



10th European Innovation Summit



Lunch Debate in cooperation with TU Delft

From Science to Industry to Society: The Synthetic Cell Revolution

Hosted by Caroline Nagtegaal MEP

Tuesday, 27 November 2018 | 12:30 – 15:00

MEP Salon, European Parliament, Brussels

Description

- Is it possible to build a living cell starting from its basic molecular components?
- And what will be the technological and societal impact of such an achievement?

Building a synthetic cell is one of the grand scientific and intellectual challenges of the 21st century. At the same time the knowledge of life processes that will result from the construction of a synthetic cell has the potential to lead to a paradigm shift in biotechnology applications in all areas. Examples range from the design of smart drugs and drug delivery systems, to cell-based therapy, to the production of biomaterials and biofuels to new methods for pathogen control and for the prevention of animal and plant diseases.

Europe has built a particularly strong track record in the field of bottom-up synthetic biology as compared to the US and Asia, and is in an excellent position to take a global lead. Europe has a strong presence in pharmaceutical, food and materials industries and a quickly developing ecosystem of small biotech companies, which can provide industrial know-how to quickly act on technological capabilities developed in synthetic cell research.

However, triggered and inspired by the successful European community building with this initiative, the US community has started to organize itself and the NSF is taking initiatives to start new funding programs in this area.



10th European Innovation Summit

This small scale, high-level lunch event will start with a short introduction on the synthetic cell research and technology status, and the positioning of the European initiative worldwide.

A plenary debate will then follow centred on the following topics:

- How to maximize opportunities for European industry and for the citizens?
- How to secure Europe's leading position with respect to US and Asiatic countries?
- What is the necessary framework in terms of Responsible Research and Innovation?
- What form for the Synthetic Cell Initiative in the new European R&I programme?

Among the participants, Nobel Prize winners (to be confirmed) and high-level representatives from industry.

Speakers

Host:

Caroline Nagtegaal, *Member of the European Parliament MEP*

Moderator:

Esther Thole, *Science journalist and writer*

Speakers:

Marileen van Doeterom, *Chair, Department of Bionanoscience, Delft University of Technology*

Petra Schwill, *Director, Max Planck Institute of Biochemistry*

Manuel Thery, *Research director CEA*

Prof. Dr. Peter Dabrock, *Chair, University of Erlangen/German Ethics Council*



10th European Innovation Summit

Host and Speakers

Caroline Nagtegaal, *Member of the European Parliament MEP*



Caroline Nagtegaal MEP (1980) was elected in the European Parliament since November 2017 on behalf of the Dutch liberal party VVD. The VVD is part of the ALDE Group, Alliance of Liberals and Democrats for Europe.

As a member of the Committee on Economic and Monetary Affairs (ECON) she is involved in subjects as macro-economics, financial regulations, EMU, FinTech, Bitcoin and crowdfunding. She focusses on improving the resilience of the financial markets and enhancing growth potential of European SMEs, for example by developing an EU framework for crowdfunding. She is also working on a new budgetary tool that promotes structural reforms in the Member

States.

As substitute member of the Committee on Industry, Research and Energy (ITRE) she deals with energy, cyber security, space, quantum technology and robotics. She took care of the new cyber security legislation. She is also committed to Horizon Europe, a programme dedicated to excellence and innovation. At this moment, she is shadow rapporteur on the Space Programme.

Besides that, she is vice-president of the delegation on relations of the European Parliament with India and co-chair of the Innovation Group.

Prior to her election to the European Parliament, Ms. Nagtegaal worked at Royal Schiphol Group and Port of Rotterdam Authority. She dealt with public & external affairs for those companies.

Esther Thole, *Science journalist and writer*



Author of *Creators of Life* (original NL: *Makers van Leven*), Maven Publishing (2018). In her book, editor Esther Thole describes how scientists build structures on the nano-scale towards hierarchically ordered materials or building blocks for life.



10th European Innovation Summit

Marileen van Doeterom, *Chair, Department of Bionanoscience, Delft University of Technology*



Marileen Dogterom was trained as a theoretical physicist at the University of Groningen, The Netherlands. She was a PhD student in Paris and Princeton until 1994 and then a postdoc at Bell Labs. In 1997 she started her own independent research group in experimental biophysics at the FOM Institute AMOLF in Amsterdam, where she was a group leader and later department head until 2014. Since then she has been professor and chair of the department of Bionanoscience at the TU Delft. She is a board member of the Royal Netherlands Academy of Arts and Sciences and recipient of an ERC Synergy Grant (2013). In 2018 she received the prestigious Dutch Spinoza price for her scientific work. Her main interest is in the reconstitution of cellular machineries in artificial confinement, with the ultimate goal to build a synthetic cell. Since 2017, she is leading a Dutch research consortium this topic.

