ISIE Automn 2015



Dear ISIE Members:

The ISIE biennial conferences are times for communication and learning, as well as for reflection, inspiration and celebration. For me, this year's conference at the University of Surrey provided all of these in abundance. As our eighth biennial conference, the Surrey meeting continued the Society's track record of successful, well-attended conferences with high quality research papers. There was an extra feature this year with a series of short plenaries reflecting back on progress in various topics within IE – plus discussion of current and possible future developments. These special plenaries have been published as a book Taking Stock of Industrial Ecology by Springer (available on open access) and can also be viewed on YouTube. Amongst the celebrations were awards for Roland Clift, Reid Lifset and Ming Xu, as well as a dinner at the spectacular Epsom racecourse– with some fun and games in recognition of Tom Graedel's retirement. Angela, Jacqui, Roland and the team at Surrey deserve congratulations for hosting such a memorable and well-organized conference.



Underlying the title of the conference: Taking Stock of Industrial Ecology is perhaps a tacit understanding that IE is maturing as a discipline. By this I certainly don't mean we've learned everything there is to learn about IE – far from it. Rather, IE is not a brand new discipline any more. We wouldn't be taking stock if there wasn't plenty to take stock of! This is relevant to some of my thoughts on the current status of teaching in IE, which I'll share here.

During my closing remarks at the conference I noted the need – and opportunity - to expand and refresh university programs in IE, building upon a remarkable era of outstanding scholarship on the subject. Research in IE is booming – and the field is just as important and relevant to sustainability challenges today as it was 25 years ago. This is evident from an inspiring special issue on IE in the Proceedings of the National Academy of Sciences earlier this year, led by Helga Weisz, Sangwon Suh and Tom. Graedel. In the past 18 years there have been over 1000 articles published in JIE alone, and perhaps at least an order of magnitude more papers in other journals that contribute to the discipline. This is a substantial amount of knowledge to be incorporated into existing IE programs – and new ones too.

In an excellent paper in JIE last year, Ashley Finlayson and colleagues provide a comprehensive description of postsecondary education in IE. They report that over 400 courses on or related to IE are taught between 190 universities in 46 countries. Based on Table 1 in the Finlayson paper, I count that there are just over 20 schools worldwide that host programs or specializations in Industrial Ecology (This is only counting programs that have IE in the title, and only counting international co-taught

### more programs in IE?

I've often thought that there are some parallels between the fields of Hydrology and Industrial Ecology. Both are interdisciplinary fields that examine stocks and flows on multiple scales. Indeed there is some overlap between the two fields, with water being amongst the material flows studied by industrial ecologists. Like programs in Industrial Ecology, programs in Hydrology also come under other names- such as Water Resources, and can be found within a variety of schools at universities - such as Earth Sciences, Environmental Sciences, Engineering or Geography. Water is of course a special molecule, but as industrial ecologist we've learned that carbon, nitrogen, phosphorus, metals and other substances also deserve focused study. Arguably university programs in IE should be as prevalent as those in Hydrology.

Hopefully, we'll see the development of new programs in IE as the discipline continues to grow. Another item noted at this year's conference is that membership of the ISIE is at its highest level ever. Growth in the Society is useful as it allows the ISIE to do more events and have greater outreach. We shouldn't take such growth for granted though. If you have colleagues who have let their membership lapse, or others who might be interested in joining ISIE, do encourage them. Faculty members could in particular bring the attractive student membership rate of \$15/year to the attention of their students, who are the future strength of the Society. If each member of ISIE could bring one other person into the Society that would be impressive.

Chris Kennedy, Toronto, September 1, 2015





# **ISIE Sections Update**

### The Industrial symbiosis / eco-industrial development section

The IS/EID section is initiating a process to redefine its activities and focus. After discussion with many members and researchers in the field during the ISIE conference in Surrey, the section is pleased to announce that Guillaume Massard (University of Lausanne, Sofies SA) agreed to chair the section during a one year transition period prior to new elections. Thus, Guillaume Massard, Wouter Spekkink and Peter Lowitt will form an executive committee of the section board to support the process.

In order to address future challenges and to better support research and practice on industrial symbiosis and eco-industrial development, the section is performing a survey among its members and any other researchers and practitioners interested in the field of industrial symbiosis, eco-industrial development and eco-industrial parks.

