



# INTERNATIONAL BALLISTICS SOCIETY

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.



## EDITORIAL BY THE PRESIDENT

I feel greatly honoured to have been selected by the Board to be the next President of the IBS. Firstly I must thank sincerely the previous President, **Dr Ian Cullis**, who served for two terms, and devoted a great

deal of time to developing the IBS. Indeed, the IBS has been fortunate in having, as its first two Presidents, **Jack Riegel** and **Ian**. They have both had a very clear vision of what the IBS should achieve and have driven it forward to the success it is now. They will be tough and challenging acts to follow!

My prime objective for this term will be to develop the educational benefits of the Society by taking it to a position where it is seen as a core part of Continuing Professional Development (CPD) and offering Continuing Education Units (CEUs). CPD is viewed increasingly by employers as an important area for all staff and the IBS needs to be seen to be a major contributor to this process. We plan to offer both online and classroom courses on various aspects of ballistics during the next few years. If you are interested in attending ballistics courses or contributing towards courses then please drop me a line at [president@ballistics.org](mailto:president@ballistics.org). I am very keen to hear your interests and views.

## LOOKING BACK TO ATLANTA

The 28th ISB in Atlanta, September 2014, was a tremendous success. I would like to thank formally the co-chairs, **Richard Ames** and **Dan Boeka**, and **Britt Bommelle** and her team from the National Defense Industrial Association for their outstanding efforts in making the event so successful. Everybody who attended thought the quality of the technical presentations, both poster and oral, was excellent.

Interestingly, the pattern of paid registrations followed a very different pattern to previous ISB (see figure below). Up until the week before the symposium's start, the numbers were well below normal. However, in the last week, including at the ISB, there was an unprecedented number of paid registrations. Reasons for this include late granting of visas and last-minute decisions by major governmental organisations on how many

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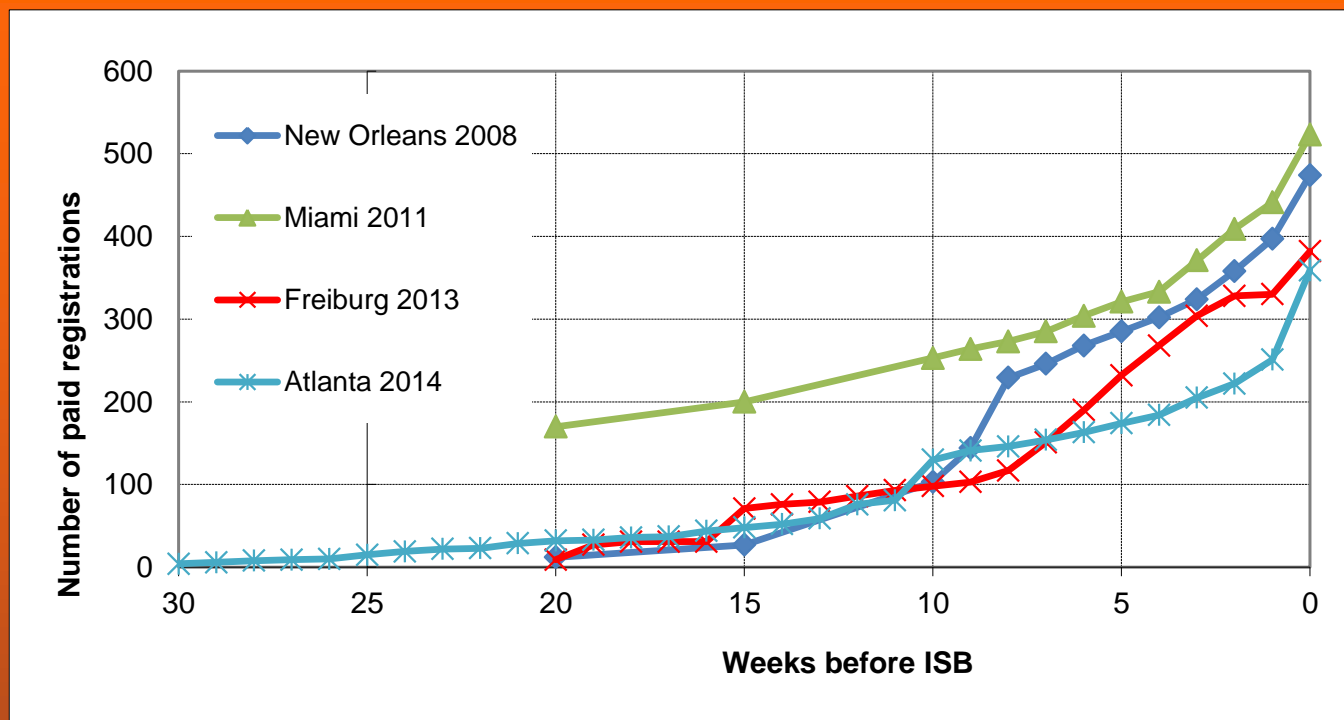
## HELP NEEDED FROM MEMBERS!

