

TURNING 10

2018 CONVERGE USER CONFERENCE

September 24-28, 2018 | Madison, WI



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10 Years · 2008-2018



WELCOME #CONVERGEUC



KELLY SENECA
CO-OWNER, CONVERGENT SCIENCE

WELCOME to the 2018 CONVERGE User Conference! We are thrilled to be back in our world headquarters of Madison, Wisconsin for this user conference celebrating ten years of CONVERGE. We are pleased to once again feature speakers and attendees from around the globe as well as keynote presentations from Argonne National Laboratory, Southwest Research Institute, and the University of Massachusetts Amherst. The diversity of presentation topics at our annual conferences highlights the versatility and broad applicability of CONVERGE's unique CFD approach to a wide array of flow problems. But even as CONVERGE is increasingly used for new applications, reacting flows remain at the heart of what we do. This is showcased by numerous presentations on combustion modeling, fuel injection, and internal combustion engines.

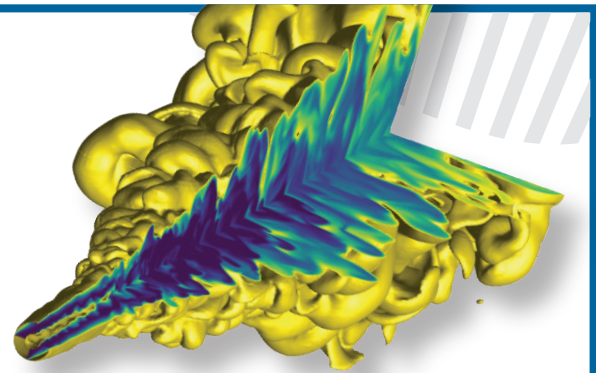
The theme of this year's conference is Turning 10. When we sold the first CONVERGE license in 2008, our company consisted of just a handful of engineers. The past decade has seen both setbacks and triumphs, but with a lot of hard work, a team of dedicated employees, and our amazing users, the CONVERGE community today is vibrant and thriving. Together we are facilitating new collaborations and pushing the bounds of innovation in internal combustion engines, gas turbines, pumps, compressors, and much more. We would not be where we are today without each of you. You are far more than just CONVERGE users; we truly believe that each of you is a partner and a collaborator, inspiring us to advance our product in a way that best suits the needs of the CFD community.

Our goal this week is to offer a unique, informative, and enjoyable conference. We hope this Turning 10 user conference is especially memorable and invite you all to join us in celebrating this collective achievement.

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.

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KEYNOTES



SIBENDU SOM

Manager, Computational Multiphysics Section, Center for Transportation Research. *Argonne National Laboratory*

A DECADE WITH GRID CONVERGED CALCULATIONS | Tuesday 8:00a-8:40a

DR. SIBENDU SOM leads a CFD team at Argonne National Laboratory with a research focus on the development of nozzle flow, spray, and combustion models, as well as using HPC tools for piston engines and gas turbine applications. He is a co-founder and technical lead on Argonne's Virtual Engine Research Institute and Fuels Initiative (VERIFI) program aimed at providing predictive simulations for OEMs. In the past decade, Dr. Som has authored several key papers using CONVERGE that have established best practices for performing robust simulations. Additionally, Dr. Som has authored more than 110 journal and peer-reviewed conference papers that have accumulated more than 3,100 citations. Dr. Som holds a B.E. in mechanical engineering from Osmania University, and received a M.S. and a Ph.D. in mechanical engineering from the University of Illinois at Chicago.



DAVID SCHMIDT

Professor, Mechanical and Industrial Engineering. *University of Massachusetts Amherst*

NEW HORIZONS IN ENERGY TECHNOLOGY WITH CONVERGE | Tuesday 3:45p-4:25p

DR. DAVID SCHMIDT attended North Carolina State University as an undergraduate and received a master's in mechanical engineering from Stanford University. In 1997, he earned his Ph.D. in mechanical engineering at the University of Wisconsin-Madison. That same year, he concurrently worked as a Visiting Scientist at MIT and helped found Convergent Thinking LLC, a CFD software and consulting firm that later became Convergent Science. Dr. Schmidt has served on the faculty of the University of Massachusetts since 2000, where he is currently a professor. Dr. Schmidt's research focuses on the fluid mechanics of two-phase flow.



