

ECCE 12/ECAB 5 – Florence, September 15-19, 2019

THE EUROPEAN CONFERENCES OF CHEMICAL ENGINEERING AND APPLIED BIOTECHNOLOGIES

INTERVIEW WITH THE PLENARY SPEAKERS

The 12th European Congress of Chemical Engineering (ECCE 12) will be held in conjunction with the 5th European Congress of Applied Biotechnology (ECAB 5) in Florence from 15 to 19 of September 2019. The event is organized by AIDIC, the Italian Association of Chemical Engineering, under the auspices of the European Federation of Chemical Engineering (EFCE), as well as of the European Society of Biochemical Engineering Science (ESBES).

The theme of the Congress will be “Bridging Science with Technology, a Renaissance in Chemical Engineering”, and Florence, being the historical birthplace of Renaissance, is the best location in the world for such event

The topics of the conference are those typical of Chemical Engineering and Applied Biotechnologies, from the classical ones, like process simulation and reactor design, to the most current ones, like nanotechnologies, bio-fuels, bio-catalysts, food and water, that represent the challenges of the future and are of interest to everybody.

We have planned 6 Plenaries, 12 Parallel and 3 Poster Sessions, 6 Symposia and one Student Session.

The choice of the Speakers of the 6 Plenaries is particularly interesting. They are:

- ✓ **Prof. H. Scott Fogler** from USA. He is the Ame and Catherine Vennema Professor of Chemical Engineering and the Arthur F. Thurnau Professor at the University of Michigan in Ann Arbor and was the 2009 National President of the American Institute of Chemical Engineers.
His lecture will be on “**Applications of Chemical Engineering to Upstream Engineering**”.
- ✓ **Prof. Flavio Manenti** from Italy. He is Professor of Chemical Plants at Milan Politecnico (Department of Chemistry, Materials and Chemical Engineering “Giulio Natta”) and former Professor at TU Berlin (Alexander von Humboldt Senior Scientist) and TPU (Chemical and Nuclear Engineering Chair).
His lecture will be on “**Perspectives for CO₂ Utilization**”.
- ✓ **Prof. Inmaculada Ortiz Uribe** is Professor of Chemical Engineering at the University of Cantabria, Spain, since 1996. She has been visiting Professor at Wuhan University, China, in 2010 and Fulbright Fellow at Carnegie Mellon University, USA, in 2017.
Her lecture will be on “**Separation challenges in the quest for sustainability**”.

- ✓ **Prof. Dr. Jürgen Pleiss** from Germany. He is head of the bioinformatics group at the Institute of Biochemistry and Technical Biochemistry of the University of Stuttgart since 1995.
His lecture will be on **“Biocatalysis/Protein Enzyme Stability”**.
- ✓ **Dr Marinke Wijngaard** from Nederland. She holds a degree in chemical engineering from the Technical University of Eindhoven and is MD of TNO Circular Economy & Environment. TNO is an independent applied research organization in Holland.
Her lecture will be on **“Chemical recycling of complex plastics”**.
- ✓ **The Winner of the Dankwerts Award, Prof. Klavs F. Jensen** from USA. He is Warren K. Lewis Professor in Chemical Engineering and Materials Science and Engineering at the Massachusetts Institute of Technology.
His lecture will be on: **“Advancing Chemical Development through Process Intensification, Automation, and Machine Learning”**.

We interviewed Prof. Scott Fogler and Prof Jensen about their lectures. Here is what they say.