1. **Recruit new members** – spread the word and get your colleagues to join
2. **Get involved** – see the website for a list of committees and projects with contacts
3. **Send or post cool photos** – we want good photographs showing ballistic events in each field
  - **Interior Ballistics**
  - **Exterior Ballistics**
  - **Launch Dynamics**
  - **Vulnerability**
  - **Terminal Ballistics & Impact Physics**
  - **Explosion Mechanics**

Please upload photos at  
[www.ballistics.org](http://www.ballistics.org)

*Remember to be responsible with sensitive or restricted information!*

people to send and who. Approximately 40 people could not obtain visas in time or received them so late that they could not attend due to very high flight costs. All of which made planning the meals and refreshments at the ISB venue very difficult!



I'm delighted to report that three members were chosen to be Ballistic Science Fellows. This is the highest membership type in the IBS. The three members, selected for their outstanding innovative research on ballistics over many years, were **Charles Anderson**, **Kenneth Kuo**, and **Gordon Johnson**.

### LOOKING AHEAD TO EDINBURGH AND BEYOND

The next ISB, the 29th, will be held in Edinburgh, Scotland, 9-13 May 2016. **Ian Cullis** and I will be the co-chairs for the symposium and are looking forward to all the enjoyable hard work this entails! Please keep an eye on the IBS website for further information and see the article below for key dates. I look forward to seeing all of you there.

In Atlanta, Hyderabad in India was chosen to be the site for the 31<sup>st</sup> ISB, in 2019. The Site Selection Committee, led by **Dennis Baum**, had a very difficult decision between the competing proposals. This will be the first time the ISB has been held in India and I will be looking forward to this event with great excitement and anticipation. India is a fascinating country with a very rich history.

If you have any views on the IBS or wish to help then please contact me. I look forward to hearing from you.

--CliveWoodley

## COMMUNICATIONS COMMITTEE UPDATE

By Nicolas Eches  
Chair, IBS Communications Committee

Since the last newsletter, many things have evolved in the Communications Committee.

In order to improve both our external and internal visibility, five topics have been chosen to be developed by the Committee. These topics are:

- a) **Newsletter.** This *Bulletin* is one of our primary internal communication media, along with the website. The purpose is to enhance its content, in order to be as close as possible to what the members expect from it. We are working on the format, content, and the frequency of issue. Your feedback is gladly welcomed. The Newsletter group consists of William Flis, Dinesh Pal and Zhang Mingan.
- b) **Educational Visibility.** The Society has few academic members such as universities, engineering schools, etc. The purpose of this group is to identify means of increasing our visibility within the academic world, in order to engage and encourage them to become members. Hendrik Lips, Dimitrios Gkritzapis and Gao Min are in charge of this topic.
- c) **Social Networks.** Social networks are everywhere today, and virtually every person around the world is a member of at least one of these networks. The group handling this topic has to determine if it would be advantageous for the society to be on these networks, and if so, in what form and on which networks. The group will first benchmark societies similar to our own, and see what are the benefits or drawbacks of being part of social networks. Hans Peter Kaufmann, Linda Heuer and Shannon Ryan will lead this work.
- d) **Web site.** The web site is a medium for both internal and external communications. We need to review it, in order to ensure that it fulfills its functions. The group is responsible for proposing the addition of new pages and functions, the refurbishment of others, the updating of information contained therein, and so on. Pierre Wey has taken on this task. If any members wish to help, they will be quite welcome.
- e) **External Communications.** Two main questions are raised under this topic: what is the image we want to show to the world, and how can we improve our visibility, in order to attract new members? Frederik Coghe and Xu Yida will address these questions and make proposals to the Board.

