HYPERVELOCITY IMPACT SOCIETY

Volume 1, Issue No. 2
September 1994

NEWSLETTER

1994 HYPERVELOCITY IMPACT SYMPOSIUM

Paper Selection and Review

As you all know, the *1994 HVIS* is just round the corner. But here are a few facts concerning the Symposium. 186 abstracts were submitted for consideration, with 156 of these selected. Since the proceedings are published in the *International Journal of Impact Engineering*, all papers must be reviewed. Therefore, all authors had to submit a draft manuscript for peer review prior to acceptance of the paper (both for the Journal and the Symposium). A total of 108 papers were received and reviewed. Some of these papers did not make it through the peer review process (in several cases, the papers were excellent, but the *HVIS* was the wrong forum for the presentation of the material, and the author(s) were encouraged to submit their paper directly to a journal). Further, a large percentage of the authors had to make significant revisions to their manuscripts before final acceptance. This process improves the overall quality of the papers and the conference.

Keynote and Plenary Lectures

Several outstanding speakers and talks are scheduled for the *1994 HVIS*. These invited talks are:

The Crash of Periodic Comet Shoemaker-Levy 9 on Jupiter, by Dr. Eugene Shoemaker, U. S. Geological Survey (Keynote Lecture): Analysis of the spectacular impact of Shoemaker-Levy 9 on Jupiter provides unprecedented information about Jupiter and the planetary consequence of cometary impact.

The Use of Shock-Structure Methods for Evaluating High-Pressure Constitutive Properties, by Dr. James Asay, Sandia National Laboratories (Distinguished Scientist Award Lecture): A review of the work to investigate and understand phase transitions and strength effects under dynamic loading conditions.

SHARP—The Jules Verne Launcher, by Dr. John Hunter, Lawrence Livermore National Laboratory (Plenary Lecture): The use of light-gas guns to launch payloads and satellites into low-earth orbit may lower the cost by up to a factor of twenty over conventional systems.

Swords-to-Plowshares: Shock Wave Applications for Advanced Photolithography, by Dr. Timothy Trucano, Sandia National Labs. (Plenary Lecture): Experimental and computational methods of shock-wave physics are playing an important role in developing the next generation of photolithographic techniques for integrated circuit applications.

Special Session

A special poster session on the Shoemaker-Levy 9 comet impact on Jupiter has been scheduled for noon on Monday, October 17 (the day Dr. Shoemaker delivers the Keynote Lecture). This informal session, suggested by Dennis Orphal and organized by Mark Boslough, will be the first opportunity for a large gathering since the SL-9 impact (although up-coming meetings include the 26th Annual Meeting of the Division for Planetary Sciences of the American Astronomical Society, Oct. 31 - Nov. 4, Bethesda, MD; and the Shoemaker-Levy Session at the American Geophysical Union Fall Meeting, Dec. 5-9, San Francisco). The list of poster titles is as follows:

Galileo Images of Impacts of SL-9 Fragments K and W, C. R. Chapman (Planetary Science Institute) and the Galileo Imaging Team

Reverberations from SL-9: Acoustic Waves at the Tropopause and the Internal Gravity Waves at the Water Cloud, A. P. Ingersoll, H. Kanamori, A. Toigo (Cal Tech)

SL-9 Impact Observations with the 1.8-m Bohyunsan Telescope, B. G. Kim, H. K. Moon, M. Y. Chun, B. G. Park, and H. G. Kim (Korea Astronomy Observatory)

Dimensions and Fragmentation of the Nuclei of Comet Shoemaker-Levy 9, Z. Sekanina (JPL)

SL-9 Fragment Size Estimates from Ballistic Fireball Trajectory Data, M. Boslough and D. Crawford (SNL)

Hydrodynamic Models of Shoemaker-Levy 9 Impact, R. F. Stellingwerf and C. A. Wingate (LANL)

Optical Properties and Vertical Distribution of Aerosol Debris from the SL-9 Impacts, R. A. West, A. J. Friedson, K. H. Baines, M. Seymour (JPL/Cal Tech), E. Karkoschka (Lunar and Planetary Lab, U. Arizona), and H. B. Hammel (MIT)

Galileo NIMS Observations of the G Impact, P. R. Weissman, R. W. Carlson, W. D. Smythe, K. Baines, J. Hui, M. Segura (JPL) and the NIMS Team

