ILASS 2021

31st Annual Conference

17-19 May 2021

The Institute for Liquid Atomization and Spray Systems

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SPONSORS

ILASS-Americas is a non-profit organization committed to providing state-of-the-art spray information to our annual conference attendees and especially to our student visitors. Thanks to our sponsors, we are able to significantly reduce conference registration fees for students each year.

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ZOOM BREAKOUT ROOMS

Main Lobby ..... Opening remarks, plenary lectures, and continuous display of the ongoing events of the day (program)

Breakout Rooms

Technical Session - Track 1 ..... Room for **Track 1** paper presentations
Technical Session - Track 2 ..... Room for **Track 2** paper presentations

Technical Committee Room 1 ..... Public Rooms reserved for Technical Committee Meetings
Technical Committee Room 2 ..... All attendees are encouraged to participate
Technical Committee Room 3 ..... and share ideas on topical areas of interest.

Atomization and Sprays Board Meeting ..... Private meeting room for AAS Board

Exhibitor - Artium
Exhibitor - Dantec
Exhibitor - Energy Research Consultants
Exhibitor - En'Urga
Exhibitor - LaVision
Exhibitor - nac Imaging Technology
Exhibitor - Photron
Exhibitor - Specialized Imaging
Exhibitor - Spraying Systems Co.
Exhibitor - TSI
Exhibitor - Vision Research

Speaker Ready Room 1 ..... Practice rooms for speakers to test presentation and controls
Speaker Ready Room 2 ..... These rooms are public, please share time with everyone.

Lobby 1 ..... Public gathering rooms. Attendees are encouraged to
Lobby 2 ..... visit with friends and colleagues with video enabled.

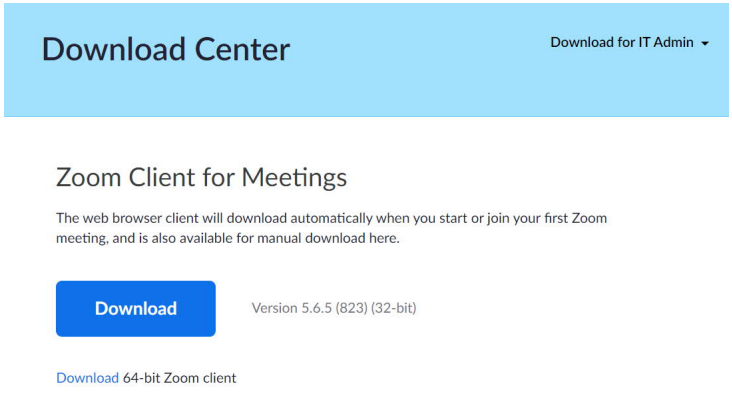
Lunch Table - Measurements and Diagnostics . Public room for attendees to gather and talk, on or off topic
Lunch Table - Modeling and Numerical Methods Public room for attendees to gather and talk, on or off topic
Lunch Table - Spray-Wall Interactions ..... Public room for attendees to gather and talk, on or off topic
Lunch Table - Sprays in Crossflow ..... Public room for attendees to gather and talk, on or off topic
Lunch Table - Internal and Near Nozzle ..... Public room for attendees to gather and talk, on or off topic
Lunch Table - Aerospace Applications ..... Public room for attendees to gather and talk, on or off topic
Lunch Table - Biomedical Applications ..... Public room for attendees to gather and talk, on or off topic
Lunch Table - Automotive Applications ..... Public room for attendees to gather and talk, on or off topic
Lunch Table - Agricultural Applications ..... Public room for attendees to gather and talk, on or off topic
Lunch Table - ILASS Board of Directors ..... Private room reserved for ILASS Board members

Zoom Guidance for the ILASS-Americas Virtual Conference

The 2021 ILASS-Americas Virtual conference will be using Zoom as a virtual meeting platform. The use of "self-select breakout rooms" will be used extensively throughout the conference. Not all versions of Zoom support this feature. To ensure the best possible experience, please install (free) the Zoom desktop client or Mobile app using the following link https://zoom.us/download. If you already have Zoom installed, please ensure that you have the latest version by clicking on the user profile icon located on the upper right of the Zoom screen and then select "Check for Updates" from the drop down menu. If for some reason you are not permitted to install the Zoom desktop client on your computer, the conference Zoom administrator can place you in the room you desire should you encounter difficulties. Please see the following for specific details for Conference Attendees, Presenting Authors, Session Chairs, and Exhibitors.

Installing Zoom Client for Meetings

Visit https://zoom.us/download and click the "Download"

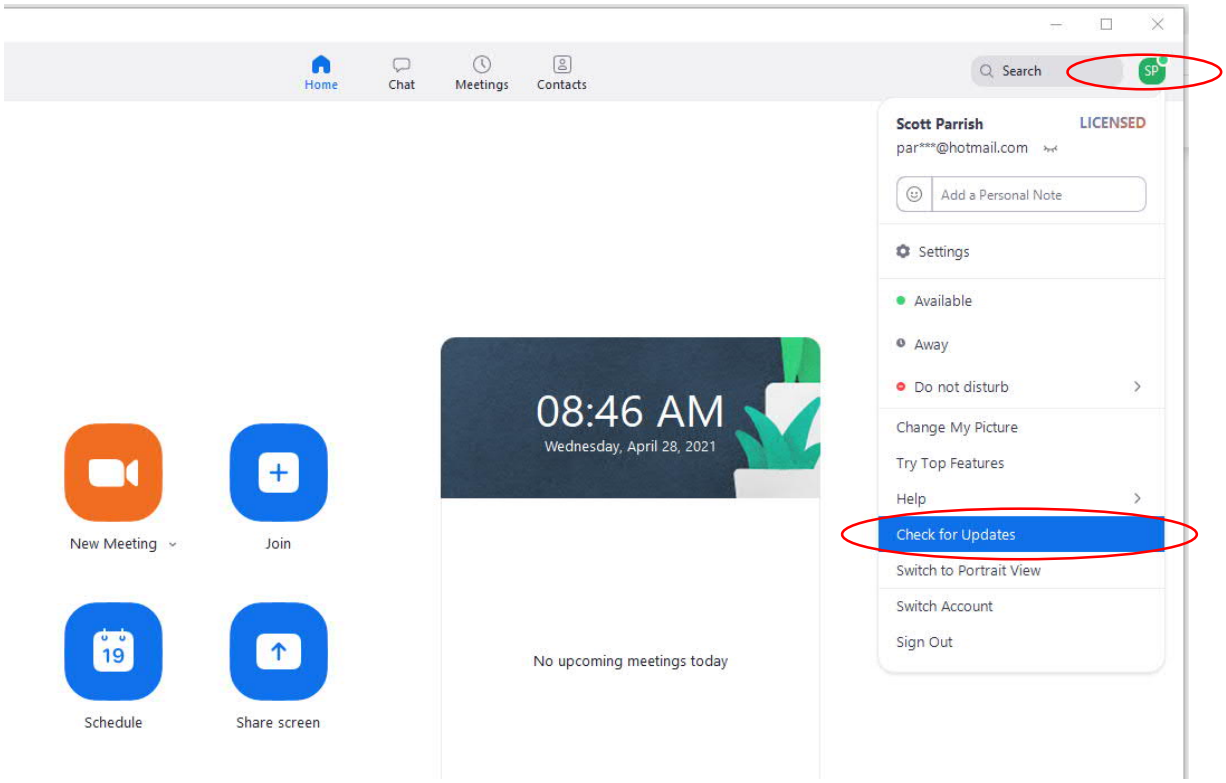


Installing Zoom mobile app (iOS or Android)

Download the Zoom mobile app from Google Play or the Apple Appstore.

Zoom displays a mobile notification whenever there is a new update.

Update to the latest version of Zoom



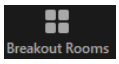
Self-selecting a breakout room

If the host has allowed participants to self-select and join breakout rooms of their choosing, participants will be able to view and select from a list of breakout rooms the host has created. They will be able to enter and leave breakout rooms freely.

Note: Participants not joined with the desktop or mobile app, version 5.3.0 or higher, (ChromeOS: version 5.0.0 (4241.1207) or higher) WILL NOT be able to self-select a breakout room. The host will need to facilitate moving these participants manually.

