

For a more prominent profile why not showcase  
your latest products at this event?  
Visit [www.iee.org/mems](http://www.iee.org/mems) to find out more

# THE IEE SEMINAR & EXHIBITION ON MEMS SENSORS & ACTUATORS

THE IEE SEMINAR &  
EXHIBITION ON MEMS  
SENSORS & ACTUATORS

Organised by the IEE Measurement,  
Sensors, Instrumentation & NDT and  
IEE Microsystems and Nanotechnology  
Professional Networks

[www.iee.org/mems](http://www.iee.org/mems)

THE IEE  
SAVOY PLACE  
WC2R 0BL  
LONDON  
UK

27 - 28 APRIL 2006

## KEY BENEFITS

- Increase your awareness of a rapidly developing field
- Gain exposure to new and extremely flexible technologies that have the capability to impact upon many application areas
- Exchange information and ideas with exhibitors and your peers, increasing knowledge sharing and building best practice

## EXHIBITORS INCLUDE:



SCIENTIFIC VACUUM SYSTEMS LTD



Solutions for a nanoscale world.™



REGISTER BEFORE FRIDAY,  
31 MARCH 2006 TO GAIN A  
DISCOUNT ON YOUR DELEGATE FEE

Visit: [www.iee.org/mems](http://www.iee.org/mems)



Engineering the future

## WHO SHOULD ATTEND?

*This is a key event for an academic engaged in sensor research, a company involved in sensor manufacture and process control and equipment manufacturers for the semiconductor industry.*

## KEYNOTE SPEAKERS INCLUDE



**BARRIE BUTLER**  
Associate Consultant,  
Technology For Industry Ltd



**PROFESSOR JIM BURDESS**  
Professor of Engineering  
Dynamics, University of  
Newcastle upon Tyne



**DR MALCOLM GOWER**  
Exitech Ltd



**PROFESSOR RON PETHIG**  
University of Wales, Bangor

# INTRODUCTION

MEMS technology is advancing rapidly, and over the last five years has allowed the construction of many integrated systems, including (for example) novel micro and nano structured materials, sensors based on movable mechanical components and self powered autonomous devices. Many involve nanotechnology. These components are allowing systems that were once confined to the laboratory to find new applications with a strong commercial potential. UK activity is now rapidly increasing, after a relatively slow start compared to the rest of the advanced industrial nations.

The aim of this event is to bring together UK expertise in MEMS, to introduce the advantage of MEMS process technology and to highlight developments. The topics will be relevant to companies engaged in sensor manufacture and process control, equipment manufacturers for the semiconductor industry and academics engaged in MEMS, nanotechnology and sensor research.

# PROGRAMME

THURSDAY, 27 APRIL 2006

## 09.30 REGISTRATION AND REFRESHMENTS

### 10.00 Chairman's Welcome and Introduction

## SESSION 1 – FLUIDICS & FLOW

**10.05 Keynote Address:**  
**Convergence of Technologies in Development of Micro-Electrokinetic Devices for Biomedical Applications**  
Professor Ron Pethig, University of Wales, Bangor, UK

## 10.40 REFRESHMENTS

**11.00 Building EWOD Microfluidic Array Technology on Top of Foundry CMOS**  
Y Li, P Li, A Kazantzis, L I Haworth, A W S Ross, J G Terry, J T M Stevenson, A M Gundlach, A Bunting and A J Walton, Institute of Micro and Nano Systems Scottish Microelectronics Centre, University of Edinburgh, UK

**11.20 Suspension-Compatible Elastomer-Glass Micropumps Employing a Linear Topology**  
M C Tracey, I D Johnston, J B Davis and C K L Tan, STRI, University of Hertfordshire, UK

**11.40 Investigation on Electro-Acoustic Characteristics of a MEMS Microfluidic Ultrasonic Separator**  
Dr Yijun Shen, Brunel University, UK

**12.20 Electroactive Diaphragm Actuators for Flow Control**  
S S Dearing, G G Arthur, J Morrison and Z Cui, Imperial College, London, UK

### 12.40 Discussion

## 12.50 LUNCH

## SESSION 2 – PHYSICAL SENSORS

**14.00 Keynote Address:**  
**The Dynamics of Degenerate Mode MEMS Sensors**  
Professor Jim Burdess, Professor of Engineering Dynamics, University of Newcastle upon Tyne, UK

