Welcome to the COMSOL Conference 2018

Join us October 22–24 at the SwissTech Convention Center. Over the course of three days, expand your skills in numerical simulation. Through a better understanding of multiphysics modeling and simulation applications, you will be better equipped and inspired to tackle your next design challenge.

3 SCHEDULE
Conference schedule at a glance

5 KEYNOTE SPEAKERS
Experience from industry leaders

6 MINICOURSES AND TECHNICAL WORKSHOPS
Choose from over 40 minicourses and sponsored technical workshops

9 PANEL DISCUSSIONS
Start conversation in an interactive and educational setting

10 USER PRESENTATIONS
Learn from your colleagues in application specific sessions

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

Learn more about the COMSOL Conference and register today!
comsol.com/conference/registration/lausanne

GOLD SPONSORS

MEDIA SPONSORS

SILVER SPONSOR
## MONDAY OCTOBER 22

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00</td>
<td>Registration Opens, Coffee</td>
<td>Foyer Campus</td>
</tr>
<tr>
<td>10:45</td>
<td>Welcome to the COMSOL Conference</td>
<td>Auditorium B</td>
</tr>
<tr>
<td>11:00</td>
<td>Minicourses and Workshop</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COMSOL Multiphysics® for New Users.................................................................................1B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conduction and Convection............................................................................................1A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Geometry Modeling and CAD Import................................................................................4BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laminar and Microfluidic Flow......................................................................................3A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RF and Microwave Modeling...........................................................................................2BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structural Mechanics and Multiphysics.........................................................................2BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Sponsored Workshop:</strong> HP Z Workstations &amp; COMSOL Multiphysics® — Because It Needs More Than Just Hardware.........................................................1C</td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>Lunch</td>
<td>Foyer Campus</td>
</tr>
<tr>
<td>13:00</td>
<td>Welcome Keynote</td>
<td>Auditorium B</td>
</tr>
<tr>
<td></td>
<td>Svante Littmarck, COMSOL, Inc.</td>
<td></td>
</tr>
<tr>
<td>14:00</td>
<td>Demo Stations, Exhibition, and Poster Sessions Open</td>
<td></td>
</tr>
<tr>
<td>14:00</td>
<td>User Presentations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acoustics 1....................................................................................................................3BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD 1.............................................................................................................................1C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemical Reaction Engineering 1................................................................................1B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electromagnetics 1: RF and Microwave............................................................................2BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electromagnetics 2: Microscopy and Photonics...................................................................1A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heat 1: General...............................................................................................................4BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing 1: Laser....................................................................................................2A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structural Mechanics 1..................................................................................................3A</td>
<td></td>
</tr>
<tr>
<td>15:00</td>
<td>Coffee Break</td>
<td>Foyer Campus, Garden</td>
</tr>
<tr>
<td>15:30</td>
<td>Keynote Session</td>
<td>Auditorium B</td>
</tr>
<tr>
<td></td>
<td>Thijs Defraeye, EMPA, Laboratory for Biomimetic Membranes and Textiles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adrien Charmetant, Nexans Research Center</td>
<td></td>
</tr>
<tr>
<td>16:30</td>
<td>Minicourses and Panel Discussion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meshing..........................................................................................................................4BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radiation and Ambient Conditions Modeling....................................................................1A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turbulent and High Mach Number Flow..........................................................................3A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Understanding the Stationary Solvers..........................................................................3BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wave Optics Modeling....................................................................................................2A</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Panel Discussion:</strong> Modeling Strategies for Acoustics Simulations.................................1C</td>
<td></td>
</tr>
<tr>
<td>17:30</td>
<td>Icebreaker Reception</td>
<td>Foyer Campus</td>
</tr>
</tbody>
</table>

## TUESDAY OCTOBER 23

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>Registration, Welcome Coffee</td>
<td>Foyer Campus, Garden</td>
</tr>
<tr>
<td>8:30</td>
<td>Minicourses and Workshop</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Introduction to the Application Builder...........................................................................1B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moisture Transport and Heat Transfer with Phase Change..................................................................1A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resistive and Capacitive Devices....................................................................................2A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Update Training: CAD and Meshing...................................................................................4BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Understanding the Time-Dependent Solvers........................................................................3BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Update Training: Structural and Acoustics......................................................................2BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Sponsored Workshop:</strong> Synopsys Simpeware™: From 3D Images to Models..............................................................................1C</td>
<td></td>
</tr>
<tr>
<td>9:30</td>
<td>Coffee Break</td>
<td>Foyer Campus, Garden</td>
</tr>
<tr>
<td>10:00</td>
<td>Keynote Session</td>
<td>Auditorium B</td>
</tr>
<tr>
<td></td>
<td>Andri Bezzola, Samsung Audio Lab</td>
<td></td>
</tr>
<tr>
<td></td>
<td>David Enfrun, Kejako SA</td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td>User Presentations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acoustics 2: Multiphysics.............................................................................................3BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Building Physics 1.........................................................................................................1B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD 2: Particle Tracing..................................................................................................1C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electromagnetics 3: Quasi-Static Fields........................................................................1A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heat 2: Multiphysics.......................................................................................................4BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing 2: Electrical...........................................................................................2A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structural Mechanics 2..................................................................................................3A</td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>Lunch</td>
<td>Foyer Campus</td>
</tr>
<tr>
<td>13:00</td>
<td>Minicourses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Charged Particle Tracing...............................................................................................3A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemical Reaction Engineering......................................................................................1B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Magnets, Coils, and Motors...........................................................................................2A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Optimization....................................................................................................................4BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structural Dynamics Modeling.......................................................................................2BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Update Training: Thermal.............................................................................................1A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Update Training: Solvers...............................................................................................1C</td>
<td></td>
</tr>
<tr>
<td>14:00</td>
<td>User Presentations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acoustics 3: Room Acoustics..........................................................................................3BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bioscience and Bioengineering 1...................................................................................3A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFD 3: Turbulent Flow.....................................................................................................1C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemical Reaction Engineering 2..................................................................................1B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electromagnetics 4: Induction.......................................................................................1A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heat 3: Phase Change.....................................................................................................4BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Porous Media Flow...........................................................................................................2A</td>
<td></td>
</tr>
<tr>
<td>15:00</td>
<td>Coffee Break</td>
<td>Foyer Campus, Garden</td>
</tr>
<tr>
<td>15:30</td>
<td>Minicourses and Panel Discussion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automating Model Building Using Methods and the Application Builder........................................................................1B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equation-Based Modeling...............................................................................................3BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Modeling Speakers, Microphones, and Other Transducers..................................................2BC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Postprocessing................................................................................................................3A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Update Training: Fluid and Chemical.............................................................................2A</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Panel Discussion:</strong> Power Electromagnetic Systems....................................................1C</td>
<td></td>
</tr>
<tr>
<td>16:30</td>
<td>Poster Session</td>
<td>Foyer Garden</td>
</tr>
<tr>
<td>17:30</td>
<td>Vote: Favorite Poster</td>
<td>Foyer Garden</td>
</tr>
<tr>
<td>18:00</td>
<td>Gala Dinner and Awards Ceremony</td>
<td>Auditorium B and Foyer Campus</td>
</tr>
</tbody>
</table>
**ICEBREAKER RECEPTION**  
Monday, 17:30–19:00  
Foyer Campus  
Meet fellow COMSOL users at the Reception with Swiss cheese and wines degustation and enjoy the traditional Swiss folklore performance.

**EXHIBITION**  
Monday, 14:00 - Wednesday 13:00  
Foyer Campus  
Learn about exhibitors’ products and services.

**LUNCH**  
Monday, 12:00–13:00  
Tuesday, 12:00–13:00  
Wednesday, 12:00–13:00  
Foyer Campus  
Have lunch by the impressive world's first solar window composed of dye-sensitive solar cells known as Graetzel cells.

**GALA DINNER AND AWARDS CEREMONY**  
Tuesday, 18:00–20:00  
Auditorium B and Foyer Campus  
Celebrate the winners of the Best Poster and Best Paper awards and taste different food at this relaxed buffet-style dinner.

**POST-CONFERENCE GUIDED TOUR TO CERN**  
Wednesday, 14:15–19:45  
Thursday, 7:30–13:00  
Discover the full scale and wonder of CERN's monumental experiments by attending our Post-Conference CERN Guided Tour. COMSOL provides the tour participants with a free bus transfer from/back to SwissTech Convention Center.
Svante Littmarck is the president and CEO of COMSOL, Inc. He cofounded the COMSOL Group in 1986. In 2004, Littmarck received an honorary doctoral degree from the Royal Institute of Technology (KTH) in Stockholm, Sweden, for the development and international reach of high-quality software for scientific computations through his company COMSOL.

How Nexans Increases the Cost-Effectiveness of Cable Assets Using Multiphysics Simulation

Nexans provides an extensive range of cable solutions to worldwide actors of the electricity value chain, from generation to consumption. Recent evolutions in the global electricity market, such as the targets for increasing the share of renewable energy and decreasing energy consumption, require further optimization of cable assets. This talk will present how combining heat transfer, electric field, magnetic field, and fluid dynamics calculations in COMSOL Multiphysics® opens new perspectives to further increase the cost-effectiveness and reliability of complex cable systems.

Drying of Soft Cellular Foods: Multiscale and Conjugate Modeling Perspectives

In this talk, I will share our latest modeling research on convective drying processes for soft cellular materials, such as fruits. I will show how multiscale modeling from the cellular scale up to the dryer scale can increase our understanding of what changes inside these exciting materials during drying. Furthermore, I will illustrate the importance and impact of a conjugate coupling of the moisture transport in the porous material to that in the turbulent airflow around it. Finally, I will discuss how we use modeling to optimize convective dehydration processes, such as solar and electrohydrodynamic drying.

Multiphysics Eye Modeling as a Tool, from Research to Personalized Ophthalmology

Kejako, in the field of ophthalmology, merges medical technology (medtech) and engineering expertise to address presbyopia with an antiaging mindset and to treat the gradual loss of visual accommodation. In this presentation, we are thrilled to illustrate our journey. We will show you how multiphysics simulation is a tool for developing an innovative solution and how it will eventually be part of the personalized antiaging solution for providing 20 years of comfortable near vision without reading glasses.

Use of the COMSOL Multiphysics® Modules for the Design of the EPFLoop Hyperloop Pod

The Hyperloop is a concept system targeting passenger transportation, aiming to carry people and goods over dedicated pods running at 1200 km/h in high-vacuum tubes. Within the framework of the SpaceX 2018 Hyperloop pod design competition, the EPFLoop team illustrates how the COMSOL software was a fundamental tool to design the EPFLoop pod prototype. Designing the aeroshell and validating the stability system of the pod, braking system, and carbon fiber components have been just some of the challenging aspects that have been addressed thanks to the coupled add-on modules implemented with COMSOL Multiphysics®.

Modern-Day Audio Systems: Better, Faster, Smaller

An audio loudspeaker is inherently a multiphysics apparatus: It converts an electrical signal to acoustic waves by moving a structural membrane via an electromechanical voice coil. As the signal travels from the record medium to the human ear, coupled linear as well as nonlinear mechanisms influence the sound quality at every stage. Finite element simulations have become an indispensable tool for the design of high-quality transducers and sound systems under modern-day design and time constraints. I will present several case studies that illustrate how simulation, optimization, and specialized applications are enabling engineers at Samsung to develop world-class audio products.
MINICOURSES

**CORE USAGE & THEORY**

**COMSOL MULTIPHYSICS® FOR NEW USERS**

**Monday, October 22, 11:00**

This minicourse is for those who are just starting out with COMSOL Multiphysics® or want a refresher on the graphical user interface (GUI) and modeling workflow. During this session, the fundamentals of using the COMSOL® software will be demonstrated.

