The COMSOL Conference 2016 features a large collection of presentations, minicourses, and social events, centered around multiphysics simulation and application design. We are delighted to share this experience with you and hope that you enjoy every aspect of the conference. Use this program to plan for three days full of training, inspiring presentations, and opportunities to interact with the COMSOL community.

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05 KEYNOTE SPEAKERS
Experiences from industry leaders

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Choose from 36 minicourses

07 USER PRESENTATIONS
Learn from your colleagues in application specific sessions

13 POSTER SESSION
Meet the presenters and learn more about their research

Coffee Breaks: Salon A/B/C/D
NASA Tech Briefs Reception: Salon A/B/C/D
Gala Dinner: Salon E/F/G/H
Breakfast on Thurs & Fri: Salon A/B/C/D

Lunch: Riverside Lawn
Directions to Riverside Lawn: Take elevator from the main lobby to the 1st floor. In case of bad weather, lunch stations will be set up outside Salon A/B/C/D
# Conference Schedule

## Wednesday, October 5

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Room</th>
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</thead>
<tbody>
<tr>
<td>8:00AM</td>
<td>Registration Opens</td>
<td>Foyer</td>
</tr>
<tr>
<td>9:00AM</td>
<td>General Session</td>
<td>Salon E-H</td>
</tr>
<tr>
<td></td>
<td>Introduction to Building and Deploying Simulation Apps</td>
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<tr>
<td>10:00AM</td>
<td>Coffee Break</td>
<td>Registration Foyer</td>
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<tr>
<td>10:30AM</td>
<td>Minicourses</td>
<td>CW Ballroom 2-3</td>
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<tr>
<td></td>
<td>Equation-Based Modeling</td>
<td>Charles River West</td>
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<tr>
<td></td>
<td>Fluid-Solid Interactions</td>
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<tr>
<td></td>
<td>Geometry Modeling and CAD Import</td>
<td>CW Ballroom 4</td>
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<tr>
<td></td>
<td>Heat Transfer 1: Conduction and Convection</td>
<td>CW Ballroom 1</td>
</tr>
<tr>
<td></td>
<td>Hands-On: Electromagnetics</td>
<td>Charles River East</td>
</tr>
<tr>
<td>12:00PM</td>
<td>Lunch</td>
<td>Riverside Lawn</td>
</tr>
<tr>
<td>1:00PM</td>
<td>Demo Stations, Poster Session, Exhibition Open</td>
<td>Salon A-D</td>
</tr>
<tr>
<td>1:00PM</td>
<td>Minicourses</td>
<td></td>
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<tr>
<td></td>
<td>LiveLink™ for MATLAB®</td>
<td>Charles River West</td>
</tr>
<tr>
<td></td>
<td>Porous Media Flow</td>
<td>CW Ballroom 1</td>
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<tr>
<td></td>
<td>Solvers 1: Understanding the Stationary Solvers</td>
<td>CW Ballroom 2-3</td>
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<tr>
<td></td>
<td>Structural Mechanics 1: Statics and Dynamics</td>
<td>CW Ballroom 4</td>
</tr>
<tr>
<td></td>
<td>Hands-On: Heat Transfer</td>
<td>Charles River East</td>
</tr>
<tr>
<td>2:30PM</td>
<td>Coffee Break</td>
<td>Salon A-D</td>
</tr>
<tr>
<td>3:00PM</td>
<td>Keynote Session</td>
<td>Salon E-H</td>
</tr>
<tr>
<td></td>
<td>Svante Littmarck, COMSOL, Inc.</td>
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</tr>
<tr>
<td>4:00PM</td>
<td>Coffee Break</td>
<td>Salon A-D</td>
</tr>
<tr>
<td>4:30PM</td>
<td>Minicourses</td>
<td></td>
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<tr>
<td></td>
<td>Electromagnetics 1: Resistive and Capacitive Devices and Particle Tracing</td>
<td>Charles River West</td>
</tr>
<tr>
<td></td>
<td>Introduction to the Application Builder</td>
<td>CW Ballroom 1</td>
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<tr>
<td></td>
<td>Solvers 2: Understanding the Time-Dependent Solvers</td>
<td>CW Ballroom 2-3</td>
</tr>
<tr>
<td></td>
<td>Structural Mechanics 2: Nonlinearity and Fatigue</td>
<td>CW Ballroom 4</td>
</tr>
<tr>
<td></td>
<td>Hands-On: CFD</td>
<td>Charles River East</td>
</tr>
<tr>
<td>6:00PM</td>
<td>NASA Tech Briefs Cocktail Reception</td>
<td>Salon A-D</td>
</tr>
</tbody>
</table>

## Thursday, October 6

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00AM</td>
<td>Registration &amp; Breakfast</td>
<td>Salon A-D</td>
</tr>
<tr>
<td>8:30AM</td>
<td>Minicourses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD 1: Laminar &amp; Microfluidic Flow &amp; Particle Tracing</td>
<td>Charles River West</td>
</tr>
<tr>
<td></td>
<td>Electromagnetics 2: Magnets, Coils, and Motors</td>
<td>CW Ballroom 1</td>
</tr>
<tr>
<td></td>
<td>Heat Transfer 2: Radiation</td>
<td>CW Ballroom 4</td>
</tr>
<tr>
<td></td>
<td>Meshing</td>
<td>CW Ballroom 2-3</td>
</tr>
<tr>
<td></td>
<td>Hands-On: Structural Mechanics</td>
<td>Charles River East</td>
</tr>
<tr>
<td>10:00AM</td>
<td>Coffee Break</td>
<td>Salon A-D</td>
</tr>
<tr>
<td>10:30AM</td>
<td>Keynote Session</td>
<td>Salon E-H</td>
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<tr>
<td></td>
<td>Bernard McGarvey, Eli Lilly and Company</td>
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<tr>
<td></td>
<td>Ed Furlani, University at Buffalo SUNY</td>
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<tr>
<td></td>
<td>Carl Meinhart, Numerical Design, Inc., UC Santa Barbara</td>
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</tr>
<tr>
<td>12:00PM</td>
<td>Lunch</td>
<td>Riverside Lawn</td>
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<tr>
<td>1:00PM</td>
<td>User Presentations</td>
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<tr>
<td>2:30PM</td>
<td>Coffee Break</td>
<td>Salon A-D</td>
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<tr>
<td>2:45PM</td>
<td>User Presentations and Focus Session</td>
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<tr>
<td></td>
<td>Focus Session: Best Practices in Nonlinear Materials Modeling</td>
<td>Salon G</td>
</tr>
<tr>
<td></td>
<td>Acoustics and Vibrations</td>
<td>CW Ballroom 3</td>
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<tr>
<td></td>
<td>Heat Transfer and Phase Change</td>
<td>Charles River West</td>
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<tr>
<td></td>
<td>Optics, Photonics, and Semiconductors 2</td>
<td>Salon H</td>
</tr>
<tr>
<td></td>
<td>Physiological Process Modeling</td>
<td>Salon F</td>
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<tr>
<td></td>
<td>Porous Media Flow and Transport Phenomena</td>
<td>CW Ballroom 2</td>
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<tr>
<td></td>
<td>RF, Microwave, and Plasma</td>
<td>CW Ballroom 4</td>
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<tr>
<td></td>
<td>Simulating Chemical Processes and Devices</td>
<td>Charles River East</td>
</tr>
<tr>
<td>4:15PM</td>
<td>Coffee Break</td>
<td>Salon A-D</td>
</tr>
<tr>
<td>4:30PM</td>
<td>Minicourses</td>
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</tr>
<tr>
<td></td>
<td>Acoustics and Vibrations</td>
<td>CW Ballroom 4</td>
</tr>
<tr>
<td></td>
<td>Automating Model Building Using the Application Builder</td>
<td>CW Ballroom 1</td>
</tr>
<tr>
<td></td>
<td>CFD 2: Turbulent, High Mach Number Flow, and Particle Tracing</td>
<td>Charles River West</td>
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<tr>
<td></td>
<td>Optimization</td>
<td>CW Ballroom 2-3</td>
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<tr>
<td></td>
<td>Hands-On: Chemical Engineering</td>
<td>Charles River East</td>
</tr>
<tr>
<td>6:00PM</td>
<td>Poster Session</td>
<td>Salon A-D</td>
</tr>
<tr>
<td>7:00PM</td>
<td>Gala Dinner</td>
<td>Salon E-H</td>
</tr>
<tr>
<td>8:30PM</td>
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</tr>
</tbody>
</table>
Conference Schedule

