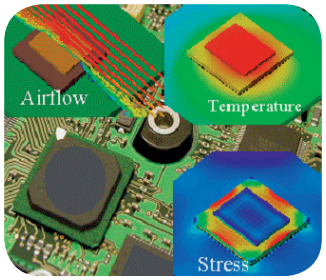
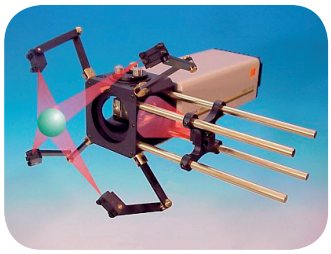
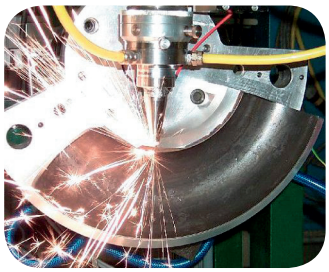
SMI Conference

Launch of SMI Phase II Programme

10th April 2008







The 2008 SMI Annual Conference is combined with the official launch of Phase II of the SMI Research Programme.

SMI the centre for excellence for advanced manufacturing solutions at Heriot-Watt University is one of 16 IMRCs (Innovative Manufacturing Research Centres) established by EPSRC with long-term funding and enhanced with substantial additional financial support from industry SMI is approaching the end of its Phase I EPSRC funding, but following an extremely successful international technical review EPSRC have formally confirmed the award of Phase II baseline funding of £7.2 million over a 5 year period commencing 1st April 2008.

The SMI Mission is to support manufacturing innovation through research in technologies that underpin sustainable growth of high value-added manufacturing industries in Scotland and the rest of the UK, by exploiting a constructive engagement between academic researchers and industrial stakeholders. Our particular focus is on new technology and processes for high value, low volume, highly customised products with high IP content. The main thrust of the SMI research portfolio includes manufacturing applications of Applied Photonics, Microsystems and Digital Tools, but also crossing classical discipline lines to draw on relevant research outputs in physics, chemistry, materials and mathematics.

SMI depends on and benefits from close ties and a two-way relationship with many partner companies, as well as a very active Industrial Steering Group. Knowledge and technology transfer is multi-mode and flexible

The SMI conference provides both an overview of research activities in the three main of areas of Digital Tools, Micro-electro-mechanical Systems (MEMS) & Photonics-based Manufacturing Technologies, as well as invited presentations from leading international figures. It also provides a forum for leading international academics and industrialists to share knowledge and experience.

To facilitate effective dialogue, Poster Presentations will be the main vehicle for showcasing SMI research; conference attendees are also invited to submit contributed poster papers (see below).

Launched in 2003 with a £4.2 million grant from EPSRC plus financial and collaborative support from industry. SMI is themed around three areas crucial to future manufacturing innovation: Digital Tools, Micro-electro-mechanical Systems (MEMS) & Photonics-based Technologies. The SMI Conference offers opportunities to learn about academic research at the frontiers in each of these areas.

Supporting Manufacturing Innovation

Conference Programme

9th and 10th April 2008

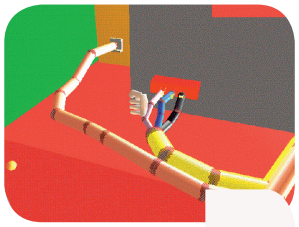
Wednesday 9th April 2008

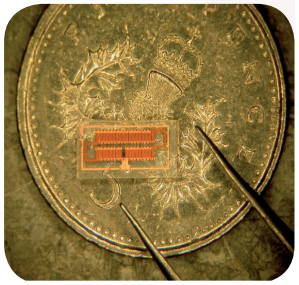
	EVENING MEAL SCHOLAR'S RESTAURANT
7.30pm	Reception
8.00pm	Dinner

Thursday 10th April 2008

9.00am-9.40am	**REGISTRATION & COFFEE - Lecture Theatre 2**
9.45am - 9.55am	**Welcome** - Lecture Theatre 3
9.55am - 10.25am	**SMI Phase II launch** - Lecture Theatre 3
10.25am	Virtual Reality – The Potential for Greatness - Lecture Theatre 3 **Professor Judy Vance** (Iowa State University and National Science Foundation)
11.10am	**COFFEE - Lecture Theatre 2**
11.25am	Laser Technology: Mission Possible - Lecture Theatre 3 **Professor. Dr.-Ing. Werner Jüptner** (Bremen Institute of applied beam technology)

