



The International Ballistics Society (IBS) promotes the science of ballistics internationally. The IBS provides for technical interchange via an International Symposium on Ballistics and provides professional development for its members by providing opportunities for publication, short courses, student programs, and other activities to promote career development.

Letter from the President



Dear Colleagues and Society Members,

Welcome to our first International Ballistics Society Newsletter!

It is a great honor for me to serve as the founding president of the society. The society may be new, but the international ballistics community has a long history. The formation of the International Ballistics Society (IBS) was simply the next logical step for us to take and it fits with plans that the

International Ballistics Committee envisioned for some years. We will be able to offer a student program and have the resources to maintain a sophisticated web site that will enable each of you to interact with your colleagues more effectively. We will be able to develop a consistent method for handling abstract and paper submissions, be able to hold the copyright to proceedings and make papers available via an online store and to develop short courses to offer in conjunction with the ISB. These are just some of the things we will be able to pursue as a society.

There are many people who have made very significant contributions to forming this society including the Founding Board of Directors and several committees. Starting the society required operating funds. The current board members have all paid lifetime membership dues. In addition, several companies have become Corporate Sponsors. Even before we openly advertised the society, many other individuals signed up and paid their dues to become Founding members.

In an attempt to recognize all members who contribute financially to the founding of the society, the board of directors decided to identify them as Founding Members. This designation is only available to all members who pay dues during 2010. As you may know, we have extended membership to everyone who attended the 25th ISB in Beijing but they will not be considered Founding Members unless they pay dues.

We have a number of announcements to make in this newsletter. We will provide a short history of how the community has progressed to the point of forming a society, information about the committees that we have formed and about the website. This is a significant resource already, and we plan to make it increasingly valuable as we continue to add content and capabilities.

You will also find information in this newsletter about the next ISB. It will be our 26th conference and will be held in Miami in September 2011. The call for papers was distributed in May and the date for the Paper Selection Meeting has been set. If you are interested in submitting a paper for peer review, you need to work with Bo Janzon and make sure that your full paper is available prior to the Paper Selection Meeting. For our normal papers, you will only need to have an abstract available at the Paper Selection Meeting.

Although the Society is a volunteer organization, we are making good progress on many fronts. The ballistics community has always benefitted from the efforts of volunteers. I served as the Chairman of the 12th International Symposium on Ballistics. Since then, I have been fortunate to be able to participate in every paper selection meeting and every symposium. Seems like quite a long history until you realize that Prof Dr. Manfred Held has attended all 25 symposia and has been at the last 12 paper selections. If you attended the 25th ISB, you know that the Society honored Manfred by making him an Honorary Lifetime Member with membership number 001.

As members of the society, we hope that you will continue the tradition of volunteering to help. This society exists to promote the science of ballistics. We will accomplish that by organizing high quality international conferences, encouraging students to pursue the various fields of ballistics, and by providing opportunities for members to further their career interests. Your support is essential. The Board of Directors and I are looking forward to hearing from you.

Sincerely,
Jack Riegel
President

ISSUE #1, SEPTEMBER 2010

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What's Happening?

Share with colleagues and let people know what you are doing. The IBS is looking for interesting news & photos in the following Fields of Ballistics:

- Interior Ballistics
- Exterior Ballistics
- Launch Dynamics
- Vulnerability
- Terminal Ballistics & Impact Physics
- Explosion Mechanics

Please upload photos at
www.ballistics.org
And submit written news to
communications@ballistics.org

Please remember to be responsible with sensitive or restricted information!

A Society is Formed

In the wake of a long heritage of symposia

The 25th International Symposium on Ballistics (ISB), its Silver Jubilee, marks two significant points for the study of the Science of Ballistics at the international level. In the first instance the holding of the symposium in Beijing, China, represents a significant milestone in terms of expanding the world-wide accessibility of the symposium to ballisticians. In the second instance the 25th ISB marks the founding of a new International Ballistics Society with its objective of taking the science of ballistics into the 21st century and allowing for a wider scope of involvement with the running of the society, the development of ballistics science and the organization of the Ballistics Symposium.