**GEOMETRY MODELING AND CAD IMPORT**

**Monday, October 22, 11:00**

Whether you choose to construct a geometry in the COMSOL Desktop® or import it from a CAD file, this minicourse will demonstrate some useful tools. Did you know that COMSOL Multiphysics® can automatically generate the cross section of a solid object and you can use it for a 2D simulation? Or that you can directly import topographic data to create 3D objects? Generating a geometry is also about preparing selections for physics settings. By using the right selection tools, you can easily automate the modeling workflow, even when this involves simulations on widely different versions of a geometry. Attend this minicourse to see a demonstration of these techniques and more.

**MESHING**

**Monday, October 22, 16:30**

In this minicourse, we will walk you through the meshing techniques that are available to you in the COMSOL Multiphysics® software. We will introduce you to basic meshing concepts, such as how to tweak the meshing parameters for unstructured meshes. More advanced topics include working with swept meshes and creating mesh plots. You will also learn a useful technique for meshing imported CAD designs: How to hide small geometry features from the mesher.

**UNDERSTANDING THE STATIONARY SOLVERS**

**Monday, October 22, 16:30**

COMSOL Multiphysics® gives you precise control over the way in which your multiphysics models are solved. In this minicourse, we will cover the fundamental numerical techniques and underlying algorithms used for steady-state models and explain the reasons behind the default solver settings. Building upon this knowledge, you will learn various techniques for achieving or accelerating convergence of nonlinear multiphysics models.

**INTRODUCTION TO THE APPLICATION BUILDER**

**Tuesday, October 23, 8:30**

The Application Builder, included in the COMSOL Multiphysics® software, allows you to wrap your COMSOL Multiphysics® models in user-friendly interfaces. This minicourse will cover the two main components of the Application Builder: the Form Editor and the Method Editor. You will learn how to use the Form Editor to add buttons, sliders, input and output objects, and more. You will also learn how to use the Method Editor and other tools to efficiently write methods to extend the functionality of your apps.

**UNDERSTANDING THE TIME-DEPENDENT SOLVERS**

**Tuesday, October 23, 8:30**

COMSOL Multiphysics® includes a set of powerful implicit time-stepping algorithms for fast and accurate solutions to transient models. In this minicourse, you will learn how to pick a solver based on the problem at hand, measure and control computational error, as well as check convergence and other salient issues in time-dependent analyses using the finite element method.

**OPTIMIZATION**

**Tuesday, October 23, 13:00**

The Optimization Module will take you beyond traditional engineering analysis and into the design process. In this minicourse, you will learn to use gradient-based optimization techniques and constraint equations to define and solve problems in shape, parameter, and topology optimization, as well as inverse modeling. The techniques shown in this minicourse are applicable for almost all types of models.

**POSTPROCESSING**

**Tuesday, October 23, 13:00**

When presenting your results, the quality of the postprocessing will determine the impact of your presentation. This minicourse will thoroughly explore the many tools in the Results node designed to make your data look its best, including mirroring, revolving symmetric data, cut planes, cut lines, exporting data, joining or comparing multiple data sets, as well as animations.

**AUTOMATING MODEL BUILDING USING METHODS AND THE APPLICATION BUILDER**

**Tuesday, October 23, 15:30**

Learn how to use the Application Builder and the Method Editor to automate your model building, including setting up the geometry, material properties, loads, and boundary conditions; meshing; solving; and extracting data. You will learn how the Application Builder can be a powerful tool in your modeling process.

**EQUATION-BASED MODELING**

**Tuesday, October 23, 15:30**

Partial differential equations (PDEs) constitute the mathematical foundation to describe the laws of nature. This minicourse will introduce you to the techniques for constructing your own linear or nonlinear PDE systems. You will also learn how to add ordinary differential equations (ODEs) and algebraic equations to your model.

**RF AND MICROWAVE MODELING**

**Monday, October 22, 11:00**

In this minicourse, we will cover the use of the RF Module for simulating Maxwell’s equations in the high-frequency electromagnetic wave regime. We will discuss applications in resonant cavity analysis, antenna modeling, transmission lines and waveguides, and scattering. Then, we will address the coupling of electromagnetic wave simulations to heat transfer, such as in RF heating.

**WAVE OPTICS MODELING**

**Monday, October 22, 16:30**

The Wave Optics Module offers both full-wave modeling of Maxwell’s equations and the beam envelope method. The beam envelope method is particularly useful for modeling optical waveguiding structures, where the field envelope varies slowly along the direction of propagation. This minicourse introduces the use of the beam envelope method and how it contrasts with full-wave models. Optical scattering from periodic structures, such as gratings, will also be covered.

**RESISTIVE AND CAPACITIVE DEVICES**

**Tuesday, October 23, 8:30**

In this minicourse, we will address the modeling of resistive and capacitive devices.
with the AC/DC Module. We will also cover the calculation of electric fields under steady-state, transient, and frequency-domain conditions, as well as the extraction of lumped parameters such as capacitance matrices. Applications include the modeling of resistive heating and sensor design.

**CHARGED PARTICLE TRACING**

*Tuesday, October 23, 13:00*

Learn how to use the Particle Tracing Module to compute the paths of ions and electrons in external electric and magnetic fields. The external fields can be entered as expressions or solved for using a different physics interface, then coupled to the Charged Particle Tracing interface. Typical applications include mass spectrometry, accelerator physics, ion optics, and etching. You will learn how to use a probabilistic approach to simulate the collisions between these ions or electrons and a rarefied background gas. We will also discuss the analysis of nonlaminar charged particle beams and self-consistent modeling of bidirectionally coupled particle-field interactions.

**MAGNETS, COILS, AND MOTORS**

*Tuesday, October 23, 13:00*

Magnetic fields arise due to magnets and the flow of current. In this minicourse, you will learn about using the AC/DC Module to model static, transient, and frequency-domain magnetic fields that arise around magnets and coils. We will introduce various ways of modeling magnetically permeable materials, motors, and generators.

**PLASMA MODELING**

*Wednesday, October 24, 8:30*

This course will introduce some of the most common types of plasmas, including inductively coupled, DC, microwave, and capacitively coupled plasmas. In addition to learning about the differences between each type of discharge, the minicourse will show how to set up a model of a capacitively coupled plasma using a revolutionary new method available in the Plasma Module.

**RAY OPTICS MODELING**

*Wednesday, October 24, 13:00*

In this minicourse, you will learn how to use the Ray Optics Module to trace rays of light and other high-frequency radiation through optically large systems. We will explain how to model ray propagation in homogeneous and graded-index media; analyze ray intensity and polarization; and apply boundary conditions including refraction, diffuse reflection, and specular reflection. We will discuss application areas including cameras, telescopes, laser focusing systems, spectrometers, and concentrated solar power systems. You will also learn how to apply the Ray Optics Module in a multiphysics context by considering structural and thermal effects.

**MECHANICAL & ACOUSTICS**

**STRUCTURAL MECHANICS AND MULTIPHYSICS**

*Monday, October 22, 11:00*

Many different physical phenomena are coupled to the deformation of solids. In this minicourse, you will get an overview of how to model fluid-structure interaction, thermal stresses and thermoelastic damping, electromechanical forces, magnetostriction, piezoelectricity, poroelasticity, and acoustic-structure interaction. The built-in multiphysics couplings are highlighted, together with examples of how to create your own couplings.

**STRUCTURAL DYNAMICS MODELING**

*Tuesday, October 23, 13:00*

In this minicourse, you will learn how to model problems within the field of structural dynamics. The course covers eigenfrequency analysis, frequency-domain analysis, time-domain analysis, and modal superposition. You will learn how to select appropriate and efficient methods. Damping models, nonlinearities, linearization, and prestressed analysis are other important topics. You will also get a brief overview of the Multibody Dynamics Module and Rotordynamics Module.

**MODELING SPEAKERS, MICROPHONES, AND OTHER TRANSDUCERS**

*Tuesday, October 23, 15:30*

This minicourse is focused on modeling all kinds of transducers. The transduction from an electric signal to an acoustic signal, including the mechanical path, is a true multiphysics application. We will set up a simple model using the built-in multiphysics couplings and also look at other modeling techniques, like combining lumped models with FEM or BEM. The analysis can be done in the frequency domain or extended to the time domain, where nonlinear effects can be included. You will also learn about recent news and additions to the COMSOL Multiphysics® software relevant to the topic. Application areas include, but are not limited to, mobile devices, piezotransducers, loudspeakers, headphones, and speaker cabinets.

**FLUID & THERMAL**

**CONDUCTION AND CONVECTION**

*Monday, October 22, 11:00*

In this minicourse, you will learn about modeling conductive and convective heat transfer with COMSOL Multiphysics®, the Heat Transfer Module, the CFD Module, and the Subsurface Flow Module. Conductive heat transfer modeling addresses heat transfer through solids and can include heat transfer in thin layers, contact thermal resistance, and phase change. Convective heat transfer addresses heat transfer in solids and fluids. We will also address natural convection induced by buoyancy forces.

**LAMINAR AND MICROFLUIDIC FLOW**

*Monday, October 22, 11:00*

In this minicourse, we will cover the Microfluidics Module, which features custom interfaces for the simulation of microfluidic devices and rarefied gas flows. Single-phase flow capabilities include both Newtonian and non-Newtonian flow. Beyond its single-phase flow capabilities, this module also allows for two-phase flow simulations to capture surface tension forces, capillary forces, and Marangoni effects. Typical applications include lab-on-a-chip (LOC) devices, digital microfluidics, electrokinetic and magnetokinetic devices, inkjets, and vacuum systems.

**RADIATION AND AMBIENT CONDITIONS MODELING**

*Monday, October 22, 16:30*

Radiative heat transfer is one of the three types of heat transfer and plays a major role in many applications. During this session, we will focus on the features for modeling surface-to-surface radiation for gray surfaces or multiple spectral bands, such as solar and infrared radiation. We will discuss different examples in order to help identify cases where thermal radiation has to be accounted for. Defining ambient conditions is a key point in the model definition, especially when solar radiation is accounted for. There are also other cases. We will review the different means to define the ambient condition and how use them for conduction,
convection, and radiation in heat transfer models. Solar power systems. You will also learn how to apply the Ray Optics Module in a multiphysics context by considering structural and thermal effects.

**TURBULENT AND HIGH MACH NUMBER FLOW**

**Monday, October 22, 16:30**

Learn how to efficiently simulate incompressible and compressible turbulent flows in this CFD minicourse. The CFD Module allows for accurate multiphysics flow simulations, such as conjugate heat transfer with nonisothermal flow and fluid-structure interactions. We will also discuss physics interfaces for simulating flow in porous media, discrete and homogeneous two-phase flow, and flow in stirred vessels with rotating parts.

**MOISTURE TRANSPORT AND HEAT TRANSFER WITH PHASE CHANGE**

**Tuesday, October 23, 8:30**

Changes in the temperature of a material can lead to a change in material phase, from solid to liquid to gas. The evaporation and condensation of water are very common cases of phase change. This minicourse will introduce you to moisture transport and the various types of phase change modeling that can be done with COMSOL Multiphysics® and the Heat Transfer Module. We will address the relative merits and tradeoffs between these techniques.

**PARTICLE TRACING IN FLUIDS**

**Wednesday, October 24, 8:30**

Lagrangian particle tracking is often used as a complement to Eulerian methods that solve for fluid flow fields. In this course, we will explain how to use the Particle Tracing Module to predict the motion of solid particles, droplets, and bubbles in a surrounding fluid. We will outline some of the myriad built-in forces included in the Particle Tracing for Fluid Flow interface, including lift, drag, electromagnetic, thermophoretic, and acoustophoretic forces. You will also learn how to accurately model particle dispersion in a turbulent flow.

**POROUS MEDIA FLOW**

**Wednesday, October 24, 13:00**

Porous media surrounds us, whether it is the ground beneath us, paper products, filters, or even biological tissue. In this minicourse, we will explore flow and diffusion in porous media as well as how to treat partially saturated media. We will also cover coupled systems including linked free and porous flows; poroelasticity; and mass convection-diffusion in forced, gravity-fed, and density-driven flows.