If you are willing to take the 5 minutes survey, please click here: <u>https://nl.surveymonkey.com/r/VL73D07</u>

The section would like to warmly thank Peter Lowitt for all the energy he brought to the section over the past years as section chair. Peter will continue to produce the section newsletter and will focus on hosting the 13<sup>th</sup> ISRS at Devens June 17-18, prior to the start of the Gordon Conference next year. Save the date!



### **JIE Impact Factor Rises!**

The journal impact factors, widely used metrics for measuring the impact of peerreviewed journals, for 2014 were announced this summer. The *JIE*'s 2-year impact factor increased from 2.71 to 3.23!

Winners of the Graedel Prizes for Best Papers in the JIE

IE, the JIE has created The Graedel Prizes to recognize outstanding papers in the JIE.

RSS 🤊

The Graedel Prizes are awarded to the best two papers published in *JIE* every year; one paper written by a junior single author or first author (below the age of 36) and one paper written by a senior single author or first author. Winners receive US\$750 and a free membership in the ISIE. As part of the start-up process for the prizes, winner for both 2013 and 2014 were announced.

- The 2013 Junior Author Best Paper: "Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles" by Troy R. Hawkins, Bhawna Singh, Guillaume Majeau-Bettez, and Anders Hammer Strømman.
- The 2013 Senior Author Best Paper: "<u>An Exploration of the Relationship</u> between Socioeconomic and Well-Being Variables and Household Greenhouse <u>Gas Emissions</u>" by Jeffrey Wilson, Peter Tyedmers, and Jamie E.L. Spinney.
- The 2014 Junior Author Best Paper: "Using LCA-based Decomposition Analysis to Study the Multidimensional Contribution of Technological Innovation to Environmental Pressures" by David Font Vivanco, René Kemp, Ester van der Voet, and Reinout Heijungs.
- The 2014 Senior Author Best Paper: "<u>Can Efficiency Improvements Reduce</u> <u>Resource Consumption? A Historical Analysis of Ten Activities</u>" by Jeffrey B. Dahmus.

More information on the winners, runners-up and commentary on the papers can be found for the 2013 prize at <a href="http://dx.doi.org/10.1111/jiec.12288">http://dx.doi.org/10.1111/jiec.12288</a> and for the 2014 prizes at <a href="http://dx.doi.org/10.1111/jiec.12339">http://dx.doi.org/10.1111/jiec.12339</a>. The rules for the JIE Best Paper Prizes and the current members of the prize committee can be found on the JIE website at <a href="http://ite.yale.edu/best\_paper\_prizes">http://ite.yale.edu/best\_paper\_prizes</a>

## Call for Papers: Environmental Dimensions of Additive Manufacturing and 3D Printing

Submission Deadline: December 31, 2015

A relatively recent approach to the manufacture of end-use products, additive manufacturing (also known as 3D printing) is based on creating parts and products directly from raw material in powder, liquid, sheet or filament form and digital 3D design data. The underlying processes operate by depositing material, usually layer-by-layer, without the need for molds, tools or dies.

Additive manufacturing allows the efficient manufacture of geometrically and functionally complex product designs within a single process step. This holds out the potential for advances in supply chain sustainability including reduced energy consumption, localized production, increased opportunities for repair and remanufacturing, and changes in sourcing of raw materials. As yet, however, limited research has been undertaken to systematically assess the overall environmental benefits and impacts of additive manufacturing technology and the resulting products.

This special issue aims to provide a forum for research on multiple aspects of additive manufacturing including methodologies for comparison of lifecycle impact, inventory analysis for additive technology (on the platform, system and aggregate levels), material flow analysis, risk management and occupational exposure assessment, integrated impact assessment, emerging possibilities for ecodesign, and sustainable supply chain innovation.

Martin Baumers, University of Nottingham, Bill Flanagan, General Electric Company, Tim Gutowski, Massachusetts Institute of Technology, and Joost Duflou of KU Leuven will serve as co-editors of the special issue.

For the full call for papers, please go to: http://jie.yale.edu/JIE-AM\_CfP

### Special Issue to be Published: Frontiers in Socio-economic Metabolism

A special issue on frontiers socio-economic metabolism (SEM) research will be published in October. Topics explored include the concept of metabolism in industrial ecology, methodologies, uncertainty analysis, water metabolism, and smart urban metabolism.

