: 978-1-84821-184-1

**Split Hopkinson (Kolsky) Bar
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W. Chen, Purdue University, West Lafayette, IN, USA and B. Song, Sandia National Laboratory, Livermore, CA, USA
Springer Verlag Inc.
ISBN: 978-1-4419-7981-0

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Basile Audoly and Yves Pomeau
Oxford Press
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High-Temperature Decomposition of Rocket Propellants and Explosives
Shteinberg, Alexander S.
Original Russian edition published by MAIK Phys Mat Lit, Moscow, 2006
2008, XIV, 202 p. 115

Shock, Impact and Explosion

Structural Analysis and Design
Bangash, M.Y.H.
2009, XLIV, 1366 p. 695 illus., Hardcover
ISBN: 978-3-540-77067-1

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Sanjay Puri, *Jawaharlal Nehru University, New Delhi, India*; Vinod Wadhawan, *Centre for Advanced Technology, Indore, India*

Summary

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2009, XX, 364 p. 100 illus., Hardcover
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September 9, 2009, Granada Spain.
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26th International Symposium on Shock Waves

Hannemann, Klaus; Seiler, Friedrich (Eds.)
2009, 800 p. 2-volume-set.
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Blast Waves

Series: Shock Wave and High Pressure Phenomena
Needham, Charles E.
2010, Approx. 330 p. 27 illus. in color.
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Obituaries

In Memory of Thomas J. Ahrens, 1937–2010

Editor's Note: This tribute was adapted from a submission by Ken Farley, California Institute of Technology, and Sara T. Stewart-Mukhopadhyay, Harvard University.



Photograph courtesy of the American Geophysical Union

Thomas J. Ahrens, one of the leading figures in mineral physics, geophysics, and planetary sciences during the Twentieth Century and a member of the Seismological Laboratory, passed away on November 24, 2010 at the age of 74. Ahrens spent more than forty years at Caltech and was the Fletcher Jones Professor of Geophysics, Emeritus when he passed away. His vast research accomplishments and impact touched on the origin, differentiation and evolution of the Earth and planets. An experimentalist at heart, he was widely known for starting and leading the Lindhurst Laboratory of Experimental Geophysics.

Born in Germany, Ahrens received his B.S. from the Massachusetts Institute of Technology in 1957, his M.S. from Caltech in 1958, and his Ph.D. from Rensselaer Polytechnic Institute in 1962. He was a geophysicist with the Pan American Petroleum Corporation from 1958-1959, worked as a Second Lieutenant for the U.S. Army in the Ballistics Research Laboratory from 1959-1960, and was the Head of the Geophysics Section in the Poulter Laboratory of the Stanford Research Institute

from 1962-1967. He became an Associate Professor of Geophysics at Caltech in 1967 and Professor of Geophysics in 1976. From 1996-2001 he was the W.M. Keck Professor of Earth Sciences and then Fletcher Jones Professor of Geophysics, Emeritus in 2005. He published more than 375 papers, owns 3 U.S. Patents, and received numerous honors and awards for his research. He was a member of the U.S. National Academy of Sciences, the American Academy of Arts and Sciences and a Foreign Associate of the Russian Academy of Sciences. He won the 1995 Arthur L. Day Medal of the Geological Society of America, the 1996 Harry H. Hess Medal of the American Geophysical Union, the 1997 Barringer Medal of the Meteoritical Society, and had an asteroid named after him. Many in the APS SCCM community will remember that he was the 1995 winner of the APS Shock Compression Science Award "in recognition of his outstanding contributions to the understanding of matter under shock compression and its application to problems in planetary physics."

His research encompassed a wide range of geophysical disciplines, including the dynamic properties of minerals and other materials, the effects of impacts on minerals, Earth and planetary crusts, shock temperatures and melting, planetary impacts, and the thermodynamics of Earth materials. He supervised more than 30 graduate students and more than 15 postdocs and visiting associates.

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**[www.aps.org/units
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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