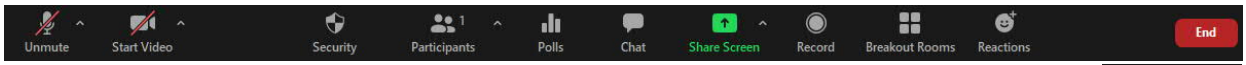
1. Click Breakout Rooms in your meeting controls.
   This will display the list of open breakout rooms created by the host.
2. Hover your pointer over the number to the right of the breakout room you wish to join, click Join, then confirm by clicking Join.
3. Repeat as necessary to join other breakout rooms or click Leave Room to return to the main session.

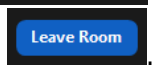
Zoom Guidance for Conference Attendees

- The main Zoom meeting room will continuously display the ongoing events of the conference and the room locations for each event. To attend an event, simply select the corresponding Breakout Room. If the Breakout Room control 

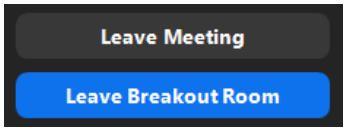
is not displayed, click on the "…" 

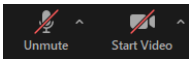
in the tool bar.



- When you want to leave a breakout room, click on "Leave Room" on the lower right 

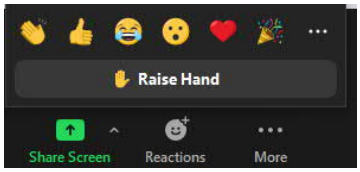
. CAUTION: After clicking on "Leave Room" you will be given the choice to "Leave Breakout Room" or "Leave Meeting," here you should select "Leave Breakout Room"



- As a courtesy to others, please keep your video turned off and your audio muted at all times with the exception of the discussion periods. 

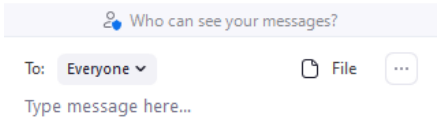
- During the discussion period, if you have a question please use the chat utility 

or the "raise hand" feature by clicking on "Reactions" and then "Raise Hand." Please wait to be called upon by the session chair prior to turning your video on (if you'd like) and unmuting. Please state your name, affiliation, and your question. After your question is addressed, please turn your video off and mute your audio.

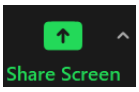


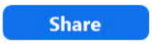
- Please consider evaluating and nominating worthy papers for ILASS-Americas awards, your feedback is very much appreciated (a link will be provided through the chat utility)
- The chat feature will be available throughout the conference. 

With the chat feature, you can chat with individuals by selecting them from the "To:" dropdown in the chat box. CAUTION: Be careful when using the chat utility as you may unintentionally broadcast a chat to everyone. Also, note that chatting is limited to the individuals in the same breakout room

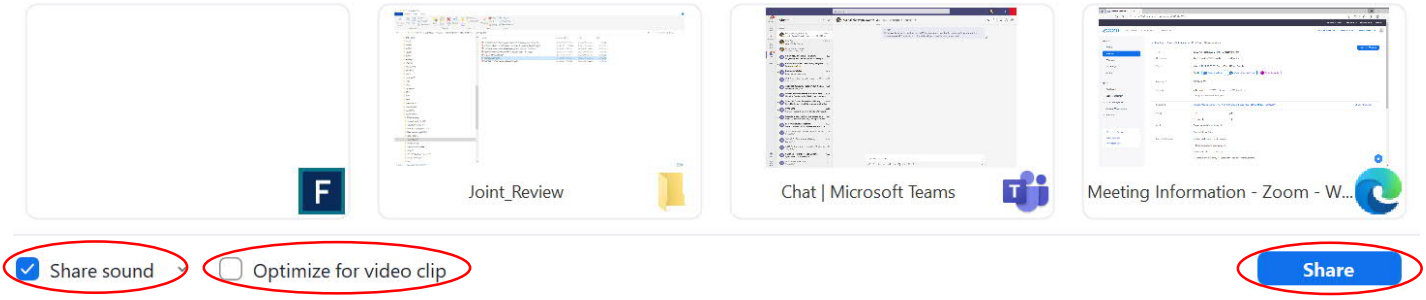


Zoom Guidance for Presenting Authors

- Please be sure to enter your meeting room well in advance (10 minutes minimum) of the start of your session and identify yourself to the session chair as a presenting author.
- Please consider turning on your web camera when presenting; this will make your presentation more engaging.
- To share your content, click on the "Share Screen" control 

; then select what you'd like to share; then click on "Share" on the lower right 

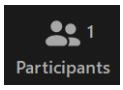
- When sharing your presentation, it is best to share the application (usually PowerPoint) as opposed to your screen. Also, it's much easier to find the application if you close as many other applications as possible in advance of sharing.
- If you're sharing a recorded presentation, be sure to select "Share sound" on the lower left prior to clicking on "Share." If your presentation is in the form of a video, be sure to select "Optimize for video clip" on the lower left prior to clicking on "Share."



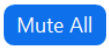
- At the end of your discussion period, stop sharing by clicking on the "Stop Share" control. 

Also, please remember to turn off your camera and mute your audio after your discussion period.

Zoom Guidance for Session Chairs

- Session chairs will be made co-hosts prior to the start of their session to allow additional Zoom control. Please be sure to enter your meeting room well in advance (15 minutes minimum) of the start of your session to allow time for presenting authors to introduce themselves and to try out sharing their presentations.
- Prior to the start of your session, please mute the audience by first clicking on the participants control 

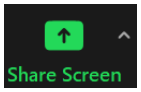
and then selecting "Mute All" participants at the bottom of the participants pane.

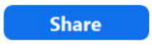


Upon clicking "Mute All" you will be given the option to allow people to unmute themselves; it is recommended that you select "YES" as this will allow speakers to unmute when it's their turn. Also, this will allow the audience to unmute when they want to ask a question during the discussion period. You can also individually mute participants (if needed) by opening the participants pane and hovering over each participant and selecting "mute"
- Please help the speakers out by verifying that you can hear them, see them, and see their presentation
- PLEASE KEEP SPEAKERS ON TIME; this will allow attendees to jump from one session to another. Presentations should be around 15 minutes; to allow 3 minutes for discussion and 2 minutes to transition and introduce the next speaker.
- During the discussion period, ask attendees to use the "raise hand" feature and to wait until called upon prior to unmuting and stating their name, affiliation, and their question.
- Remind people to perform evaluations of worthy papers (a link will be provided through the chat utility). 

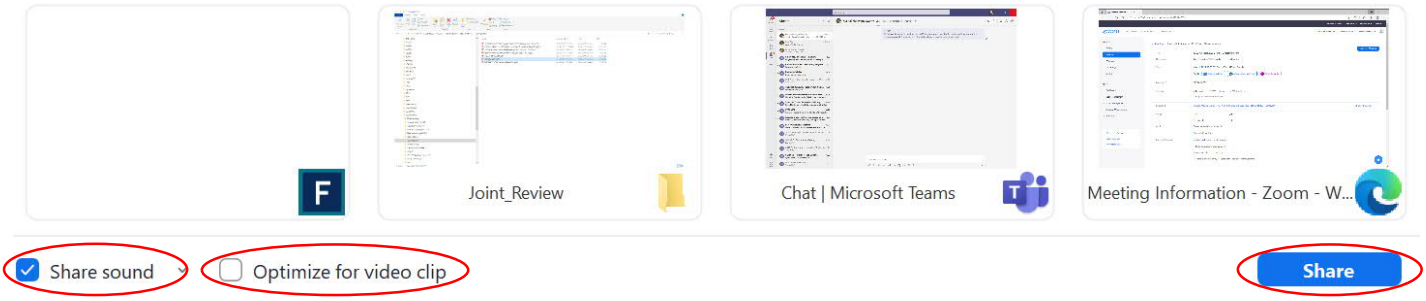
- Remember to "Mute All" at the end of each discussion period and prior to the start of each presentation.

