UNIVERSITY OF CAMBRIDGE
INSTITUTE FOR SUSTAINABILITY LEADERSHIP

CirPlas

CirPlas Forum 2:

Relative impact of materials: connecting business, policy and research to deliver solutions

Wednesday 5 February 2020, St John's College, Cambridge

Purpose

- Explore and showcase work being done in the University on the impact of plastics and the potential alternative materials and solutions
- Connect businesses, policy makers and scientists to discuss the challenge and share their perspectives, proposed approaches, and potential solutions

Agenda

09.30	*Arrival and refreshments*
10.00	**Welcome and setting the context – Eliot Whittington, Director – Centre for Policy and Industrial Transformation (CPIT), Cambridge Institute for Sustainability Leadership (CISL)** Main Lecture Theatre
10.15	**Opening keynote: Plastics: a 'wicked problem' – Dr Claire Y Barlow, Department of Engineering, University of Cambridge**
11.30	*Break*
11.50	**11.50am Cambridge research:** Series of short presentations from Cambridge researchers on the work they are doing the impact of plastics and alternative solutions, including: • Erwin Reisner (Principal Investigator), Professor of Energy & Sustainability, Department of Chemistry, Overview of CirPlas and WP2 – manufacturing and recycling processes • Professor James Elliott, WP1 – Biocompostable replacements for plastic packaging • Dr Jon Cullen, Department of Engineering, WP3 – UK Plastic Flows • Dr Beatrix Schlarb-Ridley, Director of Innovation and Impact, British Antarctic Survey - CirPlas-sponsored Venture School "People, Plastics and our Planet" The presentations will be followed by a Q&A session with the presenters
13.00	*Lunch*
14.00	**Examining the issues and identifying solutions:** **1. Towards Sustainable Packaging: Exploring the relative impact of materials – led by Beverley**

	Cornaby, CPIT, CISL: Main Lecture Theatre 2. **Pathways to a Circular Economy: Mapping the plastic problem and seeking solutions – led by Dr Anna Barford and Dr Polina Yaseneva, CISL:** Teaching Room 1 3. **Measuring the circularity of material cycles – led by Dr Jonathan Cullen:** Teaching Room 2 4. **Creating a circular economy through compostables – led by Professor James Elliott:** Arthur Quiller Couch Room
15.00	**Feedback from workshops and plenary discussion**
15.30	**Closing keynote: Moving towards a circular economy in the UK – Tom Pye, Team Leader – Resources, Waste & Plastics Strategy, Defra**
15.55	**Closing remarks: Eliot Whittington, Director - CPIT, CISL**
16.00	*Close*

Workshop options

1. **Towards Sustainable Packaging: Exploring the relative impact of materials – led by Beverley Cornaby, CISL**

   In eliminating plastic packaging waste, one option would be to switch materials, and there are instances of this already occurring in many sectors. In making this shift, businesses need to ensure they understand the full impacts of any alternative, so they do not have any other, potentially worse, environmental consequences. In this workshop, participants will explore recent work undertaken by CISL exploring what is currently known of the impacts in the water and soft drinks sector and the implications of CISL's findings for businesses in all sectors

2. **Pathways to a Circular Economy: Mapping the plastic problem and seeking solutions – led by Dr Anna Barford and Dr Polina Yaseneva, CISL**

   In this workshop, participants will be encouraged to take an overview of the challenges in managing our use and misuse of plastics. Focusing on life cycle stages of plastics, we will map out options of plastic production, use and utilisation, considering their environmental, technical, social, and economic dimensions. Participants will then be invited to share their own experiences in designing life cycle pathways for particular plastic examples and their visions how these material flows and behavioural patterns can be changed in order to balance concerns around plastic waste with concerns around climate change.

