Program

Nanomechanical Testing in Materials Research and Development VIII

October 2-7, 2022
Le Méridien Lav Split
Split, Croatia

Conference Chair
Sandra Korte-Kerzel
RWTH Aachen University, Germany
Le Méridien Lav, Split

Grljevacka 2A, Podstrana

21312, Split, Croatia

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**October 11 - 16, 2009**

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**October 9 – 14, 2011**

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**Nanomechanical Testing in Materials Research & Development VII**

**September 29 – October 4, 2019**

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Dr. Warren Oliver presents “Measurement of Hardness and Elastic Modulus by Depth Sensing Indentation: improvements to the Technique Based on Continuous Stiffness Measurement”
Poster Session

Dr. Yujie Meng presents “Exploring Accurate Structure, Composition and Mechanical Properties of η Carbides in High Tungsten Iron-based Alloy: High-throughput Mapping and DFT Calculations”
Poster Session

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**Locations and Notes**

- Technical sessions will be in Grand Dalmatia and poster sessions will be in Mestrovic.
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**Sunday, October 2, 2022**

09:30 – 10:00  
Check-in for Optional Tutorial Session *(Vis – conference office)*

10:00 – 13:00  
**Tutorial Sessions (parallel)**

**Analyzing dislocations in the TEM**  
Marc Legros, CEMES-CNRS, France

**Studying rate and temperature dependence in nanomechanics**  
Verena Maier-Kiener, Montanuniversitat Leoben, Austria

**Processing and analyzing micrographs with artificial intelligence**  
Setareh Medghalchi, RWTH Aachen University, Germany

13:00 – 14:00  
Lunch (on your own)

15:00 – 16:30  
Check-in for Conference *(Vis – conference office)*

**Session I: Nanomechanics under extreme conditions**  
Chair: Sandra Korte-Kerzel, RWTH Aachen University, Germany

16:30 – 16:40  
**Conference Welcome**  
Sandra Korte-Kerzel, RWTH Aachen University, Germany  
Larry Kabacoff, ECI Technical Liaison

16:40 – 17:20  
**Progress in the development of high strain rate nanoindentation testing**  
George Pharr, Texas A&M University, USA

17:20 – 17:50  
**In situ micromechanics during hydrogen charging: Effect of diffusible hydrogen on BBC Fe-based alloys and hydrogen protection through hydrogen barrier coatings**  
Maria Jazmin Duarte Correa, MPIE, Germany

17:50 – 18:10  
**In situ deformation observation via EBSD and EDS during high temperature tensile testing**  
Sebastian Krauss, Carl Zeiss Microscopy GmbH, Germany

18:10 – 18:30  
**In-situ nanomechanical testing at elevated humidities**  
Igor Zlotnikov, B CUBE, Germany

18:30 – 21:30  
Opening Reception and Dinner *(Gooshter Beach Club)*
Monday, October 3, 2022

07:30 – 09:00  Breakfast buffet

Session II: Crystal plasticity
Chair: Marco Sebastiani, Roma TRE University, Italy

09:00 – 09:40  Keynote
On the contribution of nanomechanical testing to the study of Earth mantle deformations
Patrick Cordier, University of Lille, France

09:40 – 10:00  Orientation-dependent plastic deformability in micropillar compression of oxide ceramics
Hiroshi Masuda, University of Tokyo, Japan

10:00 – 10:30  Solid solution hardening effects on structural evolution and mechanical properties of nanostructured high entropy alloys
Karsten Durst, Technical University of Darmstadt, Germany

10:30 – 10:50  Plastic deformation of microsamples: Intermittent dislocation avalanches and their acoustic emission
David Ugi, Eötvös Lorand University, Hungary

10:50 – 11:30  Coffee Break

11:30 – 12:00  Plasticity of the $\text{C}_{15}$-$\text{CaAl}_2$ Laves phase at room temperature
Carl F. Kusche, RWTH Aachen, Germany

12:00 – 12:20  On the mechanistic origin of the enhanced strength and ductility in rare earth-based Mg alloys
Henry Ovri, Helmholtz Zentrum Hereon, Germany