TERRY ALGER

Director, Spark Ignition Engine R&D, Powertrain Engineering Division. *Southwest Research Institute*

NEW DEVELOPMENTS IN HIGH EFFICIENCY ENGINES | Wednesday 8:00a-8:40a

DR. TERRY ALGER is the Director of Spark Ignition Engine R&D at Southwest Research Institute (SwRI) in San Antonio, Texas. He was the leader of SwRI's HEDGE I, II, and III consortia and the primary inventor of SwRI's DCO ignition system and Dedicated EGR engine concept. His current responsibilities include overseeing SwRI's activities in SI engine R&D, transmission development and testing, electrification, and vehicle emissions and fuel economy testing. He is also a fellow of the Society of Automotive Engineers. Dr. Alger received his Ph.D. in 2001 from the University of Texas at Austin and a B.S. in mechanical engineering in 1992 from the United States Military Academy.

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OVERVIEW

	MORNING	AFTERNOON	EVENING
MONDAY 9/24	CONVERGE TRAINING + TECPLOT TRAINING Convergent Science World Headquarters	CONVERGE TRAINING + TECPLOT TRAINING Convergent Science World Headquarters	NETWORKING: Welcome Reception + Trivia Convergent Science World Headquarters
TUESDAY 9/25	WELCOME + PRESENTATIONS The Madison Club	PRESENTATIONS The Madison Club	NETWORKING: 10-Year Celebration + Dinner The Orpheum Theater
WEDNESDAY 9/26	PRESENTATIONS The Madison Club	PRESENTATIONS The Madison Club	NETWORKING: Cocktail Reception The Madison Club
THURSDAY 9/27	CONVERGE TRAINING Convergent Science World Headquarters	CONVERGE TRAINING Convergent Science World Headquarters	
FRIDAY 9/28	CONVERGE TRAINING Convergent Science World Headquarters	CONVERGE TRAINING Convergent Science World Headquarters	

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TRAINING SCHEDULE DETAIL

MONDAY, SEPTEMBER 24

General Flow Modeling in CONVERGE
8a-5p (there will be a 1 hour break for lunch)

DELOREAN

Advanced Surface Preparation Tools
in CONVERGE Studio
8a-noon

CORVETTE

Tecplot for CONVERGE: Introduction to
Working with ICE Data
8a-noon

GTO

Personalized Case Setup Assistance
8a-noon

CHARGER

Post-Processing Tools in
CONVERGE Studio
1p-5p

GTO

Tecplot for CONVERGE: Introduction
to Automation
1p-3p

CORVETTE

Personalized Case Setup Assistance
1p-5p

CHARGER

Personalized Tecplot Assistance
3p-5p

CORVETTE

Lunch is provided each day of training in DeLorean between noon and 1pm for all training attendees.

