HYPERVELOCITY IMPACT SOCIETY

2016 Fall Newsletter

Message from the President

Dear Colleagues and Society Members,

It is my great pleasure to invite you to attend the 14th Hypervelocity Impact Symposium taking place Monday April 24 through Friday April 28, 2017 at the University of Kent, Canterbury, UK. Please get your abstracts submitted soon since the submission deadline is Friday, November 18, 2016. Details for the symposium can be found inside this newsletter and at http://astro.kent.ac.uk/~mcp2/HVIS2017/. As we prepare for the future, improvements to the society web site located at www.hvis.org now include an abstract submission feature on the home page. The society home page will be the abstract submission portal for all future symposia. Please spread the word about HVIS 2017 and encourage your colleagues to submit an abstract!

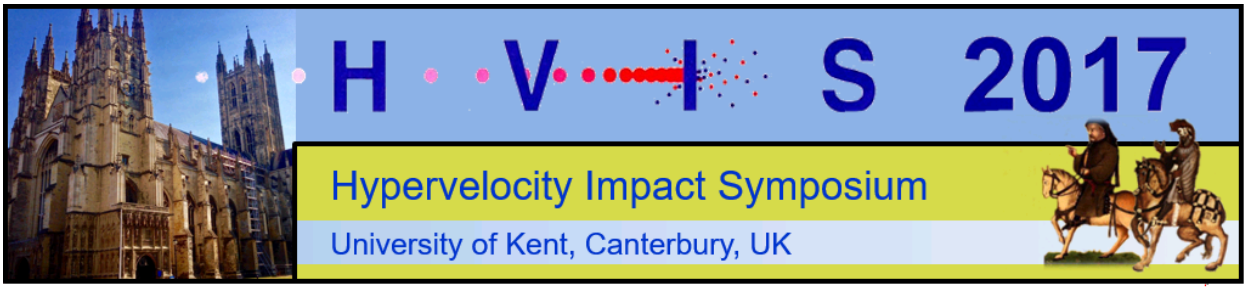
September was a sad month for the Hypervelocity Impact Society. Dennis Orphal, a visionary pioneer in hypervelocity impact science, passed away September 8, 2016. Dennis was a pivotal figure in establishing the society and served as the 4th President from 1994-1996. He won the best paper award at the 2nd Hypervelocity Impact Symposium in 1989 and received the Distinguished Scientist Award from the society in 2003. We will miss him.

This year marks the 30th anniversary of the first modern hypervelocity impact symposium. Included in this newsletter is an article written by Dr. Charles Anderson on the origins of the Hypervelocity Impact Society and establishment of the modern symposia series. It is a fascinating recount of the scientific and geo-political circumstances at that time and serves as a good summary of where we as a professional society came from.

Finally, congratulations to William Schonberg, Tim Maclay, and the rest of the HVIS 2015 organizing committee for a very successful symposium held at Boulder, Colorado. There were 149 registered participants treated to a wide variety of excellent presentations and social functions throughout the week. A tremendous amount of volunteer work goes into planning and executing each symposium, and the continued high level of participation by the research community shows we are a thriving organization.

See you in Canterbury!

Todd Bjerke

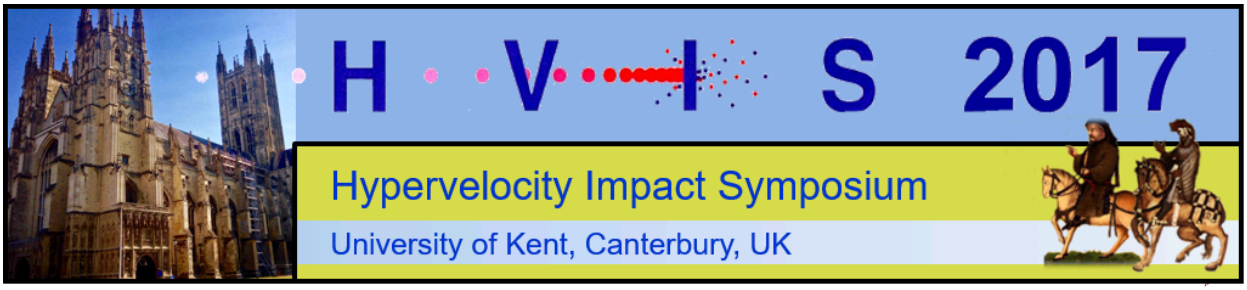


The Origins of the Hypervelocity Impact Society

Charles E. Anderson, Jr.

