



# 2019

**CONVERGE User Conference—North America**

New Orleans, Louisiana | September 23-27, 2019



# WELCOME #CONVERGEUC



**KELLY SENECA**  
CO-OWNER, CONVERGENT SCIENCE

## WELCOME to the 2019 CONVERGE User Conference!

We are thrilled to be hosting this year's North American conference in the lively and vibrant city of New Orleans.

We're pleased to once again feature speakers and attendees from around the globe, as well as keynote speakers from Isuzu Technical Center of America, Rescale, and my alma mater, the University of Wisconsin-Madison. This year's conference showcases the broad applicability of CONVERGE with diverse keynote presentations on internal combustion engines, high-performance computing, and numerical modeling of physiological flows. In addition, our speakers will be discussing a wide array of topics, including flame spray pyrolysis, rotating detonation engines, machine learning, pre-chamber ignition, blood pumps, and aerodynamic characterization of unmanned aerial systems.

While last year's conference served as a chance to celebrate the tenth anniversary of CONVERGE and reflect on the past decade, this conference looks forward to the future with the recent release of CONVERGE 3.0. Our team has been working on making 3.0 a reality for a number of years, and we're incredibly proud of what we've accomplished. CONVERGE 3.0 opens the door to larger, faster, and more diverse simulations than ever before. We're seeing dramatic improvements in scaling, significant memory savings, and we've added and enhanced numerous features to make CONVERGE an effective tool for solving any CFD problem.

At Convergent Science, we're continually inspired by all of you, our users, to push the bounds of innovation and keep improving CONVERGE in a way that best meets your CFD needs. To show our appreciation, we try to provide a unique, informative, and enjoyable conference. This year's conference activities include an evening dinner cruise down the Mississippi River and, for the first time, we're bringing together a panel of HPC and CFD experts to discuss the latest advancements in the field and the future of large-scale simulations.

Thank you to all of our speakers for sharing your expertise with the CONVERGE community. We also thank this year's sponsors and invite you to visit their displays to learn more about their exciting products. On behalf of everyone at Convergent Science, thank you for attending our conference, and we hope you enjoy the week.

## SPECIAL THANKS TO OUR 2019 SPONSORS



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Hybrid Cloud for Engineers

# OVERVIEW

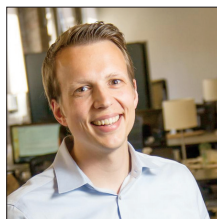
	MORNING	AFTERNOON	EVENING
MONDAY 9/23	<b>CONVERGE 3.0 TRAINING + TECPLOT TRAINING</b> Renaissance New Orleans Pere Marquette	<b>CONVERGE 3.0 TRAINING + TECPLOT TRAINING</b> Renaissance New Orleans Pere Marquette	<b>NETWORKING: Welcome Reception: An Evening with the Experts</b> Renaissance New Orleans Pere Marquette
TUESDAY 9/24	<b>WELCOME + PRESENTATIONS</b> Renaissance New Orleans Pere Marquette	<b>PRESENTATIONS</b> Renaissance New Orleans Pere Marquette	<b>NETWORKING: Dinner + River Cruise</b> Transportation provided. Meet in the Renaissance lobby.
WEDNESDAY 9/25	<b>PRESENTATIONS</b> Renaissance New Orleans Pere Marquette	<b>PRESENTATIONS</b> Renaissance New Orleans Pere Marquette	
THURSDAY 9/26	<b>CONVERGE 3.0 TRAINING</b> Renaissance New Orleans Pere Marquette	<b>CONVERGE 3.0 TRAINING</b> Renaissance New Orleans Pere Marquette	
FRIDAY 9/27	<b>CONVERGE 3.0 TRAINING</b> Renaissance New Orleans Pere Marquette	<b>CONVERGE 3.0 TRAINING</b> Renaissance New Orleans Pere Marquette	



**MONDAY, SEPTEMBER 23, 7p-9p** | Welcome Reception

## AN EVENING WITH THE EXPERTS: Scaling CFD with High-Performance Computing

Connect with your colleagues over complimentary food and drinks, and learn about the latest in CFD and HPC at our panel discussion, **An Evening with the Experts: *Scaling CFD with High-Performance Computing***. Our panelists will cover topics like scaling CFD across thousands of processors; how to take advantage of clusters, supercomputers, and the cloud to run large-scale simulations; how to post-process large datasets; and more. You'll also have the chance to ask our panel of experts any questions you have about CFD and HPC.



