

NEWSLETTER

Welcome to the Summer Edition



Issue 10

July 2014

Message from CPSE Director, Professor Nilay Shah



Welcome to the Summer edition. It has been another exciting few months for us in CPSE. We have three new academics: Adam Hawkes, Ruth Misener and Niall Mac Dowell. Geoff Maitland became President of IChemE - Geoff, I will be following your new blog. Sadly, Stratos will be leaving to take up a new post at Texas A&M Engineering. We do not have to say farewell just yet as Stratos will be giving the Professor Roger Sargent Lecture on 4th December.

This year is the 25th Anniversary of CPSE. We will be celebrating our anniversary during the Annual Industrial Consortium Meeting, 4th and 5th December...I look forward to seeing many of you there.

The newsletter comes with a technical article on Global Optimisation by our new academic Ruth. The article highlights some of the intellectual contributions made by CPSE on Global Optimisation. The Autumn edition will have a technical article on "Engineering at the Cellular Scale: Understanding and manipulating information processing networks" by PhD student Aiman Alam Nazki. I wish you all a great Summer!

Prof Pistikopoulos Leaving Imperial College

Professor Stratos Pistikopoulos is leaving to work at Texas A&M Engineering. He was headhunted as part of \$100 million Chancellor's Research Initiative to recruit four top scholars to Texas A&M Engineering. Professor Pistikopoulos was former CPSE Director and he will be greatly missed. He will start his new post in January 2015 and before he leaves, he will give the Professor Roger Sargent Lecture on Thursday 4th December 2014. The lecture is titled "Multi-Parametric Programming & Control, 25 years later: what is next?". Abstract is on page 3.

Academic Promotions

Dr Krishnan and Dr Cleo Kontoravdi have been promoted to Senior Lecturer, effective from 1st August 2014. Congratulations Krishnan and Cleo!

Dr Wiesemann is Fellow of KPMG Centre

Dr Wolfram Wiesemann has become a fellow of the new KPMG Centre for Advanced Data Analytics. The centre is funded by KPMG with £10m directly (£20m total). The Centre will focus on five core areas of research: Capital, Growth, People, Operations and Resilience. The focus will be on ground breaking analytics techniques and algorithms that will put the UK at the forefront of data science. At peak, it is planned that a joint team of more than 30 will work on this partnership with the ambition of completing 15-20 projects per year. You can find out more about KPMG from: <http://www.imperial.ac.uk/business-school/research/kpmg-centre-for-advanced-business-analytics/>

Prof Maitland becomes 74th President of IChemE



Professor Geoffrey Maitland was inaugurated the 74th President of IChemE. The inauguration ceremony took place on 28th May, at London's Ambassadors Bloomsbury Hotel.

Immediately after becoming president, Professor Maitland launched the *ChemEng365* blog. The blog catalogues 365 chemical engineering successes and achievements. Professor Maitland will be writing daily throughout his presidency. You can subscribe to the blog: <http://ichemepresident.wordpress.com/>

UKCCSRC Workshop

Professor Nilay Shah convened the UKCCSRC workshop on negative emissions technologies in March 2014. A range of presentations covered research into direct air capture, biomass-enhanced CCS, wider greenhouse gas reduction technologies and the UK global calculator project. It was concluded that the research community should undertake work that will de-risk and reduce costs of CCS-related NETs and act as a disinterested evaluator of different technology options.' You can read Prof Shah's account of the workshop in his own words on: <https://ukccsrc.ac.uk/news-events/blog/reflections-direct-air-capture-and-negative-emissions-workshop-march>

CPSE Welcomes 3 New Academics

Dr Adam Hawkes

*Lecturer in Energy Economics and Technology
Department of Chemical Engineering*



Adam Hawkes has research interests across the technical, economic, security, and environmental aspects of energy systems. He is an expert in analytical assessment of individual technologies and systems of technology and infrastructure.

His areas of research specialism are:

- Heat sector decarbonisation; technologies, infrastructures, interfaces, pathways
- Quantitative assessment of low carbon futures via energy systems modelling (optimisation, simulation, forecasting)
- Investment in microgrids and smart grids under uncertainty (stochastic programming and game theory)
- Decentralised energy resources, demand side management, and smart energy networks
- Microgeneration

Adam convenes the Energy Policy Option of the MSc in Environmental Technology offered at Imperial College. His background includes energy and climate change consultancy, energy trading, government policy impact assessment, and IT development. Adam is an author of over 50 scientific contributions, including a number of high impact briefing papers, reports and presentations.