Intercontinental ballistic missile defense was one of the pressing political concerns and scientific issues in the late 1970's and into the 1980's. It was desired to have non-nuclear kill of incoming missiles; exoatmospheric engagement meant extremely high impact velocities, i.e., hypervelocity impacts (HVI). Dr. James Wilbeck, then at Southwest Research Institute (SwRI), had a contract with the U. S. Army Ballistic Missile Defense (BMD) Organization to compile a database of articles relevant to missile defense, with an emphasis on hypervelocity impact (guidance and control was another big topic area, but these were not the focus of this database). This was in the timeframe of 1979 – 1984. In the mid-to-late 1960's, there had been a series of hypervelocity impact symposia sponsored by the tri-services (Army/Air Force/Navy), but funding had waned and the last (7th) symposium was held in 1964.[1] There was a wealth of experimental and modeling work reported in these symposia, with virtually nothing during the next 20 or so years in HVI. James stated: "What we need is another hypervelocity impact symposia."

James was the project manager; I supported James, mostly reviewing/assessing hydrocode work that was being reported on various aspects of ballistic missile defense and HVI. As part of the BMD database effort, we visited several Government agencies to learn of other hypervelocity impact work that might be on-going. One of those visits was to DARPA and Dr. Harry Fair.



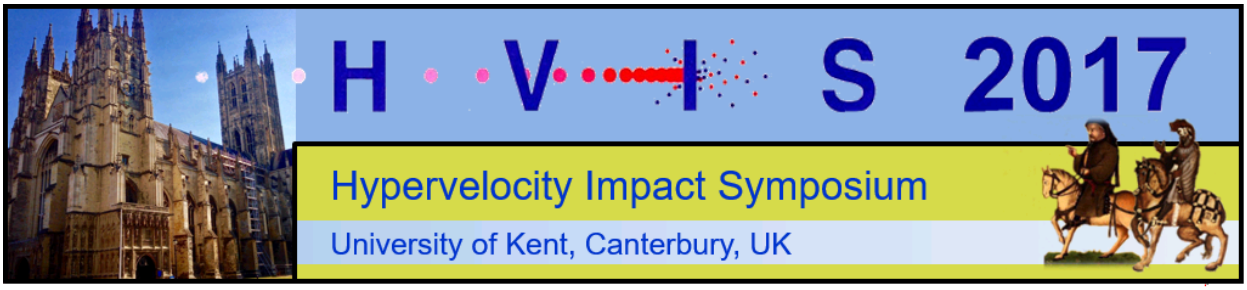
Dr. Fair had moved from the Large Caliber Laboratory at Picatinny Arsenal to DARPA. Propellant chemistry could only provide so much velocity, so Harry had moved to DARPA to investigate alternative launch mechanism, and in particular, electromagnetic launchers. Assuming that higher impact velocities could be achieved, then what would the effect be on terminal ballistics and lethality? Given his interest in hypervelocity impact, Harry asked that we submit a proposal to DARPA for a hypervelocity impact symposium.

Therefore, James and I wrote a proposal (1983/1984) that was eventually funded about the third quarter of 1985. By the time of contract award, James had changed companies; since the contract was with SwRI, I became the Organizing Chair for the symposium. Allowing time for planning and organization, the 1986 Hypervelocity Impact Symposium was held in October 1986. As it had been approximately 20 years since the last HVI symposium, and there was a whole new generation of researchers, we solicited a number of review papers in addition to new work.

