

# **Nature-Inspired Engineering 2019**

An ECI Conference Series Volume 19AB

Cetraro, Italy  
8 – 13 September 2019

**Editors:**

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ISBN: 978-1-5108-9730-4

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57 Morehouse Lane  
Red Hook, NY 12571



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## **Sunday, September 8, 2019**

14:30 – 17:50	Conference Check-in
17:50 – 18:10	Welcome from the conference chairs and ECI Liaison
18:10 – 19:10	<b><u>Opening Keynote</u></b> (Chair: Bharat Bhushan) <b>Nature-inspired chemical engineering, a transformative methodology for innovation</b> Marc-Olivier Coppens, University College London, United Kingdom
19:10 – 21:10	Opening Reception and Dinner

### **Notes**

- Audio, still photo and video recording by any device (e.g., cameras, cell phones, laptops, PDAs, watches) is strictly prohibited during the technical sessions, unless the author and ECI have granted prior permission.
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## **Monday, September 9, 2019**

- 07:30 – 08:30 Breakfast
- 08:30 – 09:30 Session Chair: Mark Cutkosky  
**Keynote**  
**From plant to product – basic principles, applications and future prospects**  
Christoph Neinhuis, TU Dresden, Germany
- 09:30 – 10:30 **Keynote**  
**Nature inspired architecture: Integrative computational design and fabrication for filamentous structures**  
Achim Menges, University of Stuttgart, Germany
- 10:30 – 11:00 Coffee Break
- 11:00 – 11:40 Session Chair: Yongmei Zheng  
**(Invited) The biological oxidation inspired biomedical hydrogels**  
Qigang Wang, Tongji University, China
- 11:40 – 12:00 **Thermal insulation design bioinspired by microstructure study of penguin feather and polar bear hair**  
Urszula Stachewicz, AGH University of Science and Technology, Poland
- 12:00 – 12:20 **Nature-inspired, multi-functional surface coatings for space applications, fabricated by additive manufacturing**  
Malica Schmidt, University College London, United Kingdom
- 12:20 – 12:40 **Bulk supercrystalline ceramic-organic nanocomposites: New processing routines and insights on the mechanical behavior**  
Diletta Giuntini, Hamburg University of Technology (TUHH), Germany
- 12:40 – 13:00 Discussion
- 13:00 – 14:30 Lunch at the Beach
- 14:30 – 15:30 Session Chair: Christoph Neinhuis  
**Keynote**  
**Bioinspired mechanically durable superliquiphilic/phobic surfaces**  
Bharat Bhushan, Ohio State University, USA
- 15:30 – 15:50 **Unexpected stability of aqueous dispersions of raspberry-like colloids**  
Yang Lan, University College London, United Kingdom
- 15:50 – 16:10 **Structure-property relations of highly ordered bio-nanocomposites**  
Suellen Pereira Espindola, Delft University of Technology, Netherlands
- 16:10 – 16:50 Afternoon refreshments
- 16:50 – 18:10 **Rapid-fire oral presentations of posters**
- 18:10 – 19:50 **Poster Session** (with snacks and drinks)
- 20:00 – 21:30 Dinner

**Tuesday, September 10, 2019**

07:30 – 08:30	Breakfast
08:30 – 10:30	<b>Nature inspired solutions Special Interest Group - A UK wide network</b> Monika Dunkel, Knowledge Transfer Network, United Kingdom
	<b>Industrial – Academic Discussion: Translation to practice</b> Moderated by Monika Dunkel, Knowledge Transfer Network, United Kingdom
10:30 – 11:00	Coffee Break
11:00 – 13:00	<b>Workshop: How to use NISE to solve problems in practice? (A Hands-On Workshop)</b> Facilitated by Marc-Olivier Coppens, University College London, United Kingdom
13:00 – 18:00	Lunch followed by guided excursion to Diamante and Bevedere**
18:00 – 19:45	<b>Poster Session</b> (with snacks and drinks)
19:45 – 21:15	Dinner

