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## The Benefits of Membership in ILASS-Americas

Sometimes it is easy to take things for granted — and we all do it from time to time — but we'd like to take just a moment to review the benefits you experience as a member.

- International and Americas annual conferences offer the ideal environment for staying on the leading edge of technology and networking.
- Seven technical committees are hard at work developing industry standards, identifying emerging technologies and promoting exchanges of information between the world's leading experts. Be a part of it!
- Do you have a specific problem you'd like to discuss with your peers right now? Log onto the ILASS-Americas' Discussion Board, where you can instantly network with other experts in your field.
- The ILASS newsletter keeps members apprised of upcoming events so you won't miss important educational opportunities and technical articles.

- Our Harold C. Simmons and W.R. Marshall awards recognize and encourage the next generation of industry experts. Can you recommend any worthy candidates?

### Encourage someone to join ILASS-Americas

Membership in ILASS-Americas is affordable for all. A one-time \$20 membership fee is all it takes to tap into the resources and benefits just noted. Why don't you take just a moment and encourage your colleagues and associates to consider joining? You'll be ensuring the continued growth and longevity of our professional association.

To become a member of ILASS-Americas, complete the application below and mail to:

Professor Scott Samuelsen  
Secretariat, ILASS-Americas  
UCI Combustion Laboratory  
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Irvine, CA 92697-3550

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# ILASS – Americas

The Institute for Liquid Atomization and Spray Systems

Newsletter #27

September 2005

## A Message from the Chairman of ILASS-Americas

Following a very successful meeting at University of California, Irvine, I am sure I join others in my satisfaction with the ILASS organization and enthusiasm for the future. Thanks are due to Vince McDonell, meeting chairman, Brian Helenbrook, program chairman, and many others. We had a flawless conference with a good number of high quality presentations. Brian has done a great job as program chairman and we thank him for his hard work. Shankar Subramanian will take over as program chairman for upcoming meetings. The organization has benefited from the hard work and efforts of our members, and we are all beneficiaries of these efforts. Thanks to Chris Edwards' work and insight as the past chairman of the board, the organization is positioned for continued success. As chairman, I will work hard to maintain these standards and help the organization become the resource for furthering development of innovations, knowledge and capabilities in atomization and spray technology. Clearly, we have many challenges and opportunities to keep us all occupied for the foreseeable future.

I would like to take this opportunity to outline some goals and a vision that the ILASS board members, technical committee members and others have discussed. By setting goals and directions, we will have a better chance of arriving at where we would like to be. It has been a general concern of ILASS members that knowledge gained is often lost to new members and researchers in the field. Technical papers are a good source of new information but realistically cannot contain many details of methods/techniques involved in the course of conducting research. Furthermore, significant amounts of hard-earned knowledge and methodologies may be very familiar to the senior members of the atomization and sprays community but are unknown to the new members.

There is a need for a comprehensive document/handbook that is continuously updated (contributed to) and can be easily accessed by young researchers and engineers entering the field. This handbook or "living document" should contain information on methods and practices used in spray research. Critical

*continued on page 2*

## Report on ILASS-Americas 2005

The 18th Annual Conference on Liquid Atomization and Spray Systems was held in Irvine, CA, May 22 - 25. The conference was well attended with over 130 registrants. 73 papers and eight posters were presented. Keynote presentations were given by Norman Chigier of Carnegie-Mellon University and A. J. Dean of GE Global Research Center. On Tuesday evening, attendees enjoyed a banquet at the Henry Samuelli School of Engineering at UC Irvine. Professor Gerry Faeth was remembered at the banquet, and the student travel stipends were awarded in his name. The program organizer was Brian Helenbrook of Clarkson University, and the local coordinator was Vince McDonell of UC Irvine. Rudi Schick and Elizabeth Kucharz of Spraying Systems

Co. were the exhibit coordinators. The conference sponsors were Solar Turbines, Goodrich, Spraying Systems Co., Mitsubishi, Nektar, Parker Aerospace, Woodward Aircraft Engine Systems, Proctor and Gamble, General Motors, Coen and UC Irvine.



*Hyatt Regency, Irvine, California*

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*Edited by David P. Schmidt, University of Massachusetts Amherst*

*Produced by Rudi Schick, Spraying Systems Co.*



Toronto, Canada, is the site of the 2006 ICLASS-Americas conference

## A Message from the Chairman of ILASS-Americas (continued)

issues in atomizer design, modeling, diagnostics, applications, etc., would be updated as these methodologies evolve. Each technical committee would be encouraged to contribute by summarizing their efforts, describing areas that need work and setting goals for their specific areas of interest. Much of this information is already available, so it would be a matter of ensuring that the information is recorded in a convenient handbook form and available to all members – especially new arrivals.