Papers examine the role of cities as a main locus of growing resource demands and emissions and as agents of change. Socio-economic metabolism as it relates to other topics such as water, climate change, and land use and food security is explored. Reviews of the use of SFA in waste management, of the metabolism of household There are topics of increased research interest including the circularity of the economy, the analysis of stock accumulation, and the need for an improved understanding of material footprints of consumption which reflect the increasingly global character of production and consumption networks. Heinz Schandl (CSIRO), Daniel Müller (NTNU) and Yuichi Moriguichi (Tokyo University) served as editors.

### JIE's Editor-in-Chief wins ISIE Society Prize

Reid Lifset, the JIE's editor-in-chief, was awarded the ISIE Society Prize at the Society's 8th Biennial Conference held at the University of Surrey in Guildford, UK in July. His contributions to the field through his work on the JIE were highlighted in the award presentation.

Do you tweet? Follow the JIE: @JIndEcol

Do you receive the JIE table of contents alerts? If not, be sure to sign up to receive these emails or RSS feeds so that you always have the latest in industrial ecology research: http://bit.ly/JIE-eToC-sign-up.

## IE News from around the world

### **Chinese Society for Industrial Ecology Launched**

Industrial Ecology has emerged as an important field in China to support decisionmaking for industrial sustainability during the past decades. The official launch of Chinese Society for Industrial Ecology (CSIE) on July 9, 2015 in Guildford, UK marked another milestone for the development of Industrial Ecology in China. By the end of July 2015, CSIE has 175 registered members from more than 70 institutions.

The formation of CSIE dated back to summer 2013, when 78 Chinese industrial ecologists attended the 7th biannual ISIE Conference in Ulsan, South Korea and discussed the possibility of establishing a platform to promote Industrial Ecology and its applications in the Greater China region. At the meeting on July 9, 2015, the CSIE bylaws were approved by the membership; a six-member board was elected including the founding Chair, Dr. Weiqiang Chen from Chinese Academy of Sciences.

CSIE is committed to promoting the research and practice in Industrial Ecology for supporting decision-making towards sustainability in China and disseminating China's experience to the international community. CSIE also aims to establish strategic collaboration with ISIE.



\*By Liang DONG (National Institute of Environmental Studies, Japan), Ben ZHU (Delft University of Technology, The Netherlands), Chang YU (Beijing Forestry University, China), and Jingzheng REN (Universityof Southern Denmark, Denmark)

## Wealth from Waste Cluster: Inspiring smarter Australian resource industries of the future

The Wealth from Waste Research Cluster is an international collaboration of research groups led by the University of Technology Sydney (UTS), including Monash University, the University of Queensland, Swinburne University of Technology, and Yale University. In partnership with the Australian CSIRO (Commonwealth Scientific Industrial Research Organisation), the Cluster is charting a pathway to enable Australia's transition to a future circular economy. The research is about helping Australia expand its resource base from being a leader in primary resource production to also being a frontrunner in enabling the emerging secondary resource markets, technologies and practices.

Analogous to geological mapping of primary deposits, the focus of Cluster researchers at **Monash** and **Yale** universities are obtaining better data for characterising and quantifying metal accumulation behaviours and distribution within urban areas, and average life cycles of metal-bearing products. This is supported by research at the **University of Queensland** and **Swinburne** to evaluate the implications of basic science specific to the new combinations of metals that are combined in urban ores and mine wastes, and key challenges that must be overcome to unlock the secondary resource base potential.

New design-led circular business models are vital for provoking change across the whole supply chain for resources. **UTS** researchers see clear <u>indicators</u> from international markets and the emergence of very innovative SMEs, focussed on designing their products and services for multi-use cycles, which has yet to be seized by Australian <u>industries.</u>

The research findings to date have informed the development of Action agenda for resource productivity and innovation, announced at the recent World Resources Forum Asia-Pacific in Sydney (<u>www.wrfasiapacific2015.net</u>). It defines the circular vision for Australian economy, highlights major future opportunities, and charts a pathway for transition.