12.10pm	**Researchers stand up – quick fire summary of SMI Projects - Lecture Theatre 3**
12.30pm	**LUNCH AND POSTER SESSION – Nasymth 1.37**
1.45pm	Computational Mechanics: A key enabler - Lecture Theatre 3 **Professor Chris Bailey** (University of Greenwich)
	SMI RESEARCH HIGHLIGHTS
2.25pm	Overview of SMI Photonics research - Lecture Theatre 3 **Professor Julian Jones** (SMI)
2.55pm	The EPSRC Grand Challenge Project 3D-Mintegration - Lecture Theatre 3 **Professor Marc Desmulliez** (SMI)
3.25pm	User Logging for Engineering Data Capture - Lecture Theatre 3 **Professor Jim Ritchie** (SMI)
3.55pm	**LABORATORY VISITS**
4.55pm	**END**





Professor Judy Vance

Virtual Reality – The Potential for Greatness

Virtual reality technology gives us the tools to create computer generated alternate realities. Through the use of three-dimensional viewing, interaction devices, and sound, developers have the freedom to assemble worlds that either reflect the real world or create worlds that emerge out of their imagination. As news about virtual reality moved from the garages and research labs into the general media, people began to extrapolate the capabilities of VR beyond the limits of the technology. Visions of tele-transportation through a holodeck-like device, haptic feedback for the entire body, and instant virtual collaboration across the world were offered by the media as possible applications of this technology. Expectations were very high for the potential impact of this technology in fields as diverse as psychology, medicine, geology, and others. The reality, however, was quite different. While during the early days of virtual reality, advancements were significant and occurred frequently, during the last 10 years, advances have been incremental - until now. Recently, new developments have been achieved which have the potential to provide the tools researchers need to achieve results that have not been possible in the past. The entertainment industry has been a key driver in the development of new hardware and software to support virtual reality. This presentation will discuss the current state of the art, the potential for new advances, a vision for the future and some thoughts on the research funding base needed to accomplish this vision.

Biography

Judy Vance is Professor of Mechanical Engineering and a faculty associate of the Virtual Reality Applications Center at Iowa State University. She is currently serving as Program Director for Engineering Design at the National Science Foundation. She received her B.S., M.S., and Ph.D. degrees from Iowa State University, all in Mechanical Engineering. Professor Vance spent several years in industry working for both Maytag and John Deere before returning to ISU to pursue her graduate education.

Professor Vance's research focuses on investigating applications of virtual reality techniques to engineering design. In 1996 she received the National Science Foundation CAREER award for her research on using virtual reality to facilitate interactive design based on shape changes and finite element analysis. She has received the Mechanical Engineering Teacher of the year award (1996) and the College of Engineering Superior Teacher award (1998). She is a Fellow of the American Society of Mechanical Engineers (ASME), Chair of the ASME Design Engineering Division Executive Committee, and past chair of the ASME Design Automation Committee. She served as Associate Editor of the *ASME Journal of Mechanical Design* from 1999 - 2002. She is active in supporting advancement of women engineering faculty into academic leadership through her activities in the Women in Engineering Leadership Institute (WELI).

Professor Dr.-Ing. Werner Jüptner

Laser Technology: Mission Possible

The laser is nearly 50 years old having a history with many "impossible" Pioneering work turned most of them into successful applications. Some of the milestones in the two major working fields of BIAS, material processing and metrology, will be reported.

Welding, (the joining of materials), has played an important role in our developments: Aluminium is a difficult to weld but the introduction of filler metal welding brought the success in the cooperative development with Airbus making welding for the first time welding a manufacturing process in aircraft industry. Another example is the welding of dissimilar metals like aluminium and steel. Metallurgical investigations resulted in a process with micrometer thick boundary layers. Laser material processing results in small dimensions of the effected areas, which must be investigated. Conventional testing methods failed. Coherent optical method promised to give solutions, especially holographic interferometry and its derivatives. A revision of the real requirements led to applications on objects with some meters in size, tons in weight, and temperature changes of several degrees. The work in coherent methods has its highlight in the invention of Digital Holography allowing to measure the intensity and the phase of a light wave field with unforeseeable chances for metrology.

The vision of laser technology may be a factory based on lasers: The laser power can be directed as fast as no other energy to any point in the plant, optical process control guarantees quality and optical metrology enable reverse engineering in time. The exciting part of this idea is to solve new up-coming impossibilities.

Biography

Werner Jüptner studied Physics in Hanover Technical University from 1964 to 1969. The Topic of his work was the emission behaviour of solid state lasers. He received his PhD in Mechanical Engineering in 1975 from Hanover University. The Topic of his thesis was the deep penetration behaviour of a high power electron beam into metals. From 1970 to 1977 he worked in the newly founded Fraunhofer-Institut IFAM. In this time he developed of full field deformations and non-destructive testing methods. In 1977 he founded together with Dr.-Ing. Gerd Sepold the BIAS (Bremen Institute of applied beam technology) being a director until 2006. BIAS was the first institute for laser applications in the fields of material processing and optical metrology. In 1989 he was nominated to an Adjunct Professor of WPI – Worcester Polytec Institute, USA. In 1989 he became also a University Professor for Laser Physics of Bremen University. In 2007 he became a Professor of the University of Aberdeen as the 6th Century Chair in Laser Engineering. Dr.-Ing. Werner Jüptner published more than 300 papers in proceedings and reviewed journals. He has written or contributed to several books. He was a chair of different national and international conferences. Dr.-Ing. Werner Jüptner has received the degree of a Captain during his military duties. He was consultant to different scientific and political institutions. He has been and still is a member of scientific committees. He is a member of the EPSRC (Engineering and Physical Sciences Research Council) College, Swindon, United Kingdom He is a director of SPIE from 2007 – 2009. He is a member of about 10 scientific societies, in some of them in leading positions.