12:20 – 12:50  Orientation, temperature and strain rate effects in deformation twinning of magnesium
Xavier Maeder, EMPA, Switzerland

13:00 – 14:30  Lunch

14:30 – 16:30  Networking / Time for ad hoc discussions

Session II: Crystal plasticity (continued)
Chair: Ralph Spolenak, ETH Zurich, Switzerland

16:30 – 16:50  Deformation twinning in $\text{Cr}_2\text{AlC}$ MAX phase single crystals: A nanomechanical testing study
Christophe Tromas, Université de Poitiers, France

16:50 – 17:10  Micromechanical study of a precipitation-hardened dual phase high-entropy alloy
Szilvia Kalacska, University of St.-Etienne, France

17:10 – 17:30  Miniaturization effects on the tensile behavior of multicrystalline and polycrystalline nickel-based superalloy: Influence of grain size, free surface and precipitation state
Damien Texier, Institut Clément Ader, France
Monday, October 3, 2022 (continued)

17:30 – 17:50  Dislocation mechanisms of toughening in Cu-graphene nanolayered composite
Subin Lee, KIT, Germany

17:50 – 18:10  Short Coffee Break

18:10 – 18:30  Plasticity of topologically close-packed phases in the Fe-Ta(-Al) system
Christina Gasper, RWTH Aachen, Germany

18:30 – 18:50  Imaging modalities of mechanical microscopy
Jeffrey M. Wheeler, FemtoTools AG, Switzerland

19:00 – 20:00  Poster Preview I

20:00 – 21:30  Dinner

21:30 – 23:00  Poster Session I with social period
Tuesday, October 4, 2022

07:30 – 08:30  Breakfast buffet

**Session III: Fracture**
Chair: Gerhard Dehm, MPIE, Germany

08:30 – 09:00  Tailoring thin-film mechanical fragmentation properties of hybrid atomic/molecular-layer-deposited materials
Ivo Utke, EMPA, Switzerland

09:00 – 09:20  Micro-scale damage tolerance studies in ferroelectric barium titanate thin films
Nidhin George Mathews, Indian Institute of Technology, Bombay, India

09:20 – 09:40  Fracture properties of CrN hard coatings: Influence of the microstructure, alloying elements, and coating architecture
Rainer Hahn, TU Wien, Austria

09:40 – 10:00  Micro-mechanical approach of the intergranular stress corrosion cracking of austenitic stainless steels in PWR environment
Rachma Azihari, CEA Sarclay, France

10:00 – 10:20  Size effects in fracture mechanics: A detailed investigation on crack growth at the micro- and mesoscale
Jutta Luksch, Saarland University, Germany

10:20 – 11:00  Coffee Break

11:00 – 11:30  Environmental reliability and crack propagation resistance of 3d-printed ALD-coated nano-ceramics
Marco Sebastiani, Roma TRE University, Italy

11:30 – 11:50  Fracture behaviour of Ti/TiN multilayer thin film modeling and experimental validation
Ashwini Kumar Mishra, Indian Institute of Technology, Bombay, India

11:50 – 12:10  Grain size tailoring of tungsten copper nanocomposites to affect local fracture characteristics
Klemens Schmuck, Montanuniversität Leoben, Austria

12:10 – 12:30  Dislocation-based competition of plasticity and cracking in oxides: Understanding and application
Xufei Fang, Technical University of Darmstadt, Germany

12:35 – 13:30  Lunch

13:45  Meet up at the front lobby of the hotel for the excursion.

**Buses leave promptly at 13:50**

13:50 – 18:00  Excursion
Tuesday, October 4, 2022 (continued)

Session IV: Biological Materials
Chair: Christian Motz, Saarland University, Germany

18:45 – 19:25  Keynote
Nanomechanical characterisation of polymer nanotubes for application as 'soft' mechanical interfaces for biology
Sohini Kar-Narayan, University of Cambridge, United Kingdom

19:25 – 19:55  Strong, stiff & auxetic - Lessons learned from a fascinating biological material
Daniel Kiener, Montanuniversität Leoben, Austria