But several more things fueled an interest in hypervelocity impact. NASA and the European Space Agency (ESA) were concerned about orbital debris. Micrometeoroids were the impact threat for the early manned missions. However, as more manmade objects were sent into orbit, and collisions and occasional “explosions” occurred resulting in fragmentation and additional objects in orbit, the probability of impact from objects larger than 1 mm was greater from orbital debris than from micrometeoroids. Thus, research was initiated to examine shielding concepts for the proposed International Space Station, along with research to investigate damage of solar panels, trusses, etc.

Also in 1985, the Defense Science Board published an assessment of the Soviet military, specifically tank and antitank capabilities; the panel was chaired by General Don Starry, so the report was called the Starry Report. The conclusions were extremely alarming to the US Department of Defense, which then initiated a major armor/anti-armor initiative (a joint DARPA/Army/Marine program). Considerable funds were made available to push the state of the art in armor and anti-armor technologies. A significant portion of the kinetic energy effort focused on novel penetrator concepts that could take advantage of higher impact velocities, such as segmented penetrators, tubular penetrators, extending penetrators, etc.

This was the background when the 1986 Hypervelocity Impact Symposium was held. At the end



of the conference, Dr. Fair issued a challenge. The primary reason for the hiatus of 20 years between hypervelocity impact symposia was the lack of funding in the technical area. Harry suggested that the formation of a Society, whose primary function would be to periodically organize and hold symposia, could provide the motivation to continue future symposia.

After the 1986 HVIS, I convened a meeting of some of the primary people who had helped in the organization and planning of the '86 HVIS: myself (SwRI), Dr. Jim Asay (Sandia National Laboratories), Dr. Harry Fair (DARPA), Mr. William Isabell (General Research Corporation), Dr. Gordon Johnson (Alliant Techsytems), and Mr. Dennis Orphal (Titan Research Corporation).[1] Over the next 18 months or so, we wrote a Constitution and By-Laws for a new society.[1] On October 7, 1988, the Hypervelocity Impact Society was incorporated. The six of us were the founding Board of Directors.

A Board member serves three terms, with a term defined as the time between symposia. The Constitution and By-Laws call for the election of two new Board members at each symposium by members of the Society. For the initial Board members, we drew straws to decide who would serve one term, two terms, and a full three terms. Additionally, the Organizer for the most recent symposium serves one term on the Board. In this manner, there is continuity between symposia, while also permitting new people to become Board members. As already stated, Society membership elects the Board members. The Board of Directors then elects the President and Secretary/Treasurer, with the stipulation that an Officer cannot serve consecutive terms in the same position. I became the first President, and Jim Asay the first Secretary/Treasurer. Jim prepared and filed the paperwork to obtain a 501C non-profit status under U.S. Internal Revenue Service rules since we are a technical society.

This set the stage for the 1989 Hypervelocity Impact Symposium, and the 11 symposia since then, with the 14th one to be held in Canterbury, UK. Current Board members, committee chairs, past symposia and organizers, awards (such as the Distinguished Scientist Award and Best Paper Awards), etc., can be found at the Society website.

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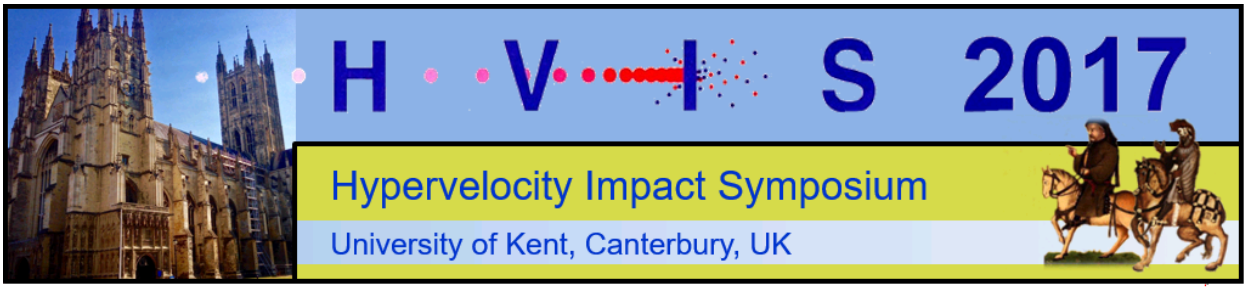
1. *There was an AIAA conference held in 1969, but it primarily reported the very little bit of work that had occurred since the '64 symposium.*
2. *These were the affiliations at the time of incorporation of the Society.*
3. *The Constitutive and By-Laws for the Society can be found at www.HVIS.org. It is interesting to note that*