FIRST FLOOR ROOMS

SECOND FLOOR ROOMS

THURSDAY, SEPTEMBER 27

Conjugate Heat Transfer Modeling
8a-noon

DELOREAN 1

Engine Aftertreatment Modeling
8a-noon

CORVETTE

Fluid-Structure Interaction Modeling
8a-10a

GTO

Tools for SAGE Detailed Chemistry
10a-noon

GTO

CONVERGE in the Cloud with Rescale
10a-noon

DELOREAN 2

Personalized Case Setup Assistance
8a-noon

CHARGER

Emissions Modeling
1p-3p

DELOREAN 1

Introduction to CONVERGE 3.0 Input Files
1p-3p

DELOREAN 2

Optimization and Model Interrogation
1p-3p

CORVETTE

Sealing
1p-3p

GTO

Spray Modeling
3p-5p

DELOREAN 1

Steady-State Modeling
3p-5p

CORVETTE

Non-Premixed Combustion Modeling
3p-5p

GTO

Personalized Case Setup Assistance
1p-5p

CHARGER

FRIDAY, SEPTEMBER 28

Gas Turbine Engine Combustion
8a-10a

DELOREAN 1

CONVERGE + GT-SUITE Coupling
8a-10a

CORVETTE

Turbulence Modeling
8a-10a

GTO

Compressor and Pump Modeling
10a-noon

DELOREAN 1

Heat Transfer Mapping
10a-noon

CORVETTE

Premixed Combustion Modeling
10a-noon

GTO

Personalized Case Setup Assistance
8a-noon

CHARGER

Advanced Topics in Internal Combustion
Engine Modeling
1p-5p

DELOREAN 1

Scripts for Simulation Analysis and
File Management
1p-3p

CORVETTE

Volume of Fluid Modeling
1p-3p

GTO

Numerical Methods
3p-5p

CORVETTE

User-Defined Functions
3p-5p

GTO

Personalized Case Setup Assistance
1p-5p

CHARGER

PRESENTATION SCHEDULE DETAIL

TUESDAY, SEPTEMBER 25

MORNING

7:00 – 8:00	BREAKFAST & REFRESHMENTS
7:45 – 8:00	WELCOME Kelly Senecal, <i>Convergent Science</i>
8:00 – 8:40	KEYNOTE A DECADE WITH GRID CONVERGED CALCULATIONS Sibendu Som, <i>Argonne National Laboratory</i>
8:40 – 9:05	THERMAL INSULATION MODELLING WITH CHT FOR LOW HEAT REJECTION DIESEL ENGINE Olivier Colin, <i>IFP Energies nouvelles</i>
9:05 – 9:30	FLAME-WALL FILM INTERACTION Peng Zhao, <i>Oakland University</i>
9:30 – 9:55	APPLICATION OF LES TO PREMIXED LOW TEMPERATURE COMBUSTION ENGINES Aimilios Sofianopoulos, <i>Stony Brook University</i>
9:55 – 10:10	TECHNICAL PARTNER PRESENTATION <i>Tecplot</i>
10:10 – 10:30	BREAK
10:30 – 10:55	STEADY STATE CALIBRATION DEVELOPMENT FOR PASSENGER CAR DIESEL ENGINES LEVER- AGING GRAPHICAL PROCESSING UNITS (GPUS) Ronald Grover Jr., <i>General Motors</i>
10:55 – 11:20	FURTHER APPLICATION OF THE FAST TABULATED CPV APPROACH Adina Werner, <i>Brandenburg University of Technology</i>
11:20 – 11:45	DEVELOPING RELIABLE SURROGATE MECHANISMS FOR COMBUSTOR MODELING Henry Curran, <i>Computational Chemistry Consortium (C3)</i>
11:45 – 12:00	TECHNICAL PARTNER PRESENTATION <i>TotalCAE</i>
12:00 – 1:30	LUNCH

AFTERNOON / EVENING

1:30 – 1:55	FLAME CHARACTERISTICS DURING LEAN BLOW-OUT IN GAS TURBINE COMBUSTORS Prithwish Kundu, <i>Argonne National Laboratory</i>
1:55 – 2:20	NUMERICAL INVESTIGATION OF A PREMIXED DUMP COMBUSTOR USING LES Madhu Vellakal, <i>National Center for Supercomputing Applications</i>
2:20 – 2:45	LES OF A STRATIFIED TURBULENT BURNER USING THICKENED FLAME MODEL AND AMR Cédric Mehl, <i>IFP Energies nouvelles</i>
2:45 – 3:10	TECHNICAL ACHIEVEMENTS IN GAS TURBINES AND AFTERTREATMENT Scott Drennan, <i>Convergent Science</i>
3:10 – 3:25	TECHNICAL PARTNER PRESENTATION <i>CAESES</i>
3:25 – 3:45	BREAK
3:45 – 4:25	KEYNOTE NEW HORIZONS IN ENERGY TECHNOLOGY WITH CONVERGE David Schmidt, <i>University of Massachusetts Amherst</i>

6:00 – 10:00 **10-YEAR CELEBRATION + DINNER**
THE ORPHEUM THEATER
Dianna Cowern, *Physics Girl*
Jamie McNaughton, *Roush Yates Engines*
Kelly Senecal, *Convergent Science*