**CHEMICAL REACTION ENGINEERING**

**Tuesday, October 23, 13:00**

In this minicourse, you will learn how to define chemical kinetics, thermodynamic properties, and transport properties for models of reacting systems using the Chemical Reaction Engineering Module. We will address topics including homogeneous and surface reactions, diffusion and convection in diluted and concentrated solutions, thermal effects on transport and reactions, and mass and heat transfer in heterogeneous catalysis.

**ELECTRODEPOSITION AND CORROSION**

**Wednesday, October 24, 8:30**

In this minicourse, you will learn how to define and solve problems in electrodeposition, corrosion protection, and corrosion studies. These systems all involve mass and charge transfer coupled to electrochemical reactions at deforming metal surfaces. We will look at two different approaches: one that treats the surface deformation as a variable and a second approach that treats the surface deformation with moving mesh. The most common type of study for these systems is the time-dependent study, but we will also briefly look at electrochemical impedance spectroscopy (EIS) studies.

**BATTERY MODELING**

**Wednesday, October 24, 13:00**

In this minicourse, you will learn to model batteries with a focus on lithium-ion batteries, including transport of ions, porous electrodes, and electrode reactions. You will also get an introduction to the corresponding couplings to heat transport for performing thermal simulations. We will address how to simulate various transient phenomena such as constant current, constant voltage (CCCV) charge/discharge cycling, electrochemical impedance spectroscopy (EIS), and capacity fade.

**UPDATE TRAINING**

**CAD AND MESHING**

**Tuesday, October 23, 8:30**

In this minicourse, we will discuss and demonstrate recent additions to the functionality for creating and importing geometry and generating meshes in COMSOL Multiphysics®. We will cover topics such as the automatic removal of small details from geometry, using variable dependent size expressions for mesh generation, defining coordinate systems based on work planes and geometry orientations, setting up selections during the import of printed circuit board geometries, and more.

**STRUCTURAL AND ACOUSTICS**

**Tuesday, October 23, 8:30**

Attend this update training minicourse for a roundup of major news for acoustics and structural analysis.

**THERMAL**

**Tuesday, October 23, 13:00**

Learn about news for thermal modeling in this update training minicourse. Upgrades of the Heat Transfer Module will be discussed as well as its multiphysics couplings with other modules for electromagnetics, structural, and fluid flow simulation.

**SOLVERS**

**Tuesday, October 23, 13:00**

In this update training minicourse, learn about news for the studies and solvers available in the COMSOL Multiphysics® software. We will go over upgrades to parametric sweeps, adaptation, model reduction, performance-enhancing functionalities, and more.

**FLUID AND CHEMICAL**

**Tuesday, October 23, 15:30**

Stay current with new modeling capabilities for fluid flow and chemical simulations through this update training minicourse.

**SPONSORED WORKSHOP**

**SYNOPSYS SIMPLERWARE™: FROM 3D IMAGES TO MODELS**

**By Synopsys**

**Tuesday, October 23, 8:30**

This minicourse demonstrates the ease of obtaining high-quality models from 3D image data in the Synopsys Simpleware™ software for use in the COMSOL Multiphysics® software. The workflow of processing 3D image data (e.g., from MRI, CT, Micro-CT, and FIB-SEM) to create models for life sciences, materials, and manufacturing applications will be outlined and demonstrated. Learn about the capabilities of the Simpleware™ software for image visualization, segmentation, analysis, and model generation. Examples will also be shown of workflows and case studies combining the Simpleware™ software and the COMSOL Multiphysics® software.

Simpleware is a trademark of Synopsys, Inc. in the U.S. and/or other countries.

**HP Z WORKSTATIONS & COMSOL MULTIPHYSICS® — BECAUSE IT NEEDS MORE THAN JUST HARDWARE**

**By HP**

**Monday, October 22, 11:00**

This minicourse will discuss the collaboration between HP and COMSOL in order to provide state-of-the-art workplaces and workflows to end users in multiphysics simulation.

HP Z Workstations can master very complex data and 3D images as required by the simulation industry. Besides, HP is supporting the newest trends of machine/ deep learning and virtual reality. However, HP does not only focus on the hardware but collaborates actively with software vendors to ensure optimized performance. This is why HP is delighted to partner up with COMSOL in order to provide concrete proposals and benchmarking of COMSOL Multiphysics® on selected HP Z Workstations. The minicourse will provide simulation experts with guidance on how to select the best hardware for their purposes and optimize performance.
Modeling Strategies for Acoustics Simulations
Monday, October 22, 16:30–17:30
Room 1C

Moderators:
Mads J. Herring Jensen, COMSOL
Alfred Svobodnik, MVOID Group (Austria)

Panelists:
Martin Olsen, Harman Lifestyle Audio (Denmark)
Roberto Magalotti, B&G Speakers S.p.A. (Italy)
Erwin Kuipers, Sonova AG, (Switzerland)

Virtual prototypes and digital twins play a major role in the development process across industries. This is also true when dealing with acoustics, from designing audio systems in cars and optimizing miniature transducer performance in mobile devices to designing muffler systems. Common to these applications is the need to use different modeling strategies depending on the frequency range, model size, and details included in the physics used. The integration of simulations and testing is also important.

Power Electromagnetic Systems
Tuesday, October 23, 15:30–16:30
Room 1C

Moderators:
Magnus Olsson, COMSOL
Jasmin Smajic, University of Applied Sciences in Rapperswil (Switzerland)

Panelists:
Nils Lavesson, ABB Corporate Research (Sweden)
Eugen Badea, GE Switzerland GmbH (Switzerland)
Iker Rodriguez, STFC Rutherford Appleton Laboratory (United Kingdom)

Simulation and modeling are becoming an integral part of development processes for power electromagnetic systems in the age of sustainable energy resources, electromobility, wireless charging, and the transformation of the electrical grid. Design optimization, protection, and control as well as the thermal management of electromagnetic converters; transducers; filters; and circuit breakers, bearings, and drive systems can benefit massively from the predictive power of multiphysics simulation. In this session, we will discuss current trends and new challenges in modeling EM systems with high voltages, high currents, or high power consumption.

Materials Processing and Additive Manufacturing
Wednesday, October 24, 8:30 –9:30
Room 1C

Moderators:
Mats Danielsson, COMSOL
Borja Lazaro Toralles, The Manufacturing Technology Centre Ltd. (United Kingdom)

Panelists:
Karl-Heinz Leitz, Plansee SE (Austria)
Iryna Tomashchuk, ICB University of Bourgogne (France)
Bojan Jokanovic, SGL Carbon (Germany)
Florian Wirth, ETH Zurich (Switzerland)

Once an engineering design has been optimized by simulation and modeling, it is typically translated into a real-world object by material processing such as cutting, drilling, welding, texturing, grinding, and polishing as well as printing, sintering or molding. As those methods themselves constitute multiphysics processes, their inclusion in the simulation process brings new opportunities to the optimization of manufacturing. In this session, we will discuss how multiphysics simulation can help address design challenges encountered in materials processing and additive manufacturing.
These user presentations happen simultaneously, choose the ones that most interest you!

**ACOUSTICS**

**Monday, October 22, 14:00**

**Acoustic Modeling of a “Minute Repeater”**
S. Charron
1Intermezzi ingénierie acoustique, Paris, France

**Development of a Wideband Steerable Acoustic Metasurface with COMSOL®**
H. Lissek1, E. Rivet1, T. Laurence1, R. Fleury1
1Ecole Polytechnique Fédérale de Lausanne, Signal Processing Laboratory LTS2, Switzerland
2Ecole Polytechnique Fédérale de Lausanne, Laboratory of Wave Engineering LWE, Switzerland

**Simulation Absorption Curves on Acoustic Panel With Front Textiles ISO 354**
K. Sánchez Vibæk1, S. Fernández Pedrón1
1Kvadrat Soft Cells A/S, Copenhagen, Nordhavn, Denmark

**CHEMICAL REACTION ENGINEERING 1**

**Monday, October 22, 14:00**

**Modeling Alpha-Galactosides Behavior during Cowpea Soaking-Cooking for Nutritional Optimization**
A. Briffaz1, F. Coffigniez2, C. Mestres1, P. Bohuon2
1CIRAD, France
2Montpellier SupAgro, France

**Modeling the Catalytic Conversion of Steel Mill Gases Using the Example of Methanol Synthesis**
S. Schlüter1, T. Hennig1
1Fraunhofer UMSICHT, Oberhausen, Germany

**ELECTROMAGNETICS 1: RF AND MICROWAVE**

**Monday, October 22, 14:00**

**Numerical Study of the Tuning, Pressure Sensitivity and Lorentz Force Detuning of SRF Crab Cavities**
E. Cano-Pleite1, A. Amorim1, J. S. Swieszek1, K. Artoos1, O. Capatina1
1European Organization for Nuclear Research (CERN), Geneva, Switzerland

**Microwave Assisted Vacuum Drying Processing: Magnetron vs Solid State. Case Study: Apple Drying**
C. Blanchi1, R. Schmid1, D. Frick1
1Gigatherm Mikrowellen AG, Switzerland

**Unbalanced Torque Signal Generation for Kinetic Energy Harvesters**
L. Kurmann1
1University of Freiburg, IMTEK, Freiburg, Germany

**ELECTROMAGNETICS 2: MICROSCOPY AND PHOTONICS**

**Monday, October 22, 14:00**

**COMSOL® Simulation for Scanning Microwave Microscopic Experiments**
T. Le Quang1, D. Vasyukov1, A. Bucbter1, J. Hoffmann1, M. Zeiler1
1Eidgenössisches Institut für Metrologie (METAS), Switzerland

**THz-based Deflectors Using Optimized Antenna Design**
M. Hayati1
1University of Bern, Switzerland

---

Simpleware Software Solutions

**Join our Minicourse**
**From 3D Images to Models**

3D Image Visualization, Analysis and Model Generation

**October 23, 2018 @8.30 - 9.30**

www.synopsys.com/simpleware | simpleware@synopsys.com
USER PRESENTATIONS

These user presentations happen simultaneously, choose the ones that most interest you!

### MANUFACTURING 1: LASER
**Monday, October 22, 14:00**

- **Thermo-Mechanical Modeling of Laser Beam Welding of Molybdenum**
  - K. H. Leitz
  - 1Plansee SE, Reutte, Austria

- **Additive Manufacturing of Metal Matrix Composites**
  - F. Wirth, K. Wegener
  - 1ETH Zurich, Institute of Machine Tools and Manufacturing, Zurich, Switzerland

- **Finite Element Prediction of Laser-Material Interaction Using COMSOL Multiphysics**
  - E. C. Chevallier, V. Bruyère, P. Namy
  - 1EPFL - EPFLoop, Lausanne, Switzerland

- **Multiphysics Simulation of a High Frequency Acoustic Microscope Lens**
  - O. Tommiska, J. Mäkinen, J. Hyvönen, A. Meriläinen, A. Salmi, E. Häggström
  - 1Department of Physics, Division of Materials Physics, University of Helsinki, Helsinki, Finland

- **Fully Symmetrical Single-Suspension Electrodynamic Loudspeaker Using a Halving Array**
  - T. Laurence, H. Lissek
  - 1LTS2 - Acoustics Group, EPFL, Switzerland

- **Prediction of Thermoacoustic Instabilities in Combustion Systems - Application to a Simplified Model of a Domestic Boiler**
  - D. Tônô
  - 1T4G Engineering GmbH, Switzerland

### BUILDING PHYSICS 1
**Tuesday, October 23, 11:00**

- **Solar Radiation Effects on the Epoxy Adhesive Temperature Used to Bond CFRP to Concrete Beams**
  - M. Breveglieri, B. Weber, C. Czaderski
  - 1EPMA - Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland

- **Heat and Moisture Transport in Wooden Bearings of Monumental Buildings**
  - H. Schellen, M. Splierings, J. van Schijndel
  - 1Eindhoven University of Technology, The Netherlands
  - 2DPA Cauberg-Huygen, The Netherlands
  - 3ASML, The Netherlands