The ISB owes its origins to the American Ordnance Association (AOA), which in turn evolved via the American Defense Preparedness Association (ADPA) into the National Defense Industrial Association (NDIA). NDIA's Bomb & Warhead Division's long-held and still continuing annual meetings were concerned with ballistics but were classified, since they also included program overviews and weapons performance. The US forerunner to the ISB was therefore created to provide an opportunity for US scientists and engineers from universities, industry and government laboratories to meet together in an open forum to present their current research work, discuss the implications of their work and identify future lines of research. The first ISB was finally organized in 1974 in Orlando (Fl., USA) and was considered a great success with between 100 and 120 attendees. The second symposium was also organized by ADPA in 1976 at Daytona Beach (Fl., USA). The third ISB, held in 1977, was organized by EMI and held in Karlsruhe (Germany). This established the alternation of successive symposia between North America and Europe with a period of 18 months between symposia. The ISB was therefore founded during the seventies with the objective of fostering all aspects of the science of ballistics. Its founding fathers represented a team of scientific pioneers in ballistics and were composed of US and European experts. A primary objective of the symposium was to compare and contrast the state of the art in ballistics in North America and Europe and foster collaboration. Once again university and industry attendance at the symposium was highly encouraged so that scientists and engineers in universities and industry might participate in creating, developing, and studying the sciences and technologies that were previously restricted to limited venues of NATO and bi-lateral exchange



agreements. Only NATO member states and other select friendly state attendance was encouraged until 1989.

The recognition that a more efficient set of rules to govern the organization of the ISB was required led to the founding of International Ballistics Committee (IBC) on 23 April 1993 at a meeting held at the French-German Research Institute – Saint-Louis (ISL) in France. The meeting finalized the “Terms of reference” for the IBC and were endorsed at the first formal IBC meeting held during the 14th ISB in Quebec, September 1993.

It has been recognized that for the ISB to continue to thrive we need to empower delegates and encourage them to take a more active participation in organizing the ISB and driving forward the science of ballistics. After some lengthy discussions within the IBC, Dr. Bo Janzon issued a simple questionnaire to seek the views of the delegates to the 23rd ISB at Tarragona, Spain in 2008. The results showed there was a clear majority interested in the formation of a Ballistics Society, with an elected board of directors. Candidates for the Board of Directors are nominated from the membership of the Society and all members take part in the elections. Since the Tarragona ISB (May 2007) Jack Riegel, the current IBC Chairman, and the Executive Board have been working out the details of how an International Ballistics Society could be registered and how it would function. After much hard work the International Ballistics Society was launched in Beijing, marking a new direction for ballisticians and their science.

This is both an exciting and critical time for the Society. There are new ideas being generated daily on how to make the Society strong by making it useful to current and prospective members. That said, it needs targeted exposure to attract new members and it needs member engagement to be successful.

This story was extracted from a more detailed history by Cullis and Giraud which can be found on www.ballistics.org.

Held Named First Ballistic Science Fellow



In addition to being named the first Ballistics Science Fellow, Dr. Held was given an Honorary Lifetime Membership to the International Ballistics Society and was further recognized by receiving Membership Number 001. Mr. Jack Riegel, President of the International Ballistics Society, stated that every member of the Board of Directors endorsed Dr. Held's nomination and unanimously voted to make him member number 1. Dr. Held is the only person to have attended all 25 International Symposia on Ballistics. He has presented multiple papers at every conference and he has personally taken on the teaching of short courses in conjunction with several of the conferences.

Dr. Held has made numerous technical contributions to the ballistics community and he has been an active participant in the International Ballistics Committee since the first year that it was formed.

The Ballistics Science Fellow designation is the most prestigious recognition that the IBS has. By naming Dr. Held as the first recipient, the bar has indeed been set high. Mr. Riegel stated that when societies are newly formed, it is common to have a backlog of individuals worthy of recognition. The Board of Directors will be considering other Society Members for this recognition in the future, perhaps recognizing additional individuals at the 26th ISB in Miami.

25th International Symposium on Ballistics a Huge Success

I attended my first International Ballistics Symposium nearly 30 years ago and any thought then of holding a future symposium in Beijing would have raised quite a few eyebrows and questioned my grasp of reality!