Friday, October 7

**Time** | **Event** | **Room**
--- | --- | ---
8:00 AM | Registration & Breakfast | Salon A-D
9:00 AM | Minicourses
Chemical Engineering 1: Chemical Reaction Engineering | CW Ballroom 1
Electromagnetics 3: Wave Electromagnetics, from RF to Optical | Charles River West
Heat Transfer 3: Heat Transfer with Phase Change | CW Ballroom 4
Postprocessing | CW Ballroom 2-3
Hands-On: Core Functionality | Charles River East

10:30 AM | Coffee Break | Salon A-D
11:00 AM | Awards and Keynote Session | Salon E-H
Awards Ceremony
Sebastien Perrier, Echologics Engineering

12:00 PM | Lunch | Riverside Lawn
1:30 PM | Exhibition Closes
1:30 PM | Minicourses
Chemical Engineering 2: Electrochemical Engineering | CW Ballroom 1
Electromagnetics 4: Ray Optics | CW Ballroom 2
Introduction to the Application Builder | Charles River West
MEMS Modeling | CW Ballroom 4
Solvers 3: Understanding Solvers and Hardware | CW Ballroom 3
Hands-On: Acoustics | Charles River East

3:00 PM | Conference Ends

Community Events

**NASA Tech Briefs Cocktail Reception**
Wednesday, 6:00 PM - 7:00 PM
Salon A-D
Meet and greet fellow COMSOL® Software users.

**Exhibition**
Wednesday, 1:00 PM - Friday 1:30 PM
Salon A-D
Learn about exhibitors’ products and services.

**Poster Session**
Thursday, 6:00 PM - 7:00 PM
Salon A-D
View the posters and meet the authors.

**Awards Ceremony**
Friday, 11:00 AM - 11:30 AM
Salon E-H
Celebrate the winners of the Best Poster and Best Paper awards.

Explore Boston

**Wednesday, 7:15 PM - 10:45 PM**
**Mit/Kendall Square**

Lunch
Wednesday, 12:00 PM - 1:00 PM
Thursday, 12:00 PM - 1:00 PM
Friday, 12:00 PM - 1:30 PM
Riverside Lawn
Enjoy lunch while overlooking the Charles River with beautiful fall foliage.

Gala Dinner
Thursday, 7:00 PM - 8:30 PM
Salon E-H
Taste everything from a great variety dinner buffet.

Veryst Engineering
Consulting for a nonlinear, multiphysics world

Using engineering fundamentals, modeling, and testing to solve complex industrial problems:
Biomedical / Consumer Products / Energy / Manufacturing / Transportation
Veryst Engineering, LLC / contact@veryst.com / 781-433-0433
Keynote Speakers

Svante Littmarck
PRESIDENT AND CEO, COMSOL, INC.
Multiphysics for Everyone

Wednesday - 3:00PM

Bernard McGarvey
ELI LILLY & COMPANY
This presentation will describe how one pharmaceutical company is leveraging modeling and the use of “first principles” thinking to improve initial process and equipment designs, to improve process troubleshooting, and to identify potential improvements in its products and manufacturing processes.

Thursday - 10:30AM

Ed Furlani
UNIVERSITY AT BUFFALO (UB) SUNY
From advancing fundamental understanding of physical phenomena to accelerating commercialization of newa technologies, we have applied COMSOL Multiphysics® software and the Application Builder to analyze multiphysics phenomena via custom-designed simulation apps.

Thursday - 11:00AM

Carl Meinhart
NUMERICAL DESIGN, INC./UNIVERSITY OF CALIFORNIA SANTA BARBARA
Because of the small length scales associated with microfluidics, electrical and magnetic fields can be used to drive fluid motion. This presentation will discuss how to simulate several microfluidic problems in COMSOL Multiphysics® relevant to academic research and product design.

Thursday - 11:30AM

Sebastien Perrier
ECHOLOGICS ENGINEERING
Acoustic-based leak detectors are often used to identify damage to buried pipe infrastructure, as local mechanical behavior can alter the detected speed of sound. Echologics enlisted the COMSOL® software and Application Builder to model such behavior and estimate the variation in speed of sound.

Friday - 11:00AM

3D IMAGE VISUALIZATION, ANALYSIS AND MODEL GENERATION SOFTWARE

Simpleware is the leading software solution for converting 3D image data (CT, micro-CT, FIB-SEM...) into simulation-ready models:

- Extensive 3D image processing tools
- Accurately quantify and analyze 3D models
- Customize workflows with scripting
- Unrivalled mesh accuracy
- Dedicated export to COMSOL Multiphysics® software

Visit www.simpleware.com for further details and to download a free trial version. Visit our booth at COMSOL Conference 2016 Boston.
## Minicourses

### COMSOL Fundamentals
- **Automating Model Building Using the Application Builder**
  - Thursday, 4:30PM
  - Commonwealth Ballroom 1
- **Equation Based Modeling**
  - Wednesday, 10:30AM
  - Commonwealth Ballroom 2-3
- **Geometry Modeling & CAD Import**
  - Wednesday, 10:30AM
  - Commonwealth Ballroom 1
- **Hands-On: Core Functionality**
  - Friday, 9:00AM
  - Charles River East
- **Intro to Building and Deploying Simulation Apps**
  - Wednesday, 9:00AM
  - Commonwealth Ballroom 2-4
- **Intro to Application Builder**
  - Wednesday 4:30PM
  - Commonwealth Ballroom 1
  - Friday 1:30pm
  - Charles River West
- **Meshing**
  - Thursday, 8:30AM
  - Commonwealth Ballroom 2-3
- **Optimization**
  - Thursday, 4:30PM
  - Commonwealth Ballroom 2-3
- **Postprocessing**
  - Friday, 9:00AM
  - Commonwealth Ballroom 2-3
- **Solvers 1: Understanding the Stationary Solvers**
  - Wednesday, 1:00PM
  - Commonwealth Ballroom 2-3
- **Solvers 2: Understanding the Time-Dependent Solvers**
  - Wednesday, 4:30PM
  - Commonwealth Ballroom 2-3
- **Solvers 3: Understanding Solvers and Hardware**
  - Friday, 1:30PM
  - Commonwealth Ballroom 3