3. **Measuring the circularity of material cycles – led by Dr Jonathan Cullen**

   If we are to pursue circularity we must first be able to measure it, where "progress" ranges on some scale from linear at one end to perfectly circular at the other. Such a scale must consider the loss of both material quantity and material quality, to take account of the energy investment in circular loops and issues such as down-cycling. This workshop will explore questions including: What is the current degree of circularity? And, how far could we realistically move toward perfect circularity?

4. **Creating a circular economy through compostables – led by Professor James Elliott.**

   James's current research seeks to develop plastics that are either easier to recycle or which degrade in the environment. Together with colleagues from Prof Paul Dupree's group, this is rediscovering the natural polymers and focusing much more on issues like waste disposal and degradability, rather than prioritising durability and cost. This workshop will explore the extent to which biocompostable plastics could be used more widely in industry, from packaging and fillers to structural (e.g. construction or vehicles) and

advanced functional (e.g. microelectronics or devices) applications. Participants will be invited to describe example applications from their own experience and contribute to discussions on how these needs could be met by biocompostable plastics.

Speakers biographies

Dr Anna Barford, Senior Research Associate, Cambridge Institute for Sustainability Leadership

Dr Anna Barford is the Prince of Wales Global Sustainability Fellow in Pathways to a Circular Economy, supported by Unilever. She is interested in how we can effectively redesign our models of production and consumption so that value is cycled, whilst ensuring a socially and economically just transition. Anna's research offers a systematic review and theorisation of the social in the circular economy, and a detailed case studies of job creation alongside circularity within lower income countries.

Dr Claire Y Barlow, Deputy Head of Department (Teaching), Department of Engineering, Cambridge University

Dr Claire Barlow is a materials engineer and is particularly interested in how we can reduce the environmental impact of the way we use materials. She looks at the whole lifecycle of material production and product manufacture, with a particular interest in the end-of-life of products, their re-use and recycling. She has worked on a wide range of materials including paper, metals and natural materials, but the focus is now mainly on plastics. Dr Barlow studied for both her undergraduate degree and her PhD at Cambridge University, and is a Fellow of Newnham College. She is Deputy Head of the Engineering Department, with special responsibility for teaching.

Beverley Cornaby, Programme Manager, Cambridge Institute for Sustainability Leadership

Beverley works in the Policy Team at CISL where she leads work on the issue of resource efficiency, including plastic packaging sustainability, and supports the Prince of Wales's Corporate Leaders Group. She led a collaborative initiative that resulted in a roadmap and vision towards eliminating plastic packaging waste from the soft drinks supply chain. Before joining CISL, Beverley spent ten years working in the public sector, in local, regional and then national government.

Dr Jonathan Cullen, University Lecturer, Department of Engineering, University of Cambridge

Jonathan Cullen is a University Lecturer in Energy, Transport and Urban Infrastructure at the University of Cambridge and a Fellow of Fitzwilliam College. Jonathan graduated with a first class degree in Chemical and Process Engineering from the University of Canterbury (NZ), and after 5 years working in industry and 5 years development work in Peru, moved to Cambridge for the MPhil in Engineering for Sustainable Development. He then completed a PhD with the title Engineering fundamentals of energy efficiency before taking up the role of Research Associate on the WellMet2050 project: a 5-year, 8-person research programme exploring all options to reduce carbon dioxide emissions from the production of steel and aluminium goods.

James Elliott, Professor of Macromolecular Materials Science, Department of Materials Science & Metallurgy, University of Cambridge

James Elliott is Deputy Head and Professor of Macromolecular Materials in the Department of Materials Science & Metallurgy at the University of Cambridge, where he leads an internationally recognized research

group on polymeric membranes, carbon nanotube fibres and composite materials. He sits on the Executive Committee of the Polymer Physics Group of the Institute of Physics, and is Director of the EPSRC Centre for Doctoral Training in Computational Methods for Materials Science. He is a co-investigator on the £1.25m UKRI "Circular Plastics" project in which he is working on the characterisation of biocompostable replacement materials for plastic packaging.