- **Modeling of Airborne Transmission in Floor System Including Flanking Transmission**
  - D. Bard, M. Kuster
  - 1Kuster + Partner AG, Switzerland

### STRUCTURAL MECHANICS 1
**Monday, October 22, 14:00**

- **The Relevant Scale for Mechanical Modeling in Additive Manufacturing Technologies**
  - S. Guessasma, S. Belhabib, H. Nouri
  - 1INRA, Nantes, France
  - 2LUMAN Université Nantes Angers Le Mans, CNRS, GEPEA, UMR 6144, IUT de Nantes, Carquefou, France
  - 3SIMT Lille Douai, Institut Mines-Télécom, Douai, France

- **Modeling the Hyperloop with COMSOL® on the Mechanical Design of the EPFLoop Capsule**
  - L. Benedetti, S. Jajo, L. N. Riva
  - 1EPFL - EPFLoop, Lausanne, Switzerland

- **Boundary Arbitrary Lagrangian-Eulerian and Deformable Boundary Perturbation Method**
  - J. Rivero-Rodriguez, B. Scheid
  - 1Université Libre de Bruxelles, Brussels, Belgium

### ACoustics 2: MULTIPHYSICS
**Tuesday, October 23, 11:00**

- **Virtual Prototyping of UV-LED Based Point-Of-Use Water Disinfection Unit**
  - P. V. Christensen, P. Juul
  - 1Virtual Water Technology, Silkeborg, Denmark
  - 2Liqtech Systems, Hobro, Denmark

- **Numerical Study of the Gas-Powder Flow from Coaxial Nozzles in Laser Metal Deposition**
  - E. Ferreira, M. Dal, P. Peyre, C. Colin, G. Marion, D. Courapied, B. Macquaire
  - 1PIMM Laboratory, UMR 8006 ENSAM – CNRS – CNET, Paris, France
  - 2Centre des Matériaux, UMR 7633 MINES ParisTech, Evry, France
  - 3Safran, Paris, France

- **Experimental and Modeling Study of the Filtering Capacity of Green Wall Species**
  - T. Ysebaert, S. Denys, G. Walpot
  - 1University of Antwerp, Belgium

- **Adaptive Mesh Refinement: Quantitative Computation of a Rising Bubble Using COMSOL Multiphysics**
  - T. Preney, P. Namy, J.-D. Wheeler
  - 1SIMTEC, Grenoble, France

### ELECTROMAGNETICS 3: QUASI-STATIC FIELDS
**Tuesday, October 23, 11:00**

- **Partial Discharge Risk Under Charge Generation and Transport Effects**
  - M. E. Banda, D. Malec, J.-P. Cambonnone
  - 1LAPLACE, Université de Toulouse, CNRS, INPT, UPS, France
**USER PRESENTATIONS**

These user presentations happen simultaneously, choose the ones that most interest you!

---

**HEAT 2: MULTIPHYSICS**

**Tuesday, October 23, 11:00**

**2D and 3D Simulation on Thermal Flow Around the Human Body**

A. Psikuta¹, J. Xu², J. Li², S. Annaheim¹, R. M. Rossi¹

¹Empa, Swiss Federal Laboratories for Materials Science and Technology, St. Gallen, Switzerland
²Protective Clothing Research Center, College of Fashion and Design, Donghua University, Shanghai, China

**Multiphysics Model for Thermal Management of Packaged Mid-IR Laser**

G. Spinola Durante¹

¹CSEM SA, Switzerland

---

**Analysis of Heat Transfer From Human Body and Effect of Clothing Surface on Heat Transfer Mechanism**

A. Psikuta¹, A. Joshi³, M.-A. Bueno², S. Annaheim¹, R. M. Rossi¹

¹Empa, Swiss Federal Laboratories for Materials Science and Technology, St. Gallen, Switzerland
²Université de Haute Alsace, Laboratoire de Physique et Mécanique Textiles (LPMT EA 4365), Mulhouse, France

---

**Modeling of Random Nanostructures Based on SEM Images and Analysis of Resulting RF-Performance**

K. Neumann¹, J. Moeller¹, L. Kuehnel¹, A. Rennings¹, N. Benson², R. Schmechel³, D. Ernst³

¹General and Theoretical Electrical Engineering (ATE), University of Duisburg-Essen, and CENIDE – Center for Nanointegration Duisburg-Essen, Duisburg, Germany
²Institute for Nanostructures and Technology (NST), University of Duisburg-Essen, and CENIDE – Center for Nanointegration Duisburg-Essen, Duisburg, Germany

---

**Investigating a Tensor Formulation to describe the Magnetic Structure of Soft Magnetic Materials**

O. Maloberti¹, M. Nesser², E. Salloum², J. Fortin³, P. Dassonvalle¹, C. Pineau³, M. Caruso¹, J-P. Birat³, I. Tolleneer⁴

¹ESIEE Amiens, France
²UPJV-LTI, France
³IRT-M2P, France
⁴CRM Group, France

---

**Simulation-Based Analysis of a Microstructuring Process for Bolt Surfaces with Increased Friction**

I. Schaarschmidt¹, M. Hackert-Oschätzchen¹, G. Meichesner¹, M. Zinecker¹, P. Steiner³, A. Schubert¹

¹Professorship Micromanufacturing Technology, Chemnitz University of Technology, Chemnitz, Germany
³Fraunhofer Institute for Machine Tools and Forming Technology, Chemnitz, Germany

---

**Free Surface Deformation of the Weld Pool in Orbital Narrow Gap GTA Welding**

S. Morville¹, V. Buryère³, P. Namy⁵

¹Technical Center FRAMATOME, Le Creusot, France
³SIMTEC, Grenoble, France

---

**MODELING OF POUND CAKE BAKING BEHAVIOR IN CONTINUOUS FLOW**

M. Khodeir¹, O. Rouaud², V. Jury², P. Le-Bail³

¹ONIRIS, GEPEA, France
²GEPEA - UMR 6144 CNRS - ONIRIS, Nantes, France
³INRA, UR 1268, Biopolymères Interactions Assemblages, Nantes, France.

---

**FREE SURFACE DEFORMATION OF THE WELD POOL IN ORBITAL NARROW GAP GTA WELDING**

S. Morville¹, V. Buryère³, P. Namy⁵

¹Technical Center FRAMATOME, Le Creusot, France
³SIMTEC, Grenoble, France

---

**MANUFACTURING 2: ELECTRICAL**

**Tuesday, October 23, 11:00**

**Modeling of Substrate Plate Preheating to Predict Efficiency in the Electron Beam Melting Process**

M. Michatz¹, S. Janson², G. Schlick³, I. Kühne⁴, A. Frey⁵

¹University of Applied Science, Faculty of Mechanical Engineering, Augsburg, Germany; Fraunhofer Research Institution for Casting, Composite and Processing Technology IGCV, Augsburg, Germany
²iwb Application Center Augsburg part of the Technical University of Munich (TUM), Augsburg, Germany
³Fraunhofer Research Institution for Casting, Composite and Processing Technology IGCV, Augsburg, Germany
⁴Heilbronn University, Faculty of Technology and Economics, Künzelsau, Germany
⁵University of Applied Science, Faculty of Electrical Engineering, Augsburg, Germany

---

**DESIGN OF A MECHANICAL RESONANT STATION TO FREE JAMMED MICRO-MECHANISMS**

L. Spicci³

³Everywave srl, Italy

---

**CHewing Mechanisms Investigated Using Finite Element Modeling (FEM) for Two Soft Cereal Foods**

M. Assad-Bustillos¹, S. Guessasma¹, A-L. Reguerre¹, G. Della-Valle¹

¹INRA, Nantes, France

---

**DETERMINATION OF CONSTITUTIVE PROPERTIES USING DIC-DISPLACEMENT DATA AND U-FEM**

A. Alshaya¹, R. Bourisli¹, J. Considine²

¹Kuwait University, Kuwait
²Forest Products Laboratory, Madison, WI, US

---

**DECOMPOSITION OF FUNDAMENTAL LAMB WAVE MODES IN COMPLEX METAL STRUCTURES USING COMSOL MULTIPHYSICS⁷**

M. Harb¹, R. Malaeb¹, E. Mahfoud¹

¹Department of Mechanical Engineering, American University of Beirut, Lebanon

These user presentations happen simultaneously, choose the ones that most interest you!

**ACOUSTICS 3: ROOM ACOUSTICS**
*Tuesday, October 23, 14:00*

- **Investigation on Quiet Zones Created by Remote Impedance Control**
  T. Laurence¹, R. Boulantet¹, H. Lissek¹
  ¹LT52 - Acoustics Group, EPFL, Switzerland

- **Acoustic metamaterial: from conception to auralization**
  C. Lagarrigue, D. Lecoq
  Met acoustic - www.metacoustic.com, Le Mans, France

- **A Simulation Test Bench for Decay Times in Room Acoustics**
  R. Magalotti¹, V. Cardinali¹
  ¹B&C Speakers S.p.A., Bagno a Ripoli (FI), Italy

**BIOENGINEERING 1**
*Tuesday, October 23, 14:00*

- **Model of the Cardiac Defibrillation Induced by an Implantable Defibrillator in the Body**
  I. Rattalino¹, D. Harndt², S. Luke³, Philippe Young²
  ¹Signal processing laboratory LT52, EPFL, Lausanne, Switzerland

- **Sound Field Reconstruction in Low-Frequency Room Acoustics: A Benchmark Study with Simulation**
  T. Pham Vu¹, E. Rivet¹, H. Lissek¹
  ¹Signal processing laboratory LT52, EPFL, Lausanne, Switzerland

**BIOENGINEERING 2**
*Tuesday, October 23, 14:00*

- **Modeling the Swirling Flow of a Hydrocyclone**
  B. Chine¹, F. Concha², M. Meneses³
  ¹University of Innsbruck, Unit Energy Efficient Buildings, Austria
  ²Galletti Group, Italy

- **Flow Optimization of a MVHR Combined with an Exhaust Air Heat Pump by Means of CFD Simulation**
  F. Ochs¹, M. Bianchi Janetti¹, M. Romani¹
  ¹University of Innsbruck, Unit Energy Efficient Buildings, Austria
  ²Galletti Group, Italy

**CHEMICAL REACTION ENGINEERING 2**
*Tuesday, October 23, 14:00*

- **CFD Modeling of a Laboratory-Scale Setup for Thermochemical Materials Performance Analysis**
  S. Salvati¹, N. Vasile¹, F. Carosio², G. Saracco², A. Fina²
  ¹Center for Sustainable Future Technologies, Istituto Italiano di Tecnologia, Cartago, Costa Rica
  ²Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, Alessandria, Italy

**ELECTROMAGNETICS 4: INDUCTION**
*Tuesday, October 23, 14:00*

- **Use of COMSOL® AC/DC Module to Model an EM Sensor Deployed to Monitor Steel Transformation**
  J. Shen¹, W. Jacobs¹, L. Zhou¹, P. Hunt³, C. Davis¹
  ¹Advanced Steel Research Centre, WMG, University of Warwick, Coventry, UK
  ²Primetals Technology Limited, Christchurch, UK

- **Simulation of Quench Behaviour of the 11 T Superconducting Dipole for HL-LHC**
  M. Mentink¹, B. Auckmann¹, L. Bortot¹, M. Maciejewski¹, Marco Prioli¹, E. Ravaoli¹, E. Stubberud¹, A. Verweij¹
  ¹CERN, Switzerland

- **Electromagnetic Design of an RF-Coil Transceiver for NQR-Based Explosive Detection**
  P. Farantatos¹, J. Barras¹, I. Poplett¹, P. Kosmas¹
  ¹King’s College London, UK

- **Modeling of High-Speed PCB-Interconnects, Vias and Connectors for the Estimation of Si-Losses**
  A. K. Palit¹
  ¹ZF-Lemförder Electronic GmbH (ZF- Friedrichshafen AG, Group), Germany