### Electrical
- **Electromagnetics 1: Resistive and Capacitive Devices and Particle Tracing**
  - Wednesday, 4:30PM
  - Charles River West
- **Electromagnetics 2: Magnets, Coils, and Motors**
  - Thursday, 8:30AM
  - Commonwealth Ballroom 1
- **Electromagnetics 3: Wave Electromagnetics, from RF to Optical**
  - Friday, 9:00AM
  - Charles River West
- **Electromagnetics 4: Ray Optics**
  - Friday, 1:30PM
  - Commonwealth Ballroom 2
- **Hands-On: Electromagnetics**
  - Wednesday, 10:30AM
  - Charles River East

### Mechanical
- **Acoustics & Vibrations**
  - Thursday, 4:30PM
  - Commonwealth Ballroom 4
- **Hands-On: Structural Mechanics**
  - Thursday, 8:30AM
  - Charles River East
- **Heat Transfer 1: Conduction and Convection**
  - Wednesday, 10:30AM
  - Commonwealth Ballroom 1
- **Heat Transfer 2: Radiation**
  - Thursday, 8:30AM
  - Commonwealth Ballroom 4
- **Heat Transfer 3: Heat Transfer with Phase Change**
  - Friday, 9:00AM
  - Commonwealth Ballroom 4
- **MEMS Modeling**
  - Friday, 1:30PM
  - Commonwealth Ballroom 4
- **Structural Mechanics 1: Statics and Dynamics**
  - Wednesday, 1:00PM
  - Commonwealth Ballroom 4
- **Structural Mechanics 2: Nonlinearity and Fatigue**
  - Wednesday, 4:30PM
  - Commonwealth Ballroom 4

### Fluid
- **CFD 1: Laminar and Microfluidic Flow and Particle Tracing**
  - Thursday, 8:30AM
  - Charles River West
- **CFD 2: Turbulent, High Mach Number Flow, and Particle Tracing**
  - Thursday, 4:30PM
  - Charles River West
- **Fluid-Solid Interactions**
  - Wednesday, 10:30AM
  - Charles River West
- **Hands-On: CFD**
  - Wednesday, 4:30PM
  - Charles River East
- **Porous Media Flow**
  - Wednesday, 1:00PM
  - Commonwealth Ballroom 1

### Chemical
- **Chemical Engineering 1: Chemical Reaction Engineering**
  - Friday, 9:00AM
  - Commonwealth Ballroom 1
- **Chemical Engineering 2: Electrochemical Engineering**
  - Friday, 1:30PM
  - Commonwealth Ballroom 1
- **Hands-On: Chemical Engineering**
  - Thursday, 4:30PM
  - Charles River East

### Interfacing
- **Livelink™ for MATLAB®**
  - Wednesday, 1:00PM
  - Charles River West
# User Presentations 1:00PM - 2:30PM

## Bioscience and Bioengineering

**Thursday, 1:00PM - 2:30PM, Commonwealth Ballroom 3**

### SESSION CHAIR
Beth Israel Deaconess Medical Center
Kris Carlson

#### Ion Concentration and Electromechanical Actuation Simulations of Ionic Polymer-Metal Composites
K. J. Kim, T. Stalbaum, Q. Shen
1. Department of Mechanical Engineering, University of Nevada, Las Vegas, NV, USA

#### Advanced Regulatory Science through Integrative Engineering with COMSOL Multiphysics® Software
G. Zhang
1. Clemson University, Clemson, SC, USA

#### Development of an Oxygen-Conserving Mask for Pediatric Patients in Low-Resource Settings
D. Gasperino
1. Intellectual Ventures Laboratory, Bellevue, WA, USA

#### Advanced Modeling of a Lung-on-a-Chip Microdevice
M. J. Hancock, N. H. Elabbasi
1. Veryst Engineering, Needham, MA, USA

#### How Finite Element Analysis Revolutionized a 100-Year Old Equation
K. Carlson, J. Arle, L. Mei, J. L. Shils
1. Beth Israel Deaconess Medical Center/Harvard Medical School, Boston, MA, USA
2. Rush Medical Center, Chicago, IL, USA

#### Simulating Spiking Neurons Using a Simple Mathematical Model
S. Kirigeeganage, J. Naber, D. Jackson, R. Keynton, T. Roussel
1. University of Louisville, Louisville, KY, USA

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## Computational Fluid Dynamics

**Thursday, 1:00PM - 2:30PM, Charles River West**

### SESSION CHAIR
US Army
Viral Panchal

#### Efficiency of a Vertical Axis Wind Turbine (VAWT) with Airfoil Pitch Control
J. Ma, C. Koutsougeras, H. Luo
1. Sam Houston State University, Huntsville, TX, USA
2. Southeastern Louisiana University, Hammond, LA, USA

#### Simulation of a Dynamic Scraped Surface Heat Exchanger for a Non-Newtonian Paste
S. Birla
1. ConAgra Foods, Omaha, NE, USA

#### Equation-Based Modeling: Simulation of a Flow with Concentrated Vorticity in an Unbounded Domain
J. M. Russell
1. Florida Institute of Technology, Melbourne, FL, USA

#### Reynolds Number and Geometry Configuration Effect on Secondary Flows in S-Shaped Circular Bends
O. Ayala, M. F. Degenring Oliveira, P. Loures
1. Department of Engineering Technology, Old Dominion University, Norfolk, VA, USA
2. Brazil Scientific Mobility Program, CAPES, Brasilia DF, Brazil

#### Secondary Flow of Liquid–liquid Two-Phase Fluids in a Pipe Bend
M. Ayala, P. Santos, G. Hamester, O. Ayala
1. Department of Mechanical Engineering, Universidad de Oriente, Puerto La Cruz, Venezuela
2. Brazil Scientific Mobility Program, CAPES, Brasilia DF, Brazil
3. Department of Engineering Technology, Old Dominion University, Norfolk, VA, USA

#### The Use of Finite Element Analysis in the Design of Oil-Water Separators
M. E. Wanas, Y. M. Elshazly, D. A. ElGayar
1. Chemical Engineering Department, Faculty of Engineering, University of Alexandria, Alexandria, Egypt

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## Electromagnetic Applications

**Thursday, 1:00PM - 2:30PM, Commonwealth Ballroom 2**

### SESSION CHAIR
Faraday Future, Inc.
Anandakumar Subbiah

#### Genetic Algorithm Based Multi-Objective Optimization of Electromagnetic Components using COMSOL® and MATLAB® Software
A. Subbiah, O. Laldin
1. Faraday Future, Inc., Hayward, CA, USA