**JORIS POORT**  
Rescale



**ALAN KLUG**  
Tecplot



**SIBENDU SOM**  
Argonne National Laboratory



**KELLY SENECA**  
Convergent Science

# PRESENTATION SCHEDULE DETAIL

TUESDAY, SEPTEMBER 24

## MORNING

7:00-8:00	<b>BREAKFAST &amp; REFRESHMENTS</b>
7:45-8:00	<b>WELCOME</b> Kelly Senecal, <i>Convergent Science</i>
8:00-8:40	<b>KEYNOTE</b> THE FUTURE OF COMPUTING: BIG DATA, BIG COMPUTE AND DIGITAL TRANSFORMATION Joris Poort, <i>Rescale</i>
8:40-9:05	ACCELERATING DESIGN OPTIMIZATION USING MACHINE LEARNING AND HPC Opeoluwa Owoyele, <i>Argonne National Laboratory</i>
9:05-9:30	CFD-BASED FEATURE ENGINEERING FOR NOX MACHINE LEARNING MODEL Saurabh Sharma, <i>Isuzu Technical Center of America</i>
9:30-9:55	COMBUSTION SYSTEM DESIGN OPTIMIZATION FOR A HEAVY DUTY GASOLINE CI ENGINE Meng Tang, <i>Aramco Research Center-Detroit</i>
9:55-10:10	SPONSOR PRESENTATION <i>TotalCAE</i>
10:10-10:30	<b>BREAK</b>
10:30-10:55	ENABLING NEW APPLICATIONS WITH CONVERGE V3.0 Tristan Burton, <i>Convergent Science</i>
10:55-11:20	AERODYNAMIC CHARACTERIZATION OF AN UNMANNED AERIAL SYSTEM VIA 3D CFD SIMULATIONS I-Han Lui, <i>Argonne National Laboratory</i>
11:20-11:45	CFD MODELING OF FLAME SPRAY PYROLYSIS FOR LARGE-SCALE MANUFACTURING APPLICATIONS Debolina Dasgupta, <i>Argonne National Laboratory</i>
11:45-12:00	SPONSOR PRESENTATION <i>Tecplot</i>
12:00-1:30	<b>LUNCH</b>

## AFTERNOON / EVENING

1:30-1:55	SIMULATION OF FLAME PROPAGATION IN AN ANNULAR COMBUSTOR Haiwen Ge, <i>Texas Tech University</i>
1:55-2:20	NUMERICAL MODELING OF SUPERSONIC COMBUSTION IN ROTATING DETONATION ENGINES Pinaki Pal, <i>Argonne National Laboratory</i>
2:20-2:45	WHAT V3.0 DELIVERS FOR AFTERTREATMENT AND GAS TURBINES Scott Drennan, <i>Convergent Science</i>
2:45-3:00	SPONSOR PRESENTATION <i>Rescale</i>
3:00-3:20	<b>BREAK</b>
3:20-4:00	<b>KEYNOTE</b> NUMERICAL SIMULATION OF PHYSIOLOGICAL FLOWS Alejandro Roldán-Alzate, <i>University of Wisconsin-Madison</i>
4:00-4:25	PARAMETRIC STUDIES ON AXIAL AND RADIAL CLEARANCES IN A BLOOD PUMP Choon-Sik Jhun, <i>Penn State University</i>

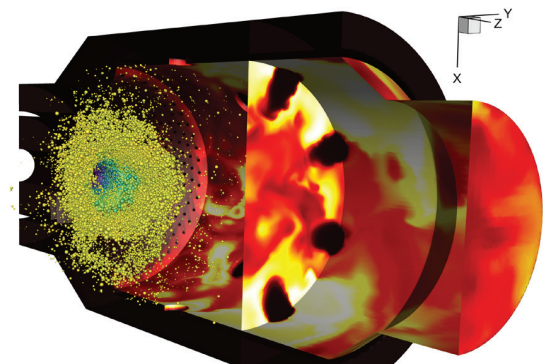
6:00-10:00	<b>DINNER + RIVER CRUISE</b> Steamboat NATCHEZ  Reservation required. Transportation provided. Please meet in venue hotel lobby at 5:30p.
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DP\_temp: 330 360 390 420 450 480 510      temp: 800 1200 1600 2000 2400