20:15 – 22:00  Dinner
Wednesday, October 5, 2022

07:30 – 09:00  Breakfast buffet

Session V: Novel sample geometries and methodical advances
Chair: Johann Michler, EMPA Thun, Switzerland

09:00 – 09:30  Optomechanics of small-scale structures
Ralph Spolenak, ETH Zürich, Switzerland

09:30 – 09:50  Two photon lithography for synthesis of fracture mechanical specimen
Alexander Jelinek, Montanuniversität Leoben, Austria

09:50 – 10:20  High-temperature scanning indentation: A new technique to assess microstructural changes along thermal ramping
Gabrielle Tiphene, École centrale de Lyon, France

10:20 – 10:40  From microlattices to 3d microprinting of multiphase micro-components: Resolution limits and mechanical properties under extreme conditions
Johann Michler, EMPA Thun, Switzerland

10:40 – 11:00  Additive micromanufacturing and dynamic characterization of copper microlattices
Rajaprakash Ramachandramoorthy, MPIE, Germany

11:00 – 11:30  Coffee Break

Session VI: In-situ nanomechanical testing
Chair: Maria Jazmin Duarte Correa, Max-Planck-Institut für Eisenforschung GmbH, Germany

11:30 – 12:00  In situ 3D mapping of local stress and crystal defect structures during micro-mechanical testing by n3D-XRD-CT
Thomas Edwards, EMPA Thun, Switzerland

12:00 – 12:20  Deformation mechanism of cerium oxide nanocubes - an in situ transmission electron microscopy study
Karine Masenelli-Varlot, University of Lyon, France

12:20 – 12:40  Deformation mechanisms of hierarchically structured 2D single-crystal materials revealed by real-time high-resolution in-situ nanomechanical testing
Tyler Dolmetsch, Florida International University, USA

12:40 – 14:30  Lunch

14:30 – 16:30  Networking / Time for ad hoc discussions

Session VII: New Methods & Analyses
Chair: Gaurav Mohanty, Tampere University, Finland

16:30 – 17:00  Challenges in the phase identification of steels using unsupervised clustering of nanoindentation data
Gerhard Dehm, MPIE, Germany
17:00 – 17:20  
Nanoindentation Surface Free Energy measurement over functionalized surfaces and structured substrates  
Edoardo Rossi, Roma TRE University, Italy

17:20 – 17:40  
A mathematical framework for high strain rate nanoindentation testing  
Sudharshan Phani Pardhasaradhi, ARCI, India

17:40 – 18:00  
Short Coffee Break

18:00 – 18:20  
Correcting for substrate elasticity contributions in depth-sensing indentation of embedded particles  
Alejandra Slagter, EPFL, Switzerland

18:20 – 18:40  
Mechanics of elastic contact with an interface between adjacent materials  
Kian Tadayon, TU Dresden, Germany

18:40 – 19:00  
In-situ monitoring of the contact area during indentation creep testing  
Ude Hangen, Bruker BNS, United States

19:00 – 20:00  
Poster Preview II

20:00 – 21:30  
Dinner

21:30 – 23:00  
Poster Session II with social period
Thursday, October 6, 2022

07:30 – 09:00  Breakfast buffet

Session VIII: Nanomechanics under Complex Stress States
Chair: George Pharr, Texas A&M University, USA

09:00 – 09:20  Plasticity in nanoscale friction: Static and dynamic
John Pethica, Trinity College Dublin, Ireland

09:20 – 09:40  Brittle to ductile transition in metal/oxide nanolaminates on flexible substrates under uniaxial and biaxial tension
Barbara Putz, EMPA Thun, Switzerland

09:40 – 10:00  A new method to measure shear surface mechanical properties
Gaylord Guillonneau, University of Lyon, France

10:00 – 10:20  Micro-shear of silicon: Elastic strain analysis using digital image correlation
Carmen Maria Lauener, ETH Zürich, Switzerland

10:20 – 10:50  Coffee Break

Session IX: Grain Boundaries and Phase Transformations
Chair: Verena Maier-Kiener, Montanuniversität Leoben, Austria

10:50 – 11:20  On grain boundary migration of a high-angle-grain boundary – Effect of shear stress and energy jump-driving force in micro-bicrystals
Christian Motz, Saarland University, Germany