The World has moved on and the 25th Symposium was indeed successfully hosted in Beijing by the China Ordnance Society. The Beijing Symposium also marked two other milestones in the evolution of ballistics science. The first was the formation of the International Ballistics Society tasked with fostering the science of ballistics and ensuring the continued success of the International Ballistics Symposia. The second was the publication of 19 journal quality papers in the first special edition of the Journal of Applied Mechanics (JAM) dedicated to this symposium. Bo Janzon has been appointed Guest Editor and the symposium journal papers will be published in September and issued to every attendee.

The opportunity to visit China was filled with a sense of excitement and curiosity and the desire to see whether the most populous country lived up to its press. One is immediately struck by the size of the city with its four ring roads and 19 million people. The taxi ride in from the airport was an experience providing copious examples of the unique style of driving in China – not to mention the bicycles and motor bikes! Crossing the road proved an interesting challenge!

The opportunities to visit the Forbidden City and the Summer Palace fulfilled personal lifetime ambitions that lived up to my wildest dreams.



Summer Palace



Symposium Venue

Our Chinese hosts provided an excellent venue of the Symposium at the Beijing Friendship Hotel. The facilities were outstanding and the food throughout mouth watering.

The visit to the Great Wall and entertainment at the Symposium banquet with performances from the Chinese Opera and the world famous Chinese Acrobatics Company, were the non-scientific highlights of the Symposium. That said the visit to the Great wall did not stop the scientific discussions, particularly on the ability of modern warheads to breach it!

The whole of ballistics science was represented by the 312 delegates representing 29 countries at the symposium, presenting 212 papers (127 from China and 85 from outside China), of which 55 were oral papers.



Overall the technical quality of the papers was to a very high standard and commensurate with previous symposia. I was particularly impressed with the number of young authors, many from China, presenting the results of their research and demonstrating a wide range of research interests in ballistics. The Symposium once again demonstrated the healthy state of ballistic science around the World and its continued attraction to future scientists and engineers.

Written by Ian Cullis, Senior QinetiQ Fellow & IBS Board Member

Upcoming Symposia Predicted to be Even Stronger

The formation of the International Ballistics Society will likely cause increased awareness in the future symposia which in turn will lead to stronger turnout and more paper submissions. The symposia over the years have had strong participation. However, there are still many people in universities, government labs and companies around the world who are not aware that such a community exists. The website will hopefully expand the reach and exposure of the IBS to new prospective participants. It will also increase activity and interaction on a regular basis so that when the time comes to submit papers or to book that reservation, the turnout will be even greater.

Speaking of an upcoming symposium, 26th International Symposium on Ballistics will be held in Miami Florida. It is organized and supported with the National Defense Industrial Association (NDIA). It should be mentioned that NDIA is a seasoned veteran of organizing the ISB and an extremely professional organization with a Ballistics Division. Dr. Ernest Baker and Dr. Douglas Templeton are the chairmen for the meeting. The call for papers was distributed in May and the date for the Paper Selection Meeting has been set for the 7th and 8th of December. Abstracts must be submitted latest by 26 November at <http://application.ndia.org/abstracts/1210>, all info available at www.ndia.org/meetings/1210.

Scientific papers for the 26th International Symposium on Ballistics, at Miami, FL., may be submitted for peer review and possible publication in the renowned Journal of Applied Mechanics. To be considered please submit your full manuscript at <http://journaltool.asme.org/Content/SubmitPaper.cfm?journalId=1>, latest by 26 November 2010. The title of the paper must begin with "ISB 2011 -". You must also, concurrently, submit your abstract at <http://application.ndia.org/abstracts/1210>, indicating that you have submitted a manuscript to the JAM. Questions may be put to Professor Bo Janzon, jam@secrab.eu.

New Website www.ballistics.org Offers Powerful Tools

In Thomas Freedman's book "The World is Flat" he talks about several significant events that are "flattening the world" or allowing information sharing to the point where individuals, companies or organizations can interact or provide services literally anywhere in the world in support of colleagues and customers in another part of the world. Among the top events cited were the creation of the internet, web browsing and killer applications. I think we have all seen how the pace of technology has not only changed the way we work and live but done so in a way where if you don't keep up you can easily be lost or left out. This is especially relevant to the International Ballistics Society and the new IBS Website. First, the IBS has been created on the base of an already existing history of international sharing through the Symposia and Committee activities. Now the Society will step it up another notch to create an environment where more people are connected, sharing, working together and solving problems on a more regular basis. It is with this in mind that the President and Board decided to make sure that the website was set up to be a very powerful tool.