**14.35 Development of a Second Generation Low Cost Silicon MEMS Gyroscope: Design for Manufacture**  
Dr Chris Fell, BAE Systems, UK

**14.55 Bio-inspired MEMS Resonant Thermal Detector**  
M E McNie, D J Combes, R R Davies, K M Brunson, K L Lewis, C J Anthony, D J Hamilton, P P Donohue and M A Todd, QinetiQ Ltd, UK

**15.15 Standard MEMS Sensor Technologies for Harsh Environment**  
Jean-Michel Stauffer, Colibrys, Switzerland

### 15.35 Discussion

## 15.45 REFRESHMENTS

## SESSION 3 – BIOMECHANICAL SENSORS

**16.00 Scent Whisper**  
Dr Jenny Tillotson and Dr Gareth Jenkins, Central Saint Martins, University of the Arts London, UK

**16.20 Towards a Truly Biomimetic Artificial Olfactory Microsystem**  
J A Covington, S L Tan and T C Pearce, University of Leicester, UK  
A Hamilton, University of Edinburgh, UK  
J W Gardner, University of Warwick, UK

**16.40 Direct Adsorption of Chemically Modified Biomolecules Onto Gold: A Rapid Method for Bio-Functionalisation of MEMS**  
G Suárez, K A Ismail, R J Jackson, S C Chang, A J Harris, J S Burdess, J Hedley and C J McNeil, University of Newcastle upon Tyne, UK

### Paying full price?

IEE members save money on all IEE events  
Join now

[www.iee.org/membership](http://www.iee.org/membership)

A New Institution from the IEE and IIE  
On 31 March 2006, the IEE and IIE will form a new organisation, the Institution of Engineering and Technology. The Institution welcomes involvement from and communication between all sectors of science, engineering and technology.

Membership of the Institution will place you at the heart of a global community of more than 150,000 engineers and technologists, providing you with a passport to a powerful knowledge network, the opportunity to develop your own expertise and to share ideas with fellow professionals.

For more information on the Institution visit [www.theiet.org](http://www.theiet.org)

- 17.00 Planar Waveguide Enzyme Sensor Array for Water Pollution Monitoring**  
A Nabok, J Travis, A Tsargorodskaya and S Haron, Materials & Engineering Research Institute, Sheffield Hallam University, UK
- 17.20 Discussion**
- 17.30 POSTER & EXHIBITION SESSION WITH EVENING DRINKS RECEPTION**
- POSTER 1: Ionchip - The First Chip-Based Mass Spectrometer Product**  
Alan Finlay, Microsaic Systems, UK
- POSTER 2: Material Selection and Design of Microelectro-Thermal Actuators**  
S Prasanna and S Mark Spearing, University of Southampton, UK
- POSTER 3: 3D Surface Analysis of MEMS Structures using White Light Confocal Microscopy**  
Alastair Sharp and Juergen Valentin, Systegration Ltd, UK/NanoFocus AG, Germany
- POSTER 4: Design and Simulation of a Micromachined Electrostatically Suspended Gyroscope**  
Badin Damrongsak and Michael Kraft, University of Southampton, UK
- POSTER 5: MEMS Actuators for Aligning and Tuning Optical Microcavities on Atom Chips**  
C O Gollasch, Z Moktadir, G Lewis, M Kraft, M Trupke, S Eriksson and E A Hinds, University of Southampton, UK
- POSTER 6: Simulation and Impedance Characterisation of Piezoelectric Microcantilevers**  
P Sanz-González, J Vázquez and J L Sánchez-Rojas, University Castilla-La Mancha, Spain
- POSTER 7: A Review of Non-Photolithographic 3D Microfabrication Technologies**  
C Stokes and P J Palmer, Loughborough University, UK
- POSTER 8: LIGA: Current Fabrication Capabilities**  
Doug Elerath, HT MicroAnalytical, Inc., USA
- POSTER 9: Design, Modelling and Fabrication of Piezoelectric MEMS Devices**  
Meiling Zhu and Paul Kirby, Cranfield University, UK
- POSTER 10: Finite Element Sensitivity Studies of Robustness in Micro-Scale Piezoelectric Technologies**  
M A Perry, R A Bates, M A Atherton and Y Shen, London School of Economics, UK