**HEAT 3: PHASE CHANGE**
*Tuesday, October 23, 14:00*

- **Modeling Water Immersion Thawing of Raw Tuna Fishes**
  S. Curel¹, O. Rouaud¹, J.M. Bonny², L. Mazuel³
  ¹ONIRIS, CNRS, GEPEA, UMR 6144, Nantes, France
  ²IVIA – IReST UMR1240 INSERM/UCA, Clermont-Ferrand, France

- **Modeling Approach to Facilitate Thermal Energy Management with Phase Change Materials (PCM)**
  D. Rubiniell¹, D. A. Weiss¹, A. Chaudhuri², D. Kranodis³
  ¹Institute of Thermal and Fluid-Engineering, University of Applied Sciences and Arts Northwestern Switzerland
  ²Department of Civil Engineering and Energy Technology, Oslo Metropolitan University, Norway

- **Using COMSOL Multiphysics® to Simulate Heat Exchanger Fouling by Heterogeneous Barite Crystallisation**
  F. Cazenave¹, F. Couture¹, P. Bernada¹, J-P. Serin¹
  ¹Univ Pau & Pays Adour / E2S UPPA, Laboratoire de Thermique, Energetique et Procedes- IPRA, EA1932, Pau, France

**MECHANICS 2**
*Tuesday, October 23, 14:00*

- **Modeling of Heat Exchanger Fouling by Heterogeneous Barite Crystallisation**
  E. Krogh¹, J.P. Serin¹
  ¹Univ Pau & Pays Adour / E2S UPPA, Laboratoire de Thermique, Energetique et Procedes- IPRA, EA1932, Pau, France

- **Remote Impedance Control Investigation on Quiet Zones Created by Remote Impedance Control**
  T. Laurence¹, R. Boulantet¹, H. Lissek¹
  ¹LT52 - Acoustics Group, EPFL, Switzerland

**3D Optical Human Eye Model Based on COMSOL Multiphysics® to Provide a Test Bench for Laser Surgery**
*Tuesday, October 23, 14:00*

- **3D Optical Human Eye Model Based on COMSOL Multiphysics® to Provide a Test Bench for Laser Surgery**
  T. R. Delattre¹, M. Ramuz¹
  ¹Department of Flexible Electronics, Ecole Nationale Superieure des Mines, Centre Microelectronique de Provence CMP-EMSE, MOC, Gardanne, France

- **Modeling Gate-Tunable Ionic Transport Using Atomically Thin Patterned Graphene Membrane**
  C.-J. Shih¹, T. Tian¹, R. Wyss¹, K. Yazda¹, H. G. Park³
  ¹D-CHAB, ETH Zürich, Switzerland
  ²D-MATL, ETH Zürich, Switzerland
  ³D-MAVT, ETH Zürich, Switzerland

**INDUCTION**
*Tuesday, October 23, 14:00*

- **Simulation of Quench Behaviour of the 11 T Superconducting Dipole for HL-LHC**
  M. Mentink¹, B. Auckmann¹, L. Bortot¹, M. Maciejewski¹, Marco Prioli¹, E. Ravaoli¹, E. Stubberud¹, A. Verweij¹
  ¹CERN, Switzerland

- **Electromagnetic Design of an RF-Coil Transceiver for NQR-Based Explosive Detection**
  P. Farantatos¹, J. Barras¹, I. Poplett¹, P. Kosmas¹
  ¹King’s College London, UK

- **Modeling of High-Speed PCB-Interconnects, Vias and Connectors for the Estimation of Si-Losses**
  A. K. Palit¹
  ¹ZF-Lemförder Electronic GmbH (ZF- Friedrichshafen AG, Group), Germany

**MECHANICS 2**
*Tuesday, October 23, 14:00*

- **Modeling Water Immersion Thawing of Raw Tuna Fishes**
  S. Curel¹, O. Rouaud¹, J.M. Bonny², L. Mazuel³
  ¹ONIRIS, CNRS, GEPEA, UMR 6144, Nantes, France
  ²IVIA – IReST UMR1240 INSERM/UCA, Clermont-Ferrand, France

- **Modeling Approach to Facilitate Thermal Energy Management with Phase Change Materials (PCM)**
  D. Rubiniell¹, D. A. Weiss¹, A. Chaudhuri², D. Kranodis³
  ¹Institute of Thermal and Fluid-Engineering, University of Applied Sciences and Arts Northwestern Switzerland
  ²Department of Civil Engineering and Energy Technology, Oslo Metropolitan University, Norway

**MECHANICS 2**
*Tuesday, October 23, 14:00*

- **Using COMSOL Multiphysics® to Simulate Heat Exchanger Fouling by Heterogeneous Barite Crystallisation**
  F. Cazenave¹, F. Couture¹, P. Bernada¹, J-P. Serin¹
  ¹Univ Pau & Pays Adour / E2S UPPA, Laboratoire de Thermique, Energetique et Procedes- IPRA, EA1932, Pau, France

**Numerical Solution of Nonlinear PDEs Exhibiting Soft Bifurcations**
*Tuesday, October 23, 14:00*

- **Numerical Solution of Nonlinear PDEs Exhibiting Soft Bifurcations**
  A. Boulbitch¹
  ¹IEE S.A. Luxembourg

**METAMATERIALS**
*Tuesday, October 23, 14:00*

- **Membrane Waves on an Eye**
  R. Magalotti¹, V. Cardinali¹
  ¹B&C Speakers S.p.A., Bagno a Ripoli (FI), Italy

- **A Simulation Test Bench for Decay Times in Room Acoustics**
  R. Magalotti¹, V. Cardinali¹
  ¹B&C Speakers S.p.A., Bagno a Ripoli (FI), Italy

- **Simulation of Acoustically Excited Membrane Waves on an Eye**
  J. Mäkinen¹, D. Veira Canle¹, M. Meneses³
  ¹D-MAVT, ETH Zürich, Switzerland
  ²D-MATL, ETH Zürich, Switzerland
  ³D-CHAB, ETH Zürich, Switzerland

- **3D Optical Human Eye Model Based on COMSOL Multiphysics® to Provide a Test Bench for Laser Surgery**
  T. R. Delattre¹, M. Ramuz¹
  ¹Department of Flexible Electronics, Ecole Nationale Superieure des Mines, Centre Microelectronique de Provence CMP-EMSE, MOC, Gardanne, France

**OPTICS 3: DESIGN OF OPTICAL SYSTEMS**
*Tuesday, October 23, 14:00*

- **Modeling Gate-Tunable Ionic Transport Using Atomically Thin Patterned Graphene Membrane**
  C.-J. Shih¹, T. Tian¹, R. Wyss¹, K. Yazda¹, H. G. Park³
  ¹D-CHAB, ETH Zürich, Switzerland
  ²D-MATL, ETH Zürich, Switzerland
  ³D-MAVT, ETH Zürich, Switzerland
These user presentations happen simultaneously, choose the ones that most interest you!

**Porous Media Flow**
Tuesday, October 23, 14:00

Groundwater Flow in the Fractured System Surrounding a Nuclear Waste Repository
D. Sampietro¹, A. Sáinz-García¹, E. Abarca¹, J. Molineri¹, H. von Schenck², O. Wessely²
¹Amphos 21 Consulting S.L., Spain
²Swedish Nuclear Fuel and Waste Management Company, Sweden

Multifysics Approach to Sediment Transport in Shallow Water
E. Holzbecher¹, A. Hadidi¹
¹German Univ. of Technology in Oman

A Black-Oil Model for Primary and Secondary Oil-Recovery in Stratified Petroleum Reservoirs
A. Dollari¹, C. Chatzichristos¹, A. Yiotis¹
¹National Center for Scientific Research Demokritos, Greece

**Bioscience and Bioengineering 2**
Wednesday, October 24, 11:00

Optimizing Elastomeric Mechanical Cell Stretching Device
A-J. Mäki¹, J. Kreuzer¹, P. Kallio¹
¹BioMediTech Institute and Faculty of Biomedical Sciences and Engineering, Tampere University of Technology, Tampere, Finland

Bioheat Dissipation of an Implantable Brain-Machine Interface
J. M. Herrera Morales¹
¹Wyss Center for Bio and Neuroengineering, Switzerland

Characterization of Biochemical and Physical Parameters of a Skin Equivalent in a Two-Organ-Chip
H-H. Hsu¹, K. Schinek², G. Linzeder³, J. Jan Kornet¹, Moritz Boehme¹, Uwe Marx¹, Ralf Pörtner¹
¹Institute of Bioprocess- and Biosystems Engineering, Hamburg, Germany
²Department of Biotechnology, Berlin, Germany and TissUse GmbH, Berlin, Germany
³TissUse GmbH, Berlin, Germany

Magnetic Fields for Cell Cultures Suspended in a Perturbed Diamagnetic Medium
P. Ferrada¹, G. Serrano², C. M. Ostojic², A. Maureira², M. Zapata², E. Fuentealba¹
¹Centro de Desarrollo Energético Antofagasta, Universidad de Antofagasta, Antofagasta, Chile
²Laboratorio de Biotecnología Algal y Sustentabilidad, Universidad de Antofagasta, Antofagasta, Chile

**Building Physics 2**
Wednesday, October 24, 11:00

A Model of Concrete Carbonation Using COMSOL Multiphysics®
B. Chine¹, R. Cuevas¹, R. Jimenez¹, A. Rodriguez¹
¹Costa Rica Institute of Technology, School of Materials Science and Engineering, Cartago, Costa Rica

Alternative Implementation of a Porous Media Model for Simulating Drying of Heated Concrete
B. Weber¹
¹Empa - Swiss Federal Laboratories for Materials Testing and Research, Dübendorf, Switzerland

Mechanical Damage Models for Concrete
M. Lavíña¹, A. Idiart¹
¹Amphos 21 Consulting S.L., Barcelona, Spain

**Acoustics 4: Multiphysics**
Wednesday, October 24, 11:00

Numerical Modeling of Viscous Damping for Acoustic Resonances of Suspended Microparticles
T. Baasch², J. Funkhauser¹, J. Dual¹
¹ETH Zurich, Zurich, Switzerland

Acoustic Upside-Down Levitator with a Solid Sample
L. Holitzner¹, E. G. Lierke²
¹Paul Scherrer Institut (PSI), Villigen PSI, Switzerland
²tec5 AG, Oberursel, Germany

Ultrasound Pressure Field of a Resonating Piezoelectric Membrane with Three Excitation Electrodes
V. Tzanov¹, E. Ledesma¹, F. Torres¹, N. Barniol¹
¹Universitat Autonoma de Barcelona, Spain

**Electrochemistry**
Wednesday, October 24, 11:00

Influence of a Porous Corrosion Product Layer on the Corrosion Phenomenon of Carbon Steel Pipelines
M. Mohamed-Saïd¹, P. Namy¹
¹SIMTEC, Grenoble, France

Electrodeposition of 3D Nickel Microcomponents: Simulation Assisted Synthesis
P. Schürch¹, L. Pethö¹, J. Schwiedrzik¹, J. Michler¹, L. Philippe¹
¹Empa Thun, Switzerland

Advanced Particle-Based 3D Modeling of Fuel Cell Electrodes
A. Bertel¹, V. Yuft¹, F. Tariq², N.P. Brandon²
¹University of Pisa, Pisa, Italy
²Imperial College London, London, UK

**Building Physics 2**
Wednesday, October 24, 11:00

A Model of Concrete Carbonation Using COMSOL Multiphysics®
B. Chine¹, R. Cuevas¹, R. Jimenez¹, A. Rodriguez¹
¹Costa Rica Institute of Technology, School of Materials Science and Engineering, Cartago, Costa Rica

Alternative Implementation of a Porous Media Model for Simulating Drying of Heated Concrete
B. Weber¹
¹Empa - Swiss Federal Laboratories for Materials Testing and Research, Dübendorf, Switzerland

Mechanical Damage Models for Concrete
M. Lavíña¹, A. Idiart¹
¹Amphos 21 Consulting S.L., Barcelona, Spain

**Electrochemistry**
Wednesday, October 24, 11:00

Influence of a Porous Corrosion Product Layer on the Corrosion Phenomenon of Carbon Steel Pipelines
M. Mohamed-Saïd¹, P. Namy¹
¹SIMTEC, Grenoble, France

Electrodeposition of 3D Nickel Microcomponents: Simulation Assisted Synthesis
P. Schürch¹, L. Pethö¹, J. Schwiedrzik¹, J. Michler¹, L. Philippe¹
¹Empa Thun, Switzerland

Advanced Particle-Based 3D Modeling of Fuel Cell Electrodes
A. Bertel¹, V. Yuft¹, F. Tariq², N.P. Brandon²
¹University of Pisa, Pisa, Italy
²Imperial College London, London, UK

---

**HP Z Workstations**

Join our workshop
How hardware and software join forces for your best performance.