Imagine a situation where you would like to search a member database for people with similar interests or backgrounds. How about the ability to post items for sale or look for specific items to buy? Speaking of buying items, wouldn't it be nice to search online for relevant past IBS papers and buy

them online? While you have your credit card out you could get a few IBS logo gift items. How about a wiki-type section to post information about ballistics? What if you wanted to reach out to a specialized community to ask a question about a book or just if someone has seen a phenomenon that you are experiencing in your specific field of work? Certainly it would be nice to renew your membership or register for an upcoming symposium online. What if you captured a really cool photo of a ballistic event and wanted to share it with others (maybe showcasing a capability of your company, university or lab in the process)?

www.ballistics.org is envisioned to be that one-stop-shop, powerful tool and it is well on its way to offering all of these services and more. In fact, it is the "and more" part that we want to hear from our members about so we can take the user feedback and continue to strengthen to capabilities. You have two other homework assignments to help make this great. First, sign in and use the website! Second, spread the word about the society! The usefulness of this system still depends on the users and it can become incredible if we reach out and grow the community.

Like all things, this new website was not without its own hiccups but the progress made recently has been very positive and it is worth mentioning Veith Consulting for their efforts.

A Few Pointers on How to Use the New Website

Front Page: The front page is divided into several sections. The top of the page shows our logo and states the purpose of the society. On the left side you will find a navigation bar that gives you access to information about our corporate sponsors, the IBS Constitution, a list of the Board of Directors, a number of resources, information about the awards, the IBS calendar, news articles, and a photo gallery. On the right hand side of the page is a bar that includes the member login, access to information to the fields of ballistics of interest to the society, a place holder for a student program committee, and a place holder for additional information, such as the status of our efforts to make the proceedings of past symposia available on line.

The center of the page highlights items of significance to the general membership. We intend to maintain information about the upcoming symposia near the top of this section, followed by upcoming events and activities such as the call for papers, and at the bottom of that section we will show introductions to a couple of news articles.

Please take a look at what is available.

Member Only Section:

After navigating through the open pages, try logging in to the member only section. You should have

received a user name and password. If you lost that information, you should be able to select "Forgot your Password" to have the system send it to you again. If you have problems, send a message to membership@ballistics.org for assistance.

Once you have logged in, you should see a section for your membership information. Please update your profile information. We will use this information to keep you informed of upcoming events. You can upload a photo of yourself as well. Note that photos must be .gif or .jpg files. You will also be able to print a membership card and a member certificate from this area.

Members Area Features:

In this section, you will be able to register for events, view the calendar, create multipost links to your LinkedIn, Facebook, and Tweeter accounts, submit messages, view committees, file archives, photo albums, and access the online store. Note that the online store is under development so you won't find much there at this time. But, eventually it will become your access point for purchasing papers from past symposia. You also have access to message boards, and surveys.

Give it a try and send suggestions for improving the site to communications@ballistics.org.