All these groups will gladly welcome any idea, comment or suggestion. Please do not hesitate to let us know at [communications@ballistics.org](mailto:communications@ballistics.org).

International *Ballistics* Society  
*Periodic Bulletin*

Questions, input, or feedback should be directed to [communications@ballistics.org](mailto:communications@ballistics.org)

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## NEW BALLISTICS SCIENCE FELLOWS NOMINATED

Three new Ballistics Science Fellows were named at the 28th ISB in Atlanta, joining **Pierre Yves Chanteret**, **Marc Giraud**, and **Meir Mayseless**, who were so honoured in Freiburg.



**Dr. Charles Anderson, Jr.**, was awarded for outstanding research in terminal ballistics. He has contributed a complex understanding of the fundamental physics of penetration mechanics and provided ongoing analytic support for the modeling and implementation of armor designs. He has shared this understanding by making a significant contribution to the education and development of ballisticians around the world.



**Dr. Gordon Johnson** was honoured for outstanding research in the development of material models and numerical simulation techniques. He has made a seminal contribution to define the role of material behavior in ballistic impact and penetration mechanics. He has pioneered the use of numerical simulation in ballistics science and continually developed and expanded the ability of modeling to describe the complex phenomena observed in terminal ballistics.



**Prof. Kenneth Kuo** was awarded for outstanding research in interior ballistics and chemical propulsion including rocket and space systems. He has demonstrated a dedication to the education of interior ballisticians from around the world. He has pioneered the theoretical modeling of high pressure combustion processes. His research has included major contributions to space propulsion and automotive safety protection systems.

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### AGENDA

**29<sup>th</sup> INTERNATIONAL SYMPOSIUM ON BALLISTICS**, Edinburgh, Scotland, 9-13 May 2016

March 2015:	Call for Abstracts/Papers
July 2015:	Abstracts due
September 2015:	Notification of accepted abstracts
March 2016:	Formal papers due
April 2016:	Powerpoints due

**30<sup>th</sup> INTERNATIONAL SYMPOSIUM ON BALLISTICS**, Long Beach, California, 11-17 Sept 2017

**31<sup>st</sup> INTERNATIONAL SYMPOSIUM ON BALLISTICS**, Hyderabad, India, April-May? 2019

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### INTERESTING LINKS

Military slide rules, including several having to do with ballistics, at the International Slide Rule Museum: <http://sliderulemuseum.com/Military.htm>

A historic issue of *Scientific American* reports on the construction of the then-largest guns in the world by Krupp: <http://www.gutenberg.org/files/11662/11662-h/11662-h.htm>



## 28TH ISB AWARDS

One of the highlights of the International Ballistics Symposia is the announcement of the several Ballistics awards, which reward remarkable contributions in various fields of Ballistics. In Atlanta, the ceremony was held on Friday, after the oral presentations.

Details of the awards can be found at the IBS website, [ballistics.org](http://ballistics.org).



**Ove Dullum** was presented with the Louis and Edith Zernow Award in Ballistics for his paper, "Engraving, Friction and Wear in Small Caliber Guns."

The Neil Griffiths Award for a significant contribution to the technology of shaped charges was presented to **Werner Arnold, Ernst Rottenkolber, and Thomas Hartmann** for their paper, "Axially Switchable Warheads."



The SABO Award for Best Poster was presented to **Long Nguyen, Shannon Ryan, Stephen Cimpoeu, Adrian Mouritz, and Adrian Orifici** for their poster, "The Effect of Target Thickness on the Ballistic Performance of UHMW Polyethylene Composite."

The Rosalind and Pei Chi Chou Award for Young Authors was presented to **Alon Weiss** for his paper, co-authored with David Durban, entitled “Cavitation Theory Applied to Polycarbonate Ballistic Response.”