Zoom Guidance for Exhibitors

- As an exhibitor you will have a dedicated break out room (exhibit booth) for your exclusive use
- You can share any content you'd like. This could include a live demonstration, or a product show-and-tell via a webcam, the interface of your instrument, a slide show presentation, a video clip, etc.
- Please consider turning on your web camera (to show yourself) when exhibiting; this will be more engaging for your visitors.
- To share something, click on the "Share Screen" control 

; then select what you'd like to share; then click on "Share" on the lower right 

- When screen sharing, it is best to share the application (a PowerPoint or your application software, etc) as opposed to your screen. Also, it's much easier to find the application if you close as many other applications as possible in advance of sharing. For exhibiting, it may be more convenient for you to share your screen as opposed to a specific application, you'll have to experiment to determine what works best.
- If you're sharing something that contains audio, be sure to select "Share sound" on the lower left prior to clicking on "Share." If you'd like to show a video, be sure to select "Optimize for video clip" on the lower left prior to clicking on "Share."



- To stop sharing, click on the "Stop Share" control. 

When having a conversation with a visitor, it will be more engaging if you're not sharing as the video display of yourself (if you have your camera turned on) will be larger.
- IMPORTANT – If you elect to leave your breakout room to visit another room (to see a technical paper, visit with another exhibitor, etc.) anything that you're sharing will be terminated and the room will appear empty. This is not a problem as you can share again upon reentering your room. Additionally, if two individuals will be manning the "booth" one can share content while the other leaves the room.
- If you need to attend to some business but can continue to share material, please consider sharing a PowerPoint slide indicated that you're currently not available but you will return at a designated time. Remember, here, if you leave your room while sharing it will be terminated.
- The chat feature will be available throughout the conference. With the chat feature you can chat with individuals and share links by copying and pasting into the chat box. CAUTION: Be careful when using the chat utility as you may unintentionally broadcast a chat to everyone. Also, note that chatting is limited to the individuals in the same breakout room.

EXHIBITOR INFORMATION

The exhibitors at this year's conference offer an array of diagnostic instrumentation, services, and equipment and they look forward to discussions with the conference participants in the dedicated exhibitor breakout rooms. Specific details are outlined on the following pages with statements from each exhibitor.

The exhibitors at this year's conference are:

Spraying Systems Co.®
Experts in Spray Technology

Spraying Systems Co.
Wheaton, IL 60187-7901, USA
630.665.5000
www.spray.com
www.sprayanalysis.com
www.sprayscan.com

Spraying Systems Co. is the world's leading manufacturer of industrial spray products.

We produce high-quality spray nozzles, manifolds, systems and accessories, so our customers can do more with less. Less resources, less time, less money, and less hassle. We've helped customers enhance sustainability, speed up product development, improve worker safety, and increase production. As a leading expert in spray technology, we help people just like you from automotive, aerospace, food, energy, chemical processing, and more. Your passion is getting the job done right. Our passion is finding the spray system to help you do it.

Spray Analysis
and Research Services
From Spraying Systems Co.

Spray Analysis and Research Services, a division of Spraying Systems Co., uses innovation, creativity, and high-quality instrumentation to optimize spray processes. With the largest and most sophisticated spray laboratories in the world, we contribute to academic and government research, publish regularly, and champion the scientific spray community.

We've recently expanded our services to bring spray diagnostic tools out of the laboratory and into your hands. This new product line makes ad hoc spray pattern measurements, drop size data, and flow and pressure readings easy and instantaneous. For more information, please visit www.SprayScan.com

Contact us at: Spray.Analysis@spray.com

En'Urga Inc.

En'Urga Inc. is the industry leader in customized optical diagnostic equipment for the most challenging factory floor application. En'Urga Inc. has 25 years experience in optical diagnostics research, serving many Fortune 50 companies and Federal Government agencies. Our expertise in emission and absorption tomography in hostile environments enables measurement and control of varied processes in a wide array of industries. We specialize in research, design, development, calibration, and installation of instruments suitable for the measurement of temperatures, gas concentrations, emissivity, and particulate (liquid and powder) characteristics.

En'Urga Inc. has several products in its portfolio. The **SETScan** optical patternator obtains the distribution of droplets in sprays or particles in particulate-laden flows at a frequency of 10,000 Hz. The optical patternator is used for 100% quality of audit of nozzles in a wide variety of industries ranging from Aerospace to consumer products. Unlike laser sheet imaging patternators, the **SETscan** optical patternator provides quantitative information on various aspects of the spray such as spray angles, plume angles, % split in plumes, deviation, pitch, roll, and yaw angles. The **SETscan** patternator also provides the planar drop surface area density, the most useful quantity for ranking the performance of injectors for combustion and nozzles for spray drying. Custom units at 200 KHz are also available for studying transient sprays.

The **SPECTRALINE** series of spectrometers provides visible spectra from 0.3 to 1.1 microns at 100 KHz, and infrared spectra from 1.3 to 4.8 microns at 1.32 KHz. These are the highest speed spectrometers available in the market. The spectrometers are used to determine temperature and species concentration profiles in high-frequency turbulent flames. These spectrometers are available with a range of accessories to enable hyper-spectral imaging and flame emission tomography.

The **SPIvel v**elocimeter provides full planar axial and radial velocities from high-speed images obtained with any of the commercially available high-speed cameras.

The **PODScan** tomography system provides the tomographic mapping of drop sizes in sprays. In combination with the SPIvel velocimeter, the **PODScan** system can provide spatially resolved mass flux in spray in a matter of seconds.

All of En'Urga products can be leased or purchased from En'Urga Inc. En'Urga Inc. provides testing and consulting services for combustors, spray nozzles, heat sinks, and other engine related components. We specialize in characterizing sprays (drop sizes, spray patterns, drop surface areas, velocities, mass fluxes, etc.) in ambient as well as high-pressure conditions. En'Urga Inc. has developed standardized test protocols for GDI injectors, urea dosers, consumer sprays, and paint sprays. These standardized test protocols ensure that the quality of the nozzle that is used in these applications conform to the highest standards possible. At En'Urga Inc., customer service and innovation are our primary goals.

Contact info: 1201 Cumberland Avenue, Suite R, W. Lafayette, IN 47906
Ph. (765) 497-3269; Email: info@enurga.com

Photron
HIGH-SPEED CAMERAS

PHOTRON HIGH-SPEED CAMERAS FOR SLOW-MOTION ANALYSIS

Photron was founded in 1974 to provide manufacturing, sales, and service for state-of-the-art professional film and video equipment used to capture thousands of high-resolution images for playback and analysis. Photron has continually expanded their product line to aid in the advancement of photo optics and electronic technologies furthering research and development in the areas of digital imaging and slow-motion analysis. For many years, high-speed imaging has been utilized in the following industries for Fluid Dynamics research and analysis: Automotive, Aerospace, Biotech and Medical, Marine Propulsion, and Electronics.

Photron high-speed cameras have been designed to meet the requirements of specialized imaging techniques employed in fluid dynamics including Particle Image Velocimetry (PIV), Laser Induced Fluorescence (LIF) and others. There are several factors that are important to consider when purchasing a high-speed camera for use with PIV. These factors include frame rate, light sensitivity, and minimum exposure time, all of which contribute to overall image quality.

Frame rate

How many frames per second (fps) are required to capture sufficient image detail to analyze a high-speed event? There are a handful of suppliers who can provide cameras that run at speeds in excess of 10,000fps at megapixel resolution or higher, and greater than 1M fps at reduced resolutions.

Light Sensitivity

Light sensitivity impacts the quality of high-speed images because without it the images will be dark and difficult, if not impossible, to analyze. Light sensitivity is typically presented as an ISO value. The higher the ISO value, the more sensitive a camera should be. Light sensitivity values on data sheets should be met with a degree of skepticism. It is important to evaluate a camera on-site in the real word application to make certain that the light sensitivity is sufficient for the application for which the camera is proposed.

Minimum Exposure Time

Some high-speed events require extremely short exposure times – sometimes less than 1 microsecond – to stop the motion of those events. A camera's ability to achieve a sub-microsecond exposure is dependent on two things. First, the camera's sensor must be capable of performing such a short exposure. Second, the camera's sensor must be sensitive enough that when it does utilize a sub-microsecond exposure it can capture enough photons of light to generate video that is of sufficient quality for analysis.

Phantom High-Speed cameras, manufactured by Vision Research, are the world's leader in high-speed imaging with the broadest range of cameras available. The recent release of the revolutionary Phantom TMX 7510 has elevated the research and development capabilities of liquid atomization and spray system focused organizations. This new, top-of-the-line camera not only delivers frames-per-second and resolution combinations not previously possible but also provides extreme light sensitivity.