As a senior member of the organization, I have observed the growth of methods and related technologies over the past decades which have radically advanced our capabilities and our potential for furthering the state of the art. However, I have also been disappointed by the failures in some cases to fully exploit these new capabilities. It is my firm belief that we need to make a concerted effort in advancing the level of sophistication in our modeling and experimentation. Care must be taken to fully document all relevant parameters affecting the process under investigation. We must also move toward more closely integrating modeling and experimentation. Neither experiments nor modeling alone will serve to advance our technological needs in addressing, for example, the coming crisis due to limited energy supplies. We should move away from old habits of separating modeling and experimentation and combine these efforts. A good start would be to stop separating these sessions at our conferences.

As a mature organization, we must meet or exceed the standards for presentation and publications set by other organizations. In

## Announcements

- The 2005 ILASS-Europe conference will be held September 5 - 7 in Orléans, France. The meeting will be hosted at the École Polytechnique de l'Université d'Orléans. For more information, visit <http://www.ilass2005.org>.
- The arrangements for ILASS-Americas 2006 are still being finalized. Professor Nasser Ashgriz will be supervising the local arrangements for the conference, which will be in Toronto. For more information, visit <http://www.ilass.org>.

our workshop during the last meeting, we addressed measurement uncertainty and the need to express levels of confidence that exist in the results presented. Credible publications must have credible statements about the quality of the information presented, whether obtained through modeling or experimentation. We will continue to encourage the use of uncertainty analyses in the papers presented and especially those papers submitted for publication in our journal, *Atomization and Sprays*. Our "living document" will require a section on methods of uncertainty analysis and estimation of errors.

Finally, it is obvious that our organization is still not reaching large numbers of researchers working in atomization, sprays and related areas. All members are encouraged to make a greater effort to communicate with these researchers, let them know we exist and how participation in ILASS will help them gain greater insights/knowledge needed to advance their research/development. Each ILASS member is encouraged to participate in promoting our organization, not only to help the organization grow but to bring in new individuals with new ideas and challenges.

I welcome all comments, suggestions and criticisms that will serve to make ILASS a better organization. Our goal is to provide a resource for information and a valuable experience for our members.

William Bachalo  
Artium Technologies, Inc.  
Chairman, ILASS-Americas

- The next ICLASS meeting will be in Kyoto, Japan, August 27 - September 1, 2006. Abstracts are due December 15, 2005 and final papers will be due July 27, 2006. For more information, visit <http://comb.doshisha.ac.jp/iclass2006>.
- The 31st International Symposium on Combustion will be held August 6 - 11, 2006 in Heidelberg, Germany. For full papers, abstracts are due December 4, 2005. For work-in-progress papers, abstracts are due April 14, 2006. For more information, visit <http://www.combustion2006.org>.

## Research Brief

A research group at the Lund Institute of Technology has recently published images of the core region of several sprays using a new technique called ballistic imaging, described in detail by Paciaroni and Linne<sup>1</sup>. Several sprays have been investigated including a steady, turbulent water jet<sup>2</sup>, a transient diesel spray<sup>3</sup>, and a steady water jet in crossflow<sup>4</sup>. The technique has recently been extended for imaging of velocities at the liquid/gas interface<sup>5</sup>.

When light passes through a highly turbid

single shot image of the spray interior<sup>1</sup>. This system is capable of resolving feature sizes around 20 to 25  $\mu\text{m}$  in moderately dense sprays (optical depth  $\sim 8$  to 10) and features around 40 to 50  $\mu\text{m}$  in very dense sprays (optical depth  $> 10$ ). A ballistic image for a transient diesel fuel spray issuing into still air at 1 bar<sup>3</sup> is presented in Figure 1a and a water jet in cross flow<sup>4</sup> is shown in Figure 1b.

Images were also made of a dripping flow spaced 1 ms apart to demonstrate an ability to image velocity of the liquid/gas