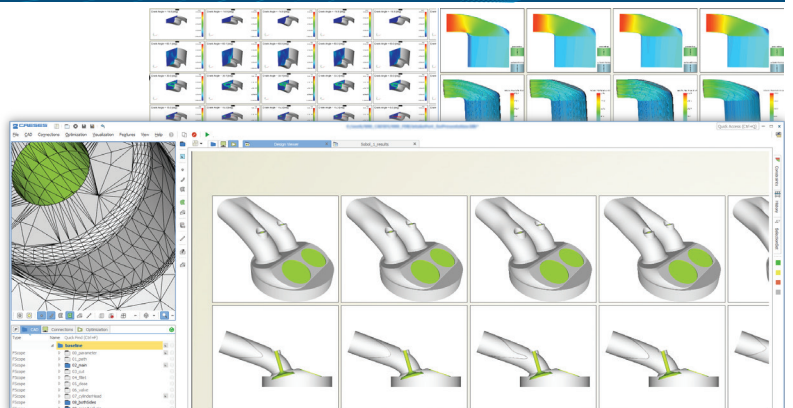
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WEDNESDAY, SEPTEMBER 26

MORNING

7:00 - 8:00	BREAKFAST & REFRESHMENTS
7:50 - 8:00	WELCOME BACK Elizabeth Favreau & Erik Tylczak, <i>Convergent Science</i>
8:00 - 8:40	KEYNOTE NEW DEVELOPMENTS IN HIGH EFFICIENCY ENGINES Terry Alger, <i>Southwest Research Institute</i>
8:40 - 9:05	SIMULATION OF SPARK-IGNITION COMBUSTION FOR CO-OPTIMIZATION OF FUELS AND ENGINES Zongyu Yue, <i>Argonne National Laboratory</i>
9:05 - 9:30	A COMPREHENSIVE AND ROBUST IGNITION SYSTEM MODEL FOR SI ENGINES Haiwen Ge, <i>Virtual Thermal Fluids LLC, Oakland University</i>
9:30 - 9:55	MODELING ADVANCED IGNITION SYSTEMS IN CONVERGE Riccardo Scarcelli, <i>Argonne National Laboratory</i>
9:55 - 10:10	TECHNICAL PARTNER PRESENTATION <i>Rescale</i>
10:10 - 10:30	BREAK
10:30 - 10:55	AERODYNAMIC AND COMBUSTION LARGE-EDDY SIMULATIONS OF ENGINE CONFIGURATIONS Anthony Robert, <i>IFP Energies nouvelles</i>
10:55 - 11:20	SURROGATE IMPACT ON FLAME PROPAGATION AND KNOCK PREDICTION Corinna Netzer, <i>Brandenburg University of Technology</i>
11:20 - 11:45	AUTOIGNITION PROCESSES IN ADVANCED INTERNAL COMBUSTION ENGINES Andrew Zdanowicz, <i>Colorado State University</i>
11:45 - 12:00	TECHNICAL PARTNER PRESENTATION <i>Intelligent Light</i>
12:00 - 1:30	LUNCH

AFTERNOON / EVENING

1:30 - 1:55	CONFESSIONS OF A SPRAY EXPERIMENTALIST Lyle Pickett, <i>Sandia National Laboratory</i>
1:55 - 2:20	FUEL EFFECT ON SPRAY UNDER COMPRES- SION IGNITION ENGINE CONDITIONS Yuanjiang Pei, <i>Aramco Research Center - Detroit</i>
2:20 - 2:45	AN OVERVIEW OF MULTIPHASE FLOW MODEL- ING AT ARGONNE NATIONAL LABORATORY Gina Magnotti, <i>Argonne National Laboratory</i>
2:45 - 3:10	ENGINE OPTIMIZATION USING MACHINE LEARNING EMULATORS Dan Probst, <i>Convergent Science</i>
3:10 - 3:30	BREAK
3:30 - 3:55	THE POWER OF SIMULATION IN RACING AT ROUSH YATES ENGINES Brian Kurn, <i>Roush Yates Engines</i>
3:55 - 4:20	CFD DEVELOPMENT OF THE LIQUIDPISTON ROTARY ENGINE Mike Bergin, <i>Liquid Piston</i>
4:20 - 4:45	MODELING FLOWS IN TWIN SCREW SUPERCHARGERS AND EXHAUST HEAT RECOVERY UNITS David Rowinski, <i>Convergent Science</i>
4:45 - 5:10	CHANGING THE GAME (AGAIN) WITH CONVERGE 3.0 Keith Richards, <i>Convergent Science</i>
5:10	CLOSING REMARKS

5:10-7:00

COCKTAIL RECEPTION
Madison Club

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NETWORKING INFORMATION



MONDAY

WELCOME RECEPTION & TRIVIA

Monday, 7p - 10p

Convergent Science World Headquarters

Whether you're a trivia buff or novice, join us for an evening of food, drinks, and fun! Our third-ever user conference trivia event will provide a chance to continue the camaraderie and friendly rivalries.