Dr Niall Mac Dowell

Lecturer in Energy and Environmental Technology and Policy, Centre for Environmental Policy



Niall Mac Dowell is a lecturer in Energy and Environmental Technology and Policy in the Centre for Environmental Policy at Imperial College London and is a Chartered Engineer with the Institution of Chemical Engineers, and is a guest researcher at the MATerials

and GASes (MATGAS) Research Institute in Barcelona, Spain.

Niall received his PhD from Imperial College for which he was awarded the Qatar Petroleum Prize for Research Excellence on Clean Fossil Fuels. Niall's research interests are highly interdisciplinary and are focused on the development and integration of multi-scale models in the context of low carbon energy systems.

In addition to his research work, Niall conducts consultancy work for companies involved in power generation and has given advice to DECC, the IEA, the JRC and the ETI. He has travelled on behalf of the Foreign Office to travel to China and Korea to promote low carbon power generation and was part of the Imperial College Delegation to the UN FCC COP18 event in Doha, Qatar and has been invited to provide written evidence to members of the Select Committee on Energy and Climate Change.

**Dr Ruth Misener**

Royal Academy of Engineering Fellow, Lecturer, Department of Computing

Ruth Misener completed her PhD in Chemical Engineering in 2012 at Princeton University. She received MA Bachelor of Science in Chemical Engineering; Minor in Political Science in 2007 at Massachusetts Institute of Technology Cambridge. She is now a Royal Academy of Engineering Research Fellow.

Ruth's research domain is Optimisation Methods & Computation Foundations Global optimisation of mixed-integer nonlinear programs (MINLP); Numerical optimisation algorithms; Computational optimisation frameworks; Implementations and software for global optimisation. The Applications are Optimal chemotherapy scheduling for leukaemia; Bioprocess optimisation under uncertainty; Cell cycle modelling; Superstructure optimisation of chemical and petrochemical plants for energy efficiency; Process network design and operations.

Dates For Your Diary!

CPSE's 25th Anniversary Celebration 4th - 5th December 2014

CPSE will be celebrating its **25th Anniversary** this year. We will mark this huge milestone during the **Annual Consortium Meeting, 4th and 5th December 2014**. The event will take place at CPSE, Seminar Room, C615 Roderic Hill. The programme will be available soon.

The **Twenty First Professor Roger Sargent Lecture** will be delivered by **Professor Stratos Pistikopoulos FEng**. The Lecture titled "**Multi-Parametric Programming & Control 25 years later: what is next?**" will take place on **4th December 2014 at 17:30**, Lecture Theatre 1 (room 250), Department of Chemical Engineering.

Abstract: The developments of multi-parametric programming and control coincide with the quarter of a century presence and growth of the Centre for Process Systems Engineering, the 'brainchild' of Professor Roger Sargent's vision. At this milestone anniversary, the lecture will first follow the parallel historical evolutions of multi-parametric programming and explicit/multi-parametric model predictive control within the field of process systems engineering - in particular, how advances in optimization and decision making under uncertainty, the interactions of design and control and the quest for process operability have led to a powerful new paradigm. We will then provide a perspective for the future, outlining the foundations and features of a multi-scale, systems-based platform for the grand unification of design, control and operations under uncertainty which opens unprecedented new opportunities for novel applications in smart manufacturing, sustainable energy systems and personalized healthcare engineering.

CPSE Seminar Series

8 September 2014, 3pm - "From Sand to Silicon Wafer: A Process Systems View of Solar Cell Production" Professor B. Erik Ydstie, Carnegie Mellon University, CPSE Seminar room, C615 Roderic Hill Building. . Registration is not required.

19 September 2014, 11am - "A FT-GTL Technology for small-scale applications" Dr. Mark Peters, University of South Africa, CPSE Seminar room, C615 Roderic Hill Building. Registration is not required.

For CPSE Events, please check:
www3.imperial.ac.uk/centreforprocesssystemsengineering/newsandevents

CPSE Inaugural Lecture

Professor Amparo Galindo's journey, in her own words...