October 22, 2018 at 11.00 am

www.value-hub.ch
TRANSPORTATION /three.altp: GENERAL
Wednesday, October 24, 11:00

Design and Simulation of Cyclotron Magnet Using COMSOL Multiphysics®
F. Alrumayan¹, A. Hendy², H. Kassim²
¹King Faisal Specialist Hospital and Research Centre, Saudia Arabia
²King Saud University, Saudia Arabia

Analysis of the Behavior in a Squirrel Cage Motor under Electrical Internal Fault
D. A. Aguilar Arévalo¹, H. D. Puin Avila¹, H. E. Ortiz Suárez²
¹Universidad Distrital Francisco José de Caldas, Bogota, Colombia

Simulation of Thermal Breakdown in a Multi-Layered Stack of Dielectric Elastomers
L. R. Madsen¹, O. Hassager¹, A. L. Skov¹
¹Danish Polymer Centre, DTU Chemical Engineering, Lyngby, Denmark

Multiphysics Simulation of the Material State in Single-Screw Extruder
S. Yan¹, H. Zeizinger¹
¹Polymertechnology Powertrain, Daimler AG, Stuttgart, Germany

Finite Element Simulation of Impulse Arc Discharge
A. Chusov¹, E. Rodikova¹, M. Pinchuk², Y. Murashov³, Vladimir Frolov³, Dmitriy Ivanov³
¹Streamer Electric Inc., St.Petersburg, Russia
²Institute for Electrophysics and Electrical Power, St.Petersburg, Russia
³St.Petersburg Polytechnical University, Russia

Simulation of CVD Process in a Reactor
A. Kulkarni¹, F. Mumme¹, V. Frettßh¹
¹Gemeinnützige KIMW Forschungs-GmbH, Lüdenscheid, NRW, Germany

MATHEMATICAL MODELLING /five.altp: MECHANICS
Wednesday, October 24, 11:00

Transient Simulation of the Removal Process in Plasma Electrolytic Polishing of Stainless Steel
I. Danilov¹, M. Hackert-Oschätzchen¹, J. Schaarschmidt¹, M. Zinecker¹, A. Schubert¹
¹Professorship Micromanufacturing Technology, Chemnitz University of Technology, Chemnitz, Germany

Finite Element Simulation of Impulse Arc Discharge
A. Chusov¹, E. Rodikova¹, M. Pinchuk², Y. Murashov³, Vladimir Frolov³, Dmitriy Ivanov³
¹Streamer Electric Inc., St.Petersburg, Russia
²Institute for Electrophysics and Electrical Power, St.Petersburg, Russia
³St.Petersburg Polytechnical University, Russia

Simulation of CVD Process in a Reactor
A. Kulkarni¹, F. Mumme¹, V. Frettßh¹
¹Gemeinnützige KIMW Forschungs-GmbH, Lüdenscheid, NRW, Germany

USER PRESENTATIONS
These user presentations happen simultaneously, choose the ones that most interest you!

Transient Modeling of a Fluorine Electrolysis Cell Using COMSOL Multiphysics®
E. Oosthuizen¹, P. L. Crouse¹
¹University of Pretoria, Pretoria, South Africa

ELECTROMAGNETICS 5: FORCES AND MOTION
Wednesday, October 24, 11:00

Design and Simulation of Cyclotron Magnet Using COMSOL Multiphysics®
F. Alrumayan¹, A. Hendy², H. Kassim²
¹King Faisal Specialist Hospital and Research Centre, Saudia Arabia
²King Saud University, Saudia Arabia

ELT M4 Adaptive Mirror Actuator: Magnetic Optimization and Future Developments
C. Del Vecchio¹, R. Biasi¹, D. Gallieni¹, A. Riccardi¹
¹National Institute for Astrophysics - Arcetri Astronomical Observatory - Florence, Italy
²Microgate Spa - Bolzano, Italy
³ADS International Srl -Val madrena (LC), Italy

Simulation of Thermal Breakdown in a Multi-Layered Stack of Dielectric Elastomers
L. R. Madsen¹, O. Hassager¹, A. L. Skov¹
¹Danish Polymer Centre, DTU Chemical Engineering, Lyngby, Denmark

Finite Element Simulation of Impulse Arc Discharge
A. Chusov¹, E. Rodikova¹, M. Pinchuk², Y. Murashov³, Vladimir Frolov³, Dmitriy Ivanov³
¹Streamer Electric Inc., St.Petersburg, Russia
²Institute for Electrophysics and Electrical Power, St.Petersburg, Russia
³St.Petersburg Polytechnical University, Russia

Simulation of CVD Process in a Reactor
A. Kulkarni¹, F. Mumme¹, V. Frettßh¹
¹Gemeinnützige KIMW Forschungs-GmbH, Lüdenscheid, NRW, Germany

MANUFACTURING 3: GENERAL
Wednesday, October 24, 11:00

Thermal Simulation of a Heat Pipe Tempered Injection Mould Tool
S. Kartelmeyer¹, C. Jaro schek¹, L. Fromme¹, V. Hüttemann¹, E. Moritzer²
¹University of Applied Sciences Bielefeld, Department of Engineering Sciences and Mathematics, Bielefeld, Germany
²Paderborn University, Department of Plastics Engineering (KTP), Paderborn, Germany

Multiphysics Simulation of the Material State in Single-Screw Extruder
S. Yan¹, H. Zeizinger¹
¹Polymertechnology Powertrain, Daimler AG, Stuttgart, Germany

2D Simulation of Crimping Process for Electric Vehicle Battery Charge Cable
O. Ozgonenel¹, O. Bostan², S. Guzel²
¹Ondokuz Mayis University, Samsun, Turkey
²DE-KA, Kocaeli, Turkey
Spatial Dynamics of Insecticide Resistance in Mosquitoes
O. Richter¹
¹University of Technology Braunschweig, Germany

Computational Modeling of Drug Release from an Ocular Iontophoretic Drug Delivery Device
J. Naghipoor I., N. Jafary², T. Rabczuk¹
¹Institute of Structural Mechanics, Bauhaus University of Weimar, Weimar, Germany
²Augsärzte am Meer, Wilhelmshaven, Germany

Design and Implementation of SF6 Gas Insulated Medium Voltage Instrument Transformer
O. Ozgonenel¹, B. Cepken², B. Cilsal²
¹Ondokuz Mayis University, Samsun,Turkey
²EMITAS, Istanbul, Turkey

Easy Teaching of Numerical Simulation of Welding with COMSOL®
I. Tomashchuk¹, P. Sallamand², J.-P. Chateau-Cornu¹
¹Laboratoire Interdisciplinaire Carnot de Bourgogne, Université de Bourgogne-Franche-Comté, Le Creusot, France

COMSOL Multiphysics® Contribution to the Current Knowledge of the Proton Mass
M. Schuh¹
¹Max-Planck-Institut for Nuclear Physics, Heidelberg, Germany

3D-Printed Microfluidic Chip System for Dielectrophoretic Manipulation of Colloids
I. Kuehne¹, N. Philippin¹, M. Michatz², A. Frey³
¹Heilbronn University of Applied Science, Kuenzelsau, Germany
²University of Applied Science, Augsburg, Germany

COMSOL Multiphysics® Models as the Design Guidance in the Selected Transport Phenomena Problems
S. Spotar¹
¹Nazarbayev University, Astana, Kazakhstan

Empirical Verification of COMSOL® - Simulation of Resonance Frequency of an Archimedean Spiral Coil
M. P. Adams¹, K. P. Koch²
¹Hochschule Trier, Trier, Rhineland Palatinate, Germany
²COMSOL Multiphysics GmbH, Goettingen, Germany

Adaptive Mesh Refinement: Quantitative Computation of a Rising Bubble Using COMSOL Multiphysics®
T. Preney¹, P. Nanny¹, J.-D. Wheeler¹
¹SIMTEC, Grenoble, France

Simulation of an Electrically Heated Carbon Fibre Fabric
L. Fromme¹, H. Funke¹, J. Stückemann¹, P. Tschöke¹
¹Bielefeld University of Applied Sciences, Faculty of Engineering and Mathematics, Bielefeld, Germany

Numerical Optimization of Active Heat Sinks Considering Restrictions of Selective Laser Melting
F. Lange¹, C. Hein¹, C. Emmelmann¹
¹Fraunhofer Institution for Additive Production Technologies IAP, Hamburg, Germany

Reducing Loudspeaker Systems Panel Vibrations
D. Cinanni¹
¹ASK Industries Spa. subject to direction and coordination of JVECKENWOOD Corporation, Italy

Study of the Optical Field Scattering Enhancement on a 2D Rough Surface Using COMSOL Multiphysics®
P. de Carvalho Gomes¹, P. Goldberg Oppenheimer¹
¹School of Chemical Engineering, University of Birmingham, UK

Iterative Electric Potential Adjustment of Damaged Naval Vessels Using the Onboard ICCP-System
C. Thiele¹, K. Neumann¹, C. Braecheler¹, F. Ludwar¹, A. Remnings¹, J. Doose¹, D. Ermi¹
¹General and Theoretical Electrical Engineering, University of Applied Sciences Offenburg, Germany
¹SwissNeutronics AG, Klingnau, Switzerland

Numerical Prototyping of Locally Heated Digital Microfluidic Devices
C. Ozen¹, G. Sathyaranayanan¹, S. Cito¹, T. Sikanen¹
¹School of Chemical Engineering, University of Technology, Finland
²University of Applied Sciences Offenburg, Germany

Phase Field Modeling of Phase Separation and Dendritic Growth
A. Bertel¹, A. Lamorgese¹, R. Mauri¹, B. Tellini¹
¹University of Pisa, Pisa, Italy

Experimental Setup to Investigate the Liquid Water Content in Snow
A. Coulin¹
¹SLF Davos, ETH Zurich, Switzerland

Design of an AC Transformer in the MHz Range
D. Martinet¹, Ch. Ellert¹
¹University of Applied Sciences Western Switzerland (HES-SO Valais-Wallis), Institute of Systems Engineering, Sion, Switzerland

Optimization of Static Magnetic Fields for Neutron Science
M. Schneider¹
¹SwissNeutronics AG, Klingnau, Switzerland

Magneto-Mechanical-Thermal Couplings for the Pulsed Magnetic Technology with Single-Turn Coils
O. Maloberti¹, P. Sansen¹, D. Jouaffre², D. Haye³
¹ESIEE Amiens, France
²PFT Innovatech, France
³PFT Innovatech, France

Electromagnetic Analysis of Flat Spiral Coils Fed by a Current Pulse at Medium Frequency
O. Maloberti¹, P. Sansen¹, O. Mansouri¹, D. Jouaffre², D. Haye³
¹ESIEE Amiens, France
²PFT Innovatech, France

Integrating Geological Structures into 3D Numerical Groundwater Flow Models
S. Scheidler¹, B. Anders¹, H. Dressmann¹, P. Huggenberger¹
¹University of Basel, Department of Environmental Sciences, Applied and Environmental Geology (AUG), Basel, Switzerland

Characterization of an Open GTEM Cell with the COMSOL Multiphysics® Software
A. De Vita¹, R. Gaffoglio², B. Sacco¹
¹RAI - Radiotelevisione Italiana, Italy
²Polito, Italy

Modeling Convective Heat Transfer in the Porous Active Layer of an Alpine Rock Glacier
J. Wicky¹, M. Scherer², Ch. Hauck³
¹Alpine Cryosphere and Geomorphology Group, University of Fribourg, Switzerland

Developing the A-V Magnetic and Electric Fields Formulation for 3D Models in Transient States
O. Maloberti¹
¹ESIEE Amiens, France

Modeling and Experimental Evaluation of Structured Powder Dissolution
H. Teichmann¹, N. Ruprecht¹, R. Kohlus¹
¹University of Hohenheim, Stuttgart, Germany

Simulating Approaches for Heating Process in Continuous Furnaces
G. Petrone¹, R. Sinatra¹, C. Barbagallo¹
¹BE CAE & Test, Italy

Eigenfrequency-App for University Laboratory Educations
A. Frey¹, R. Grossmann¹, T. Koch², I. Kuehne³
¹University of Applied Science, Faculty of Electrical Engineering, Augsburg, Germany
²COMSOL Multiphysics GmbH, Goettingen, Germany
³Heilbronn University of Applied Science, Kuenzelsau, Germany

Investigation of Silicon Etching Process with COMSOL®
D. Kray¹, L. Leis¹
¹ESIEE Amiens, France

PIR Sensor Modeling and Simulation Using COMSOL Multiphysics® and its Ray Optics Module
M. Maaspuro¹
¹School of Electrical Engineering, Aalto University, Finland

16
POSTER SESSION

Join us on Thursday evening at 16:30 to meet the authors. Don’t forget to vote for your favorite poster!