The custom-made CMOS sensor utilizes a new technology, that has never been seen in ultrahigh-speed cameras before, called back side illumination. A back side illuminated sensor moves the standard metallic parts of a sensor from the front to the underside of the sensor. This change in construction enhances the processing efficiency of the sensor by a significant margin and increases the pixel's exposure to light, allowing the camera to reach speed and resolution combinations not previously possible. Previously the Phantom v2512 was able to reach around 25,000 fps at full 1 Mpx resolution, the new TMX 7510 is able to reach over 75,000 fps at the same resolution and can reach up to 1.75M fps at reduced resolutions. The increased speed and light sensitivity capabilities are ideal for applications where speed and detail are mandatory. When viewing spray and liquid atomization the Phantom TMX 7510 provides the ability to view even the smallest of details.

In certain situations, research capabilities are restricted based on the amount of room available around or inside the subject matter. Vision Research offers a variety of Phantom high-speed camera options with reduced housing structures to ensure that smaller environments are not a concern when imaging an event. The Phantom T-Series cameras offer a housing unit that measures 5 x 5 x 8 inches with the option to add a handle that increases height by 2". The detachable handle is useful for portability making setup and relocation much easier. The T1340 delivers 4 Mpx high-speed imaging for situations where detail is critical. The Phantom VEO series of cameras reduces the form factor of high-speed imaging even more with compact housing unit that measures 5 x 5 x 5 inches. This small unit is able to reach up to 423,000 fps depending on which model is used. The reduced weight of 6.6lbs reduces stress or strain on sensitive equipment and makes the VEO series of cameras our most versatile cameras with connection options for both in and outside laboratory settings.

When long duration record times are critical to understanding spray functionality or fluid movement over long durations of time the Phantom Machine Vision cameras are best able to deliver quality high-speed images with extended record times. The use of CXP protocol connections directly from a camera to a PC or DVR system means that the amount of imaging captured is limited only by the throughput and memory capabilities of the data storage device. These cameras are also excellent options for potentially destructive situations because the image data is stored at a location separate from the camera head.

We would like to invite you to join us during the ILASS Americas 2020 conference to speak directly with a Phantom expert. After the conference Phantom camera experts are available to provide virtual demos and discuss your specific imaging needs. Contact us for a demo at www.phantomhighspeed.com/contactus.

470 Lakeside Drive, Unit C
Sunnyvale, CA 94085

Artium specializes in developing and manufacturing advanced particle characterization instruments for the spray community. We offer a broad range of instruments for measuring sprays, clouds, and aerosol droplets. Our **Phase Doppler Interferometry (PDI)** instruments are based on the light scattering interferometry principle which was **invented and developed by our scientists**. This technology has been developed and evaluated over the past few decades and is acknowledged as the most reliable and accurate means for characterizing spray and aerosol droplet dynamics. Our goal over the past 20 years has been to further refine the method and its implementation to insure greater measurement reliability and accuracy while making the instruments much easier to use. We have now introduced advanced particle imaging systems to allow easy and economic characterization of spray formation and drop size distributions. This method is also used for measuring aircraft icing sprays with mixed phase (liquid and ice) particles as well as large droplets that may be highly deformed. Other applications include spray drying particle characterizations wherein particulate in liquid and solid irregular-shaped particles exist.

System automation (US Patent 7,564,564) has been one of our key goals. We have introduced advanced methods and algorithms **(US Patent 7,788,067)** to minimize the possibility for user setup errors even for the most complex measurement tasks**.** Advanced modern electronics and computers coupled with **software utilizing innovative signal processing algorithms** and validation strategies have resulted in significantly improved instrument performance even under the most difficult measurement conditions.

Our **newly developed flight probes based on the phase Doppler method and multi-beam imaging (patents pending) have been designed for atmospheric cloud monitoring and aircraft icing research.** These instruments are also used for a broad range of spray applications. They have undergone significant testing in the field. Testing at the **U.S. Air Force Eglin Air Force Base McKinley Climatic Laboratory**, General Electric's aircraft engine icing facility, and in the **NASA Glenn Research Center Icing Research Tunnel (IRT)** proved our instruments are capable of making reliable and accurate measurements in these challenging environments.

Under **U.S. Army SBIR Ph II and NASA SBIR Phase I, II and III programs**, we have developed PDI and **High Speed Imaging** (**HSI**) systems for icing research. The probes have been successfully tested on a **UH60 Black Hawk Helicopter** under the U.S. Army's helicopter icing research program. The high speed imaging (HSI) probe characterizes non-spherical particles (deformed droplets, ice crystals, and mixed phase conditions). We have also developed a line of **TurnKey (TK)** systems, an integrated PDI probe suitable for in-spray use. Our instruments are also used for quality control for inkjet printing of large OLED displays. Artium's other products include the **Laser Doppler Velocimeter (LDV)** and **Laser Induced Incandescence (LII)** which is used for measuring soot (black carbon) emission from engine exhaust and in ambient air.

We are proud to announce our new **STTP Award** (2020) with the **US Air Force Test Center** for **Characterization of Simulated Weather and Turbine Exhaust** which will involve extensive use and development of both our **HSI** and **LII** instrumentation.

Contact Information: Dr. William Bachalo, President and CEO
Artium Technologies, Inc.
408-737-2364
Email: info@artium.com
Website www.artium.com

DANTEC DYNAMICS Turn Measurements into Knowledge

Scientists and Engineers in fluid dynamics and solid mechanics rely on measurements to make breakthroughs in applied research, technology development, and quality assurance.

Dantec Dynamics specializes in the development, manufacture and application support of measurement systems that acquire and analyze data of physical properties in fluids and in solid structures.

We deliver turnkey and customized solutions built on high-end laser optics, imaging, and sensor technologies. Our user-friendly software performs advanced data analysis and produces real-time results. Furthermore, we pride ourselves in providing our clients superior technical application support worldwide.

You gain accurate measurement results easily and quickly which help you accelerate the pace of discovery, innovation, quality control or NDT. Our distinct competence and experience in integrating measurement methods and technologies into the right solution for you, is unique.

Partnering with Dantec Dynamics helps you gain crucial knowledge from any test or measurement campaign.

Contact us at:

Dantec Dynamics, Inc.
750 Blue Point Road
Holtsville, NY 11742
United States
Phone / +1 631 654 1290
Fax / +1 631 654 1293
Email: USA@dantecdynamics.com
www.dantecdynamics.com

Wing Lai

TSI Inc.

wlai@tsi.com

651-490-2860

TSI product information for 2021 ILASS conference

TSI Incorporated is located in Shoreview, Minnesota. We offer a complete line of products for spray diagnostics. Products include Phase Doppler Particle Analysis (PDPA) systems, Time-Resolved Particle Image Velocimetry (TR-PIV) systems, Global Patternation Systems, Global Sizing Velocimetry (GSV) systems and Quantitative Flow Visualization systems. These systems are used to characterize various aspects of a spray; from measuring droplet velocity and size at a specific location, to obtaining global information of the ligament formation, to identifying the breakup in a spray. Many of these systems are complementary to one other, helping the user to obtain the complete diagnostics of a spray.

The next generation of the PDPA system: the Powersight. It is a compact, simple to use, and flexible with more laser power. For real-time instant velocity or simultaneous velocity and size measurements, the Powersight provides a higher laser power up to 500 mW per channel increasing the capability of making measurements in challenging environments. An example of this could be for GDI dense spray and large facilities with long focal standoff of several meters. Not only providing higher laser power, the Powersight is compact and can be used as a standalone module for both velocity measurement as a Laser Doppler Velocimetry (LDV) system, and for simultaneous velocity and size measurement as a Phase Doppler Particle Analyzer (PDPA) system.

TSI's Fluid Mechanic Systems can be easily configured to meet your current, and also be expanded for future, applications. Our new FSA signal processor is designed for all Laser and Phase Doppler measurements, with unique benefits in Doppler frequency range, data sampling rate and validation of burst. Please join us to learn more about our systems and how our measurement systems can meet your challenging research today.

Energy Research Consultants (ERC) was founded in 1990 to address a demand for application of state-of-the-art experimental and numerical modeling tools to problems associated with transportation, propulsion, and energy generation and use. Projects which require fast and confidential answers via advanced research tools which are not otherwise readily available are conducted by experienced personnel using a fully equipped research laboratory. Both experimental and numerical studies are conducted for clients that are addressing mission oriented, time critical projects. In addition, customer on-site work can be accommodated.