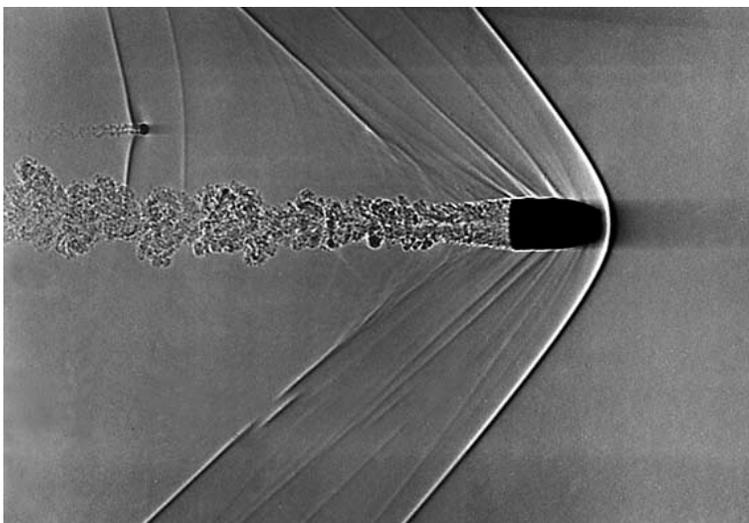
Committee Activities

Committee and Members	Primary Objective	Immediate Focus & Needs
<p style="text-align: center;"><u>Audit Committee</u></p> <p>Baum, Dennis Brown, Ronald Cullis, Ian</p>	<p>The Audit Committee is responsible for setting the standards for record-keeping to be followed by the treasurer and for periodically auditing the financial records of the society and reporting to the Board of Directors on the results of the audit.</p>	
<p style="text-align: center;"><u>Board of Directors</u></p> <p>Baum, Dennis Chocron, Sidney Cullis, Ian Janzon, Bo Mayseless, Meir Murphy, Michael Riegel, Jack Wang, Zhongyuan</p>	<p>In accordance with the Constitution of the International Ballistics Society, the Board of Directors is responsible for conducting the business of the society, managing the finances of the society, and promoting the goals of the society.</p>	
<p style="text-align: center;"><u>Communications Committee</u></p> <p>Murphy, Michael Riegel, Jack Russell, Tony</p>	<p>The Communications Committee is a standing committee that is responsible for developing and maintaining the web site and for handling press releases, conference advertisements, etc.</p>	<p><i>Ensure website is useful – so give feedback!</i> <i>Recruit 3 more committee members</i> <i>Creative ways for IBS promotion</i> <i>Obtain cool “ballistics” photos</i> <i>Get input from members on interesting topics and research (newsletter and website stories)</i></p>
<p style="text-align: center;"><u>Education Committee</u></p> <p>Riegel, Jack</p>	<p>The Education Committee is responsible for organizing short courses and other material to assist with technical advancement of the members.</p>	<p><i>Recruit more committee members</i></p>
<p style="text-align: center;"><u>Corporate Structure Committee</u></p> <p>Baum, Dennis Chocron, Sidney Cullis, Ian</p>	<p>This committee is tasked to incorporate the society.</p>	
<p style="text-align: center;"><u>Griffiths Award Committee</u></p> <p>Ian Cullis</p>	<p>This committee is responsible for selecting the winner of the Neill Griffiths Award for the best paper on shaped charge warheads.</p>	<p><i>We need papers on shaped charge warheads!</i></p>
<p style="text-align: center;"><u>Membership Committee</u></p> <p>Baum, Dennis Chocron, Sidney Woodley, Clive</p>	<p>The Membership Committee is responsible for recruiting new members and retaining existing members. It works closely with the communications committee, the outreach committee, the student program committee, and the symposium committee to identify potential new members and to encourage existing members to renew their membership.</p>	<p><i>Bring in new members!</i></p>
<p style="text-align: center;"><u>Nominations Committee</u></p> <p>Cullis, Ian</p>	<p>The Nominating Committee is a standing committee that is responsible for identifying candidates for board vacancies. The committee is also responsible for recommending candidate qualifications</p>	<p><i>Draft the Guidelines for holding elections to the Society Board of Directors.</i> <i>Seek candidates to stand in the election and organize and hold the first election in time for the new Board to take over at the 26th ISB in Miami.</i></p>

Committee Activities

Committee and Members	Primary Objective	Immediate Focus & Needs
<p style="text-align: center;"><u>Outreach Committee</u> Murphy, Michael</p>	The Outreach Committee is responsible for establishing Points of Contact within the various countries that are normally represented at the International Symposia on Ballistics.	
<p style="text-align: center;"><u>Publications Committee</u> Giraud, Marc Janzon, Bo Kuo, Kenneth Mayseless, Meir Schmidt, Edward Wang, Zhongyuan</p>	The Publications Committee is responsible for assisting members in publishing peer reviewed articles. The committee works with the Journal of Applied Mechanics to create a volume dedicated to papers submitted by IBS members in association with ISB.	
<p style="text-align: center;"><u>SABO Award Committee</u> Izak Snyman</p>	This committee is responsible for selecting the winner of the SABO Award.	
<p style="text-align: center;"><u>Student Program Committee</u> Galvez, Francisco Kuo, Kenneth Mostert, Frederik Thoma, Klaus Wang, Zhongyuan</p>	The Student Program Committee is responsible for establishing a student paper award program and for organizing short course to be held in conjunction with ISB.	<i>Create stronger university connections</i>
<p style="text-align: center;"><u>Symposium Committee</u> Baker, Ernest Baum, Dennis</p>	The Symposium Committee assists with site selection and symposium preparation. Tasked with identifying potential hosts and assisting in the development of proposals. This committee serves as corporate memory for what works and what doesn't.	
<p style="text-align: center;"><u>Zernow Award Committee</u> Ed Schmidt</p>	This committee is responsible for selecting the winner of the Zernow award.	