**POSTER 11: Metrology of MEMS**  
Dr Mike Conroy, Taylor Hobson, UK

**POSTER 12: Bulk Micromachined Electrothermal Hydraulic Microactuator and Its Applications**  
S Lucyszyn and J S Lee, Imperial College London, UK

**20.00 Close of Seminar**

## FRIDAY, 28 APRIL 2006

**09.30 REGISTRATION AND REFRESHMENTS**

**10.00 Chairman's Welcome and Introduction**

### SESSION 4 - RF & WIRELESS

**10.05 Keynote Address: Trends in Microsystems Packaging for Cost Effective Manufacturing**  
Barrie Butler, Associate Consultant, Technology For Industry Ltd

**10.40 REFRESHMENTS**

**11.00 Design of an Injectable Microsensor to Wirelessly Transmit Signals from the Motor Cortex of the Human Brain**  
Jon P F Spratley, Mike C L Ward and Peter S Hall, The University of Birmingham, UK

**11.20 Miniaturised MEMS Drug Delivery System with RF Power Transfer and Communication**  
J T M Stevenson, S Smith, T B Tang, A F Murray, B W Flynn, H M Reekie, D R Renshaw, B Dhillon, A Ohtori, Y Inoue and A J Walton, University of Edinburgh, UK

**11.40 Critical Issues in Fabrication of RF MEMS Switches**  
Zheng Cui, Central Microstructure Facility, Rutherford Appleton Laboratory, UK

**12.00 Enhanced THz Transmission through Micromachined Sub-wavelength Annular Apertures**  
Dr A J Gallant, Dr J A Levitt, Prof J M Chamberlain, Prof D Wood, Prof M C Petty, Dr M Kaliteevski, Dr S Brand and Prof R A Abram, Durham University, UK

**12.20 Discussion**

**12.30 LUNCH**

### SESSION 5 – ACTUATORS 1

**13.30 Keynote Address: Laser Micromachining of Materials for Industrial Manufacturing**  
Dr Malcolm Gower, Exitech Ltd, UK

**14.05 Microactuator Application of Shape Memory TiNi Films**  
Y Q Fu, J K Luo, A J Flewitt and W I Milne, University of Cambridge, UK

**14.25 Microscale Magnetic Components**  
David Flynn and Dr Marc Desmulliez, Heriot Watt University, UK

**14.45 MEMS Large Throw Magnetic Actuator**  
N Dimitrakopoulos, R E Miles and A C Hartley, University of Leeds, UK

**15.05 Discussion**

**15.15 REFRESHMENTS**

### SESSION 6 – ACTUATORS 2

**15.30 An Automated Performance Testing System for Piezoelectric Micromotors**  
P J Rayner, S A Wilson, R W Whatmore and M Cain, Cranfield University, UK

**15.50 Assembly of PZT Fibre Array Composites by Dielectrophoresis**  
Stephen A Wilson and Ennio Capria, Cranfield University, UK

**16.10 Design of a Microgripping System with Visual and Force Feedback for MEMS Applications**  
I Giouroudi, D Andrijasevic, W Brenner and J Kosel, Vienna University of Technology, Austria  
Harald Hötzenedorfer, Fundacion Robotiker Department of Design, Engineering and Manufacturing, Zamudio, Spain

**16.30 Air Damped Microresonators with Enhanced Quality Factor**  
Lijie Li, Gordon Brown and Deepak Uttamchandani, University of Strathclyde, UK

**16.50 Discussion**

**17.00 Close of Seminar**

### THREE EASY WAYS TO BOOK

- 1 ► Book Online at: [www.iee.org/mems](http://www.iee.org/mems)
- 2 ► Fax the completed booking form to: +44 (0)1438 765659
- 3 ► Post your booking to: Finance Dept, The IEE, PO Box 96, Stevenage, Herts, SG1 2SD

One person per form only (forms may be photocopied)

**Registration** (Please complete in CAPITALS)

Family Name																Title (Mr, Mrs, Miss etc)					
Name																Job Title					
IEE/IIIE/Other membership																Membership No					
Name of Organisation (for name badge)																					
Address for Correspondence																					
Town/City					Postcode					Country											
Business Telephone										Fax											
Email																					
Do you have any dietary or other requirements?																					
How did you hear about this event?																					
Flyer in the post <input type="checkbox"/> Email <input type="checkbox"/> Advert (IEE publication) <input type="checkbox"/> Advert (Other) <input type="checkbox"/> Website <input type="checkbox"/>																					
Other (please specify) _____																					

**Fees and charges** (Please complete the appropriate box)

Registration fees include attendance at the sessions, a copy of the proceedings, morning and afternoon refreshments, attendance at the evening drinks reception and lunch each day.