Prof. Scott Fogler

H. Scott Fogler is the Ame and Catherine Vennema Professor of Chemical Engineering and the Arthur F. Thurnau Professor at the University of Michigan in Ann Arbor and was the 2009 National President of the American Institute of Chemical Engineers. He received his B.S. from the University of Illinois and his M.S. and Ph.D. from the University of Colorado. Scott recently received a doctor honoris causa degree from the Universitat Rovira i Virgili, Tarragona, Spain and in 1985 he received a diploma from the New Orleans School of Cooking. He is the author of 12 books, including the Elements of Chemical Reaction Engineering, 5th Edition, and Essentials of Chemical Reaction Engineering, which are estimated to be used by 70-80% of all chemical engineering programs in the United States and also dominate the worldwide market. In addition, he co-authored the 3rd edition of Strategies for Creative Problem Solving with Steven LeBlanc and Benjamin Rizzo. Scott and his students are well known for their work on the application of chemical reaction engineering principles to the petroleum industry. He has graduated 47 PhDs and they have published over 240 research articles in areas such

as acidization of petroleum wells, gelation kinetics wax deposition in subsea pipelines and asphaltene flocculation and deposition kinetics. In 1996 Scott was recipient of the Warren K. Lewis award from the American Institute of Chemical Engineers for contributions to chemical engineering education and he is the recipient of 14 named lectureships. Scott is an associate editor of Energy & Fuels.

Professor Fogler, we are very happy that you have accepted AIDIC invitation to be a Plenary Speaker at the ECCE 12/ECAB 5 Conference in Florence. You have a very impressive CV, in particular in relation to the subject of your lecture, Safety. Can you please summarize briefly your professional experience and tell us when and why you started to be interested in safety ?

It started about 20 years ago when I began using case studies of runaway reactions in my textbook: The Elements of Chemical Reaction Engineering: see <http://www.umich.edu/~elements/5e/index.html>.

I found throughout my career that most universities students were not getting an adequate training in Chemical Process Safety. Consequently, two years ago I started to develop an initiative called *Safety Across the Chemical Engineering Curriculum*. The concept there is to have a safety module in every core chemical engineering lecture course, see <http://umich.edu/~safeche/>.

Can you tell us about your lecture? Which aspects will be treated in particular?

In my presentation I will describe the initiative modules, which include a Chemical Safety Board Video of an accident and tutorials on how the accident could have been prevented and the impacts mitigated. I will also describe the components of the safety website and the safety tutorials and the need for this initiative. See web sites above.

The theme of the conference is: Bridging Science and Technology: a renaissance in Chemical Engineering. What are your views about it and how do you see the role of the chemical engineer in this fast changing world?

I believe that the fundamentals will for the most part remain unchanged, e.g., force will always equal mass times acceleration. On the other hand the application of such fundamental principles is where we have to be more creative. Consequently we have to focus on teaching our students how to be more versatile, using techniques as lateral thinking, analogy, TRIZ, futuring, etc. For instance TRIZ, an acronym from Russian, literally the theory of the resolution of invention-related tasks, is a problem-solving, analysis and forecasting tool derived from the study of patterns of invention in the global patent literature. By using such tools, I expect that young engineers and researchers will be better equipped in problem solving for their work.

The conference will be held in Florence, 22 years after the first European Conference in 1997. What is your relationship with this special city?

When our grandchildren become teenagers, we offer each one a trip anywhere in the world they would like to go individually with only their grandparents, Janet and me. It's an occasion to explore new places and new cultures and have quality time together. For his trip with Janet and me, my grandson, Joe, chose Italy and a Smithsonian Tour for only

grandparents and grandchildren. We therefore spent 3 days of the trip in Florence and we all loved it so much! My wife and I have been to Tuscany at least 4 or 5 times previously and we are looking forward to returning in September.