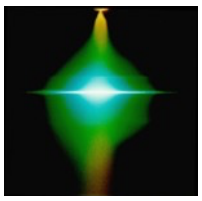
ERC has extensive experience with a wide variety of fluid dynamic, combustion, and spray system applications. In particular, ERC maintains expertise in the characterization of non-reacting and reacting flows such as those found in automotive combustion chambers and exhaust after-treatment systems, as well as those found in spray and gas fired gas turbine combustion systems and industrial processes. The expertise ranges from the basic science of liquid injection and sprays associated with a wide array of applications to study of complex practical configurations for atomization and spray formation, fuel/air mixing and combustion, swirl generation, and associated pollutant formation and operability performance and control.

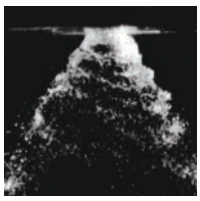
Specialized measurement services are offered to both commercial and government clients. Available spray diagnostics include Phase Doppler Interferometry, Laser Diffraction, Planar Liquid Laser Induced Fluorescence (PLIF with continuous and pulsed lasers with intensified CCD cameras), planar and global OH* LIF, optical patternation, particle image velocity, tunable diode laser spectroscopy, liquid film thickness measurements, and high speed visualization. ERC has extensive experience applying these methods to wide array of customer systems. Other capabilities include CFD modeling, test facility development, and test plan development and execution using statistically designed experimental methods.

In addition to measurement services, ERC has also developed standalone design tools (for example, Advanced Spray Injection Phenomena Simulator--ASIPS; Flame Response Sensitivity Tool—FRST) and image analysis tools (for example, Automated Feature Extraction and Analysis Tool—AFEAT). ERC has also developed other products such as a specialized imaging system for inspection inside high temperature environments and a turn-key reference burner for calibration of laser diagnostics. Gaseous and liquid fired burners are also available.

Contact Information:

Christopher Brown, Research Manager, Business Manager, Co-Owner
23342 South Pointe Drive, Suite E
Laguna Hills, CA 92653-1422
Tel: (949) 583-1197 x 101 Fax: (949) 583-1198
Email: Brown@ERC-Ltd.com Website: www.ERC-Ltd.com


Phase Doppler Interferometry


High Speed Video


Reacting Spray Visualization

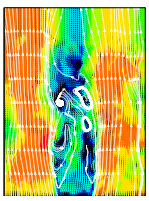

Particle Image Velocimetry

Figure 1 – Sample Data Sets (Many Other Measurements Are Available, Please Inquire).

LaVision started in 1989 in Göttingen, Germany, a historically well-known city for academic and innovative excellence. Measurement science is our specialty and we bring our ideas, products and support to a global market. We have developed non or minimally intrusive optical measurement systems for the automotive, aerospace, pharmaceutical and medical industries as well as equipping educational and government research labs with tools that have become ubiquitous and synonymous with the name LaVision.

Contact Details:

Callum Gray PhD
LaVision Inc
211 W Michigan Ave, Ste 100
Ypsilanti, MI 48197
Tel: 734 485 0913
Cel: 734 546 3387
lavision.com

Specialised Imaging is an internationally renowned company that designs and manufactures ultra-high-speed imaging cameras for industrial, scientific and defense research applications.

The company was formed in 2003, its founder members having previously worked together in the high-speed imaging field and bringing over 80 years' combined experience to the venture.

Since its inception in 2004, Specialised Imaging have successfully launched many new and innovative ultra-highspeed imaging systems. The company is at the forefront of world-wide innovation in the high-speed imaging field, having been awarded the BEEA's Small Company of the year in 2009 and the Queen's Award for Enterprise in 2011 & 2016.

This commitment to development has enabled the company to establish a reputation as an exciting and creative player in the high-speed camera market.

Innovative imaging solutions that incorporate the latest technological advances. Supporting you... and your camera.

At Specialised Imaging we relish new technological challenges, and we enjoy creating effective solutions.

Producing a system that exactly meets your requirements, demands a company prepared and able to create specific optimized solutions. Specialised Imaging has a strong track record in working with clients to design and develop new functions and facilities that fulfill their requirements.

This level of commitment and support continues throughout the life of your product; on-going advice, problem-solving and the design and reconfiguration of software are all part of our after-sales service.

nac IMAGE TECHNOLOGY

nacamericas@gmail.com (805) 584-8862

nac Image Technology is the most experienced name in high speed camera systems. Since 1958, nac's reputation for technical and digital innovation and comprehensive, integrated line-up of products have set industry standards for performance and reliability. nac cameras feature industry leading, clean, crisp image quality, combined with the fastest frame rates and unmatched light sensitivity.

FEATURED PRODUCTS FOR ILASS 2021

World's First 100 GigaPixel/Sec Camera

MEMRECAM ACS-1 M60

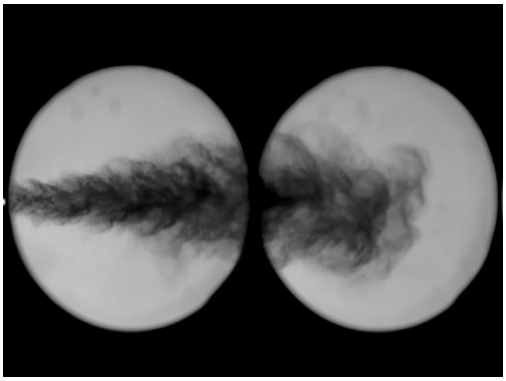
High Speed
1,280×896pixel@54,000fps
1,280×800pixel@60,000fps
1,280×448pixel@100,000fps

High Sensitivity
Color ISO25000
Mono ISO100000

Large Memory
Max. 256GB internal memory
Built-in SSD

High Speed Data Transfer
USB3.0B download
400% faster (vs Lan)

High End Affordable Compact High Speed Camera



MEMRECAM ACS-3

High Speed
1,280×896pixel@25,000fps
1MPix 30,000fps
0.4MPix 65,000fps

High Sensitivity
Mono ISO100000

Large Memory
Max64GB memory
Built-in SSD

Light weight/Compact
Dimension 128×128×206mm
Weight 4.5kg

OTHER KEY nac CAMERA FEATURES:

- Frame Straddling for PIV
- 190 nanosecond exposures
- Synced Laser Illumination
- Image Based Triggering
- Add-on image intensifiers (UV and Visible)
- Multiple Image Analysis Software Packages