#### Maximizing the Fatigue Crack Response in Surface Eddy Current Inspections of Aircraft Structures
C. Mandsche, T. Theodoulidis
1. National Research Council Canada, Ottawa, ON, Canada
2. University of Western Macedonia, Kozani, Western Macedonia, Greece

#### Numerical Modeling of Magnetic Field Emissions From am HDD Walkover Locating System
A. Jaganathan, J. Montoute
1. Louisiana Tech University, Ruston, LA, USA

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For the most up to date list of presentations visit: [https://www.comsol.com/conference/user-presentations](https://www.comsol.com/conference/user-presentations)
User Presentations 1:00PM - 2:30PM

### Multiphysics Flow with Particle Tracing

**Thursday, 1:00PM - 2:30PM, Commonwealth Ballroom 4**

**Simulating Fluid Flow through a Culture Chip for Cell Migration Studies in Microgravity**
A. Dhall 1, T. Masiello 1, L. Butt 1, M. Strohmayer 1, M. Hemachandra 1, N. Tokranova 1, J. Castracane 1
1 Colleges of Nanoscale Science and Engineering, SUNY Polytechnic Institute, Albany, NY, USA

**Quantitative Assessment of Secondary Flows of Single-phase Fluid through Pipe Bends**
Z. Kaldy 1, O. Ayala 1
1 Department of Engineering Technology, Old Dominion University, Norfolk, VA, USA

**Sample Preconcentration in Channels with Nonuniform Surface Charge and Thick Electric Double Layers**
A. Eden 1, C. McCallum 1, C. D. Meinhart 1, S. Pennathur 1, B. Storey 1
1 University of California Santa Barbara, Santa Barbara, CA, USA
2 Olin College, Needham, MA, USA

**Study of Particle Collection Using Magnets**
M. D. Cheng 1
1 Oak Ridge National Laboratory, Oak Ridge, TN, USA

**Simulation of the Flow of an Autonomous Spherical Ball inside a Pipeline**
W. Chalgham 1, A. C. Seibi 1, M. Mokhtari 1
1 University of Louisiana at Lafayette, Lafayette, LA, USA

### Multiphysics Modeling with Heat Transfer

**Thursday, 1:00PM - 2:30PM, Salon F**

**Effect of Proximity on the Thermal Rating of a Single Power Cable in Ventilated Tunnels**
F. Boukrouche 1, C. Moreau 1, W. Frelin 1, S. Harmand 1, J. Pelle 1, F. Beaubert 1, G. Moreau 1, EDF R&D, Paris, France
1 University of Valenciennes, Valenciennes, France
2 EDF CIST, Paris, France

**Thermo-mechanical Modeling of Pu-238 Production Target at HFIR**
C. J. Hurt 1, J. D. Freels 1
1 Oak Ridge National Laboratory, Oak Ridge, TN, USA

**A COMSOL Multiphysics® Software Analysis of Beam Tube Cooling in the High Flux Isotope Reactor of ORNL**
J. D. Freels 1
1 Research Reactors Division, Oak Ridge National Laboratory, Oak Ridge, TN, USA

**Thermohydraulic Study of a Fixed Bed for the Core of a Nuclear Reactor**
J. C. Almachi 1, J. A. Montenegro 1
1 Departamento de Formación Básica, Escuela Politécnica Nacional, Quito, Pichincha, Ecuador

**Modeling Research Reactor Fuel Plate Hotspots with the Thin Layer and Thermal Contact Feature in COMSOL Multiphysics® Software**
M. J. Richards 1, A. E. Ruggles 1, J. D. Freels 1
1 Bredesen Center for Interdisciplinary Research and Graduate Education, University of Tennessee, Knoxville, TN, USA
2 Department of Nuclear Engineering, University of Tennessee, Knoxville, TN, USA
3 Research Reactors Division, Oak Ridge National Laboratory, Oak Ridge, TN, USA

### Optics, Photonics, and Semiconductors 1

**Thursday, 1:00PM - 2:30PM, Salon H**

**Design of Next Generation Mid-infrared Fiber Optics**
X. Ji 1, V. Gopalan 1, R. Page 2
1 Pennsylvania State University, State College, PA, USA
2 Pacific Lutheran University, Tacoma, WA, USA

**Extraordinary Optical Transmission in Copper-Based Devices at Terahertz Frequencies**
S. Almousa 1, J. A. Deibel 1
1 Department of Physics, Wright State University, Dayton, OH, USA

**The COMSOL Multiphysics® Software as a Metasurfaces Design Tool for Plasmonic-Based Flat Lenses**
B. Adomanis 1, M. Marciniak 1, D. B. Burckel 1
1 Air Force Institute of Technology, Wright-Patterson AFB, OH, USA
2 Sandia National Laboratories, Albuquerque, NM, USA

**Optimizing the Fluorescence of Diamond Color Centers Encapsulated into Core-Shell Nano-Resonators**
M. Csete 1, L. Z. Szabó 2, A. Szenes 1, G. Szabó 1, B. Bánhelyi 1, T. Csendes 1
1 Department of Optics and Quantum Electronics, University of Szeged, Szeged, Hungary
2 Institute of Informatics, University of Szeged, Szeged, Hungary

**Thermal Corrective Devices for Advanced Gravitational Wave Interferometers**
M. Kasprzack 1, J. Ramette 1
1 Louisiana State University, Baton Rouge, LA, USA
2 Hillsdale College, Hillsdale, MI, USA
<table>
<thead>
<tr>
<th><strong>Optimization and Simulation Methods</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thursday, 1:00pm - 2:30pm, Commonwealth Ballroom 1</strong></td>
<td><strong>SESSION CHAIR</strong> Peter Lyu COMSOL, Inc.</td>
</tr>
<tr>
<td>Comparison of User vs. COMSOL® Developed Automated Installation Verification of COMSOL Multiphysics® Software</td>
<td>Optimization of Microstructures Used in CMOS-MEMS Devices Based on a Topological Design Process</td>
</tr>
<tr>
<td>M. W. Crowell ¹</td>
<td>J. Mares-Carreño ¹, G. S. Abarca-Jiménez ², M. A. Reyes-Barranca ³</td>
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<td>¹Oak Ridge National Laboratory, Oak Ridge, TN, USA</td>
<td>²Escuela Superior de Ingeniería Mecánica y Eléctrica, Instituto Politécnico Nacional, Ciudad de México, D.F., Mexico</td>
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<tr>
<th><strong>Structural Mechanics and Thermal Stress</strong></th>
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<td><strong>Thursday, 1:00pm - 2:30pm, Charles River East</strong></td>
<td><strong>SESSION CHAIR</strong> Mukund Karwe Rutgers University</td>
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<tr>
<td>S. Zhuang ¹</td>
<td>J. R. Chase ¹</td>
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<td>¹CAEaid, Inc., Austin, TX, USA</td>
<td>¹Alphabet Energy, Hayward, CA, USA</td>
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<tr>
<td>N. Nama ¹, T. J. Huang ¹, F. Costanzo ¹</td>
<td>B. Liu ¹</td>
</tr>
<tr>
<td>¹Department of Engineering Science and Mechanics, Pennsylvania State University, PA, USA</td>
<td>¹Monmouth University, West Long Branch, NJ, USA</td>
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**Import data into COMSOL® software from MatWeb’s database of over 115,000 Polymers, Alloys, Composites, and more!**

www.matweb.com/comsol
Focus Session: Best Practices in Nonlinear Materials Modeling