11:20 – 11:40  Phase transformations and local deformation mechanisms - A case study on Cu 20 m.% Sn
Lea Lumper, Montanuniversität Leoben, Austria

11:40 – 12:00  Role of grain boundary on the deformation of micropillars
Manmath Dash, University of Birmingham, United Kingdom

12:00 – 12:20  The ductility of thin freestanding metallic films investigated by in-situ TEM / AFM nanomechanical testing
Benoit Merle, University of Kassel, Germany

12:20 – 12:40  Size-dependent coherent twin boundary strength contribution in Cu micropillars
Reza Hosseinabadi, MPIE, Germany

12:40 – 14:30  Lunch

14:30 – 16:30  Networking / Time for ad hoc discussions
Thursday, October 6, 2022 (continued)

**Session X: Amorphous Materials**  
Chairs: Karsten Durst, Technical University of Darmstadt, Germany

16:30 – 17:00  
Uncovering exceptional micro-scale plasticity accommodation mechanisms in amorphous aluminum oxide through experimental and simulation results  
Gaurav Mohanty, Tampere University, Finland

17:00 – 17:20  
Electron beam induced softening of fused silica  
Sebastian Bruns, Technical University of Darmstadt, Germany

17:20 – 17:40  
Temperature-dependent dynamic plasticity of micro-scale fused silica  
Remo Widmer, Alemnis AG, Switzerland

17:40 – 18:00  
Fracture propagation in glassy polymers: From nanometer to centimeter  
Bruno Bresson, ESPCI ParisTech, France

18:00 – 18:20  
Short Coffee Break

18:20 – 18:50  
Evidence of electron-irradiation activated creep in amorphous olivine at room temperature  
Guillaume Kermouche, Ecole des Mines de Saint-Etienne, France

18:50 – 19:10  
Full-field strain around propagating shear bands and von mises criteria for metallic glasses  
Olexsandr Glushko, Montanuniversität Leoben, Austria

19:10 – 19:30  
Plastic flow and structural heterogeneities in silicate glasses - A high throughput investigation  
Etienne Barthel, ESPCi Paris / Sorbonne University, France

19:30 – 19:50  
Densification of polymer glass film under combined high pressure and shear flow revealed via scanning X-ray microscopy  
Graham Cross, Trinity College Dublin, Ireland

20:30 – 22:30  
Conference Banquet (7 Palms Restaurant)

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Friday, October 7, 2022

07:30 – 09:00  
Breakfast and Departures
Poster Presentations

1. MecaNano – European network for mechanics of matter at the nano-scale
   Benoît Merle, University of Kassel, Germany

2. The effect of size, crystal orientation and temperature on the deformation of cast microwires
   Luciano Borasi, EPFL, Switzerland

3. Temperature-dependance evaluation on deformation processes in the Alloy 718 using high-resolution digital image correlation
   Damien Texier, Institut Clément Ader - UMR CNRS 5312, France

4. Nanoindentation strain rate jump test-based prediction of fracture and the brittle to ductile transition in tungsten
   Kevin Schmalbach, University of Minnesota, USA

5. The calibration of nanoindenters revisited
   Thomas Chudoba, ASMEC GmbH, Germany

6. Experimental and numerical investigations of nanoindentation properties at the sub-grain level in Ni-based and Ti-based polycrystalline alloys
   Damien Texier, Institut Clément Ader - UMR CNRS 5312, France

7. Micromechanical characterisation of protein crystals and filamentous microorganisms
   Achim Overbeck, Technische Universität Braunschweig, Institute for Particle Technology, Germany

8. Indentation unloading phase transformations in silicon: A new perspective
   Gerald Josef Kamillo Schaffar, Montanuniversität Leoben, Austria

9. Fast fabrication of micropillar arrays using a combination of laser and FIB for micromechanical compression tests
   Fang Zhou, ZEISS Research Microscopy Solutions, Carl Zeiss Microscopy GmbH, Germany

10. Nanoindentation material testing using SMART and SMART CUBES
    Dennis Bedorf, SURFACE, Germany

11. Nanomechanical testing of novel conducting 2D composite materials produced by additive manufacturing
    Aaron D. Sinnott, Trinity College Dublin, Ireland