nac Americas Inc.
193 Jefferson Ave, Suite 102
Salem, MA 01907

(805) 584-8862
nacamericas@gmail.com
www.nacinc.com

Detailed Program

Session Start Time			Monday, May 17th 2021		
M	10:00 AM	EDT	Welcome and Opening Remarks		
M	10:15 AM	EDT	**Keynote Lecture - "Advances in Spray Imaging Diagnostics"** **Prof. Edouard Berrocal (Lund University)**		
M	11:00 AM	EDT	Exhibitor Showcase		
M	11:35 AM	EDT	Break with the Exhibitors		**Exhibitor Booths Open!**
			Technical Sessions - Track 1	**Technical Sessions - Track 2**	
			Advances in Spray Diagnostics Session Chair: Chad Sipperley	**Droplet/Spray-Wall Interactions I** Session Chair: Tiegang Fang	
M	11:40 AM	EDT	**9. Long-Range Microscopy of Primary Atomization Fluid Structures In Diesel Sprays Using Ultra-Short Pulse Off-Axis Digital Holography** Marco Minniti, University of California, Irvine; Derek Dunn-Rankin, University of California, Irvine; Yu-Chien Chien, University of California, Irvine	**11. Flat-Wall Impingement Behaviors of Multiple Droplets Induced By Spray Slicer** Hongliang LUO, Hiroshima University; Feixiang CHANG, Hiroshima University; Yu JIN, Hiroshima University; Youichi OGATA, Hiroshima University; Keiya NISHIDA, Hiroshima University	
M	12:00 PM	EDT	**43. An Automated System For Systematic Spray Expansion Angle Measurements** Timothy Morgan, Iowa State University; Theodore Heindel, Iowa State University	**6. Effect of Gas Phase Temperature In Altering Drop Splashing On Solid Surfaces** Akshay Sreenivasan, Department of Aerospace Engineering, Indian Institute of Science, Bengaluru; Kiran Satheesh, Department of Mechanical Engineering, Indian Institute of Science, Bengaluru; Gaurav Tomar, Department of Mechanical Engineering, Indian Institute of Science, Bengaluru; Sivakumar Deivandren, Department of Aerospace Engineering, Indian Institute of Science, Bengaluru	
M	12:20 PM	EDT	**57. Planar SMD Measurement With Tomographic Reconstruction of Extinction and Dual Angle Scattering Measurement** Jongmook Lim, En'Urga Inc; Yudaya Sivathanu, En'Urga Inc; Vinoo Narayanan, En'Urga Inc; Marcus Wolverton, En'Urga Inc	**16. Investigations of The Impact of Fuel Composition and Multiple Injection On Liquid Fuel Wall Films In Gasoline Direct Injection** Vanessa Da Silva Cruz Lis, Robert Bosch GmbH; Wolfgang Samenfink, Robert Bosch GmbH; Erik Schünemann, Robert Bosch GmbH; Michael Wensing, Institute of Engineering Thermodynamics, FAU Erlangen-Nürnberg	
M	12:40 PM	EDT	Lunch / Break		
M	1:10 PM	EDT	Atomization and Sprays Editorial Board Meeting		
			Technical Sessions - Track 1	**Technical Sessions - Track 2**	
			X-ray Diagnostics Session Chair: Chris Powell	**Advances in Numerical Methods** Session Chair: Marcus Herrmann	
M	1:40 PM	EDT	**65. High-Speed X-Ray Phase Contrast Imaging of Jet Fuel Spray Breakup In An Operating Gas Turbine Combustor** Eric Wood, University of Illinois at Urbana-Champaign; Eric Mayhew, Combat Capabilities Development Command Army Research Laboratory; Austen Motily, University of Illinois at Urbana-Champaign; Brendan McGann, University of Illinois at Urbana-Champaign; Kyungwook Min, University of Illinois at Urbana-Champaign; Keunsoo Kim, University of Illinois at Urbana-Champaign; Tonghun Lee, University of Illinois at Urbana-Champaign; Jacob Temme, Combat Capabilities Development Command Army Research Laboratory; Chol-Bum Kweon, Combat Capabilities Development Command Army Research Laboratory; Alan Kastengren, Argonne National Laboratory	**35. Examining The Deterioration of Adaptive Mesh Refinement Performance In Spray Computations** Chia-Wei Kuo, University of Wisconsin; Mario Trujillo, University of Wisconsin	
M	2:00 PM	EDT	**25. Aero Engine Fuel Spray Characterization Via X-Ray Radiography and White Beam Imaging** Krishna Venkatesan, GE Research; Brandon Sforzo, Argonne National Laboratory; Katarzyna Matusik, Argonne National Laboratory; Alan Kastengren, Argonne National Laboratory	**62. A Dual Scale Approach To Modeling Sub-Filter Shear-Induced Instabilities With A Vortex Sheet Method** Austin Goodrich, Arizona State University; Marcus Herrmann, Arizona State University	

M	**2:20 PM**	**EDT**	**71. X-Ray Characterization of Liquid Jet In Crossflow Wall Impingement and Film Atomization** Brandon Sforzo, Argonne National Laboratory; Alan Kastengren, Argonne National Laboratory; Christopher Powell, Argonne National Laboratory	**76. A Dual Scale LES Model For Phase Interfaces At Finite Weber Numbers** Dominic Kedelty, Arizona State University; Marcus Herrmann, Arizona State University	**Exhibitor Booths Open!**
M	**2:40 PM**	**EDT**	**69. Internal Flow and Spray Characterization of The Standard Simplex Atomizer With X-Ray Diagnostics** Brandon Sforzo, Argonne National Laboratory; Alan Kastengren, Argonne National Laboratory; Jan Ilavsky, Argonne National Laboratory; Christopher Powell, Argonne National Laboratory	**74. Towards Scalable Framework For Photo-Realistic Rendering of CFD Results** China Rama Lakshman Anumolu, Convergent Science Inc.; Nevzat Akkurt, Munzur University	
M	**3:00 PM**	**EDT**	**Technical Committee Meetings** **Technical Committee Meeting Room 1: Physics of Atomization** **Technical Committee Meeting Room 2: Computation and Modeling** **Technical Committee Meeting Room 3: Diesel & Automotive**		
M	**3:50 PM**	**EDT**	**Break with the Exhibitors**		
			Technical Sessions - Track 1	**Technical Sessions - Track 2**	
			Machine Learning-Aided Experiments and Simulations Session Chair: Gina Magnotti	**Spray Applications - Agriculture and Drones** Session Chair: Dan Cederberg	
M	**4:10 PM**	**EDT**	**49. Data-Driven Deep Learning Surrogates For Parametric Prediction of Reacting Flows** Petro Junior Milan, Georgia Institute of Technology; Gina M. Magnotti, Argonne National Laboratory; Vigor Yang, Georgia Institute of Technology	**85. Effects of Payload Capacity On Spray Pattern and Effective Swath From Remotely Piloted Aerial Application Systems** Daniel Martin, USDA-ARS; Mohamed Latheef, USDA-ARS	
M	**4:30 PM**	**EDT**	**47. Exploration of Transfer Learning For Prediction of Transient Injection Maps** Sudeepta Mondal, Argonne National Laboratory; Bethany Lusch, Argonne National Laboratory; Romit Maulik, Argonne National Laboratory; Roberto Torelli, Argonne National Laboratory; Gina Magnotti, Argonne National Laboratory	**46. Experimental Evaluation of The Teejet® Xr-8002 Flat Fan Nozzle With Formulations For Spray Drift Control** Michael Cloeter, Dow	
M	**4:50 PM**	**EDT**	**Meeting Adjourn**		