"In This House We Obey The Laws Of Thermodynamics"

3 CPSE academics gave inaugural lectures in the summer of 2013. In the last two newsletters, we featured articles on Professors C. Adjiman and E. Müller's academic journey. We end the inaugural journeys with Professor A. Galindo's story. You can view all Inaugural Lectures on: <http://www3.imperial.ac.uk/centreforprocesssystemsengineering/newsandevents/inaugurallecturesvideo>



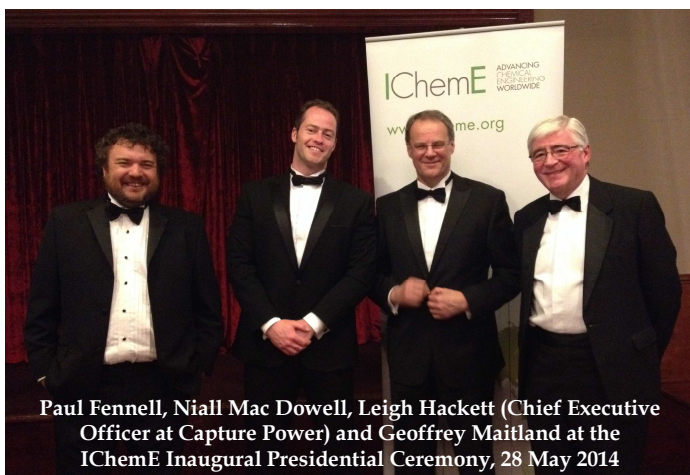
Professor Amparo Galindo

It was a privilege to share my inaugural with my family, friends and colleagues. In my lecture, I talked about the laws of thermodynamics, a topic that still fascinates me after so many years.

The fundamental phase diagram of a pure substance exhibiting gas, liquid and solid phases is reasonably well understood. I highlighted the pioneering work of Dutch physicist Johannes van der Waals in the late 1800s which showed that the behaviour of simple fluids can be understood in terms of the balance of spherical repulsive and attractive forces. The challenge however arises when trying to describe and predict the properties of more complex molecular systems and their mixtures. Modern equations of state which are based on detailed molecular models and the fundamental laws of thermodynamics have greatly enhanced the capability of analytical methods and provide a tool that can be used to study complex systems. In my lecture, I discussed some of our contributions in this area, touching on unusual phase behaviour in liquid crystal systems, the challenges and progress in treating and understanding aqueous solutions and the recasting of the free energy expression as a group contribution method.

My journey so far has been wonderful. I started my scientific career when I studied Chemistry in Madrid, graduating in 1993. I then moved to the UK where I obtained my PhD from the University of Sheffield. I joined Imperial as a Lecturer in 2002 upon receiving an Advanced EPSRC Fellowship in 2000.

Dr Fennell and Dr Mac Dowell report on Professor Maitland's Inaugural Presidential Address



Paul Fennell, Niall Mac Dowell, Leigh Hackett (Chief Executive Officer at Capture Power) and Geoffrey Maitland at the IChemE Inaugural Presidential Ceremony, 28 May 2014

We were pleased to attend Geoff Maitland's presidential address, it was a tour de force, taking in many areas of chemical engineering (and a brief* potted history of the potters - Stoke FC). Geoff discussed the significant importance of Chemical Engineering to the world, introducing Chem Eng 365 - a new engagement strategy, sharing good chemical engineering stories (<http://ichemepresident.wordpress.com/>). Geoff spoke passionately about the requirements for carbon management, including CCS. He issued a clarion call for Chemical Engineers (and all other scientists and engineers) to join the

fight against climate change, to take individual responsibility for their climate impact and to ensure that their representatives in parliament understand that the UK must take climate change seriously. Geoff emphasised the global nature of the challenges presented by anthropogenic climate change, and highlighted the political prevarication that has characterised this area to date. He went on to draw a parallel between the scale of mobilisation required in time of war, and suggested that a similar degree of social and political commitment is required to ensure sustained action to tackle this challenge and the ultimate successful resolution of this global disaster, into which we are currently walking...

Geoff also discussed his work at Imperial College, where he led the Qatar Carbonates and Carbon Storage Research Centre until earlier this year, the largest industry/academic research partnership in the UK. <http://www3.imperial.ac.uk/qatarcarbonatesandcarbonstorage>

The final message from Geoff's talk was that he planned to assist and encourage Chemical Engineers to build and strengthen bridges with other institutions and disciplines, in particular to ensure that engineers have a coherent and clear voice in the media and to influence government policy.