An Overview of Some Preliminary Results on SL-9 Impact Phenomena from Earth-Based and Spacecraft Observations, G. S. Orton (JPL)

A Search for Seismic Waves after Impact R, M. Marley (New Mexico State University)

Comparison Between Observations and Numerical Models of the Impact of Comet Shoemaker-Levy 9 on Jupiter, M.-M. Mac Low (U. Chicago/UIUC) and K. Zahnle (NASA Ames)

Density and Size of Comet Shoemaker-Levy 9, W. Benz (U. Arizona) and E. Asphaug (NASA Ames)

The Comet Impact Network Experiment (CINE): Early Results, S. Larson, et al. (there are 25 authors from all over the world)

Impact of Comet SL-9 with Jupiter: Comparison of Cratering and Radiative Calculations with Observations, T. Takata, T. J. Ahrens, J. D. O'Keefe (Cal Tech), G. S. Orton, and A. J. Friedson (JPL)

Pre-Impact Cloud Rise Calculations of the P/SL-9 Impact into Jupiter, P. Hassig (Titan Research), D. Roddy (USGS), E. Shoemaker (USGS, Lowell Observatory), and A. Ingersoll (Cal Tech)

SOCIETY NEWS

Election for the Board of Directors

Members to the Board of Directors of the Hypervelocity Impact Society are elected by the general membership and serve for three terms (a term is defined as the time between symposia). The terms for Charles Anderson, Harry Fair, and Gordon Johnson expire in October, and the Nominations Committee—Andy Piekutowski, Chairman (University of Dayton Research Institute); Eric Christiansen (NASA/Johnson Space Center); Dennis Orphal (Titan Research & Technology); Bill Reinecke (Institute for Advanced Technology); and James Wilbeck (Kaman Sciences)—has come up with an outstanding list of candidates:

Lalit C. Chhabildas (Sandia National Laboratories)

James D. Colton (SRI, International)

Jeanne Lee Crews (NASA/Johnson Space Center)

Thomas M. Kiehne (Institute for Advanced Technology)

William J. Nellis (Lawrence Livermore National Laboratory)

All members in good standing should have received an election ballot. Unfortunately, you can only vote for two (I tried to vote for all five, but Andy Piekutowski said that I couldn't; I then tried to vote for three, but he said I couldn't do that, either). Please make sure that you return your ballots.

Constitution and Bylaws

If you wish a copy of the *Constitution and Bylaws of the Hypervelocity Impact Society*, please request a copy from Charlie Anderson (phone: 210-522-2313; fax: 210-522-3042; e-mail: canderson@swri.edu).

1996 Hypervelocity Impact Symposium

The next *HVIS* is scheduled for the fall of 1996 in Freiburg, Germany. Hosts and coordinators for the Symposium will be the Ernst-Mach-Institut (EMI).

THIS ISSUE'S FEATURE FACILITY OVERVIEW: Impact Physics Group at the University of Dayton Research Institute (UDRI)

The Impact Physics Group conducts a wide variety of impact research projects which include:

- foreign object damage and engine blade containment studies,
- hypervelocity impact research,
- terminal ballistics and penetration mechanics,
- dynamic material behavior and characterization, and
- high-speed, transient instrumentation.

Researchers investigate methods to improve the foreign object damage (FOD) resistance of aircraft components to impacts with rocks, hail, rain, ice, and birds; and assist manufacturers in meeting FAA and DOD requirements for engine fan blades, propellers, windscreens, and wing leading edges. Investigators also conduct numerous impact experiments to examine engine blade containment system materials and designs by launching actual and simulated engine fan blades and rotor fragments.

In hypervelocity impact, researchers have performed significant research to evaluate protective bumper shield materials and designs, and to develop empirical models for hypervelocity impact protection of spacecraft. These efforts have evolved the design of improved spacecraft structures and materials which can survive natural or man-made orbital debris impacts at hypervelocity. The complexities of debris cloud morphology resulting from hypervelocity impacts also have been analyzed and modeled.

Principal investigators are actively involved in developing improved armor materials and designs for DOD and commercial applications. Researchers investigate and model the penetration mechanisms of rod-like projectiles at conventional velocities and hypervelocity. Failure processes in ceramics and the mechanisms of composite material penetration have been examined. The Group frequently assists industry in the selection and ballistic evaluation of light-weight armor materials and transparencies for military vehicles and armored limousines.