Thursday, 2:45PM - 4:15PM, Salon G

Best Practices in Nonlinear Materials Modeling
H. Sonnerlind 1
1COMSOLAB, Stockholm, Sweden

Nonlinear Mechanical Modeling of Thermoplastics
J. Bergstrom 1, N. Elabbasi 1
1Veryst Engineering, Needham, MA, USA

COMSOL Multiphysics® Software Simulation Application for Thermoplastics Viscosity Measurement
Q. Guo 1, S. Ahmed 2
1EHC Canada, Inc., Oshawa, ON, Canada
2University of Ontario Institute of Technology, Oshawa, ON, Canada

Acoustics and Vibrations

Thursday, 2:45PM - 4:15PM, Commonwealth Ballroom 3

Acoustic Wave Crack Detection: A First Principles Approach
R. W. Pryor 1
1Pryor Knowledge Systems, Inc., Bloomfield Hills, MI, USA

CFD Analysis of a Macroscale Ultrasonic Separator
K. Chitale 1, W. Prew Jr. 1, B. Lipkens 2
1FloDesign Sonics Inc., Wilbraham, MA, USA
2FloDesign Sonics Inc, Wilbraham, MA, USA and Western New England University, Springfield, MA, USA

Design of a Self-Recharging Untethered Mobile Inspection Tool inside a Pipeline
W. Chalgham 1, A. C. Seibi 1
1University of Louisiana at Lafayette, Lafayette, LA, USA

Modeling the Acoustic Scattering from Objects Buried in Porous Sediment Using COMSOL Multiphysics® Software
A. Bonomo 1, M. Isakson 1
1Applied Research Laboratories, The University of Texas at Austin, Austin, TX, USA

Simulation and Testing of a Tunable Organ Pipe for Ocean Acoustic Tomography
A. K. Morozov 1
1Teledyne Technologies Inc., Falmouth, MA, USA

Heat Transfer and Phase Change

Thursday, 2:45PM - 4:15PM, Charles River West

Glass Transition of ABS in 3D Printing
M. Rahman 1, N. R. Schott 2, L. K. Sadhu 3
1North South University, Dhaka, Bangladesh
2Department of Plastics Engineering, University of Massachusetts - Lowell, Lowell, MA, USA
3IRays Teknology Ltd., Dhaka, Bangladesh

Heat Transfer Optimization of a Solar Radiation Concrete Oven for Rural Areas
I. Abu-Mahfouz 1, G. F. Mathews IV 1, M. J. Young 1
1Penn State University Harrisburg, Middletown, PA, USA

Heat Transfer Simulation for Reliability Estimation of Additive Manufacturing Process using COMSOL Multiphysics® Software
K. W. K. Leung 1, A. Keshtgar 1, N. Iyyer 1
1Technical Data Analysis, Inc., Falls Church, VA, USA

Modeling Scheil Cooling of a Metal Alloy: Thermodynamic and Multiphysics Solidification
T. Marin-Alvarado 1
1M4Dynamics, Toronto, ON, Canada

Simulation and Validation of Seasonal Soil Temperature Variations Using COMSOL Multiphysics® Software
L. J. Matel 1
1Green Streets Infrastructure LLC, Seattle, WA, USA

Theoretical and Experimental Validation of Micro Hot Embossing on Polymeric Substrates
F. Lai 1, N. K. Shivaprakash 1, J. Zhang 1, A. Panwar 1, J. Mead 3, C. Barry 1, Q. Truong 1
1University of Massachusetts Lowell, Lowell, MA, USA
2US Army Natick Soldier Research, Development and Engineering Center, Natick, MA, USA

User Presentations 2:45PM - 4:15PM
### Optics, Photonics, and Semiconductors 2

**Thursday, 2:45PM - 4:15PM, Salon H**

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</thead>
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<tr>
<td>Genetic Algorithm for Geometry Optimization of Optical Antennas</td>
<td>R. Diaz de Leon 1, G. Gonzalez 1, F. J. Gonzalez 1, A. G. Rodriguez 1, E. Flores 1</td>
<td>Universidad Autonoma de SLP, San Luis Potosi, S.L.P., Mexico</td>
</tr>
<tr>
<td>Highly Sensitive Grating-Coupled Bloch Surface Wave Resonance Biosensor via Azimuthal Interrogation</td>
<td>V. Koju 1, W. M. Robertson 1</td>
<td>Middle Tennessee State University, Murfreesboro, TN, USA</td>
</tr>
<tr>
<td>Modeling of a Diffraction Grating Coupled Waveguide Based Biosensor for Microfluidic Applications</td>
<td>Y. Wu 1, M. L. Adams 1</td>
<td>Auburn University, Auburn, AL, USA</td>
</tr>
<tr>
<td>Simulation of Diffuse Optical Tomography using COMSOL Multiphysics</td>
<td>S. A. M. Kirmani 1, L. Velmanickam 1, I. T. Lima Jr. 1, D. Nawarathna 1, S. S. Sherif 2</td>
<td>North Dakota State University, Fargo, ND, USA</td>
</tr>
<tr>
<td>Transformation Optics Simulation Method for Stimulated Brillouin Scattering</td>
<td>R. Zecca 1, P. T. Bowen 1, D. R. Smith 1, S. Larouche 1</td>
<td>Center for Metamaterials and Integrated Plasmonics, Department of Electrical and Computer Engineering, Duke University, Durham, NC, USA</td>
</tr>
<tr>
<td>Vibrational Modes and Optical Photon Dispersion in Silicon Metalattices</td>
<td>Y. Xiong 1</td>
<td>Institut Tecnologico de SLP, San Luis Potosi, S.L.P., Mexico</td>
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</table>