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# WEDNESDAY, SEPTEMBER 25

## MORNING

7:00-8:00	<b>BREAKFAST &amp; REFRESHMENTS</b>
7:50-8:00	WELCOME BACK Elizabeth Favreau, <i>Convergent Science</i>
8:00-8:40	<b>KEYNOTE</b> ITCA'S WAY FORWARD? MAYBE! Bruce Vernham, <i>Isuzu Technical Center of America</i>
8:40-9:05	INTERNAL NOZZLE FLOW SIMULATIONS ACCOUNTING FOR GAS WITHIN THE SAC AND INJECTOR ELASTICITY Lyle Pickett, <i>Sandia National Laboratories</i>
9:05-9:30	FUEL EFFECTS IN MULTIPHASE FLOW MODELING FOR SI AND CI CONDITIONS AND INJECTORS Lorenzo Nocivelli, <i>Argonne National Laboratory</i>
9:30-9:55	SPRAY A MODELLING USING CONVERGE Rajes Ram Muthukumar, <i>Texas Tech University</i>
9:55-10:15	<b>BREAK</b>
10:15-10:40	THE IMPORTANCE OF NON-SPHERICAL DROPS IN SUPERCRITICAL FUEL INJECTION Tuan Nguyen, <i>Sandia National Laboratories</i>
10:40-11:05	NUMERICAL STUDY OF PRE-CHAMBER IGNITION IN A GASOLINE DIRECT-INJECTION ENGINE Anqi Zhang, <i>Aramco Research Center-Detroit</i>
11:05-11:30	STATE-OF-THE-ART IN PRE-CHAMBER SPARK-IGNITION MODELING Joochan Kim, <i>Argonne National Laboratory</i>
11:30-11:55	INVESTIGATIONS ON PASSIVE PRE-CHAMBER IGNITION DEVICE Adele Poubeau, <i>IFP Energies nouvelles</i>
12:00-1:30	<b>LUNCH</b>

## AFTERNOON / EVENING

1:30-1:55	LES OF STRATIFIED LOW TEMPERATURE COMBUSTION ENGINES USING CONVERGE Aimilios Sofianopoulos, <i>Convergent Science</i>
1:55-2:20	POTENTIAL EFFICIENCY IMPROVEMENTS WITH CO-OPTIMIZATION OF FUELS AND ENGINES Chao Xu, <i>Argonne National Laboratory</i>
2:20-2:45	STUDY OF THE SOOT FORMATION IN A GDI SPRAY USING LASER-INDUCED PLASMA IGNITION Fabien Tagliante, <i>Sandia National Laboratories</i>
2:45-3:10	CFD STUDY OF TSCI WITH WET ETHANOL: SPRAY ANGLE EFFECT ON THERMAL STRATIFICATION Mozhgan Rahimi Boldaji, <i>Clemson University</i>
3:10-3:30	<b>BREAK</b>
3:30-3:55	CI AND SI ENGINE APPLICATIONS WITH ECFM AND ECFM3Z Olivier Colin, <i>IFP Energies nouvelles</i>
3:55-4:20	USING THICKENED FLAME MODEL AND AMR FOR TURBULENT COMBUSTION MODELING Cedric Mehl, <i>IFP Energies nouvelles</i>
4:20-4:45	RECENT PROGRESS OF THE COMPUTATIONAL CHEMISTRY CONSORTIUM Henry Curran, <i>NUI Galway</i>
4:45-5:10	CONVERGE 3.0 RESULTS AND LOOKING AHEAD TO 3.1 Keith Richards, <i>Convergent Science</i>
5:10	<b>CLOSING REMARKS</b>

# CFD? CF-DONE.

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# TRAINING SCHEDULE DETAIL

## MONDAY, SEPTEMBER 23

MAHALIA JACKSON	SIDNEY BECHET	JELLY ROLL MORTON	BUDDY BOLDEN
General Flow Modeling in CONVERGE 8a-noon	Advanced Surface Preparation Tools in CONVERGE Studio 8a-noon	Tecplot for CONVERGE: Introduction to Working with ICE Data 8a-noon	Personalized Case Setup Assistance 8a-noon
General Flow Modeling in CONVERGE 1p-5p		Tecplot for CONVERGE: Introduction to Automation 1p-3p  Tecplot Personalized Assistance 3p-5p	Personalized Case Setup Assistance 1p-5p