\*\*Information on the excursion can be found after the last page of the program

**Wednesday, September 11, 2019**

- 07:30 – 08:30 Breakfast
- 08:30 – 09:30 Session Chair: Jacob Thiar  
**Keynote**  
**Is direct air capture nature-inspired?**  
Klaus Lackner, Arizona State University, USA
- 09:30 – 09:50 **Nature-inspired flow-fields and water management for PEM fuel cells**  
Jason Cho, University College London, United Kingdom
- 09:50 – 10:10 **Electrochemical materials discovery and intelligence**  
Kourosh Malek, NRC, Canada
- 10:10 – 10:30 **Nonequilibrium thermodynamics and constructal law guidelines for nature-inspired chemical engineering processes**  
Sergio da Cunha, Institut National Polytechnique de Toulouse, France
- 10:30 – 11:00 Coffee Break
- 11:00 – 11:40 Session Chair: Klaus Lackner  
**(Invited) Discovery, applications and scale-up of bioinspired nanomaterials**  
Siddharth Patwardhan, University of Sheffield, United Kingdom
- 11:40 – 12:00 **Influence of pulsating flow on dispersion in helically coiled tubes and coiled flow inverters**  
Gleb Valitov, University College London, United Kingdom
- 12:00 – 12:20 **Process intensification and process scale-up: Gaps and opportunities**  
Jacob Thiar, Exxon Mobil, USA
- 12:20 – 13:00 **(Invited) Bio-Inspired Optics: Liquid lenses imitating eye reflexes**  
Natalia Ivanova, Tyumen State University, Russia
- 13:00 – 14:30 Lunch at the Beach
- 14:30 – 15:30 Session Chair: Eugene Goldfield  
**Keynote**  
**Bioinspired micro/nanostructured surfaces with wettability from design to functions**  
Yongmei Zheng, Beihang University, China
- 15:30 – 15:50 **Bioinspired materials for water collection, water purification and oil-water separation**  
Bharat Bhushan, Ohio State University, USA
- 15:50 – 16:10 **Water-assisted growth of nano-floret hybrid nanostructures and their application in sensing platforms**  
Roie Yerushalmi, The Hebrew University of Jerusalem, Israel
- 16:10 – 16:50 Afternoon refreshments
- 16:50 – 17:10 Session Chair: Siddharth Patwardhan  
**Microfluidic platform for continuous synthesis of nanoparticles**  
Ondrej Kaspar, University of Chemistry & Technology, Prague, Czech Republic

**Wednesday, September 11, 2019 (continued)**

- |               |  |
|---------------|--|
| 17:10 – 17:30 | <b>Balance-of-force selective accumulation of trace ionic species in hierarchical sub-nano-/nano-/micro-porous structures</b><br>Andriy Yaroshchuk, ICREA, Spain |
| 17:30 – 17:50 | <b>pH driven colloidal transformation of MS2 virus particles for water purification</b><br>Samuel Watts, EMPA, Switzerland                                       |
| 19:00 – 19:30 | Pre-Dinner Social Period   |
| 19:30 – 21:30 | Conference Banquet<br>Poster Prizes  |

**Thursday, September 12, 2019**

- 07:30 – 08:30 Breakfast
- 08:50 – 09:50 Session Chair: Marc-Olivier Coppens  
**Keynote**  
**Developmental Bioengineering**  
Eugene Goldfield, Harvard University, USA
- 09:50 – 10:10 **Development of compartmentalized antibacterial systems based on immobilized alliinase**  
Viola Tokarova, University of Chemistry and Technology, Czech Republic
- 10:10 – 10:30 **Insect-inspired navigation: Smart tricks from small brains**  
Alex Dewar, University of Sussex, United Kingdom
- 10:30 – 11:00 Coffee Break
- 11:00 – 12:00 Session Chair: Bharat Bhushan  
**Keynote**  
**Nature-inspired robotics for physical interaction with the world**  
Mark Cutkosky, Stanford University, USA
- 12:45 – 14:30 Lunch at the beach
- 14:30 – 15:50 **Impromptu Session** (discuss a topic that spurred much interest)
- 15:50 – 16:10 Concluding remarks
- 16:10 – 16:50 Afternoon Refreshments
- 16:50 – 19:00 Free time
- 19:00 – 19:30 Pre-dinner social period
- 19:30 – 21:30 Dinner



## **Poster Presentations**

1. **Kidney-inspired membranes with superior antifouling properties**  
Halan Mohamed, University College London, United Kingdom
2. **Synthesis and catalytic properties of hierarchically structured zeolite catalysts with intracrystalline macropores**  
Tobias Weissenberger, University College London, United Kingdom
3. **The effects of external surface barriers on diffusion and reaction in zeolite catalysts**  
Mohammad Alkhunaizi, University College London, Saudi Aramco, United Kingdom
4. **Trade-offs in Computer-aided Biomimetics**  
Ruben Kruiper, Heriot-Watt University, United Kingdom
5. **An evolutionary approach to kinetic modelling inspired by Lamarckian inheritance**  
Marco Quaglio, University College London, United Kingdom
6. **Development of biomimetic surfaces with an antibacterial effect based on the structure of dragonfly wings**  
Viola Tokárová, University of Chemistry and Technology, Prague, Czech Republic
7. **Microfluidic chemotaxis screening platform for quantification of bacterial viability**  
Anand Narayanan Pallipurath Radhakrishnan, University College London, United Kingdom
8. **A nature-inspired passive airflow system for carbon capture and sequestration**  
James Niffenegger, Harvard College, USA
9. **A nature inspired approach toward superhydrophobic cotton fabric for multifunctional use**  
Poonam Chauhan, Indian Institute of Technology (ISM), Dhanbad, India
10. **Structural change of fluid catalytic cracking catalysts study incorporate with coke characterization formed in heavy oil volatilization/decomposition**  
Yeshui Zhang, University College London, United Kingdom
11. **Mussel inspired chemistry and bacterially synthesised polymers for oral mucosal adhesion and drug delivery**  
Nazanin Owji, University College London, United Kingdom
12. **A study of solar energy storage using sugar mixture**  
Nuttapol Lerkkasemsan, King Mongkut's Institute of Technology Ladkrabang, Thailand
13. **Whale 'blubber' as bio-inspired phase change material**  
Özge Güngör, Cukurova University, Turkey