Prof. Klavs F. Jensen

Klavs F. Jensen is Warren K. Lewis Professor in Chemical Engineering and Materials Science and Engineering at the Massachusetts Institute of Technology. From 2007- July 2015 he was the Head of the Department of Chemical Engineering. He received his MSc in Chemical Engineering from the Technical University of Denmark (DTU) and his Ph.D. in chemical engineering from the University of Wisconsin-Madison. His research interests include on-demand multistep synthesis, methods for automated synthesis, and machine learning techniques for chemical synthesis and interpreting large chemical data sets. He is a co-director of MIT's Pharma AI consortium that aims to bring machine learning technology into pharmaceutical discovery and development. Catalysis, chemical kinetics and transport phenomena are also topics of interest along with development of methods for predicting performance of reactive chemical systems. He is the co-author of more than more than 430 refereed journal and 175 conference publications as well as 8 edited volumes and 50 US patents. He chairs the Editorial Board for the new Royal Society of Chemistry Journal Reaction Chemistry and Engineering. He serves on advisory boards to universities, companies, professional societies, and governments. He is the recipient of several awards, including a National Science Foundation Presidential Young Investigator Award, a Camille and Henry Dreyfus Foundation Teacher-Scholar Grant, a Guggenheim Fellowship, and the Allan P. Colburn, Charles C.M. Stine, R.H. Wilhelm, W.H. Walker, and Founders Awards of the American Institute of Chemical Engineers. He received the inaugural IUPAC-ThalesNano Prize in Flow Chemistry in 2012 and the inaugural Corning International Prize for Outstanding Work in Continuous Flow Reactors & Chemistry in 2018. Professor Jensen is a member of the US National Academy of Sciences, the US National Academy of Engineering as well as the American Academy of Arts and Science. He is a Fellow of the American Association

for the Advancement of Science (AAAS), and the American Institute of Chemical Engineers, and the Royal Society of Chemistry.

Prof. Jensen, we are very happy that you have also accepted AIDIC invitation to be a Plenary Speaker at our Conference in Florence. Can you please introduce yourself briefly?

I received my chemical engineering education from the Technical University of Denmark (DTU) and University of Wisconsin-Madison (PhD). From 1980 to 1989, I was a faculty member in Chemical engineering and Materials Science at the University of Minnesota. In 1989, I joined the Massachusetts Institute of Technology (MIT), where I am now the Warren K. Lewis Professor of Chemical Engineering and Materials Science and Engineering. From 2007- 2015, I was the Head of the Department of Chemical Engineering. My research revolves around reaction engineering with current projects in continuous multistep synthesis (flow chemistry), techniques and algorithms for automated chemical synthesis, and machine learning techniques for chemical synthesis planning and experimentation.

What inspired your career in research?

Mathematics and Chemistry were my favorite topics in high school and a family friend encourage me to pursue chemical engineering with its combination of chemistry, engineering, and problem solving. Opportunities to (1) work on challenging new problems, (2) to continue to learn new concepts and methods, and (3) to teach made me choose a university research career. My teachers, colleagues, and students have been a constant source of inspiration and encouragement.

What is your Danckwerts Lecture about?

The Lecture focuses on advancing chemical development and manufacture through process Intensification, automation, and machine learning. I start by describing our work on process intensification and green chemistry through micro-reaction technology and continuous multistep organic synthesis (also called flow chemistry). Examples include examples of individual reaction units as well as on-demand synthesis of common pharmaceuticals. Next, I highlight advances in automated screening and optimization of chemical reactions to accelerate translation of laboratory discoveries to manufacturing. Finally, I show how computer aided chemical synthesis based on machine learning can be executed in a modular, automated continuous flow platform configured by a robotic arm. Case studies of automatic continuous synthesis of pharmaceutical compounds illustrate this combined approach of machine learning, reaction engineering, and robotics.

Can you share your view on the future of the Chemical Engineer?

With its strong foundation in the sciences, engineering principles, and problems solving, chemical engineering is uniquely placed to play a leading role in addressing challenges in low carbon energy conversion, sustainability, stable food supplies, clean water, and global health.

Do you have any career/personal relationship with Italy and Florence?

I have had the opportunity to work with wonderful Italian students and colleagues. Italy has been a favorite vacation destination for my wife and me the past 40 years. We are great admirers of Italian history and culture. Presenting the Danckwerts Lecture and participating in the ECCE & ECAB Conference make a wonderful return to Florence.