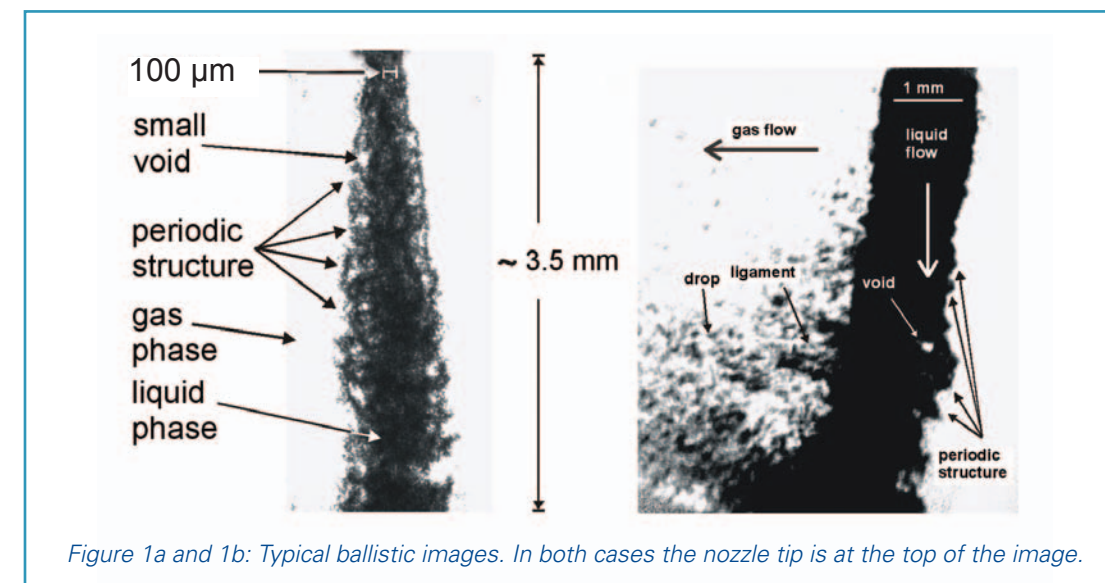


Figure 1a and 1b: Typical ballistic images. In both cases the nozzle tip is at the top of the image.

medium, some of the photons actually pass straight through without scattering, exiting the medium within roughly the same solid angle that they entered. These relatively few photons are termed "ballistic". They also exit first because they travel the shortest path. A larger group of photons is called "snake", because they are scattered just once or twice. They exit the medium in the same direction as the input light but with a somewhat larger solid angle than the ballistic photons. Because they travel a bit further, they exit just after the ballistic photons. Light that experiences multiple scattering has a larger photon number density but a very large solid angle and exits last.

Due to their undisturbed path, ballistic photons retain an undistorted shadowgram image of structures that may be embedded within the turbid material (e.g., the liquid core of a dense spray). Snake photons slightly degrade the image, but they exist in much higher numbers. It is necessary to reject the diffuse photons and image the ballistic and snake photons. The Lund group uses a time-gated system with mild or no spatial filtering in order to capture a

interface. Figure 2a contains an image pair representing the motion of one group of droplets. Figure 2b contains the velocity vectors extracted from those two images

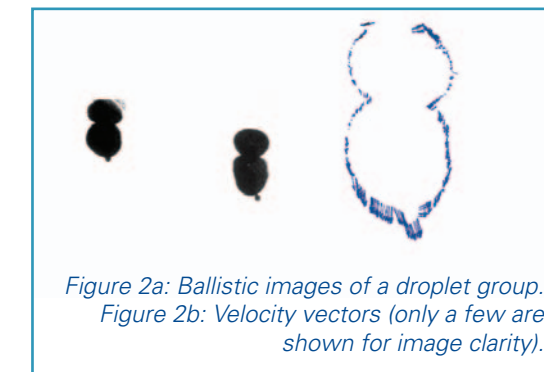


Figure 2a: Ballistic images of a droplet group. Figure 2b: Velocity vectors (only a few are shown for image clarity).

after image processing and edge correlation (the bulk vertical velocity has been removed so the vectors indicate velocity of the liquid/gas interface).

To nominate a topic for future Research Briefs, email your ideas to the editor, David P. Schmidt at [schmidt@ecs.umass.edu](mailto:schmidt@ecs.umass.edu) or call (413) 545-1393.



Kyoto, Japan, is the site of the 2006 ICLASS meeting

## Footnotes

<sup>1</sup>"Single-Shot Two-Dimensional Ballistic Imaging through Scattering Media", M. Paciaroni and M. Linne, *Applied Optics*, 43, No. 26, 5100-5109 (2004).

<sup>2</sup>"Single-Shot Two-Dimensional Ballistic Imaging of the Liquid Core in an Atomizing Spray", M. Paciaroni, T. Hall, J. Delpanque, T. Parker and M. Linne, in press, *Atomization and Sprays*, (2006).

<sup>3</sup>"Single-Shot Two-Dimensional Ballistic Imaging of the Liquid Core in an Atomizing Diesel Fuel Spray", M. Paciaroni, T. Hall, J. Delpanque, T. Parker and M. Linne, under review, *Experiments in Fluids*.

<sup>4</sup>"Ballistic Imaging of the Liquid Core for a Steady Jet in Crossflow", M. Linne, M. Paciaroni, J. Gord and T. Meyer, accepted for publication, *Applied Optics*, (2005).

<sup>5</sup>"Edge Velocity Determination in Ballistic Images", D. Sedarsky, M. Paciaroni, M. Linne, J. Gord, and T. Meyer, under review, *Optics Letters*.