The IBS Logo was selected to be a depiction of a common and recognizable example of a scientific analysis for a ballistic event. Below is a shadowgraph of a bullet in flight. Image Credit: Andrew Davidhazy/Rochester Institute of Technology



Did you know...

In 1538, the first bullet proof vest was commissioned. In 1561, the Holy Roman Emperor is recorded as testing his armor against gun-fire.[1] The term "bulletproof" originated shortly thereafter to identify a dent on the armor which proved it would resist bullet penetration. One of the first recorded descriptions of soft armor use was found in medieval Japan, with the armor having been manufactured from silk.[2] Today body armor is used by commonly by soldiers, law enforcement, security guards and other individuals. There is a significant push for lighter materials and integrated solutions to counter increased threats. Ceramic plates, fabrics and composites made from and high tenacity plastic fibers are common. Nanotechnology has shown potential to make substantial breakthroughs in material performance.

1. Williams, Allan (2003). *The Knight and the Blast Furnace: A History of the Metallurgy of Armour in the Middle Ages & the Early Modern Period*. [Boston](#): Brill Academic Publishers.
2. "Selection and Application guide to Personal Body Armor". National Criminal Justice Reference Service. Retrieved 2009-12-30.

Membership

Welcome to the membership section of this first newsletter of the IBS. These are exciting times for all of us. Since the IBS was founded in January 2010, there has been a strong interest in both Corporate and Individual Memberships. Note that it is not necessary to attend an International Symposium on Ballistics to become a member.

There are three levels of Corporate Membership: Silver, Gold and Platinum. The benefits due to Corporate Members are evolving – there is a discussion group on the IBS website debating what the current Corporate Members would like from the IBS. Among the benefits that Corporate Members will receive is free advertisements in the IBS newsletters, information about the company on the IBS web site (with links to a corporate page) and the right to nominate employees to individual membership of the IBS. Such nominees are not required to pay individual members fees.

Costs per term (a term lasts approximately 18 months and covers the period from the start of one symposium to the start of the next) for the Corporate Membership categories are:

- Silver – US\$250
- Gold – US\$500
- Platinum – US\$1000

All Corporate Members who pay prior to 31 December 2010 will be identified as Founding Members. These members will be given a certificate identifying them as such.

Individual Membership comes in various categories, catering for students and regular members. Currently we have nearly 400 members, from five continents – we are still awaiting our first members from the continents of Antarctica and South America! The individual membership categories and costs per term are:

- Student – US\$15
- Regular – US\$50
- Senior – US\$50
- Fellow – US\$50

Senior Members have at least 8 years of membership in the IBS. However, in the founding years of the IBS, the Board of Directors may establish alternative criteria for Senior Members. Fellow Membership status is conferred at the discretion of the Board of Directors on those individuals who have rendered meritorious service to the IBS or to the science of ballistics.

It is also possible to become a Lifetime Member by payment of the following amount:

- US\$500 under the age of 50
- US\$300 50 years of age and older

Only individual members who pay before 31 December 2010 will become Founding Members, so it is important to join now to receive this status.

All attendees of the 25th are automatically members of the IBS. However, only those that pay a fee will become a Founding Member.

For future symposia, registration will include a membership fee.

The IBS has another individual membership category, that of Ballistic Science Fellow. This category is only conferred to those individuals who have distinguished themselves within the ballistics community. Recipients must have made either a number of contributions to the science of ballistics or an outstanding significant contribution.

In recognition of his outstanding contributions over many decades, and having attended every ISB, the Board of Directors assigned membership number 1 and awarded the title of Ballistics Science Fellow to Professor Doctor Manfred Held at Beijing in May 2010.

All members of the IBS receive a certificate and a membership card. An example of a Founding Member's certificate (in this case, Professor Held's) is shown (actual words will vary according to membership status).



The membership benefits are evolving but it is anticipated that they will include the ability to download papers from previous symposia.