Application for Construction and Numerical Analysis of New Melting Elements
L. Streha, ¹, S. Kova, ², D. Janc ³
¹ETI d.o.o., Izlake, Slovenia

Pore-Scale Modeling of Immiscible Two-Phase Flow in Predominantly 2D Microfluidic Porous Domains
A. Dolar, ¹, A. Yiatis, ², I. Zarikos, ², N. Karadimitriou, ², S.M. Hassanzadeh ³
¹Environmental Research Laboratory, NCSR “Demokritos”, Athens, Greece
²Environmental Hydrogeology Group, Utrecht University, The Netherlands

Numerical Study of Membrane Polarization for a Network of Connected Pores
N. Rezaii ¹, A. Hördt ³
¹Braunschweig University of Technology, Institute for Geophysics and Extraterrestrial Physics, Braunschweig, Germany

Modeling of Electrodynamic in High Temperature Superconducting Magnets with COMSOL Multiphysics®
L. Bortol ², ³, M. Mentink ², S. Schoeps ², A. Verweij ²
²Laboratory for Solid State Physics, ETH Zürich, Freiberg, Germany
²Professorship Micromanufacturing Technology, Chemnitz University of Technology, Chemnitz, Germany

Methodology to Assess the Impact of Electrochemical Model Parameters Based on Design of Experiments
L. Oca, ¹, E. Miguel, ¹, L. Otaegui, ¹, A. Villaverde, ¹, U. Iraola ¹
¹Mondragon University of Technology, Department of Mechanical Engineering, Mondragon, Spain
²CIC energiGUNE, Arabako Teknoloji Parkea, Mirano, Spain

Solid Hydrogen Extrusion Modeling
N. Luchier ¹, S. Michaux ¹, D. Chatain ¹
¹DRF/INAC/SBT, CEA-Université Grenoble Alpes, Grenoble, France

To a Fluidic Diode for Biomedical Application
A. Slami ¹, ², V. Tishkova ³, R. Grossier ², M. Lagaize ³, S. Veessler ², S. Soheie, ², N. Candoni ²
¹Biomedical Engineering Laboratory, University of Tlemcen, Algeria and Aix Marseille Univ, CNRS, Centre Interdisciplinaire de Nanoscience de Marseille (CINaM), Marseille, France
²Aix Marseille Univ, CNRS, Centre Interdisciplinaire de Nanoscience de Marseille (CINaM), Marseille, France
³Biomedical Engineering laboratory, University of Tlemcen, Algeria

Modeling Solid-Liquid Settling System as a Two-Phase Flow Problem
L. Gyurik ¹, A. Egedy ², Zs. Ulbert ³
¹University of Pannonia, Veszprém, Hungary
²University of Szeged, Szeged, Hungary
³University of Szeged, Szeged, Hungary

Simulation-Led Design to Optimize Innovative Acoustic Phantom and Ice Catheter Calibration Method
E. Adawi ¹
¹Biosense Webster, Inc., Kibbutz Shefayim, Israel

Photoacoustic Modeling Using Amplitude Mode Expansion Method in a Multi-Scale T-cell Resonator
S. El-Busayy ¹, B. Baumann ¹, M. Wolff ¹, L. Duggen ¹
¹Hamburg University of Applied Sciences, Germany
²University of Southern Denmark, Denmark

Thermo-Fluid-Metallurgical Modeling and Parametric Study of Laser-Based Powder Bed Fusion Process
M. Bayat ¹, S. Mohanty, ², J.H. Hartel ²
¹Department of Mechanical Engineering, Technical University of Denmark, Lyngby, Denmark
²Biomedical Engineering Laboratory, University of Detroit Mercy, Detroit, Michigan

Computational Biophysics in COMSOL®: FSI-Simulations of Cells in a Microfluidic Device
L. D. Wittwer ¹, S. Aal ¹
¹HTW Dresden / TU Dresden, Germany
²HTW Dresden, Germany

Simulation of 1D Heat Distribution in Heavy Oil Reservoirs During Steam Injection Process
T. H. Nasser ¹
¹Freiberg University of Technology, Institute of Drilling Technology and Fluid Mining Engineering, Freiberg, Germany

Structural Mechanics, Acoustics Module - Numerical Study of Loudspeaker Diaphragm Geometry
A. Mageswaran ¹
¹DTU-Technical University of Denmark, Denmark

Light Scattering by Subwavelength Arrays of Silicon Nanowires
M.J. Urbaneja Torres, A. Manolescu
School of Science and Engineering, Reykjavik University, Reykjavik, Iceland

Collecting Photons from an STM Microscope
H. Cabrera ¹, B. Zengin ¹
¹Laboratory for Solid State Physics, ETH Zürich, Zürich, Switzerland
²Department of Physics, Istanbul Technical University, Turkey

ThermoElectric Generators with Air/ Water Cooling and Novel Metamaterial Components
D. Buna ¹, D. Tafone ¹, L. Hohxa ¹
¹Rampaco College of NJ, US

COMSOL Multiphysics® Bio-Cellular Tuning Model
E. Lacatus ¹
¹Politechnic University of Bucharest, Romania

Graphene-Assisted Lipid Bilayer: A Synthetic Cell Model
E. Lacatus ¹
¹Politechnic University of Bucharest, Romania

A Study of HV Capacitor Series Element Failure
C. Mackinnon ¹, B. Stewart ¹
¹University of Strathclyde, Glasgow, UK

Homogenization of Fiber Composite Material Properties: An Adaptive Multiphysics Implementation
J. Stolz ¹, P. Fiderer ², A. Herrmann ³
¹Faserinstitut Bremen e.V., Bremen, Germany
²Airbus Operations GmbH, Hamburg, Germany
³GVR Trade SA, Gorgier, Neuchatel, Switzerland

Improving the Performance of Instant-Fit Earpieces by Making Use of FE-Analyses
D. Stauske ¹, S. Kahms ¹
¹Institute of Dynamics and Vibration Research, Hannover, Lower Saxony, Germany

Numerical Investigation of Electrolyte Flow in a Multi-Cathode System for Electrochemical Machining
M. Penzel ¹, I. Schaarschmidt, ¹, M. Hackert-Oschätzchen ¹, A. Schubert ³
²Professorship Micromanufacturing Technology, Chemnitz University of Technology, Chemnitz, Germany

Modeling Lightweight Charging Systems in the High-Temperature Applications
B. Jokanovic ¹
¹SGL Carbon GmbH, Meltingen, Germany

Influence of Micro Gaps on the Magnetic Characteristics of FI Relay
L. Streha, ¹, D. Janc ³, A. Smrkolj, ², A. Pušnik, ², N. Štroš ²
³ETI d.o.o., Izlake, Slovenia

Multiphysics Modeling of a Fluorine Production Cell
J. Yukasin ¹, P. Namy ³, J. Sanchez-Marcano ³
¹Orano Cycle, HRP, BP 16, Pierrelatte, France
²SIMTEC, Grenoble, France
³Institut Européen des Membranes – UMR 5635 - Université de Montpellier, Montpellier, France

Advanced Loudspeaker Calculator – an Example of COMSOL® Apps Utilization
F. Malbos ¹, M.K. Bogdanski, ³, M. Strauss ²
¹Harman France, VPDT, Paris, France
²Harman International, VPDT, Straubing, Germany

Using COMSOL® for the Development of the UK’s Second Hyperloop Prototype
A. Jocas ¹, I. C. H, Chan ¹, A. Malekos, ¹, H. P. Chan ¹
¹The University of Edinburgh, UK

Frequency Dependent UEP Signatures of Naval Vessels Modeled by a Current Dipole
C. Broecheler ¹, Ch. Thié ¹, A. Rennings, ¹, F. Ludwar ², J. Doose ³, D. Erni ³
¹General and Theoretical Electrical Engineering (ATE), University of Duisburg-Essen, and CENIDE Center for Nanointegration Duisburg-Essen, Duisburg, Germany
²Technical Center for Ships and Naval Weapons, Naval Technology and Research (WTD71), Eckernförde, Germany

17
Hygrothermal Evaluation of Timber Building Envelope Exposed to Future Climate Changes
S. Ameri1, N. Rüther1
1Fraunhofer Institute for Wood Research, Wilhelm-Klauditz-Institut, Braunschweig, Lower Saxony, Germany

Multiscale and Multiphysics Modeling of an Adaptive Material for Sound Absorption
T. G. Zeliński1, K. C. Opieć1
1Institute of Fundamental Technological Research of the Polish Academy of Sciences, Warsaw, Poland

Hot Cracking in Nb-Si Alloys
I. Y. Fernando1
1University of Leicester, Leicester, UK

The Numerical Challenges in Multiphysical Modeling of Laser Welding with ALE
I. Tomashchuk1, I. Bendaud1, J.-M. Jouard1, P. Sallamand1
1Laboratoire Interdisciplinaire Carnot de Bourgogne, Université de Bourgogne-Franche-Comté, Le Creusot, France

Simulation of Laser-Excited Surface Acoustic Waves Travelling on a Steel Hemisphere Shell
J. Mäkinnen1, D. Veira Canle1, M. Salmi1, E. Häggström1
1Department of Physics, Division of Materials Physics, University of Helsinki, Helsinki, Finland

Detailed Axial Symmetrical Model of Large-Scale Underground Thermal Energy Storage
A. Dahashi1, M. B. Janeti1, F. Ochs1
1Unit of Energy-Efficient Buildings, Institute of Structural Engineering and Material Science, University of Innbruck, Innbruck, Austria

Numerical Approaches to Modeling of WGM Resonator and Waveguide Coupling
N. M. Kondratiev1
1Russian Quantum Center (RQC), Skolkovo, Moscow, Russia

Solar Active Plaster for the Renovation of Existing Buildings
S. Malz1
1Ostbayrische Technische Hochschule Regensburg, Regensburg, Bayern, Germany

Chiral Media Simulation in COMSOL®
E. Mohamad1, Y. Jahan1, K. L. Tsakmakidis1, H. Altug1
1EPFL University, Lausanne, Switzerland

Simulation of Thermal Breakdown in a Multi-Layered Stack of Dielectric Elastomers
L. R. Madsen1, O. Hassager1, A. L. Shoiv1
1Danish Polymer Centre, DTU Chemical Engineering, Lyngby, Denmark