The Student Awards provide conference registration and travel support to selected students for attendance at the International Symposia on Ballistics. Awards were granted to:

- **Mickael Zeidler**
- **Carey Price**
- **Maria Jesus Perez-Martin**
- **Francisca Martinez**
- **Weitao Yang**
- **Jie Liu**

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## THE *BULLETIN* NEEDS YOU!

This newsletter is one of the means of keeping you informed about the life of the society, and about the main events it organizes. You can participate in making this bulletin more lively and closer to your fields of interest by proposing technical papers about works you have carried out or facts about ballistics you are aware of. For instance, if in browsing the web you find sites related to ballistics you think are interesting, funny, or worthy of sharing, do not hesitate to send a message to [communications@ballistics.org](mailto:communications@ballistics.org). However, be careful not to infringe any copyright or classification rules.

Also, we all belong to lots of different organizations, industries, and laboratories. It could be interesting for other members if, from time to time, one of you made a short informative presentation on your organization. This presentation should be more information than advertising, and have the same obvious requirements about copyrights and classification. Dinesh Pal volunteered to be the first to do so. Any other type of contribution is obviously welcomed!

Thanks in advance!

## DID YOU KNOW ... ?

by William Flis, IBS Communications Committee

From time to time, we will include in the *Bulletin* some topics about ballistics science, the society, or anything else that might be worthy of interest. If you have any ideas to share, in order to enrich this section, email to [communications@ballistics.org](mailto:communications@ballistics.org)

- ... that, before the advent of the **Minié ball**, named for its inventor, Claude-Étienne Minié (1804-1879), all penetrating ballistic projectiles (not counting spears and arrows) were spherical?
- ... that, in the best-selling non-fiction book *David and Goliath: Underdogs, Misfits, and the Art of Battling Giants* (Oct. 2013, Little, Brown & Co.), author Malcolm Gladwell quotes **Dr. Eitan Hirsch** of the Israeli Defense Force on David's biblical victory over his gigantic Philistine opponent? In the book's afternotes (pp. 279-80), Gladwell cites the paper "David's Choice: A Sling and Tactical Advantage," by Dr. Hirsch, **Jaime H. Cuadros**, and **Joseph E. Backofen**, which was presented as the theme of the 15<sup>th</sup> ISB in Jerusalem, 1995. The premise of Gladwell's book, supported by the ballistics and tactical analysis of their paper, is that the mighty and heavily armored Goliath didn't really stand a chance against the mobility and precision weaponry of his opponent. Gladwell also reports an e-mail communication with Dr. Hirsch, who has been a prolific participant in the ISB going back to the 6<sup>th</sup> in 1981, with over two dozen papers as author and co-author. Mr. Backofen, one of the founders of the ISB, has been nearly as prolific, with papers going back to the 2<sup>nd</sup> ISB in 1976; he also served for many years as chair of NDIA's Ballistics Division Executive Committee, the precursor to the International Ballistics Committee and our present society. Both have been active in the Warhead Mechanisms and Penetration Mechanics areas, concentrating mainly on shaped charges. Their ISB paper can be downloaded from the IBS online store.



*Goliath Laughs at David*, by Ilya Repin, 1915.

- ... that, during each term of membership (between symposia), each IBS member is entitled to download up to 5 individual papers from previous International Symposia on Ballistics free of charge? Visit the IBS online store here (be sure to log in as a member):

<http://mms.ballistics.org/members/store.php?orgcode=IBSO>

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## 28<sup>TH</sup> ISB PRESENTATIONS UPLOADING

The uploading of the slides of the oral presentations performed during the last symposium has begun. These files will be available to the members for downloading. Many thanks to the authors who have authorized the publication of their slides.