	Charge per person	£	p
<b>EARLY BIRD REGISTRATION</b> (before 31 March 2006)			
Author	<b>£195.00</b> (+ £34.13 VAT = £229.13)		
Member	<b>£245.00</b> (+ £42.88 VAT = £287.88)		
Non Member	<b>£295.00</b> (+ £51.63 VAT = £346.63)		
IEE Member (Student/Retired)‡	<b>£95.00</b> (+ £16.63 VAT = £111.63)		
<b>STANDARD REGISTRATION</b> (after 31 March 2006)			
Member	<b>£295.00</b> (+ £51.63 VAT = £346.63)		
Non Member	<b>£345.00</b> (+ £60.38 VAT = £405.38)		
IEE Member (Student/Retired)‡	<b>£145.00</b> (+ £25.38 VAT = £170.38)		
‡ All students must have their applications endorsed by their Professor or Head of Department			
<b>Total Remittance</b>			

**Data Protection** Information provided by you on this form will be processed by the IEE and used for the purpose of the goods and services ordered by you, and for billing accounts. If you are an IEE member and do not want to hear about similar events and services provided by the IEE, please tick here  If you are not an IEE member and would like to hear about similar events and services provided by the IEE, please tick here  The IEE is not, as a body, responsible for the views or opinions expressed by individual authors or speakers.

**Payment Details** Payment must accompany this registration form. Registration will only be confirmed on receipt of the full payment.

**PLEASE NOTE: Payment via Purchase Order is not accepted.** Please indicate the method of payment:

Cheque <input type="checkbox"/>	Credit Card <input type="checkbox"/>	BACS <input type="checkbox"/>	Cheques should be made payable to the "The IEE" and crossed.	CSC (Card Security Code) <input type="text" value=""/> <input type="text" value=""/> <input type="text" value=""/>
Visa <input type="checkbox"/>	MasterCard <input type="checkbox"/>	AMEX <input type="checkbox"/>	Switch <input type="checkbox"/>	Last 3 digits on signature strip
Card Number		Issue No		Valid From
Cardholder's Name		Expiry Date		
Registered address of Cardholder/Invoicing Address (if different from above)				
_____				
_____				

**Bank Transfers (BACS)** can be made to Barclays Bank Plc, Pall Mall Corporate Banking Group, 50 Pall Mall, PO Box 15162, London SW1A 1QB. Account no: 50480606 Sort code: 20-65-82. IBAN GB43 BARC 2065 8250 4806 06. A copy of the Draft must accompany this form.

The Institution of Electrical Engineers is registered as a charity.

# THE IEE SEMINAR & EXHIBITION ON **MEMS SENSORS** & ACTUATORS

## **EXHIBITION**

For a more prominent profile, why not exhibit at this event? The Exhibition will take place in The Riverside Room. Situated in the same room as the registration desk, refreshment breaks and lunch, the exhibition area is well positioned to achieve maximum exposure to delegates.

## **CONFIRMED EXHIBITORS INCLUDE:**

- ANSYS
- BAE SYSTEMS ADVANCED TECHNOLOGY CENTRE
- COMSOL
- LAMBDA PHOTOMETRICS
- LOGITECH LTD
- SCIENTIFIC VACUUM SYSTEMS LTD
- VEECO INSTRUMENTS

For more information on sponsorship/exhibition opportunities visit the website – [www.iee.org/mems](http://www.iee.org/mems)

Or contact the organisers:

Tel: +44 (0)1438 765653

Fax: +44 (0)1438 765659

Email: [eventsa3@iee.org](mailto:eventsa3@iee.org)

---

## **DR DAVID MOORE**

It is our sad duty to report the death of our long-standing colleague David Moore of a heart attack, on Friday, 17th February 2006.