12. A novel indentation size effect analysis to quantify material damage for safer nuclear structural health monitoring
    Rohit Sharma, Coventry University, United Kingdom

13. Nanoindentation-based strength measurements of spherical polymeric micro-samples
    Edoardo Rossi, Università degli Studi Roma Tre, Italy

14. A simple method for pile-up correction by high-speed nanoindentation combined with optical profilometry
    Marco Sebastiani, Università degli studi Roma Tre, Italy

15. On the effects of microstructural orientation on fracture toughness in (V,Al)-nitride and oxynitride thin films
    Markus Reiner Schoof, RWTH Aachen University, Germany
16 WITHDRAWN

17 Thermal activation of plasticity in BCC materials investigated by cryo-micropillar compression
Carl F. Kusche, RWTH Aachen University, Germany

18 Exploring accurate structure, composition and mechanical properties of $\eta$ carbides in high tungsten iron-based alloy: High-throughput mapping and DFT calculations
Yujie Meng, KLA, USA

19 Microstructural and mechanical characterization of yarns made from carbon nanotubes for the instrumentation of particle beams at CERN
Ana Teresa Perez Fontenla, CERN, Switzerland

20 Continuous measurement of strain rate sensitivity – A novel nanoindentation method
Hendrik Holz, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

21 Micropillar compression of anisotropic $\text{Al}_2\text{O}_3$-based eutectic composite
Yuta Aoki, The University of Tokyo, Japan

22 Dislocation and grain boundary interaction in oxides: Slip transmission or cracking?
Kuan Ding, TU Darmstadt, Germany

23 Alloy discovery via combinatorial and high-throughput synthesis and mechanical characterization
Adie Alwen, University of Southern California, USA

24 Nano mechanical and microstructural investigation of damage mechanisms in copper wire bonds
Liz Karanja, Centre d’Élaboration de Matériaux et d’Etudes Structurales, France

25 Spherical indentation study on incipient plasticity of medium-/high-entropy alloys
A-Hyun Jeon, Hanyang University, South Korea

26 About the measurement of restoration kinetics in metals using the HTSI method
Gabrielle Tiphene, Ecole Centrale de Lyon, France

27 Effect of hydrogen on the nanomechanical behavior of dual-phase nanocrystalline high-entropy alloy
Zhe Gao, Hanyang University, South Korea

28 Nanoparticle stabilized thin film metallic glasses
Emese Huszar, Empa, Switzerland

29 Shear-coupling migration of grain boundaries in UFG Al
Marc Legros, CEMES-CNRS, France

30 Effects of radiation damage on the critical resolved shear stresses in zirconium alloys for nuclear applications
James Gibson, University of Oxford, United Kingdom

31 Intrinsic room temperature ductilisation of lean rare-earth free ternary Mg alloys
Wassilios Johannes Delis, RWTH Aachen University, Germany
32 Using small-scale mechanics to probe the origins of segregation-induced strengthening
Mohammed Kamran Bhat, Max-Planck-Institut für Eisenforschung GmbH, Germany

34 Mechanical properties and fracture behavior of TiB2+z thin films
Anna Hirle, CDL-SEC at TU Wien, Austria

36 Comparison of mechanical properties of titanium processed by ECAP: Macro vs. micro
Jan Maňák, Institute of Physics of the Czech Academy of Sciences, Czech Republic

38 Mechanical properties and deformation mechanisms of manganese sulphide inclusions
Maximilian A. Wollenweber, RWTH Aachen University, Germany

40 Development of a custom high strain rate nanoindenter for small scale mechanical characterization over a wide range of strain rates
Stefan Zeiler, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

42 Investigating adhesion of polyimide in semiconductor devices with cross-sectional nanoindentation
Moritz Hartleb, KAI Kompetenzzentrum Automobil- und Industrieelektronik GmbH, Austria

44 Nanomechanical behavior of biodegradable metallic glass for transient electrodes
Seung-Kyun Kang, Seoul National University, South Korea