CPSE Activities

The results of the Department of Chemical Engineering Annual Dinner Best Lecturer Award were announced. CPSE academics in particular, Dr Krishnan were ranked high by Chemical Engineering undergraduates. Dr Krishnan was voted Third by the 1st Years and Second by the 4th Years. The 2nd Year's voted Prof Amparo Galindo First place, Prof Sakis Mantalaris was joint Second.



From left to right: Kush Amin, Alex Bate, David Gibbon, Naveed Tariq and Max Thompson

PhD student Naveed Tariq (supervisor Prof Nilay Shah) and his four team mates won a prize of £13,000 on the BBC2 quiz show 'The Eggheads.' The show sees contestants challenging a group of intimidating experienced quizzers. Well Done Naveed and Team!

Dr Salvador Acha Izquierdo was featured in the Imperial Podcast talking about the research he was involved in along with his supervisor Prof Nilay Shah and colleagues for Sainsbury's. Salvador highlighted what they are doing to assist Sainsbury's drive to reduce energy use. You can view the Podcast at: http://www3.imperial.ac.uk/newsandeventspggrp/imperialcollege/newssummary/news_19-3-2014-10-50-23

Dr Cleo Kontoravdi and her group were involved in Science Museum Lates event on Bio-Revolution. Their demonstration was called 'the Icing on the Cake.' They made sugar structures attached on therapeutic antibodies out of midget gems which they then ate. With over 7,000 visitors, Cleo and her group had a blast with the public. You can view the video of the event: <http://www.youtube.com/watch?v=LFCaofu1jYw&feature=youtu.be>

Professor Geoffrey Maitland completed 9 years as President of Chem Eng Soc. His support and efforts were appreciated by all the members.

More CPSE Activities

Research Associate, Dr Ioscani Jimenez del Val will be starting a new job as a lecturer at University College Dublin. Ioscani had completed both his MSc studies and PhD at Imperial. His supervisor, Dr Cleo Kontoravdi said she is thrilled but will miss him. Congratulations Ioscani!

Prof G. Maitland, Director, Qatar Carbonates and Carbon Storage Research Centre was quoted in the **Gulf Times**, talking about the success of QCCSRC's Qatari PhD students, during the inaugural Qatar Energy R&D awards: <http://www.gulf-times.com/eco.-bus.%20news/256/details/385234/shell-backs-tech-innovation-with-%24100mn%2c-10-year-qatar-%26d-spend>

Ahmad Alhaji (supervised by Prof N. Shah) and Olga Lobanova (supervised by Profs G. Jackson and E. Müller) successfully defended their thesis.

Imperial pledged to end Mental Health Discrimination, during the Mental Health Awareness Week 12th-18th May, Professor Debra Humphris signed the 'Time to Change' pledge on behalf of the College. CPSE representative Cristina Romano, one of the College's trained Mental Health First Aiders was at the event. If you have any concerns, or would like some information, please contact Cristina.

Two New Software Package Releases

SobolHDMR Software - Developers: S. Kucherenko, O. Zacheus, M. Zuniga

SobolHDMR is a general purpose metamodeling software. It is based on a number of new techniques which improve the efficiency of the Random Sampling-High dimensional model representation (RS-HDMR) method.

SobolOpt Software - Developers: S. Kucherenko, O. Zacheus

Solution of nonconvex global optimization problems is one of the hardest fields of optimization, presenting many challenges in both practical and theoretical aspects. We developed a novel method, which combines advantages of deterministic and stochastic methods. It is based on application of Quasi Monte Carlo (QMC) methods based on Sobol' sequences [1] and multi-level linkage methods [2].

You can be downloaded both software for free:
<http://www3.imperial.ac.uk/centreforprocesssystemsengineering/software1>

Dr Sergei Kucherenko was one of the organisers at the 11th International Conference on Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing in Leuven, The Netherlands.



Sara Budinis (IC), Sara Giarola (IC), Olga Parkes (UCL) and Carolin Kiefer (IC) successfully run **RACE FOR LIFE** on 5th July. Race for life is an event organised by Cancer Research UK to raise awareness and money against cancer. The run was in Hampstead Heath Park and the goal was to run 5 km! Sara Budinis (team leader) lead her team to the finishing line. Donations are accepted until 23rd August and there is still time if you wish to donate towards this great cause: <https://www.justgiving.com/princess-and-co>

The CPSE Newsletter aims to keep members of the Industrial Consortium, Staff and Students updated on Centre activities. If you have any comments, or would like to add to the next issue, please email: Miss Senait Selassie: s.selassie@imperial.ac.uk.