Professor Chris Bailey

Computational Mechanics: A key enabler for the Design and Manufacture of Reliable Microsystems and Photonic Components

Computational mechanics is now a key tool for DfX and has seen significant uptake by both small and large companies who design, manufacture, package and test Microsystems and photonic components. Numerical technologies such as multi-physics modelling, optimisation, and uncertainty analysis, are helping organisations predict the performance and reliability of new processes and products at the very early stage of design resulting in significant reduction in lead times. This presentation will discuss the current capabilities of computational mechanics tools and how these are making a significant impact for many companies.

Biography

Chris Bailey is Director of the Computational Mechanics and Reliability Group at the University of Greenwich. He has PhD in Computational Modelling and an MBA in Technology Management. Since 2001 his group has secured over £3m from the EPSRC, Dti, EU and other organisations. Professor Bailey is a Fellow of the IMA and a Senior Member of IEEE and IET. In 2007 he organised the EuroSime conference in London and in 2008 he is the General Chair of the IEEE Electronics System-integration Technology Conference (ESTC-2008) to be held in Greenwich.

Professor Julian D C Jones (SMI)

Overview of SMI Photonics research

An overview of the research areas of the SMI Photonics theme will be given. These areas include our work on:

- manufacturing cost reduction and performance enhancement of industrial lasers
- fabrication technologies for next generation (bright, intelligent) lasers
- high precision laser-based manufacturing processes
- beam delivery of high power laser light for laser-based manufacturing processes
- sensors for process monitoring and control of laser-based manufacturing processes.

Biography

Julian Jones studied physics at the University of Wales, Aberystwyth and in 1980 gained a PhD on the plasma chemistry of excimer lasers. In 1988 he became a Lecturer in Physics at the University of Kent where he developed his interests in optical instrumentation. In 1988 he moved to Heriot-Watt University, Edinburgh and established a research group specialising in the physics and technology of optical fibres. Since 2007 he has been Deputy Principal for Strategy and Resources at Heriot-Watt University. Professor Jones is President of the UK Consortium for Photonics and Optics. He was elected a Fellow of the Royal Society of Edinburgh in 2000 and a Fellow of the Optical Society of America in 2004. He was appointed as an Officer of the Order of the British Empire in 2002, 'for services to science and engineering

Professor Marc Desmulliez (SMI)

The EPSRC Grand Challenge Project 3D-Mintegration

3D-Mintegration is a £4M funded project to develop new ways of thinking for the design, processing, assembly, packaging, integration and testing of complete 3D miniaturised/ integrated "3D-MINTEGRATED" products. This talk will present the results obtained by the 6 universities and 20 companies which are partners of this Grand Challenge.

Biography

Marc Desmulliez, Director of the MIcroSystems Enginering Centre (MISEC) at HWU and Head of EECE, holds a Diploma in Electrical Engineering from the Grand Ecole Supelec, two MSc's in modern optics and theoretical physics from UCL and Cambridge, and a PhD in opto-electronics from HWU. His research interests are in MEMS, advanced manufacturing and packaging. He has published over 150 publications in these fields of research.

Professor Jim Ritchie (SMI)

User Logging for Engineering Data Capture

Recent SMI research has shown how the computerised logging of engineers' behaviour can facilitate engineering information generation and knowledge capture. This seminar will give examples of how, using virtual reality systems, engineer monitoring and subsequent data analysis have been applied to automatically output assembly plans, analyse design tasks, identify design behaviour patterns, acquire design process maps and generate decision making syntax during product engineering tasks; demonstrating the potential for automating engineering rationale capture and reuse. Future research plans will also be discussed showing how, through a unique approach combining a number of human-centred logging techniques, engineering decision making and rationale can potentially be automatically formalised and the associated costs reduced.

Biography

Jim Ritchie is a Professor in Mechanical Engineering at Heriot-Watt University who specialises in design, manufacture and manufacturing management. With over 120 publications, his most recent research interests have focussed on product development applications including the analysis and use of virtual reality in design and manufacture, rapid prototyping, design process capability analysis and mechanical engineering knowledge and information capture. He is a member of the SMI Management Group and, since its inception, has been involved in a number of SMI projects as well two Knowledge Transfer Partnerships and some EU-funded work. He is also Academic Director of the University's Advanced Manufacturing Unit.