## THURSDAY, SEPTEMBER 26

MAHALIA JACKSON	SIDNEY BECHET	JELLY ROLL MORTON	BUDDY BOLDEN
Conjugate Heat Transfer Modeling 8a-noon	Fluid-Structure Interaction Modeling 8a-10a  Tools for SAGE Detailed Chemistry 10a-noon	Engine Aftertreatment Modeling 8a-noon	Personalized Case Setup Assistance 8a-noon
<b>STORYVILLE I: CONVERGE in the Cloud with Rescale, 12noon-1p</b>			
What's New in CONVERGE 3.0 1p-3p	Emissions Modeling 1p-3p	Sealing 1p-3p	Personalized Case Setup Assistance 1p-5p
Spray Modeling 3p-5p	Non-Premixed Combustion Modeling 3p-5p	Steady-State Modeling 3p-5p	

## FRIDAY, SEPTEMBER 27

MAHALIA JACKSON	SIDNEY BECHET	JELLY ROLL MORTON	BUDDY BOLDEN
Turbulence Modeling 8a-10a	Gas Turbine Engine Combustion 8a-10a	Optimization and Model Interrogation 8a-10a	Personalized Case Setup Assistance 8a-noon
Premixed Combustion Modeling 10a-noon	Compressor and Pump Modeling 10a-noon		
Advanced Topics in Internal Combustion Engine Modeling 1p-5p	User-Defined Functions 1p-3p	Volume of Fluid Modeling 1p-3p	Personalized Case Setup Assistance 1p-5p

# KEYNOTES



**JORIS POORT**  
*Rescale*

## **THE FUTURE OF COMPUTING: BIG DATA, BIG COMPUTE & DIGITAL TRANSFORMATION** | Tuesday 8:00a-8:40a

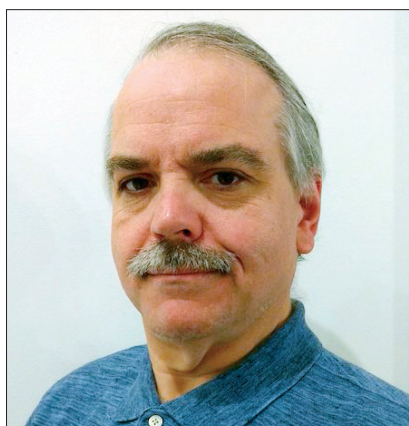
JORIS POORT is the co-founder and CEO of Rescale, which offers industry-leading software platforms and hardware infrastructure for companies to perform scientific and engineering simulations. Prior to founding Rescale, Mr. Poort worked as a consultant for McKinsey & Company on product development engagements in the high-tech sector. He began his career at Boeing as an engineer on the 787 Dreamliner program, optimizing the design of the tail and wings. Mr. Poort received an M.B.A. from Harvard Business School, an M.S. in aeronautics and astronautics from the University of Washington, and a B.S. in mechanical engineering from the University of Michigan.



**ALEJANDRO ROLDÁN-ALZATE**  
*University of Wisconsin-Madison*

## **NUMERICAL SIMULATION OF PHYSIOLOGICAL FLOWS** | Tuesday 3:20p-4:00p

DR. ALEJANDRO ROLDÁN-ALZATE received a Ph.D. in mechanical engineering from the University of Wisconsin-Madison in 2008. He then joined the Vascular Tissue Biomechanics Laboratory at the same institution as a research associate. In 2010, Dr. Roldán-Alzate joined the Department of Radiology at the University of Wisconsin-Madison as a Cardiovascular Modeling Scientist, and in 2015, he obtained a joint faculty appointment in the Department of Mechanical Engineering and the Department of Radiology. Dr. Roldán-Alzate's research focuses on fluid dynamics analysis of physiological and pathological flows using a combination of medical imaging, additive manufacturing, particle image velocimetry, and computational fluid dynamics.



**BRUCE VERNHAM**  
*Isuzu Technical Center of America*

## **ITCA'S WAY FORWARD? MAYBE!** | Wednesday 8:00a-8:40a

BRUCE VERNHAM is the Technical Director of the Powertrain and Vehicle Research Department at Isuzu Technical Center of America. As Technical Director, he is responsible for various projects, project plans, oversight, and execution. Mr. Vernham focuses on complex technical problems which require innovative solutions for commercial vehicles, and he develops advanced technological ideas and pilots their progression into a final product. His latest efforts include developing an in-house team for 1D and 3D engine combustion simulation, controls, HDOBD, aftertreatment, and platform-level simulation. Mr. Vernham received a master's degree in electrical engineering from the University of Michigan with a focus on powertrain controls.



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**CONVERGE User Conference | Europe**  
30 March-03 April | **Stuttgart, Germany**

**20/20**

**CONVERGE User Conference | North America**  
September 21-25 | **Detroit, Michigan**

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**Convergent Science | Makers of CONVERGE CFD Software**

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