Session Start Time			Tuesday, May 18th 2021		
T	10:00 AM	EDT	**Welcome and Opening Remarks**		
T	10:15 AM	EDT	**Keynote Lecture - "Advances in Modeling Atomization and Spray Formation in the Euler-Lagrange Framework"** **Prof. Sourabh Apte (Oregon State University)**		
T	11:00 AM	EDT	**ILASS-Americas Annual Business Meeting**		
T	11:20 AM	EDT	**Break with the Exhibitors**		**Exhibitor Booths Open!**
			Technical Sessions - Track 1	**Technical Sessions - Track 2**	
			Spray Characterization and Measurements Session Chair: Michael Cloeter	**Droplet/Spray-Wall Interactions II** Session Chair: Fujun Wang	
T	11:40 AM	EDT	**37. Effect of Back Pressure On Liquid Breakup Length and Droplet Size Distribution For A Spray Emanating From A Simplex Nozzle** Santhosh Kumar Keerthi, IIT Hyderabad; Raja Banerjee, IIT Hyderabad	**17. Imaging of Liquid Water On Surfaces In An Optically Accessible Engine Via Laser-Induced Fluorescence** Florian Mirschinka, Robert Bosch GmbH, Powertrain Solutions; Jan N. Geiler, Robert Bosch GmbH, Powertrain Solutions; Fabio Messina, Robert Bosch GmbH, Powertrain Solutions; Matthias Mansbart, Robert Bosch GmbH, Powertrain Solutions; Sebastian A. Kaiser, University of Duisburg-Essen	
T	12:00 PM	EDT	**54. Near-Field Spray Velocity and Development In Single-Hole Diesel Injector** Mohammad Nikouei, Chalmers University of Technology; David Sedarsky, Chalmers University of Technology	**18. Droplet Impact, Infiltration, and Boiling In A Heated Narrow Gap** Dwight Jordan Bouchard, University of Toronto; Sanjeev Chandra, University of Toronto	
T	12:20 PM	EDT	**21. Probabilistic Analysis of Twin-Fluid Spray Based On Diffused Background Imaging** Kelsey Johnson, The University of Alabama; Christopher Wanstall, The University of Alabama; Joshua Bittle, The University of Alabama; Ajay Agrawal, The University of Alabama	**20. Application of Surface Wettability To Control Spreading of An Impacting Droplet: A Numerical Study** Yating Hu, Department of Mechanical Engineering, York University; Junfei Ou, China-Canada Institute for Advanced Surface & Interface Science and Engineering, Jiangsu University of Technology; Wen Li, China-Canada Institute for Advanced Surface & Interface Science and Engineering, Jiangsu University of Technology; Hamed Almohammadi, Department of Health Sciences and Technology, ETH Zurich; Alidad Amirfazli, Department of Mechanical Engineering, York University	
T	12:40 PM	EDT	**Lunch / Break**		
			Technical Sessions - Track 1	**Technical Sessions - Track 2**	
			Liquid Jets and Sprays in Crossflow Session Chair: Steven Lin	**Droplet Phenomena** Session Chair: Mario Trujillo	
T	1:10 PM	EDT	**81. Study On Scalability and Structures of Pure- and Aerated-Liquid Jets In Supersonic Crossflow Using X-Ray Diagnostics** Kuo-Cheng Lin, Taitech, Inc.; Alan Kastengren, Argonne National Laboratory; Stephen Hammack, Air Force Research Laboratory; Campbell Carter, Air Force Research Laboratory	**12. Extraction and Analysis of Atomization Process From High-Fidelity Simulations** Brendan Christensen, Montana State University; Mark Owkes, Montana State University	
T	1:30 PM	EDT	**82. Injection of Diesel With Dissolved Gas Into Supersonic Crossflow** Travis Tidball, Taitech, Inc.; Kuo-Cheng Lin, Taitech, Inc.; Stephen Hammack, Air Force Research Laboratory; Timothy Ombrello, Air Force Research Laboratory	**42. Interactions Between Shock Waves and Droplet Clusters: Interfacial Physics and Fragmentation Behaviors** Mitansh Tripathi, University of Cincinnati; Himakar Ganti, University of Cincinnati; Prashant Khare, University of Cincinnati	
T	1:50 PM	EDT	**38. Numerical Simulation of Primary Liquid Jet Atomization In A Supersonic Crossflow** Tynan Guerra, North Carolina State University; Jack Edwards, North Carolina State University; Kuo-Cheng Lin, Taitech Incorporated	**33. Statistical Model of Splashing Products From The Breakup of A Droplet** Chia-Wei Kuo, University of Wisconsin - Madison; Mario Trujillo, University of Wisconsin - Madison	
T	2:10 PM	EDT	**70. A Numerical Study of Atomization In A Liquid Jet In Supersonic Crossflow** Michael Kuhn, Cornell University; Olivier Desjardins, Cornell University	**29. Determination of Droplet Diameters and Flow Rates In Sprays and Aerosols** Maksim Mezhericher, Princeton University; Howard A. Stone, Princeton University	**Exhibitor Booths Open!**
T	2:30 PM	EDT	**Technical Committee Meetings** **Technical Committee Meeting Room 1: Industrial & Agricultural Sprays** **Technical Committee Meeting Room 2: Aerospace Propulsion** **Technical Committee Meeting Room 3: Spray Measurements**		

T	3:20 PM	EDT	**Break with the Exhibitors**	
			Technical Sessions - Track 1	**Technical Sessions - Track 2**
			Panel Discussion Moderator: Krishna Venkatesan	**Trans/Supercritical Environments** Session Chair: Malissa Lightfoot
T	3:40 PM	EDT	**Reference Simplex Atomizer - Progress and Plans** Panelists: Vince McDonell, Univ. of California Irvine; Ethan Hanson, Advanced Atomization Technologies; Yudaya Sivathanu, En'Urga; Gabe Jacobsohn, Convergent Science; Brandon Sforzo, Argonne National Laboratory	**14. Early Deformation and Interface Thermodynamics of Real Liquid Jets At High Pressures** Jordi Poblador Ibanez, University of California, Irvine; William Sirignano, University of California, Irvine
T	4:00 PM	EDT		**23. Multi-Component Transcritical Flow Simulation Using In Situ Adaptive Tabulation of Vapor-Liquid Equilibrium Solutions** Hongyuan Zhang, University of Minnesota; Suo Yang, University of Minnesota
T	4:20 PM	EDT		**50. Three-Dimensional Investigation of Fluid Dynamics In A Rocket Engine Injector At Supercritical Pressure** Petro Junior Milan, Georgia Institute of Technology; Xingjian Wang, Florida Institute of Technology; Vigor Yang, Georgia Institute of Technology
T	4:40 PM	EDT	**Meeting Adjourn**	

Session Start Time			Wednesday, May 19th 2021		
W	10:00 AM	EDT	Opening Remarks and Awards Ceremony		
			Technical Sessions - Track 1	Technical Sessions - Track 2	
			Spray Applications - Aerospace Session Chair: Brandon Sforzo	**Spray Applications - Biomedical and Viral Transport** Session Chair: Kyle Bade	
W	10:20 AM	EDT	**52. Classification and Research of Pneumatic Atomizers** Aleksandr Vasilyev, Central Institute of Aviation Motors; Anna Maiorova, Central Institute of Aviation Motors; Anton Tarasenko, Central Institute of Aviation Motors	**15. Evaluation of Cryogen Spray Cooling Exposure On Animal Skin For Laser Lipolysis** Hui XIN, Xian Jiaotong University; Bin CHEN, Xian Jiaotong University; Dong LI, Xian Jiaotong University; Fangbo YU, Xian Jiaotong University; Yu ZHONG, Ganzhou People's Hospital; Hongwan GAN, Ganzhou People's Hospital	
W	10:40 AM	EDT	**48. Effect of Flare Geometry and Swirl Ratio On The Coanda Effect In Unconfined Spray of Pre-Filming Air-Blast Nozzle With Triple Swirler** Reza Alidoost Dafsari, Jeonbuk National University; Milad Khaleghi kasbi, Jeonbuk National University; Jupyong Kim, Hanwha Aerospace; Jeekeun Lee, Jeonbuk National University	**80. Numerical Simulation On Auxiliary Cryogen Spray Cooling For The Laser Lipolysis** Fangbo Yu, Xian Jiaotong University; Hui Xin, Xian Jiaotong University; Bin CHEN, Xian Jiaotong University; Qi Wang, Xian Jiaotong University; Yu ZHONG, Ganzhou People's Hospital; Hongwan GAN, Ganzhou People's Hospital	**Exhibitor Booths Open!**
W	11:00 AM	EDT	**5. Geometrical Sensitiveness of A High Shear Injector Over The Spray Flow Field** Sonu Kumar, Indian Institute of Science Bangalore; Saptarshi Basu, Indian Institute of Science Bangalore	**68. Investigation Jet Nebulizer Airflow Source and Fluid Fill On Resulting Particle Size Distribution** Kamille Davis, Rochester Institute of Technology; Jennifer O'Neil, Rochester Institute of Technology	
W	11:20 AM	EDT	**61. Modelling of Combustion In Rocket Engines Using Pintle Injectors** Gurunadh Velidi, University of Petroleum and Energy Studies; Divyam Paliwal, University of Petroleum and Energy Studies; Prashant Gahlot, University of Petroleum and Energy Studies; Suramya Bhatt, University of Petroleum and Energy Studies; Vanshika Arora, University of Petroleum and Energy Studies	**67. Investigation of Initial Droplet Formation Region In A Jet Nebulizer** Abhishek Khatiwada, Rochester Institute of Technology; Kamille Davis, Rochester Institute of Technology; Jennifer O'Neil, Rochester Institute of Technology	
W	11:40 AM	EDT	**60. Analysis of A Secondary Injection Thrust Vector Control System For Mars Ascent Vehicle** Gurunadh Velidi, University of Petroleum and Energy Studies; Anagha Vats, University of Petroleum and Energy Studies; Syed Faraz Ali, University of Petroleum and Energy Studies	**84. Evaluation of Face Mask Droplet Suppression Using Laser Sheet Imaging** Jacqueline Swift, Spraying Systems Co.; Kyle M. Bade, Spraying Systems Co.; Rudolf J. Schick, Spraying Systems Co.	
W	12:00 PM	EDT	Break with the Exhibitors		
			Technical Sessions - Track 1	Technical Sessions - Track 2	
			Spray Applications - Automotive Session Chair: Lyle Pickett	**Atomization and Spray Simulations** Session Chair: Olivier Desjardins	
W	12:20 PM	EDT	**44. A Numerical Study of Electric Motor Cooling Over Varying Speeds With Consideration To Numerical Approaches For Mesh Motion** Xiaofeng Yang, General Motors; Ronald Grover, General Motors; Scott Parrish, General Motors	**58. Liquid Structure Classification Towards Breakup and Coalescence Modeling** Austin Han, Cornell University; Olivier Desjardins, Cornell University	
W	12:40 PM	EDT	**83. A New Approach For The Modeling and Simulation of Liquid/vapor Phase Change At Engine-Relevant Conditions** Everett Wenzel, Sandia National Laboratories; Marco Arienti, Sandia National Laboratories	**24. High-Fidelity Simulations of Electrolyte Jets In An Electric Field** Venkata Krisshna, Montana State University; Mark Owkes, Montana State University	
W	1:00 PM	EDT	**59. Large Eddy Simulation of Gasoline Sprays Using The Spectral-Element Method** Juan D Colmenares Fernandez, Argonne National Laboratory; Muhsin M Ameen, Argonne National Laboratory; Saumil S Patel, Argonne National Laboratory	**34. DES of Liquid Jet Breakup In A Coaxial Air-Blast Atomizer** Ankit Pandey, Indian Institute of Technology Madras; Abhijeet kumar, Indian Institute of Technology Madras; Vagesh D Narasimhamurthy, Indian Institute of Technology Madras; Srikrishna Sahu, Indian Institute of Technology Madras	**Exhibitor Booths Open!**