### Physiological Process Modeling

**Thursday, 2:45PM - 4:15PM, Salon F**

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<td>Effect of Viscosity of Food on Digestion and Nutrient Absorption in the Human Small Intestine</td>
<td>J. S. Kartibkeyan 1, D. Salvi 1, M. V. Karwe 1</td>
<td>Rutgers University, New Brunswick, NJ, USA</td>
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<tr>
<td>Simulating Light Propagation during I-PDT of Locally Advanced Head and Neck Cancer</td>
<td>E. Oakley 1, H. Arshad 1, G. Shafrstein 1</td>
<td>Roswell Park Cancer Institute, Buffalo, NY, USA</td>
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<tr>
<td>Transdermal Drug Delivery with Permeation Enhancer</td>
<td>A. Kermani 1, N. Elbabas 1</td>
<td>Veryst Engineering, Needham, MA, USA</td>
</tr>
<tr>
<td>Development of an Oxygen-Conserving Mask for Pediatric Patients in Low-Resource Settings</td>
<td>D. Gasperino 1</td>
<td>Intellectual Ventures Laboratory, Bellevue, WA, USA</td>
</tr>
<tr>
<td>Control-Release Anesthetics to Enable an Integrated Anesthetic-MSC Therapeutic</td>
<td>T. Maguire 1, M. Davis 1, I. Marrero-Berrios 1, C. Zhu 1, R. S. Schliss 1, M. Yarmush 1, C. Gaughan 1, J. Weinberg 1, D. Manchikalapati 1, J. SchemiodiCola 1, R. Davis 1</td>
<td>Rutgers University, New Brunswick, NJ, USA, BeauRidge Pharmaceuticals, New York, NY, USA, Department of Anesthesiology, New York Methodist Hospital, Brooklyn, NY, USA</td>
</tr>
<tr>
<td>Modeling of the Singlet Oxygen Distribution in Photofrin Photodynamic Therapy of the Plural Cavity</td>
<td>R. Penjweini 1, T. C. Zhu 1, M. M. Kim 1</td>
<td>Department of Radiation Oncology, School of Medicine, University of Pennsylvania, Philadelphia, PA, USA</td>
</tr>
<tr>
<td>Using COMSOL Multiphysics® Software for Benchmarking Problems in Cell Migration</td>
<td>M. Nickaen 1, I. L. Novak 1, B. M. Slepenchenko 1, A. Mogilner 1</td>
<td>Richard D. Berlin Center for Cell Analysis and Modeling, University of Connecticut Health Center, Farmington, CT, USA, Courant Institute and Department of Biology, New York University, New York, NY, USA</td>
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### Porous Media Flow and Transport Phenomena

**Thursday, 2:45PM - 4:15PM, Commonwealth Ballroom 2**

<table>
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<tr>
<th>Title</th>
<th>Authors</th>
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<tr>
<td>Pore-Level Bénard–Marangoni Convection in Microgravity</td>
<td>P. Mohammadmoradi 1, A. Kantzas 1</td>
<td>University of Calgary, Calgary, AB, Canada</td>
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<td>On the Limitations of Breakthrough Curve Analysis in Fixed-Bed Adsorption</td>
<td>J. Knox 1</td>
<td>Marshall Space Flight Center - NASA, Huntsville, AL, USA</td>
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<td>CFD Simulation of Pore Pressure Oscillation Method to Measure the Permeability of Tight Formations</td>
<td>M. Mohktari 1, S. A. Madani 1, A. Seibi 1</td>
<td>Department of Petroleum Engineering, University of Louisiana at Lafayette, Lafayette, LA, USA</td>
</tr>
<tr>
<td>A Virtual Laboratory for the 4 Bed Molecular Sieve of the Carbon Dioxide Removal Assembly</td>
<td>R. Coker 1, J. Knox 1, B. O’Connor 1</td>
<td>Marshall Space Flight Center - NASA, Huntsville, AL, USA</td>
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### RF, Microwave, and Plasma

**Analysis of a Prototype MRI Hybrid Birdcage RF Coil with Uncertainty Quantification (*)**

J. T. Fong 1
1 National Institute of Standards & Technology, Gaithersburg, MD, USA

**Multiphysics Analysis of RF Cavities for Particle Accelerators: Perspective and Overview**

M. Awida 1
1 Fermi National Particle Accelerator Laboratory, Warrenville, IL, USA

**Electromagnetic Modeling of a Millimeter-Wavelength Resonant Cavity**

J. C. Weatherall 1, J. Barber 1, J. Greca 1, B. T. Smith 1
1 Battelle Memorial Institute, Norwell, MA, USA

### Radio Frequency Tissue Ablation Simulation with COMSOL Multiphysics® Software

N. Elabbasi 1, M. Hancock 1
1 Veryst Engineering, Needham, MA, USA

### Simulating Chemical Processes and Devices

**A COMSOL Multiphysics® Software Interface with GEMS3K for Modeling Reactive Transport (Geo)Chemical Processes**

O. B. Isgor 1, V. J. Azad 1
1 Oregon State University, Corvallis, OR, USA

**Uniform Reaction Rates and Optimal Porosity Design for Hydrogen Fuel Cells**

J. H. Al-Smail 1
1 King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia

**Modeling of Mixing-Sensitive Pharmaceutical Drug Substance Processes in Batch Reactors**

F. Akpinar 1, B. Cohen 1, J. Tabora 1, A. Glace 1, K. Lauser 1, F. Lora Gonzalez 1, J. Albrecht 1
1 Bristol-Myers Squibb, New Brunswick, NJ, USA