Tom Pye, Team Leader, Resources, Waste & Plastics Strategy, Defra

Tom leads Defra's Resources, Waste and Plastics Strategy team, whose responsibilities include overseeing implementation of the Resources and Waste Strategy and single-use plastics policy. Tom has previously worked in the Defra Chief Scientific Advisor's office and at the Department for International Development. Tom has an MSc with distinction from King's College London in Environmental Monitoring, Modelling and Management.

Erwin Reisner, Professor of Energy & Sustainability, Department of Chemistry, University of Cambridge

Professor Reisner was born and raised in the foothills of the alps in Upper Austria and studied Chemistry at the University of Vienna. He developed an early interest in bioinorganic and coordination chemistry, and his PhD studies in the Keppler group focused on 'redox activated ruthenium anticancer drugs'. Erwin subsequently changed from medicinal inorganic chemistry to different aspects of bio-inspired energy conversion as a postdoc. In the Lippard group at MIT, he studied synthetic models of the diiron(II) active site of soluble Methane Monooxygenase, which selectively converts natural gas to methanol. Erwin subsequently joined the Armstrong group in Oxford to work on solar hydrogen production with enzyme-nanoparticle hybrid systems. His independent career started with an EPSRC research fellowship at The University of Manchester, followed by a University Lectureship at the University of Cambridge. Erwin is currently the Professor of Energy and Sustainability and a Fellow of St. John's College in Cambridge. He is also coordinating the UK Solar Fuels network, which organises the national activities in artificial photosynthesis, and the Cambridge Creative Circular Plastics Centre.

Dr Beatrix Schlarb-Ridley, Director of Innovation and Impact British Antarctic Survey

Beatrix joined BAS as Director of Innovations and Impact in 2014. She studied Biochemistry in Germany and then moved to Cambridge, where she obtained her MPhil and PhD in photosynthesis research. A protein biochemist by background with 20 years experience in fundamental and applied research, Beatrix's focus is on unlocking the potential of polar research for the benefit of society and industry. She has gained real-life experience of the challenges associated with commercialisation through involvement in a spin-out company developing algae- and moss-based biophotovoltaic devices, and has driven the development of the Aurora Innovation Centre at BAS – a space with excellent conference and meeting facilities, exhibition spaces and an open-plan office for collaborators. Aurora aims to create a vibrant niche in the Cambridge ecosystem for excellent research and entrepreneurial activity in the areas of climate change, environmental stewardship and technologies for challenging environments, addressing issues of global importance and helping society adapt to a changing world.

Eliot Whittington, Director, Centre for Policy and Industrial Transformation, Cambridge Institute for Sustainability Leadership

Eliot leads CISL's team that bridges between business and policy makers to bring about a more sustainable economy. He is the current Director of The Prince of Wales's Corporate Leaders Group, which brings together

businesses to work towards a step change in policy and action on climate change, and of the EU Green Growth Platform, which creates a common space for governments, businesses and parliamentarians to collaborate in support of a greener EU economy.

Dr Polina Yaseneva, Senior Research Fellow, Cambridge Institute for Sustainability Leadership

Dr Yaseneva is the Prince of Wales Global Sustainability Fellow in Transforming the Pulp and Paper Industry, supported by Sappi. Polina joined CISL Prince of Wales Global Sustainability Fellowship Programme in October 2019 to work on pathways of sustainable industrial transformation within pulp and paper industry. The emphasis of her work will be on life cycle assessment (LCA) and tools development bridging chemistry, environmental analysis and process design. She obtained MSc degree in ecology from Novosibirsk State University (Russia) followed by PhD in Chemistry at Cardiff University. During her post-doctoral positions at Universities of Warwick and Cambridge she was involved in European projects SYNFLOW, MONOCAT and MEASURE as an expert on sustainability assessment and metrics for evaluation of new chemical technologies. She was also involved in The Cambridge Centre for Carbon Reduction in Chemical Technology (C4T) in Singapore working on valorisation of bio-waste into high-value molecules.