Following a PhD on Josephson junctions at Stanford University, David held a post-doc position at IBM Zurich. Returning to England, he became a Fellow in Engineering at Trinity Hall, Cambridge in 1984, and was later promoted to Reader in Electrical Engineering at Cambridge University Engineering Department.

In recent years his research was in microelectromechanical systems (MEMS), with a special interest in materials. He developed one of the first MEMS devices for rapid cycling through the polymerase chain reaction, laser etched micro-nibs for transfer of very small quantities of liquid analyte, and on-chip alignment fixtures for components in silicon opto-hybrids. Many of these devices attracted commercial interest, and his PCR cycler became a textbook example of a microsystem design.

David was well known in the UK MEMS community. He was friendly and gregarious, and an easily recognisable figure at meetings, where he would always initiate the discussions. He will be badly missed, and our sympathies go to his family.

## **THREE EASY WAYS TO BOOK**

**1** ► Book Online at: [www.iee.org/mems](http://www.iee.org/mems)

**2** ► Fax the completed booking form to: +44 (0)1438 765659

**3** ► Post your booking to: Finance Dept, The IEE, PO Box 96, Stevenage, Herts, SG1 2SD

### THREE EASY WAYS TO BOOK

- 1 ► Book Online at: [www.iee.org/mems](http://www.iee.org/mems)
- 2 ► Fax the completed booking form to: +44 (0)1438 765659
- 3 ► Post your booking to: Finance Dept, The IEE, PO Box 96, Stevenage, Herts, SG1 2SD

## FORTHCOMING EVENTS

### THE IEE ANNUAL WHEATSTONE LECTURE

Wednesday, 13 December 2006: Savoy Place, London

For more IEE events visit – [www.iee.org/events](http://www.iee.org/events)

### The IEE Seminar & Exhibition on MEMS Sensors & Actuators Organisers

The IEE, Event Services  
Michael Faraday House  
Six Hills Way  
Stevenage  
Hertfordshire  
SG1 2AY  
UK

Tel: +44 (0)1438 765653  
Fax: +44 (0)1438 765659  
Email: [eventsa3@iee.org](mailto:eventsa3@iee.org)  
Web: [www.iee.org/mems](http://www.iee.org/mems)

### THE IEE SEMINAR & EXHIBITION ON MEMS SENSORS & ACTUATORS

27 - 28 April 2006  
The IEE, Savoy Place, London, UK  
[www.iee.org/mems](http://www.iee.org/mems)

## EXHIBITION

For a more prominent profile, why not exhibit at this event? The Exhibition will take place in The Riverside Room. Situated in the same room as the registration desk, refreshment breaks and lunch, the exhibition area is well positioned to achieve maximum exposure to delegates.

For more information visit the website – [www.iee.org/mems](http://www.iee.org/mems)

Or contact the organisers:

Tel: +44 (0)1438 765653  
Fax: +44 (0)1438 765659  
Email: [eventsa3@iee.org](mailto:eventsa3@iee.org)

#### Conditions of Booking

Forms should be received no later than **Thursday, 20 April 2006**. Please note that reservations cannot be made by telephone. All participants registering less than one week before the date of the event are advised to bring a copy of their registration form with them.

#### Cancellation

In the event of cancellation and provided that written notice is received seven days prior to the event, a refund of 50% of the total fee will be made. If no notice of cancellation is received, no refund can be made. The IEE reserves the right to cancel any event. In this case, the full fee will be refunded unless a mutually convenient transfer can be arranged. Details of event changes or cancellations are available by phoning +44 (0)1438 765 650.

#### Name Substitutions

Name Substitutions are accepted at any time by fax or email.  
Fax: +44 (0)1438 765659  
Email: [Eventscs1@iee.org](mailto:Eventscs1@iee.org)

#### Supporting organisations

Members of supporting organisations who can provide evidence of their affiliation will be admitted at members' rates.

#### Delegates with Special Needs

The IEE aims to offer fully accessible events to all its delegates. Please help us to accommodate any individual needs that you may have by attaching a note to the registration form. We will contact you to discuss this as necessary.

The IEE is not, as a body, responsible for the views or opinions expressed by individual authors or speakers.

UK IEE VAT Reg No: 240-3420-16

The Institution of Electrical Engineers is registered as a Charity