HYPERVELOCITY IMPACT SOCIETY

HVIS 2017

The Board of Directors of the Hypervelocity Impact Society is pleased to announce that the 14th Hypervelocity Impact Symposium will be held April 24th – 28th, 2017 in Canterbury, UK. This Symposium serves as the principal forum for the discussion, interchange and presentation of the physics of high- and hypervelocity impact and related technical areas. It is intended for scientists, engineers, and technical managers from academia, industry, government and defence programs.

The HVIS Symposia have a long-standing international reputation as a catalyst for stimulating research in this area through a wealth of oral and poster presentations, and commercial exhibits. The Symposium's proceedings are the major archival source of papers published in this field. Oral and poster presentations will be made in the following technical areas:

- **Hypervelocity Phenomenology Studies**
- **High-Velocity Launchers and Diagnostics**
- **Spacecraft Meteoroid/Debris Shielding and Failure Analyses**
- **Material Response (including EOS)**
- **Fracture and Fragmentation**
- **High-Velocity Penetration Mechanics and Target Response**
- **Armor/Anti-Armor and Ballistic Technology**
- **Analytical and Numerical Methodologies**
- **Theoretical/Applied Mechanics Relevant to Hypervelocity Impact**
- **Asteroid Impact and Planetary Defense Technology**

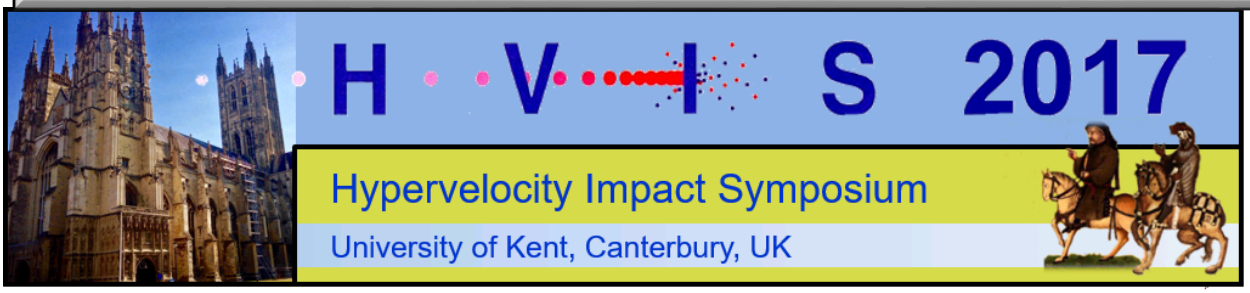
A special session in the topical area of Impacts in the Solar System is also being planned. This special session will include a full afternoon of papers devoted to this topic, including a plenary speaker. We encourage those studying impacts in the solar system via experiments and modelling to submit abstracts.

Companies are also invited to exhibit during the Symposium. Space is limited, so make your plans early!

The Symposium venue is the University of Kent, Canterbury (https://www.kent.ac.uk/ http://www.canterbury.co.uk/). For those who are not familiar with Canterbury, the city is home to Canterbury Cathedral (where Thomas Beckett was famously murdered for King Henry II), a huge number of quaint shops and restaurants and a plethora of pubs!