Trapping of Single-Cells Within 3D Electrokinetic Cages
K. Keim1, A. Gonçalves1, C. Guiducci1
1École Polytechnique Fédérale de Lausanne - Laboratory of Life Sciences Electronics (Guiducci Lab), Lausanne, Switzerland

Mazar’s Damage Model for Masonry Structures: a Case Study on an Italian Church
M. Mor1, A. De Falco1, G. Sevieri1
1Università di Pisa, Italy
2Università di Firenze, Italy

COMSOL® Application to Estimate 3D Blast Furnace Hearth Wear Using Thermocouple Measurements
Y. Kaymak1, T. Hauck1, J. Mernitz2, R. Lin3, H. Rauch3
1VDEh-Betriebsforschungsinstitut GmbH, Düsseldorf, NW, Germany
3ArcelorMittal Eisenhüttenstadt GmbH, Eisenhüttenstadt, BB, Germany

Microwave Assisted Vacuum Drying Processing: Magnetron vs Solid State. Case Study: Apple Drying
C. Blanch1, R. Schmid1, D. Frick1
1Gigatherm Mikrowellen AG, Switzerland

Acoustic Modeling of a “Minute Repeater”
S. Charron1
1Intermezzì ingénierie acoustique, Paris, France

Transient Simulation of the Removal Process in Plasma Electrolytic Polishing of Stainless Steel
I. Danilov1, M. Hackert-Oschätzchen1, I. Schaarschmidt1, M. Zinecker1, A. Schubert1
1Professorship Micromanufacturing Technology, Chemnitz University of Technology, Chemnitz, Germany

Thermal Simulation of a Heat Pipe Tempered Injection Mould Tool
S. Kertelmeier1, C. Jaroschek1, L. Fromme1, V. Hüttermann1, E. Moritzer1
1University of Applied Sciences Bielefeld, Department of Engineering Sciences and Mathematics, Bielefeld, Germany
2Paderborn University, Department of Plastics Engineering (KTP), Paderborn, Germany
Influence of a Porous Corrosion Product Layer on the Corrosion Phenomenon of Carbon Steel Pipelines
M. Mohamed-Said1, P. Namy1
1SIMTEC, Grenoble, France

Multiphysics Approach to Sediment Transport in Shallow Water
E. Holzbecher1, A. Hadidi1
1German Univ. of Technology in Oman

Mechanical Damage Models for Concrete
M. Laviña1, A. Idiart1
1Amphos 21 Consulting S.L., Barcelona, Spain

Simulation of CVD Process in a Reactor
A. Kulkarni1, F. Mumme1, V. Frettö1
1Gemeinnützige KIMW Forschungs-GmbH, Lüdenscheid, NRW, Germany

COMSOL® Application Builder Lets End-Users Harness the Power of Numerical Modeling and Simulation
J. Speyer1, A. Maurer1, D. Enfrun1, R. Roszyło1
1Kejako SA, Plan les Ouates, Switzerland
2MNCM/HES-SO, Geneva, Switzerland

Controlling the Deposition Regime in Close-Proximity Spatial Atomic Layer Deposition with COMSOL®
C. Masse de la Huerta1, V. Nguyen1, J.-M. Dedulle1, D. Bellet1, C. Jiménez1, D. Muñoz-Rojas1
1Universitat Autònoma de Barcelona, Barcelona, Spain

Multiphysics Simulation of the Material State in Single-Screw Extruder
S. Yan1, H. Zeizinger1
1Polymer technology Powertrain, Daimler AG, Stuttgart, Germany

Modeling of Random Nanostructures Based on SEM Images and Analysis of Resulting RF-Performance
K. Neumann1, J. Moeller1, L. Kuehnel1, A. Rennings1, N. Benson1, B. Schmechel1, D. Ernst1
1General and Theoretical Electrical Engineering (ATE), University of Duisburg-Essen, and CENIDE – Center for Nanointegration Duisburg-Essen, Duisburg, Germany
2Institute for Nanostructures and Technology (NST), University of Duisburg-Essen, and CENIDE – Center for Nanointegration Duisburg-Essen, Duisburg, Germany

Simulation of an Aerodynamic Furnace for High Temperature Thermodynamic Data Acquisition
J.M. Borgard1, A. Quaini1, L. Soldi1, E. Lizon1, T. Alpetta2
1CEA Saclay, GIF sur Yvette, France

Optimum Insulation Thickness Distribution for Heat Loss Uniformity from Heated Corrugated Pipes
R. Bourisli1
1Kuwait University, Kuwait

Energy Harvesting in a Fluid Flow Using Piezoelectric Materials
M. Curato1, M. La Rosa1, P. Prestinini1
1Roma Tre University, Rome, Italy

Ultrasonic Pressure Field of a Resonating Piezoelectric Membrane with Three Excitation Electrodes
V. Tzanov1, E. Ledesma1, F. Torres1, N. Barniol1
1Universitat Autonoma de Barcelona, Spain

Finite Element Prediction of Laser-Material Interaction Using COMSOL Multiphysics®
E.C. Chevalier1, V. Bruyère1, P. Namy1
1SIMTEC, Grenoble, France

Acoustic Upside-Down Levitator with a Solid Sample
L. Hollitzer1, E.G. Lierke1
1Paul Scherrer Institut (PSI), Villigen PSI, Switzerland
tec5 AG, Oberursel, Germany

Modeling Gate-Tunable Ionic Transport Using Atomically Thin Patterned Graphene Membrane
C.-J. Shih1, T. Tian1, R. Wyss1, K. Yazda1, H.G. Park1
1D-MATEB, ETH Zürich, Switzerland
2D-MATL, ETH Zürich, Switzerland

Modeling Water Immersion Thawing of Raw Tuna Fishes
S. Curet1, O. Rouaud1, J.M. Bonny1, L. Mazuel1
1ONIRIS, CNRS, GEPEA, UMR 6144, Nantes, France
2IVIA – IMoST UMR 1240 INSERM/UCa, Clermont-Ferrand, France

Nanoscale Heat Transfer and Phonon Hydrodynamics
A. Beardo1
1Universitat Autonoma de Barcelona, Barcelona, Spain

Magnetic Fields for Cell Cultures Suspended in a Perturbed Diamagnetic Medium
P. Ferrada1, G. Serrano1, C. M. Ostojic1, A. Maurea1, E. Zapata1, A. Fuentealba1
1Centro de Desarrollo Energético Antofagasta, Universidad de Antofagasta, Antofagasta, Chile
2Laboratorio de Biotecnología Algal y Sustentabilidad, Universidad de Antofagasta, Antofagasta, Chile

Simulation-Based Analysis of a Microstructuring Process for Bolt Surfaces with Increased Friction
I. Scharschmidt1, M. Hackert-Oschätzchen1, G. Meichsner1, M. Zinecker1, P. Steinert1, A. Schubert1, 2
1Professorship Micromanufacturing Technology, Chemnitz University of Technology, Chemnitz, Germany
2Fraunhofer Institute for Machine Tools and Forming Technology, Chemnitz, Germany

Groundwater Flow in the Fractured System Surrounding a Nuclear Waste Repository
D. Sampietro1, A. Sáinz-García1, E. Abarca1, J. Molinero1, H. von Schenck1, C. Wessely3
1Amphos 21 Consulting S.L., Spain
2Swedish Nuclear Fuel and Waste Management Company, Sweden

A Black-Oil Model for Primary and Secondary Oil Recovery in Stratified Petroleum Reservoirs
A. Dollari1, C. Chatziichristos1, A. Yiotis1
1National Center for Scientific Research Demokritos, Greece

Multiphysics Model for Thermal Management of Packaged Mid-IR Laser
G. Spinola Durante1
1CSEM SA, Switzerland

Two-Phase Flow Modeling of Metal Vapourisation under Static Laser Shot Using a Double ALE Method
Y. A. May1, M. Dal1, P. Peyre1, M. Bellé1, C. Metton1, C. Moriconi1, R. Fabbro1
1PIMM Laboratory, UMR 8006 Arts et Métiers-CNRS-CNAM, Paris, France
2CEMIF Laboratory, UMR 7635 PSL Research University MINES ParisTech, Sophia Antipolis, France
3Safran, Paris, France

Numerical Study of the Gas-Powder Flow from Coaxial Nozzles in Laser Metal Deposition
E. Ferreira1, M. Dal1, P. Peyre1, C. Colin1, G. Marion1, D. Courapied1, B. Maquare1
1PIMM Laboratory, UMR 8006 ENSAM – CNRS – CNAM, Paris, France
2Centre des Matériaux, UMR 7633 MINES Paris Tech, Evry, France
3Safran, Paris, France

Electromagnetic Design of an RF-Coil Transceiver for NQR-Based Explosive Detection
P. Farantatos1, J. Barras1, I. Poplett1, P. Kosmas1
1King’s College London, UK

RF Emission Spectra in Laser-Plasma Acceleration of Protons
M. Seimetz1
1Instituto de Instrumentación para Imagen Molecular (I3M), CSIC-Universitat Politècnica de Valencia, Spain

Ultrasonic Power Delivery Through a Steel Wall - Water Interface
P. Molianen1, A. Salmi1, E. Haaegström1
1Electronics Research Laboratory, Division of Materials Physics, Department of Physics, University of Helsinki, Helsinki, Finland

When Precise Numerical Predictions Come to the Rescue of Liquid Lubrication
J.-D. Wheeler1, V. Bruyère1, P. Namy1
1SIMTEC, Grenoble, France
POSTER SESSION

Join us on Thursday evening at 16:30 to meet the authors. Don’t forget to vote for your favorite poster!

Modeling the Hyperloop with COMSOL®: on the Mechanical Design of the EPFLoop Capsule
L. Benedetti¹, Z. Sajó¹, N. Riva¹
¹EPFL - EPFLoop, Lausanne, Switzerland

Numerical Study of the Tuning, Pressure Sensitivity and Lorentz Force Detuning of SRF Crab Cavities
E. Cano-Pleite¹, A. Amorim¹, J. Schwiedrzik¹, K. Artoos¹, O. Capatina¹
¹European Organization for Nuclear Research (CERN), Geneva, Switzerland

Additive Manufacturing of Metal Matrix Composites
F. Wirth¹, K. Wegener¹
¹ETH Zurich, Institute of Machine Tools and Manufacturing, Zurich, Switzerland

Electrodeposition of 3D Nickel Microcomponents: Simulation Assisted Synthesis
P. Schürch¹, L. Pethö¹, J. Schwiedrzik¹, J. Michler¹, L. Philippe¹
¹Empa Thun, Switzerland

Modeling of Airborne Transmission in Floor System Including Flanking Transmission
D. Bard¹, M. Kuster¹
¹Kuster + Partner AG, Switzerland

Experimental and Modeling Study of the Filtering Capacity of Green Wall Species
T. Ysebaert¹, S. Denys¹, G. Walpot¹
¹University of Antwerp, Belgium

Boundary Arbitrary Lagrangian-Eulerian and Deformable Boundary Perturbation Method
J. Rivero-Rodriguez¹, B. Scheid¹
¹Université Libre de Bruxelles, Brussels, Belgium

Decomposition of Fundamental Lamb Wave Modes in Complex Metal Structures Using COMSOL Multiphysics
M. Harb¹, R. Malaeb¹, E. Mahfoud¹
¹Department of Mechanical Engineering, American University of Beirut, Lebanon

Acoustic metamaterial: from conception to auralization
C. Lagarrigue, D. Lecoq
Metacoustic - www.metacoustic.com, Le Mans, France

Optimization for Improving Efficiency on Membrane Reactor for WGS Reaction
D.Y. Shin, T.E. Kim, J.Y. Lee
Altsoft Inc., Seoul, South Korea

Simulation as Various Operating Condition for High Temperature Magnesium HydrideReactors
D.Y. Shin, T.E. Kim, J.Y. Lee
Altsoft Inc., Seoul, South Korea