For more details visit: http://wealthfromwaste.net/



### New publications in the Springer Book Series "Sustainable Production, Life Cycle Engineering and Management"

(http://www.springer.com/series/10615)

## Supachai Vongbunyong and Wei Hua Chen // Disassembly Automation. Automated Systems with Cognitive Abilities

This book presents a number of aspects to be considered in the development of disassembly automation, including the mechanical system, vision system and intelligent planner. The implementation of cognitive robotics increases the flexibility and degree of autonomy of the disassembly system. Disassembly, as a step in the treatment of end-of-life products, can allow the recovery of embodied value left within disposed products, as well as the appropriate separation of potentially-hazardous components. In the end-of-life treatment industry, disassembly has largely been limited to manual labor, which is expensive in developed countries. Automation is one possible solution for economic feasibility. The target audience primarily comprises researchers and experts in the field, but the book may also be beneficial for graduate students.

http://www.springer.com/de/book/9783319151823

Wen Li // Efficiency of Manufacturing Processes. Energy and Ecological Perspectives

SEC, will be identified as the key indicator for the energy efficiency of unit processes. An empirical approach will be validated on different machine tools and manufacturing processes to depict the relationship between process parameters and energy consumptions. Statistical results and additional validation runs will corroborate the high level of accuracy in predicting the energy consumption. In relation to the eco-efficiency, the value and the associated environmental impacts of manufacturing processes will also be discussed. The interrelationship between process parameters, process value and the associated environmental impact will be integrated in the evaluation of eco-efficiency. The book concludes with a further investigation of the results in order to develop strategies for further efficiency improvement. The target audience primarily comprises researchers and experts in the field, but the book may also be beneficial for graduate students. http://www.springer.com/de/book/9783319173641

# MEMAN - Integral Material and Energy Flow MANagement in MANufacturing

### Metal Mechanic Sector

The MEMAN project will support European companies in the metal mechanical sector in their efforts to maximise their resource saving potential and increase competitiveness. The project is based on an innovative approach that addresses optimisation of whole manufacturing value chains instead of isolated single company or process optimisation, and includes energy, raw materials, supplies and waste. Fourteen partners, including industrial enterprises, SMEs, and experts in ecoinnovative business models, will be working on optimising resource efficiency across three manufacturing value chain cases: casting, machining, and surface finishing. This will be done through the full validation of new business models that allow for collaboration of different companies along the whole value chain, and provide tools for practical decision making support.

It is expected that the MEMAN project will modify the consumption patterns of the whole metalworking value chain, achieving a reduction of energy consumption and CO2 emissions of at least 30%, and over 10% of the Product Life Cycle Cost of existing and future products. Given the significantly increasing need to limit greenhouse gas emissions, as well as escalating costs of energy resources and raw materials, the project is of strategic importance for the European economy. Project duration: 01/2015 – 06/2018

### New paths, strategies, business and communication models for bioplastics as a building block of a sustainable economy (BiNa)

The use of bioplastics enhances the opportunity to save fossil resources as well as to reduce the emissions of gases relevant for the climate. But are bioplastics during production, utilization and end-of-life really more sustainable than their fossil competitors and which challenges result e.g. for the sustainability assessment? Which ecological potential exists due to cascade use? How does the population judge the use of bioplastics and do they know what bioplastics are and can do? What is the best option to inform the consumer about existing bioproducts? These and further questions are in the focus of the new research platform. The work will be conducted by a broad consortium of specialists that examine the aspects of ecological and socio-economic sustainability of bioplastics as well as the opportunities and obstacles which occur during the communication about and the commercialisation of these materials.

The research group Sustainable Manufacturing & Life Cycle Engineering of the IWF is concerned with the holistic view of the energy value stream in the production of bioplastics. The aim is to develop new recommendations for the sustainable production of bioplastics based on the existing methodologies in the context of conventional plastics. The practical relevance is ensured by the testing with cooperating companies on specific product examples from bioplastics.

The project energy and resource efficiency of bioplastics in production aims at the detection and appropriate modeling and simulation of relevant energy and emission flows considering various material compositions of bioplastics and their production processes. In the development of suitable methods and tools, the ecologically and economically most advantageous combinations of different materials and process parameters can be evaluated and integrated into the product and process design.