Material characterization studies employ flyer plate impact, and split and torsional Hopkinson bars. Considerable work has focused on the behavior of glass under load and unload conditions.

Instrumentation supporting the experimental work includes:

- multiple channel, soft and hard flash radiography;
- high-speed photography (framing rates from 2000 to 4.5 million frames/s);
- high-speed (up to million samples/s) digital data acquisition systems.

UDRI - IMPACT PHYSICS GROUP EXPERIMENTAL FACILITIES AND CAPABILITIES

System	Characteristics	Typical Uses
Two-stage light-gas guns	50/22 mm and 75/30 mm guns, Velocities to 7.3 km/s	Hypervelocity, Pre-stressed targets, Explosive targets, Space structures, Debris cloud studies
Powder-propellant guns	Smooth and rifled barrels to 50 mm, Velocities to 2.2 km/s	Penetration studies, Long flight distances, FOD, Shock physics, Dynamic properties, Ballistic limits, Materials screening
Compressed - gas guns	Barrels up to 12 in, Package weights to 15 lb., Velocities to 400 m/s	Soft and hard body FOD, Very large targets, Shock loading of large packages
Hopkinson Bar	Torsional and split tension or compression set ups, Strain rates to 5000 s^{-1}, temperatures from 125 to 1000 K	High-strain-rate material property characterization, Failure studies

Mr. Garry H. Abfalter, Group Leader
University of Dayton Research Institute
Impact Physics
300 College Park
Dayton, OH 45469-0182
PHONE: (513) 229-3546
FAX: (513) 229-3869

Joke du Jour: "The scientific theory I like best is that the rings of Saturn are composed entirely of lost airline luggage." Mark Russell

NOTE FROM THE EDITOR

Journal Subscriptions

As a service to our membership, we have negotiated a special subscription price for the ***International Journal of Impact Engineering***. The Journal is now being published six times a year. The subscription cost for HVIS members is $85.00 for 1994; this is approximately one-third the regular subscription costs. If you are not already signed up for the journal, please remit a check for $85.00, payable to the Hypervelocity Impact Society, and send the check with the mailing address for where you want to receive the Journal to:

Mr. John P. Riegel, III
Southwest Research Institute
Division 07
P. O. Drawer 28510
San Antonio, TX 78228-0510.

You will receive all issues for the current year with your subscription.

1995 Subscriptions

If you are interested in the 1995 subscription, please let Jack know. His e-mail address is *jriegel@swri.edu*, and his FAX number is 210-522-5122. At this point, we do not know the subscription rate, but it should be on the same order as the 1994 rate.

Note to Authors—Color Figures

It is often desirable, particularly with computational results, to use color to enhance and clarify technical information. Color figures are possible for the *1994 HVIS* proceedings that will be published as a volume of *International Journal of Impact Engineering*. However, there are additional cost requirements that must be met by the author or his/her institution. Since each figure must be processed separately, the cost is per figure, even if more than one figure is published on the same page. The cost per figure of color artwork is $576.00 (US), payable to the Hypervelocity Impact Society at the time the final mats are submitted. Color figures will be located in the middle of the relevant paper; thus, they could be out of sequence with regard to other figures in the paper. The price of reprints is not affected.

HVIS & IBC DATABASES

Åke Persson of Dynamec Research AB, Sweden, has developed a PC database, that operates under DOS or under WINDOWS, that includes the titles, authors, and the full abstract of all 183 papers published in the *HVIS-86, -89,* and *-92* symposia. The search program allows the user to search for words or parts of words, or combinations thereof, in the whole text. This database is fully compatible with the DTX/BALLISTICS database for the *International Ballistics Symposia.* Such a database might be of considerable interest to our membership. The prices are as follows:

1. **DTX/HVIS (3 symposia)**
   - Full price $295.00
   - HVIS attendees $150.00

2. **DTX/BALLISTICS + HVIS (14 + 3 symposia)**
   - Full price $550.00
   - IBC or HVIS attendees $225.00

3. **HVIS upgrade for DTX/BALLISTICS holders**
   - Full price $100.00
   - IBC or HVIS attendees $75.00

The price for future upgrades with abstracts from new symposia is $50.00.