The Symposium organising committee Co-Chairs are Prof. Mark Burchell, Dr Mark Price and Dr Penny Wozniakiewicz (University of Kent). More information on the Symposium, including contact information, hotel reservations, schedules, commercial exhibits, and timelines can be found at the Symposium website, (http://astro.kent.ac.uk/~mcp2/HVIS2017/) or by contacting the organising committee's email (HVIS2017@star.kent.ac.uk).

We are looking forward to seeing you all in Canterbury next year!



HYPERVELOCITY IMPACT SOCIETY

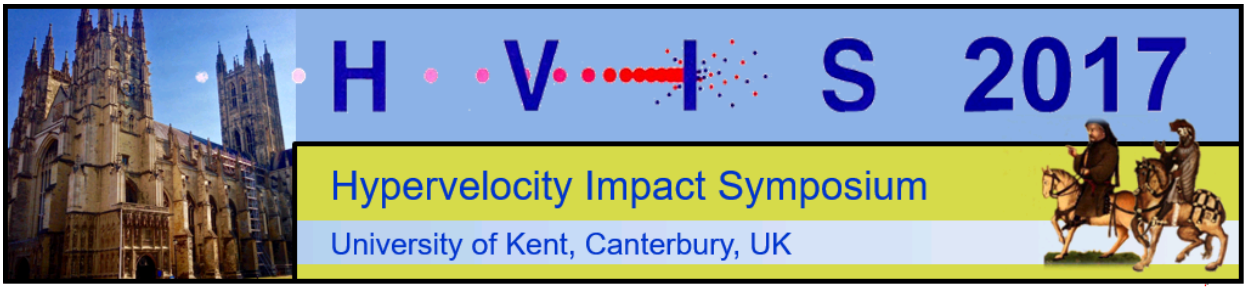
SITE SELECTION COMMITTEE

The Site Selection Committee is charged with developing prospective hosts for future Symposia. We are currently considering options for the next meeting (tentatively spring 2019), if you or your organization is interested in hosting a Symposium, please contact Dr. Gene Hertel by email at esherte@sandia.gov.

Volunteers would be appreciated!

NOMINATION COMMITTEE

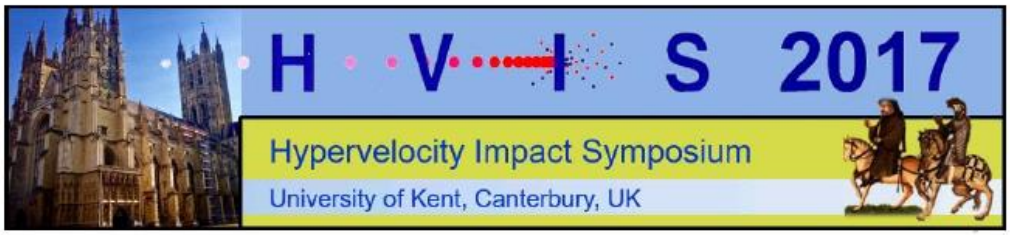
The nominations committee of HVIS is seeking nominations to fill 2 positions on the HVIS board of directors. Nominations can be sent to the nominations committee chair at altonge+hvis@gmail.com. Individuals wishing to nominate themselves may do so, but should include a brief biographical sketch discussing their accomplishments and service to the society. Nominations should be submitted by December 31 2016 so that a final list of nominees can be prepared for an election in February.



HVIS

HYPERVELOCITY IMPACT SOCIETY

University of Kent | School of Physical Sciences



You are cordially invited to attend and present at the 14th Hypervelocity impact symposium to be held at the **University of Kent, Canterbury, 24th -28th April, 2017.**

The committee members, Prof Mark Burchell, Dr Mark Price, Dr Penny Wozniakiewicz and Dr Kathryn Harriss invite abstracts on topics related to the physics of high and hyper velocity impacts.

For more information please visit the HVIS 2017 website:
astro.kent.ac.uk/mcp2/HVIS2017/

Abstract submission:
Midnight (GMT) Friday 18th November 2016.

Early Bird Registration deadline: Tuesday 24th January 2017

Contact: HVIS2017@star.kent.ac.uk