TUESDAY

10-YEAR CELEBRATION + DINNER

Wednesday, 6p - 10p

The Orpheum Theater

Ten years of CONVERGE calls for a celebration! Please join us for an extraordinary evening at the historic Orpheum Theater on State Street in Madison. Enjoy great speakers, food, and entertainment in a festive environment with CONVERGE colleagues from around the world. Renew old connections and make new contacts throughout the evening. This is one event you don't want to miss!



WEDNESDAY

COCKTAIL RECEPTION

Wednesday, 5:10p (immediately following the presentations)

The Madison Club

Join us for an evening of light food and drinks at the beautiful Madison Club and enjoy one final evening with CONVERGE colleagues from around the globe.



ORPHEUM CELEBRATION



DIANNA COWERN
Physics Girl

PHYSICS GIRL!

DIANNA COWERN is a science communicator and educator. She is the content creator for her YouTube channel, Physics Girl with PBS Digital Studios, which has over 1 million subscribers and tens of millions of views. Dianna received her BS in physics from MIT before researching low-metallicity stars at the Harvard CfA and designing an iPad app as a software engineer at GE. She then pursued her career in STEM outreach working as an educator at the Reuben H Fleet Science Center and as a physics outreach coordinator at UCSD. Her work on Physics Girl has been featured on the Huffington Post, Slate Magazine, and Scientific American blogs.



JAMIE MCNAUGHTON
Technical Director
Roush Yates Engines

A POWERFUL AND WINNING COMBINATION: ROUSH YATES ENGINES & CONVERGENT SCIENCE

JAMIE MCNAUGHTON, Technical Director of Roush Yates Engines, manages the technical engineering content and guides the strategic direction of all in-house powertrain programs.

McNaughton and his team work in partnership with Ford Performance on the design, development, and test strategies for the NASCAR Ford FR9 V8 engine platforms, as well as the twin-turbo Ford EcoBoost V6 and Ford Shelby GT350R-C V8 road race engine programs, and Roush Yates Engines' own RY45 engine program.

Prior to joining Roush Yates Engines in 2013, he led the design and development of several production and race engine programs while working at Ford Motor Company and Harley-Davidson Motor Company, which took him around the world to Austria, Italy, Germany and India.

He has been involved in motorsports for over 30 years and enjoys the challenge of competition, winning, and teamwork.



KELLY SENECA
Co-Owner
Convergent Science

CELEBRATING CONVERGE: A BEHIND-THE-SCENES LOOK AT THE FIRST DECADE

KELLY SENECA, Convergent Science vice president and co-owner, takes you on a look back at the trials, triumphs, and breakthroughs of the evolution of CONVERGE. A history of tears and cheers sets the stage for a bright prospective for the next 10 years.



10 Years of Autonomous Meshing · 2008-2018



COMPUTATIONAL CHEMISTRY CONSORTIUM

VISION

To provide the most accurate and complete computational chemistry combustion and emissions models, tools, and mechanisms to the entire scientific community.

MISSION

Through knowledge sharing, recurring meetings, and financial support, the consortium will work to refine existing computational chemistry tools and to develop new models, tools, and mechanisms.

VALUES

The consortium values an open mechanism format to ensure widespread use.

The consortium values the contributions of both industry and academic/government partners.

The consortium values long-term validation and development by the entire combustion community.

INFORMATION

For more information, to sign up for email updates, and to become a member, please visit fuelmech.org.

UC 2019—SAVE THE DATES!

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INDIA

Office #701,
Supreme Headquarters
Mumbai-Bangalore Highway
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ONLINE

convergecdf.com
info@convergecdf.com



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