If you are interested, you should contact:

Åke Persson
Dynamec Research AB
FAX No.: +46 8 550 60466
Tel. No.: +46 8 550 65323

Åke will also be at the *1994 HVIS* in Santa Fe.

HVIS STANDING COMMITTEES	Chairs
Awards Committee	Stephan Bless
Educational Outreach Committee	Bill Isbell, Gordon Johnson, & Peter Schultz
Membership Committee	Jack Riegel
Nominations Committee	Andy Piekutowski
International Advisory Board Committee	Bill Isbell & Alois Stilp
Publications Committee	Charles Anderson
1994 Hypervelocity Impact Symposium	
Technical Chairman	Jim Asay
Symposium Program Co-Chairmen	Billy Hogan & Lalit Chhabildas
Symposium Coordinators	Alita Roach & Bill Deal
Commercial Exhibits Committee	Jim Ang & Dick Warnes

CALENDER OF RELATED CONFERENCES AND SYMPOSIA

Meeting	Location	Dates
Euro DYMAT	Oxford, England	September 26-30, 1994
AIAA Space Program & Technologies Conference	Huntsville, AL	September 27-29, 1994
Dynamic Behavior of Materials: TMS 1994 Materials Week	Rosemont, IL	October 2-6, 1994
Paper Selection, 15th Int. Ballistics Symp.	Haifa, Israel	October 3-7, 1994
NADR Working Group Meeting	Ft. Walton Beach, FL	October 5, 1994
Aeroballistic Range Association	Huntsville, AL	October 10-14, 1994
3rd Int. Symp. on Structural and Functional Gradient Materials	Lausanne, Switzerland	October 10-12, 1994
Society of Engineering Science Conference	Texas A&M University College Station, TX	October 12-14, 1994
Hypervelocity Impact Symposium	Santa Fe, NM	October 16-20, 1994
Int. Conf. on Tungsten and Refractory Metals	Washington, D.C.	October 17-19, 1994
U. S. Army Missile Command 1994 Advance Planning Briefing for Industry	Redstone Arsenal, AL	October 24-26, 1994
Life Cycles of Energetic Materials Conference	Santa Fe, NM	October 24-29, 1994
1st Australian Explosive Ordnance Symposium	Canberra, Australia	October 26-30, 1994
TACOM Advance Planning Briefing for Industry	Dearborn, MI	November 2-3, 1994
AIAA Missile Sciences Conference	Monterey, CA	November 7-9, 1994
ASME Winter Annual Meeting	Chicago, IL	Nov. 14-18, 1994
Special Operations/Low Intensity Conflict Symposium	Washington, D.C.	December 14-16, 1994
Tactical Vehicles Conference	Monterey, CA	January 30-31, 1995
6th Annual TACOM Combat Vehicle Survivability Symposium	Monterey, CA	March 28-30, 1995
Munitions Technology Symposium III	Orlando, FL	April 11-12, 1995
7th Int. Symp. on Interaction of the Effects of Munitions and Structures	Mannheim, Germany	April 24-28, 1995
15th International Symposium on Ballistics	Jerusalem, Israel	May 21-24, 1995
EuroPyro 95 (combined with HDP IV)	Tours, France	June 5-9, 1995
4th Int. Symp. on Behavior of Dense Media under High Dynamic Pressures (HDP IV)	Tours, France	June 5-9, 1995
Joint Applied Mechanics and Materials Summer Meeting	UCLA, CA	June 28-30, 1995
Symp. on Structures under Extreme Loading Conditions (1995 ASME/JSME Pressure Vessels and Piping Conf.)	Honolulu, Hawaii	July 23-27, 1995
EXPLOMET™ '95	El Paso, TX	August 6-10, 1995
APS Topical Meeting on Shock Waves	Seattle, WA	August 13-19, 1995
2nd Int. Conf. on Composites Engineering (ICCE/1)	New Orleans, LA	August 20-23, 1995
Joint XV AIRAPT & XXXIII EHPRG International Conference	Warsaw, Poland	September 11-15, 1995
14th International Symposium on the Military Aspects of Blast and Shock	Las Cruces, NM	September 11-15, 1995
1996 Hypervelocity Impact Symposium	Freiburg, Germany	Fall 1996
XVI AIRAPT Conference	Kobe, Japan	1997