46 Slip and deformation behavior in intermetallic Cobalt-Samarium phases
Tobias Stollenwerk, RWTH Aachen University, Germany

48 Quantitative measurement of stress vs. strain in supported thin films by the layer compression test
Aaron D. Sinnott, Trinity College Dublin, Ireland
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>Microshear mechanical properties measurements on tribolayers</td>
<td>Fadlallah Abouhadid, Ecole Centrale de Lyon, France</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>How do H/E and H3/E2 control coating system wear? - Insights gained from elevated temperature nanoindentation, scratch and impact tests</td>
<td>Ben D. Beake, Micro Materials Ltd, United Kingdom</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Fatigue behavior of gold thin films at elevated temperatures studied by bulge testing</td>
<td>Anna Krapf, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Development of protocols to quantify the twinning stress of a CoCrFeMnNi high entropy alloy</td>
<td>Camila Aguiar Teixeira, Karlsruhe Institute of Technology, Germany</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Measurement of hardness and elastic modulus by depth sensing indentation: Improvements to the technique based on continuous stiffness measurement</td>
<td>Warren C. Oliver, KLA, USA</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Plasticity of the CaAl2 phase and its change with Mg addition at room temperature</td>
<td>Martina Freund, RWTH Aachen University, Institut für Metallkunde und Materialphysik, Germany</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>In-situ micromechanical testing of Su-8 polymer at high strain rates using indentation and micropillar compression</td>
<td>Rahul Cherukuri, Tampere University, Finland</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>High strain rate testing of ultra fine grained aluminium at micro and macro length scales</td>
<td>Aloshious Lambai, Tampere University, Finland</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>A geometry for quantitative analysis of interface fracture at the micron scale</td>
<td>Eloho Okotete, Karlsruhe Institute of Technology, Germany</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Mechanical behavior of optimized optical nanomultilayers</td>
<td>Danielle White, University of Southern California, USA</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Development of novel indentation-based stress relaxation tests to study transient plasticity in metals</td>
<td>Suprit Purushottam Bhusare, University of Tampere, Finland</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Unveiling the mechanisms of motion of synchro-Shockley dislocations in Laves phases</td>
<td>Zhuocheng Xie, RWTH Aachen University, Germany</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>The restructuring of grain boundaries at the surfaces of meals</td>
<td>John J. Boland, Trinity College Dublin, Ireland</td>
<td></td>
</tr>
</tbody>
</table>
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The ECI Conferences Committee invites you to suggest topics and leaders for additional conferences and encourages you to submit a proposal for an ECI conference.

Ideally, proposals should be submitted from 18 to 24 months in advance of the conference although the staff can work on a shorter timeline.

The traditional format for an ECI conference is registration Sunday afternoon with technical sessions held each morning and evening through Thursday or Friday noon. Afternoons are used for informal gatherings, poster sessions, field trips, subgroup meetings and relaxation. This format has served well to build important professional networks in many areas.

ECI welcomes proposals for shorter conferences and for conferences which span weekends in order to reduce the number of working days participants are away from their offices.
ECI Works With You

ECI works with conference chairs in two complementary ways. First, an experienced member of the Conferences Committee acts as your technical liaison from the proposal stage through the conference itself. He or she is always available to consult with you on any conference issue.

Second, after your proposal has been approved by the Conferences Committee, the ECI staff will assume responsibility for the administration of the conference.

Your primary responsibilities will be recruiting the organizing committee, developing the technical program and securing third-party funding necessary to support the travel of key speakers.

The responsibilities of ECI’s “full service” staff include -- but are not limited to -- the following:

- Recommend, negotiate, contract and make substantial deposits for housing, meals, meeting space, A/V equipment and tours.
- Maintain web sites for the conference and for submission of abstracts.
- Publicize via electronic and print media.
- Administer all finances including grants, contributions and purchase orders. (ECI makes grant funds available as soon as a grant is approved.) There is no need for chairs to set up a conference bank account or file tax returns for their conference.
- Process all applications and registrations.
- Produce bound program/abstracts book.
- Contract for the publication of print or electronic proceedings, if any.
- Provide on-site staff during the conference.

For more information, please contact the ECI Director at Barbara@engconfintl.org