Speech Abstract: Worldwide there are several initiatives in the quest for minimal cells. The United States and Europe are currently playing a major role. Europe has a large number of world-leading researchers from various countries and disciplines, currently working on different aspects of minimal cells. In the last years, these researchers have been working towards the establishment of a coordinated European effort to develop synthetic cell technology. Triggered and inspired by the voiced European ambition and successful community building, the US community on synthetic cell research has recently also started to organize itself and the NSF is taking initiatives to start new funding programs in this area.

All these developments now make a European Initiative on Synthetic Cell Science & Technology even more timely and urgent, since Europe has an opportunity to be in the lead of what will be a global and rapidly expanding endeavour with major impact on a broad range of application areas.

Petra Schwille, *Director, Max Planck Institute of Biochemistry*



Petra Schwille studied physics in Stuttgart and Göttingen and obtained her PhD in 1996 with Nobel Laureate Manfred Eigen at the MPI for Biophysical Chemistry in Göttingen, Germany. After a postdoctoral stay at Cornell University (Ithaca, USA) she established a research group at the MPI Göttingen in 1999 and accepted a call as professor and chair of biophysics at the BIOTEC of the TU Dresden in 2002. In 2011, she was appointed as scientific member of the Max Planck Society and director at the MPI of Biochemistry, Martinsried. Her research interests range from single-molecule biophysics to bottom-up synthetic biology of artificial cells.



10th European Innovation Summit

Speech Abstract: I will briefly introduce the fundamental scientific challenge of understanding systems as complex and redundant as living organisms with the degree of quantitative rigor inherent to physics and chemistry. Ironically, the more physiological a system under study, the harder it is to define a manageable number of relevant control parameters. Even more disturbing, in spite of our great advances in the life sciences in the past century, we still lack a decisive definition of when a system is actually alive. In order to solve this riddle and at the same time arrive at a better control of biological systems in practice, the emerging field of synthetic biology has lately received much attraction. Its ambition is to deconstruct cells and organisms into fundamental functional modules, which can in turn be subject to controlled assembly *via* a bottom-up approach. Identifying minimal biological systems, particularly of subcellular structures and modules, has in the past years been very successful, and highly quantitative *in vitro* experiments with reduced complexity could be performed. I will outline recent breakthroughs with regard to assembling a minimal machinery for cell division, and highlight novel insights into essential features of microorganisms that resulted from these studies.

Manuel Théry, *Research director CEA*



Manuel Théry works on cell shape and internal architecture. He studies the skeleton of the cell, the “cytoskeleton”. He has developed micro-devices to control cell shape in order to study how cytoskeleton filaments form networks that sense and adapt to geometrical boundary conditions. Recently he developed “*in vitro*” cell-free reconstitution assays in which isolated filaments grow and adapt to geometrical cues.

Speech Abstract: In this presentation we will discuss the industrial impact of cell-free biological systems. We will first review the existing applications of cell-free biological systems and discuss the potential future applications in pharmaceutical industry, biofuels, agriculture and food industry.

Prof. Dr. Peter Dabrock, *Chair, University of Erlangen / German Ethics Council*



Professor Peter Dabrock, born 1964, studied Protestant and Catholic Theology, Philosophy and Social Sciences in Würzburg, Bonn and Bochum, Germany. After several positions in academia as researcher, Assistant, Associate and Full Professor in Bochum and Marburg (from 1995-2010) he has been Chair of Systematic Theology (Ethics) at the University of Erlangen-Nuremberg since October 2010. Beyond serving in many high-level national and international advisory bodies in academia, Church, and Society including the European Group on Ethics (2011-2016) he has been an appointed member of the German Ethics Council since 2012. Since 2016 he has been its elected Chairperson.



10th European Innovation Summit

Dabrock has published several books and more than 200 articles with special focus on ethics of life sciences, of technology (including ethics of energy), of social justice and of life styles.

Speech Abstract: „Building” a synthetic cell must be regarded as a promising cutting-edge biotechnological effort. In order to responsibly govern research and innovation of such cutting-edge biotechnologies a comprehensive ethical approach is needed. Such an approach covers three dimensions. Firstly, it has to combine and balance (a) risk assessment, (b) deliberation as well as application of moral, ethical and legal criteria, and (c) an evaluation of attitudes against the background of the scientific state of the art. Secondly, it has to cope with the challenges of shaping the still precarious interface between science, industry and society in order to effectively foster the currently established approach of public engagement with science and technology in the field of synthetic cell-building. Thirdly, being aware that many people cannot grasp the complexities and proceedings in science and technology, but have been willing to give a (nevertheless sensitive) “granted loan” for such activities it is crucial to conceptualize and implement a tool-box for the sake of trust building, trust maintaining and (if the communication between science and society will be challenged at a certain point) trust re-gaining.