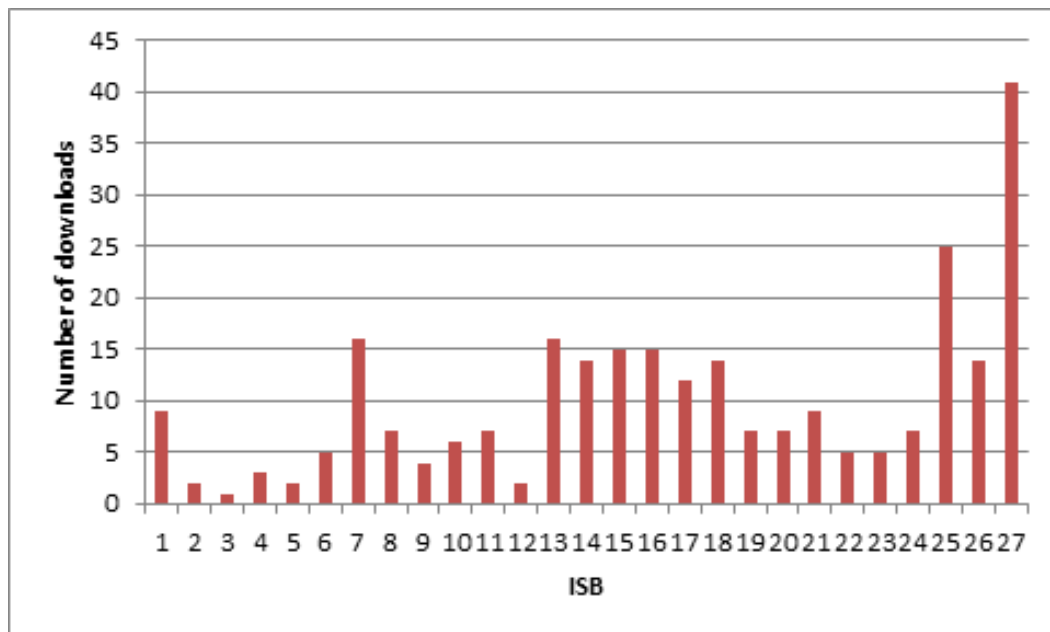
## TERMINAL BALLISTICS RESEARCH LABORATORY CHANDIGARH, INDIA

by Dinesh Pal, IBS Communications Committee

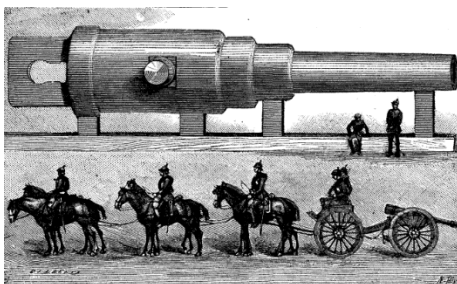
The Terminal Ballistics Research Laboratory, Chandigarh, India, was established in 1961 as one of the national armament research laboratories, with an aim to provide facilities for basic and applied research in the fields of terminal ballistics, high explosives, blast and damage, immunity, lethality and fragmentation, defeat of armour, impact, penetration, and characterization of materials at high strain rates, explosive welding, and forming. The laboratory has facilities for performance evaluation of ammunitions on a fully instrumented range spanning 5000 acres.

Activities include:

- Ballistics evaluation of various protective systems including body armour, vehicle armour, jackets, and helmets against small-arms ammunition.
- Development and testing of non-lethal plastic and frangible bullets for low-intensity conflicts and riot control.
- Baffle range for firing practice by paramilitary and civilian police forces.





Cumulative numbers of papers downloaded from the IBS online store, by symposium, 1<sup>st</sup> through 27<sup>th</sup>.



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SECRA B is owned and managed by Professor Bo Janzon.

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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 22562 members, among which more than 585 are senior members and 34 are fellows.

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R3 Technology, Inc. is proud to support the International Ballistics Society. Jack served as the founding president of the IBS and previously served as the Chairman of the 12th ISB, in addition to other positions. R3 Technology provides technical services, business development support, and short courses.

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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](http://www.engineeringdynamics.swri.org)  
for more information or  
[www.swri.org/PMSC/default.htm](http://www.swri.org/PMSC/default.htm)  
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[www.rma.ac.be/en/rma%20-%20weapon%20systems%20and%20ballistics.html](http://www.rma.ac.be/en/rma%20-%20weapon%20systems%20and%20ballistics.html)

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