W	1:20 PM	EDT	---	**41. Application of Single Droplet Combustion Modelling For Design of Nanomaterials Made With Flame Synthesis** Musa Najimu, University of California, Irvine; Vicki Baghdassarian, University of California, Irvine; Scott Leask, University of California, Irvine; Vince McDonell, University of California, Irvine; Bihter Padak, University of California, Irvine; Erdem Sasmaz, University of California, Irvine	
W	1:40 PM	EDT	**Lunch / Break**		
			Technical Sessions - Track 1	**Technical Sessions - Track 2**	**Exhibitor Booths Open!**
			Internal and Near Nozzle Behavior Session Chair: Roberto Torelli	**Spray Modeling** Session Chair: David Schmidt	
W	2:10 PM	EDT	**8. Cavitation Erosion Modeling of Multi-Component Diesel Surrogates** Sampath K Rachakonda, Argonne National Laboratory; Gina M Magnotti, Argonne National Laboratory	**30. The Ideal Turbulent Jet of Non-Circular Cross-Section** Fernando Cabrera-Ward, Faculty of Science, Autonomous University of Baja California; Oscar Ivan Valdes-Martinez, Faculty of Science, Autonomous University of Baja California; Fermin Franco-Medrano, Faculty of Science, Autonomous University of Baja California	
W	2:30 PM	EDT	**31. Experimental Investigation of Pressure-Swirl Atomizer Spray Stability With Addition of A Pre-Filming Surface** Ethan Hanson, Advanced Atomization Technologies; Steven Day, Rochester Institute of Technology	**75. Improved Methods For Mixing-Limited Spray Modeling** Majid Haghshenas, University of Massachusetts Amherst; Peetak Mitra, University of Massachusetts Amherst; Chu Wang, Convergent Science Inc.; Fabien Tagliante, Sandia National Laboratories; Lyle Pickett, Sandia National Laboratories; David P. Schmidt , University of Massachusetts Amherst	
W	2:50 PM	EDT	**66. Validation of Inflow Modeling Strategies For Numerical Simulations of Air-Blast Atomization Against Experimental Backlit Imaging and Radiographs** Lam Vu, Cornell University; Nathanael Machicoane, University of Washington; Danyu Li, Iowa State University; Timothy Morgan, Iowa State University; Theodore Heindel, Iowa State University; Alberto Aliseda , University of Washington; Olivier Desjardins, Cornell University	**13. Observations of Similarity In Non-Evaporating Sprays** David Schmidt, University of Massachusetts Amherst; Marco Arienti, Sandia National Laboratories	
W	3:10 PM	EDT	**Meeting Adjourn**		

KEYNOTE SPEAKERS

Monday Keynote

"Advances in Spray Imaging Diagnostics"

Prof. Edouard Berrocal

Senior Lecturer
Combustion Physics
Lund University

Tuesday Keynote

"Advances in Modeling Atomization and Spray Formation in the Euler-Lagrange Framework"

Prof. Sourabh Apte

Professor of Mechanical Engineering
Mechanical, Industrial & Manufacturing Engineering
Oregon State University

LIST-OF-PAPERS

Paper Numbers, Titles, Authors, and Download Link

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5. Geometrical sensitiveness of a High Shear Injector Over the Spray flow field
Sonu Kumar, Saptarshi Basu

6. Effect of gas phase temperature in altering drop splashing on solid surfaces
Akshay Sreenivasan, Kiran Satheesh, Gaurav Tomar, Sivakumar Deivandren

8. Cavitation Erosion Modeling of Multi-Component Diesel Surrogates
Sampath K. Rachakonda, Gina M. Magnotti

9. Long-range microscopy of primary atomization fluid structures in diesel sprays using Ultra-Short Pulse Off-Axis Digital Holography
Marco Minniti, Derek Dunn-Rankin, Yu-Chien Chien

11. Flat-wall Impingement Behaviors of Multiple Droplets Induced by Spray Slicer
Hongliang Luo, Feixiang Chang, Yu Jin, Youichi Ogata, Keiya Nishida

12. Extraction and Analysis of Atomization Process from High-Fidelity Simulations
Brendan Christensen, Mark Owkes

13. Observations of Similarity in Non-Evaporating Sprays
David Schmidt Marco Arienti

14. Early deformation and interface thermodynamics of real liquid jets at high pressures
Jordi Poblador Ibanez, William Sirignano

15. Evaluation of Cryogen Spray Cooling Exposure on Animal Skin for Laser Lipolysis
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16. Investigations of the impact of fuel composition and multiple injection on liquid fuel wall films in gasoline direct injection
Vanessa Da Silva Cruz Lis, Wolfgang Samenfink, Erik Schnemann, Michael Wensing

17. Imaging of liquid water on surfaces in an optically accessible engine via laser-induced fluorescence
Florian Mirschinka, Jan N. Geiler, Fabio Messina, Matthias Mansbart, Sebastian A. Kaiser

18. Droplet Impact, Infiltration, and Boiling in a Heated Narrow Gap
Dwight Jordan Bouchard, Sanjeev Chandra

20. Application of Surface Wettability to Control Spreading of An Impacting Droplet: A Numerical Study
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21. Probabilistic Analysis of Twin-Fluid Spray based on Diffused Background Imaging
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23. Multi-component transcritical flow simulation using in situ adaptive tabulation of vapor-liquid equilibrium solutions
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24. High-fidelity simulations of electrolyte jets in an electric field
Venkata Krisshna, Mark Owkes

25. Aero Engine Fuel Spray Characterization via X-ray Radiography and White Beam Imaging
Krishna Venkatesan, Brandon Sforzo, Katarzyna Matusik, Alan Kastengren

29. Determination of Droplet Diameters and Flow Rates in Sprays and Aerosols
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30. The ideal turbulent jet of non-circular cross-section
Fernando Cabrera-Ward, Oscar Ivan Valdes-Martinez, Fermin Franco-Medrano

31. Experimental Investigation of Pressure-Swirl Atomizer Spray Stability with Addition of a Pre-Filming Surface
Ethan Hanson, Steven Day

33. Statistical Model of Splashing Products from the Breakup of a Droplet
Chia-Wei Kuo, Mario Trujillo

34. DES of liquid jet breakup in a coaxial air-blast atomizer
Ankit Pandey, Abhijeet Kumar, Vagesh D Narasimhamurthy, Srikrishna Sahu

35. Examining the Deterioration of Adaptive Mesh Refinement Performance in Spray Computations
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37. Effect of Back Pressure on Liquid Breakup Length and Droplet Size Distribution for a Spray Emanating from a Simplex Nozzle
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38. Numerical Simulation of Primary Liquid Jet Atomization in a Supersonic Crossflow
Tynan Guerra, Jack Edwards, Kuo-Cheng Lin

41. Application of Single Droplet Combustion Modelling for Design of Nanomaterials made with Flame Synthesis
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69. Internal flow and Spray Characterization of the Standard Simplex Atomizer with X-ray Diagnostics
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74. Towards scalable framework for photo-realistic rendering of CFD results
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