It is important to remember that the IBS is run by its members, for its members. We want to know what you think. We welcome any comments or questions on membership of the IBS at membership@ballistics.org.

Written by Clive Woodley, QinetiQ Principal Scientist, Weapons Technology & IBS Board Member

The First SABO Award goes to Mr Chen-li Tao and co-authors

The South African Ballistics Organisation (SABO) Award was instituted for the first time at the 25th International Symposium on Ballistics (ISB) in Beijing as an incentive measure for presenters of poster papers at the ISB. The idea of the award sprung from an earlier discussion between members of SABO (after attending the 23rd ISB in Spain) on the topic of informal interaction at the poster presentation sessions at the ISB. Whereas a formal code of conduct was in place at the ISB for the oral presentations, the poster sessions were a relatively informal affair. Consensus was that some incentive needed to be found to entice poster presenters to be present at their posters for the duration of the poster sessions in order to maximize the potential interaction during these sessions. It was decided within the SABO group to propose an award at the ISB to, firstly, give recognition to authors who wrote an excellent paper but not have had the opportunity to orally present it, but also secondly, who created a good quality poster and then presented it with clarity and dedication at the scheduled poster session. The award procedure was instituted at the 25th ISB in Beijing with Dr Izak Snyman of SABO the award committee chairman. The first winner of the SABO award at the 25th ISB was Mr Chen-li Tao and co-authors, for their poster paper entitled "Mechanism of Interior Ballistics Peak Phenomenon in Guns and its Effects".



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SECRAB Security Research – a Societal Entrepreneurship Company - works with research and technology, mostly within public safety and security, especially in connection with the EU 7th Framework Program.



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- Scientific publications, reviews, seminars, conferences and symposia
- Analysis of safety and security problems
- Energetic materials, effects, detection and remediation of explosives, protection against effects
- Rock blasting, underwater blasting and shaped charges
- Threat, Risk and Consequence Analysis, foremost in connection with energetic materials
- Protection of critical infrastructure against physical attack, explosives, fire

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- We are the UK's largest research and technology organization.
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中国兵工学会
China Ordnance Society

Founded in April, 1964 and affiliated with the China Association for Science and Technology, the China Ordnance Society is an academic social group composed of science and technology workers for China Ordnance.

The purpose of the China Ordnance Society is to serve the defense construction and economic development by organizing science and technology workers and to promote and develop scientific ideas and disciplines. Its main task is to organize academic exchange, publish academic periodicals, promote the development of science and technology, propagate scientific information and popularize scientific knowledge.

The Society has general members, senior members and fellows and so on. It has all together 21120 members, among which more than 533 are senior members and 33 are fellows.



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The Fraunhofer Institute for High-Speed Dynamics, known under the name Ernst-Mach-Institut (EMI) is one of the 60 institutes of the German Fraunhofer society. Fraunhofer is a non profit organization which specialises in applied research and has close links to German government authorities. It is the biggest research organization in its field in Germany and one of the essential European research organizations.

Southwest Research Institute (SwRI) is a nonprofit engineering R&D center. The main facility is a 1200-acre campus in San Antonio, Texas where over 3000 employees perform contract research for both government and industry. SwRI's Engineering Dynamics Department in the Mechanical Engineering Division works on armor and impact physics.

1. SwRI maintains multiple indoor and outdoor ballistic range facilities, where small and medium arms are tested against various armor configurations.
2. At a facility further out of town large explosive tests, including land mines, IEDs, and arena tests are performed to assess the survivability of vehicles and structures.
3. Low, medium, and high-strain-rate laboratory testing facilities provide the ability to characterize materials and then develop constitutive models for use in computational tools.
4. SwRI has extensive experience with the three primary software tools used for ballistics and explosive-loading: CTH, LS-DYNA, and EPIC. SwRI has modified all three for new constitutive models and boundary conditions.

Thus, SwRI's numerical work is directly applicable and available to the armor community. The armor and shielding program at SwRI has been funded over the years by the Army, Navy, Air Force, Marines, Department of Energy, NASA, and DARPA.

Please, visit
www.engineeringdynamics.swri.org
for more information or
www.swri.org/PMSC/default.htm
for the Penetration Mechanics
weeklong course taught every year.



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