### Project partners

- Hochschule Hannover Institute for Bioplastics and Biocomposites (IfBB)
- Technische Universität Braunschweig Institute for Machine Tools and Production Technology (IWF)
- Bundesdeutsche Arbeitskreis für Umweltbewusstes Management e.V. (B.A.U.M.)

 Hochschule Weihenstephan-Triesdorf, Marketing und Management Nachwachsender Rohstoffe

### Project advisory board

- European Bioplastics e.V.
- World Wide Fund For Nature (WWF)

### Project duration: 04/2015 - 03/2018





Dr. Callie Babbitt of the Rochester Institute of Technology provided a useful video from her Tedx appearance, engaging new audiences in the Intustrial Ecology discourse.

## **Members' News**

Dr. Miguel Brandão, manager of the IEA Bioenergy Task 38, will be taking up an associate professorship in industrial ecology and life cycle assessment at KTH. We congratulate him on his appointment, and wish him luck and success!

Stefan Pauliuk, who did his PhD with Daniel B Müller and worked for Edgar Hertwich at NTNU, Trondheim, was appointed assistant professor for sustainable energy and material flow management at the University of Freiburg, Germany.

In Freiburg, Stefan is building up a research group on environmental systems analysis with focus on dynamic modeling of industrial systems and prospective assessment of sustainable development strategies. The group's goal is to increase scientific understanding of society's metabolism and to give sound advice to decision makers and policy designers.

More info can be found on www.indecol.uni-freiburg.de

## **Upcoming Conferences**

Mining the Technosphere - Potentials and Challenges, Drivers and Barriers

### International Workshop

October 1 - 2, 2015; TU Vienna, Kuppelsaal

Besides the exploitation of natural deposits and the continuous promotion of resource efficiency, concepts such as **urban mining** and **landfill mining** have been increasingly proposed as suitable means to secure current and future resource supply. To what extent these concepts can actually contribute to covering our future resource consumption and which challenges are to be tackled in this regard are subject of the **International Workshop "Mining the Technosphere"**, which will be hosted at Vienna University of Technology from October 1 -2, 2015. Leading experts from more than 10 countries will present and discuss their latest research in an informal setting.

Gordon Research Conference Industrial Ecology 2016: Opportunities for the critical decade - decoupling well-being from environmental pressures and impacts

Conference Chairs: Heinz Schandl, CSIRO, Australia and Stefanie Hellweg, ETH Zurich, Switzerland

The 10th Industrial Ecology Gordon Research Conference will be held at the Stoweflake Conference Center in Vermont, United Sates from June 19-24, 2016. Applications for this meeting must be submitted by May 22, 2016. Please apply early, as some meetings become oversubscribed (full) before this deadline. The GRC will be combined with a Gordon Research Seminar for young professionals (PhD students and PostDocs). Information of the meeting can be found at <a href="https://www.grc.org/programs.aspx?id=12729">https://www.grc.org/programs.aspx?id=12729</a>

#### Meeting Overview

The second wave of industrialization and urbanization in many developing countries, and continuing economic growth and consumption in industrialized countries, have led to an acceleration of natural resource use, climate change and a suite of related environmental impacts. The supply chains for natural resources have become more complex and it is harder today to gain knowledge about the environmental footprint of certain products and processes.

While the industrialization of developing countries has lifted millions out of poverty it has also contributed to increased global environmental change. To reverse this trend, and to allow the global economy to stay within the limits of the Earth's resources and ecosystems, the new sustainable development goals call for economic activity and consumption and production processes to be underpinned by large investment and appropriate policy settings to guide decoupling of economic activity from environmental pressure and impacts.

This opens a huge window of opportunity for industrial ecology to deliver the knowledge base to transition the current economic pattern to sustainable consumption and production. Industrial ecology concepts and tools support creating sustainable value chains for products and services, to build human settlements and design industrial systems to be maintained with lower material and energy throughput and with fewer emissions. For new industrial ecology technologies and practices to become economically viable and socially acceptable it will require new policy settings and business decisions supported by institutions and governance arrangements that encourage and drive innovation and experiments that ultimately serve decoupling.

This conference will investigate the newest insights from the science of industrial ecology to support technological solutions, policy innovation and new business models for sustainable development. This is a critical decade for reconciling human development and environmental protection and we explore the contribution industrial ecology can make.