**Effect of Pretreatments on Throwing Power of Sacrificial Metallic Coatings**

J. S. Lee 1
1 Naval Research Laboratory, Stennis Center, MS, USA
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<td>3D Simulation of the Electric Field of Polymeric Insulators under Adverse Conditions</td>
<td>D. F. Reis 1, E. J. da Silva 1, I. J. S. Lopes 1</td>
<td>Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil</td>
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<tr>
<td></td>
<td>A Field Simulator for Permanent Magnet Applications</td>
<td>Fuxin Dare Auto Parts, Ltd., Fuxin, China, Shenzhen South Dare Auto Parts, Ltd., Shenzhen, China</td>
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<td></td>
<td>A Flow and Transport Model of Catalytic Multi-Pump Systems with Parametric Dependencies</td>
<td>A. Sen 1, D. Myers 1, A. Altemose 1, Department of Chemistry, Pennsylvania State University, University Park, PA, USA</td>
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<td></td>
<td>A Novel Plug n Play MEMS-Based DNA Microarray</td>
<td>K. Jindal 1, V. Grover 1, B. Nayak 1, Birla Institute of Technology and Science - Pilani, Ghaziabad, Uttar Pradesh, India</td>
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<td>A Virtual Product Development Environment for Electronic Hydraulic Power Steering Pump via Multiphysics Modeling</td>
<td>F. Qi 1, J. Men 1, L. Yang 1, Z. Bing 1, J. Yang 1, F. He 1, L. Pan 1, Z. Shao 1, G. Gao 1, X. Zhang 1, H. Wei 1, S. Du 1, L. Song 1, X. Wang 1, Z. Wang 1, G. Wei 1, Y. Li 1, Y. Yang 1, Z. Ma 1, B. Li 1, Y. Zhang 1, Y. Li 1, Y. Xie 1, D. Yu 1, FZB Technology, Inc., Plymouth, MI, USA, Shenzhen South Dare Auto Parts, Ltd., Shenzhen, China, Fuxin Dare Auto Parts, Ltd., Fuxin, China</td>
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<td>Absorption and Scattering of Gold Nanoparticles</td>
<td>I. Bariaikhtar 1, Boston College, Chestnut Hill, MA, USA</td>
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<td></td>
<td>Acoustic Wave Crack Detection: A First Principles Approach</td>
<td>R. W. Pryor 1, Pryor Knowledge Systems, Inc., Bloomfield Hills, MI, USA</td>
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<td></td>
<td>Advanced Techniques for Predicting Mechanical Product Design via COMSOL Multiphysics® Software</td>
<td>S. Zhuang 1, CAEaid, Inc., Austin, TX, USA</td>
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<td>Advancing Regulatory Science through Integrative Engineering with COMSOL Multiphysics® Software</td>
<td>G. Zhang 1, Clemson University, Clemson, SC, USA</td>
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<td>Aerodynamic Analysis of a Ski Jumper: a CFD Approach</td>
<td>R. Latchman 1, A. Pooransingh 1, The University of the West Indies, St. Augustine, Trinidad and Tobago</td>
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<td>An Exploration of Heat Dissipation in Microchips Through the Use of Microchannels</td>
<td>S. Bose 1, J. Drewery 1, A. Kaushtik 1, R. Mays 1, Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, Philadelphia, PA, USA</td>
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<td>Analysis of an Automobile Disc Brake</td>
<td>H. Krishnan 1, T. Zhu 1, Y. Zeng 1, University of California Los Angeles, Los Angeles, CA, USA</td>
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<td>Analysis of Deformation of a Liquid Packaging Made With Board of the LPB Type</td>
<td>K. B. Matos 1, I. Neitzel 1, FATEB, Telêmaco Borba, PR, Brazil</td>
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<td>Calculation of Inductance of Sparsely Wound Toroidal Coils</td>
<td>A. Pokryvalov 1, Spellman High Voltage Electronics Corporation, Hauppauge, NY, USA</td>
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<td></td>
<td>CFD Simulation of Coolant Flow of 2nd Generation HIFIR Irradiation Target Holder</td>
<td>J. D’Arrigo 1, A. Ezzawawy 1, S. Rabban 1, J. D. Freels 1, Vaughn College of Aeronautics and Technology, New York, NY, USA, Oak Ridge National Laboratory, Oak Ridge, TN, USA</td>
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<td>Comparison of 2D and 3D FEM Models of Eddy Current Pressure Tube to Calandria Tube Gap Measurement</td>
<td>G. Klein 1, J. Morelli 1, T. Krause 1, Queen’s University, Kingston, ON, Canada, Royal Military College of Canada, Kingston, ON, Canada</td>
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<td>Comparison of User vs. COMSOL® Developed Automated Installation Verification of COMSOL Multiphysics® Software</td>
<td>M. W. Crowell 1, Oak Ridge National Laboratory, Oak Ridge, TN, USA</td>
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<td>Computational Evaluation of Improved Anaerobic Digestion Reactor Designs</td>
<td>A. A. Forbis-Stokes 1, M. A. Deshusses 1, Duke University, Durham, NC, USA</td>
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<td>COMSOL Multiphysics® Software as a Metasurfaces Design Tool for Plasmonic-Based Flat Lenses</td>
<td>B. Adomantis 1, D. B. Burckel 1, M. Marciniak 1, Air Force Institute of Technology, Wright-Patterson AFB, OH, USA, Sandia National Laboratories, Albuquerque, NM, USA</td>
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<td>COMSOL Multiphysics® Software: Simplifying Workflow and Promoting Innovations in Nuclear Engineering at ORNL</td>
<td>P. K. Jain 1, J. D. Freels 1, Oak Ridge National Laboratory, Oak Ridge, TN, USA</td>
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<td>Control-Release Anesthetics to Enable an Integrated Anesthetic-MSC Therapeutic</td>
<td>T. Maguire 1, M. Davis 1, I. Marrero-Berrios 1, C. Zhu 1, C. Gaughan 1, J. Weinberg 1, D. Manchikapally 1, J. SchianoDiCola 1, R. S. Schloss 1, J. Yarmush 1, M. Yarmush 1, Rutgers University, New Brunswick, NJ, USA, BayBridge Pharmaceuticals, New York, NY, USA, Department of Anesthesiology, New York Methodist Hospital, Brooklyn, NY, USA</td>
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<td>Controlled Delivery to Olfactory Region Using Magnetophoretic Guidance in Intranasal Ferro-fluids</td>
<td>J. Xi 1, Z. Zhang 1, X. Si 1, Central Michigan University, Mount Pleasant, MI, USA, California Baptist University, Riverside, CA, USA</td>
</tr>
<tr>
<td>Title</td>
<td>Authors</td>
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| Coupled Computational Fluid Dynamics (CFD) and Artificial Neural Networks (ANNs) for Prediction of Thermal-hydraulic Performance of Plate-fin-tube Heat Exchangers | W. Yaidi 1, E. Entchev 1  
1 Renewable Energy, Heat and Power Laboratory, CanmetENERGY Research Centre, Natural Resources Canada, Ottawa, ON, Canada |
| Direct Numerical Simulation of Time Evolution of Vortex Ring          | M. Hashiguchi 1  
1 Keisoku Engineering System Co., Ltd., Chiyoda-ku, Tokyo, Japan |
| Effect of Viscosity of Food on Digestion and Nutrient Absorption in the Human Small Intestine | J. S. Kartzkeyan 1, D. Salvi 2, M. V. Karwe 3  
1 Rutgers University, New Brunswick, NJ, USA |
| Electromagnetic(EM) and Thermal Characterization of a Microwave Oven in COMSOL Multiphysics® Software | S. Fuji 1, E. Suzuki 2  
1 National Institute of Technology, Okinawa College, Nago, Okinawa, Japan  
2 Tokyo Institute of Technology, Meguro, Tokyo, Japan |
| Finite Element Analysis of Contact Studies of Radio Frequency MEMs Switch Membranes | J. Liu 1, V. B. Chalivendra 1, C. Goldsmith 1, W. Huang 1  
1 University of Massachusetts - Dartmouth, Dartmouth, MA, USA |
| Flow Distributor Optimization in a Tubular Reactor                   | J. O. R. Lizarazo 1, L. A. S. Mejia 1, M. I. J. Gutierrez 1, J. A. P. Avella 1  
1 Grupo de Investigaciones en Minerales, Biohidrometallurgia y Ambiente - GIMBA, Universidad Industrial de Santander, Bucaramanga, Santander, Colombia |
| Genetic Algorithm Based Multi-Objective Optimization of Electromagnetic Components using COMSOL® and MATLAB® Software | A. Subblia 1, O. Ladin 1  
1 Faraday Future, Inc., Hayward, CA, USA |
| Highly Sensitive Grating-Coupled Bloch Surface Wave Resonance Biosensor via Azimuthal Interrogation | V. Koju 1, W. M. Robertson 1  
1 Middle Tennessee State University, Murfreesboro, TN, USA |
| How Finite Element Analysis Revolutionized a 100-Year Old Equation    | K. Carlson 1, J. Arle 1, J. L. Shils 2, L. Mei 1  
1 Beth Israel Deaconess Medical Center/Harvard Medical School, Boston, MA, USA  
2 Rush Medical Center, Chicago, IL, USA |
| Ion Concentration and Electromechanical Actuation Simulations of Ionic Polymer-Metal Composites | K. J. Kim 1, T. Stalbaum 1, Q. Shen 1  
1 Department of Mechanical Engineering, University of Nevada, Las Vegas, NV, USA |
| Kinetics of Proteins in the Blood-Brain Barrier                      | K. Gandhi 1  
1 University of California, Riverside, CA, USA |
| Magnetically-Induced Displacement Force on Medical Devices in the Magnetic Resonance Environment | A. Ferreira 1, O. Chiico 1, R. Siskey 2  
1 Drexel University, Philadelphia, PA, USA  
2 Exponent Failure Analysis Associates, Philadelphia, PA, USA |
| Modeling of a Diffraction Grating Coupled Waveguide Based Biosensor for Microfluidic Applications | Y. Wu 1, M. L. Adams 1  
1 Auburn University, Auburn, AL, USA |
| Modeling of Mixing-Sensitive Pharmaceutical Drug Substance Processes in Batch Reactors | F. Alpinar 1, B. Cohen 1, J. Tabora 1, A. Glace 2  
1 Bristol-Myers Squibb, New Brunswick, NJ, USA  
2 Rutgers University, New Brunswick, NJ, USA |
| Modeling of the Singlet Oxygen Distribution in Photofrin-Photodynamic Therapy of the Plural Cavity | R. Penjweini 1, T. C. Zhu 1, M. M. Kim 3  
1 Department of Radiation Oncology, School of Medicine, University of Pennsylvania, Philadelphia, PA, USA |
| Modeling the Behavior of a Composite Riser                          | C. V. Amaechi 1, J. Ye 1  
1 Lancaster University, Lancaster, United Kingdom |
Modeling, Simulation, and Optimization of Piezoelectric Bimorph For Broadband Energy Harvesting
N. Chen 1, V. Bedekar 2
1 Middle Tennessee State University, Murfreesboro, TN, USA

Multiple-Mode Polymeric-Silicon Dual-Channel Gas Sensors
K. Liang 1, A. Dodabalapur 1, D. Sharma 1
1 Microelectronics Research Center, University of Texas, Austin, TX, USA

Numerical Simulation and Thermal Analysis of Tumor in the Human Body
S. Hossain 1, F. A. Mohammadi 1
1 Department of Electrical and Computer Engineering, Ryerson University, Toronto, ON, Canada

Numerical Simulation of Electromagnetic Convection-Enhanced Delivery of Macromolecules
Y. Ou 1, A. Jaquins-Gerstl 1, S. G. Weber 1
1 Department of Chemistry, University of Pittsburgh, Pittsburgh, PA, USA

Numerical Study of Secondary Flows in a Sinusoidal Pipe
O. Ayala 1, J. Ahumada 1, L. Renaudin 1
1 Engineering Technology Department, Old Dominion University, Norfolk, VA, USA
2 Brazil Scientific Mobility Program, CAPES, Brasilia DF, Brazil

Optimization of an Electrochemistry System
D. Mi 1
1 KEISOKU Engineering System Co., Ltd., Chiyoda-ku, Tokyo, Japan

Permeation of Chemicals Through Pipes or Hoses
R. Kher 1
1 University of Pittsburgh, Pittsburgh, PA, USA

Predicting Critical Current as a Function of Magnetic Field in High-Temperature Superconductors
J. Doody 1, P. Michael 1, R. Viera 1, W. Beck 1, L. Zhou 1, J. Irby 1
1 Massachusetts Institute of Technology - Plasma Science and Fusion Center, Cambridge, MA, USA

Quantitative Assessment of Secondary Flows of Single-phase Fluid through Pipe Bends
Z. Kaldy 1, O. Ayala 1
1 Department of Engineering Technology, Old Dominion University, Norfolk, VA, USA

Radio Frequency Tissue Ablation Simulation with COMSOL Multiphysics® Software
N. Elabbasi 1, M. Hancock 1
1 Veryst Engineering, Needham, MA, USA

Relativistic Quantum Mechanics Applications Using the Time Independent Dirac Equation in COMSOL Multiphysics® Software
A. J. Kalinowski 1
1 Consultant, East Lyme, CT, USA

Sample Preconcentration in Channels with Nonuniform Surface Charge and Thick Electric Double Layers
A. Eden 1, C. Mccallum 1, B. Storry 1, C. D. Meinhart 1, S. Pennathur 1
1 University of California Santa Barbara, Santa Barbara, CA, USA
2 Olin College, Needham, MA, USA

Secondary Flow of Liquid-liquid Two-Phase Fluids in a Pipe Bend
M. Ayala 1, P. Santos 2, G. Hamester 2, O. Ayala 3
1 Department of Mechanical Engineering, Universidad de Oriente, Puerto La Cruz, Venezuela
2 Brazil Scientific Mobility Program, CAPES, Brasilia DF, Brazil
3 Department of Engineering Technology, Old Dominion University, Norfolk, VA, USA

Simulating Fluid Flow through a Culture Chip for Cell Migration Studies in Microgravity
A. Dhall 1, T. Masiello 1, L. Butt 1, M. Strohmayer 1, M. Hemachandra 1, N. Tokanova 1, J. Castracane 1
1 Colleges of Nanoscale Science and Engineering, SUNY Polytechnic Institute, Albany, NY, USA

Simulating Hydraulic Fracturing and Contaminant Transport with MATLAB® and COMSOL Multiphysics® Software
D. W. Pepper 1, E. Nabiabdip 1, J. Water 2
1 University of Nevada Las Vegas, Las Vegas, NV, USA
2 Los Alamos National Laboratory, Los Alamos, NM, USA

Simulating Light Propagation during I-PDT of Locally Advanced Head and Neck Cancer
E. Oakley 1, H. Arshad 1, G. Shafrstein 1
1 Roswell Park Cancer Institute, Buffalo, NY, USA
Studies of Sound Radiation from Beams with Acoustic Black Holes
C. Zhao 1, M. G. Prasad 2
1 Stevens Institute of Technology, Hoboken, NJ, USA

The Effect of Eccentricity in Fully Developed Annular Pipe Flow on Convection Heat Transfer and the Darcy Friction Factor
S. Rabbani 1, A. Elzawahy 1, J. D’Arrigo 1, J. D. Freels 2
1 Vaughn College of Aeronautics and Technology, New York, NY, USA
2 Oak Ridge National Laboratory, Oak Ridge, TN, USA

The Impact of Using Computer Models on Academic Performance of Engineering Students
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The Use of Finite Element Analysis in the Design of Oil-Water Separators
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Thermal Analysis of Dry Type Power Transformer under Effect of Linear and Nonlinear Loads
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Thermohydraulic Study of a Fixed Bed for the Core of a Nuclear Reactor
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Time Domain Reflectometry of a Water Tree inside an Underground Cable
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Transformation Optics Simulation Method for Stimulated Brillouin Scattering
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Transient Heating and Cooling in a Packed Bed with Fluid Flow for Controlling Solute Adsorption
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Tunable Resonance of Star Shaped Nanostructures
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Two-Dimensional Simulation of All-Solid-State Lithium-ion Batteries
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Underwater Flow Noise Simulation
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