

## Foreword

Micro and nano technologies are advancing rapidly into our everyday lives, increasing our prosperity, our health, our environment and our quality of life. The technology requirements for making very accurate and very small products raise a host of novel scientific and technical problems which cut across many different disciplines. This in turn drives the need for effective interdisciplinary research and collaboration to address these challenges. These technological issues and their possible solutions will be comprehensively addressed at this 4<sup>th</sup> International Conference of the European Society for Precision Engineering and Nanotechnology, **euspen**.

**euspen** links industrialists to researchers across 31 countries in an influential and extended network of people involved in the development, application and commercialisation of these ultra-precision engineering technologies. The 7 technical sessions of the society's 2004 international conference will cover new developments and market forces in process technologies, machine tools/instruments and metrology in the ultra-precision, micro and nano engineering sectors, in particular: MEMS design, fabrication and markets; non-contact microfabrication processes and novel materials; contact microfabrication processes and assembly; nano/precision manufacturing processes and systems; nanometrology, positioning and sensors; ultra precision measurements, machines and control systems. We have received more than 260 abstracts from 24 countries and the conference contributions have been selected by an international board for oral or poster presentations.

This programme provides details of the agenda for the **euspen** conference from Sunday 30<sup>th</sup> May to Thursday 3<sup>rd</sup> June 2004. This is followed by information about the technical exhibition and the location of the conference, the conference welcome reception, the conference dinner and the Civic Reception to which delegates have been kindly invited by the Lord Provost of Glasgow and Glasgow City Council.

It gives me great pleasure, on behalf of the **euspen** Council, to welcome you to the 4<sup>th</sup> International Conference at the Scottish Exhibition and Conference Centre (SECC), Glasgow, one of Europe's finest and most technically advanced conference venues. We look forward to meeting with you in a stimulating and interesting environment, where old acquaintances can be renewed, new ones made and where new ideas and new collaborations will be conceived.

**Glasgow May 2004**

Paul Atherton  
**euspen** President

## Conference Timetable

Time	Sunday 30 <sup>th</sup> May	Monday 31 <sup>st</sup> May
9.00-10.30	<b>Tutorial Sessions</b> 09.00- 12.45	(Registration in foyer of Loch Suite from 8.15am)  <b>Opening Session</b> <i>Lomond Auditorium</i> 9.15 Presidential Address 9.30 Keynotes
10.30-11.00		coffee break
11.00-12.45	(Exhibitor set-up 12.00- 18.30)	<b>Oral Session I</b> <i>Lomond Auditorium</i>
12.45-14.00		<b>Lunch</b>
14.00-15.45	<b>Tutorial sessions</b> 13.45-17.30 (Conference registration desk open in foyer of Loch Suite from 14.30- 19.00)	<b>Poster Sessions 1-4</b> Alsh Room  ( euspen AGM 14.00-15.00 <i>Lomond Auditorium</i> )
15.45-16.15		coffee break
16.15-18.00		<b>Oral Session 2</b> <i>Lomond Auditorium</i>
18.30-19.30	<b>Welcome Reception at SECC</b> <i>Clyde Auditorium Reception Area</i>	
19.30-		
20.00-		<b>Glasgow Civic Hospitality Reception</b> <i>Glasgow City Chambers</i>

Tuesday 1 <sup>st</sup> June	Wednesday 2 <sup>nd</sup> June	Thursday 3 <sup>rd</sup> June
<p><b>Oral Session 3</b> <i>Lomond Auditorium</i></p>	<p><b>Oral Session 5</b> <i>Lomond Auditorium</i></p> <p><b>(Nanogrind Seminar</b> <i>Alsh Room)</i></p>	<p><b>Golf Trip</b> <i>Departing from Marriott Hotel</i> <i>08.00am</i></p> <p><b>Company</b> <b>Tours</b> <i>Departing from SECC at 10.00am</i></p>
<p>coffee break</p>	<p>coffee break</p>	
<p><b>Poster Sessions 5-7</b> <i>Boisdale Room</i></p>	<p><b>Oral Session 6</b> <i>Lomond Auditorium</i></p>	
<p><b>Lunch</b></p>	<p><b>Lunch</b></p>	
<p><b>Oral Session 4</b> <i>Lomond Auditorium</i></p> <p><b>(Exhibitors Meeting</b> 14.30-15.00 <i>Buffet area)</i></p>	<p><b>Oral Session 7</b> <i>Lomond Auditorium</i></p> <p><b>(VisionOnline Training</b> <b>Presentation</b> <b>and Practical Session</b> <i>Alsh Room)</i></p>	
<p>coffee break</p>	<p>coffee break</p>	
<p><b>Commercial Session &amp; Small Company Profile</b> <i>Lomond Auditorium</i> (Ice cream provided)</p>		
<p><b>Conference Dinner</b> <i>The Arches, Argyle Street,</i> <i>Glasgow</i></p>	<p>Free evening</p>	

# Topics

- Session 1-**      **MEMs Design, Fabrication & Market Review**  
Chairman: Prof. Ron Lawes
- Session 2-**      **Non Contact (Non Mechanical) Micro Fabrication  
Processes & Novel Materials**  
Chairman: Dr. David Moore
- Session 3-**      **Contact (Mechanical) Micro Fabrication Processes &  
Assembly**  
Chairman: Prof. Takahisa Masuzawa
- Session 4-**      **Nano/ Precision Manufacturing Processes & Systems**  
Chairman: Prof. Marc Bonis
- Session 5-**      **Nano Metrology, Positioning & Sensors**  
Chairman: Don Martin
- Session 6-**      **Ultra Precision Measurements**  
Chairman: Prof. Guenter Wilkening
- Session 7-**      **Ultra Precision Machines & Control Systems**  
Chairman: Prof. Toshimichi Moriwaki

# Monday, 31<sup>st</sup> May 2004

## euspen 4<sup>th</sup> International Conference

### 9.15 Presidential Address

Prof. Paul Atherton, euspen President

### 9.30 Keynotes

#### **From Nanotechnology to New Production Systems: The EU Perspective**

H. Péro

DG Research, European Commission, Brussels, Belgium

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#### **The Micro/Nano Interface**

G. J Davies, M. Ward

School of Engineering, University of Birmingham, United Kingdom

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### 10.30 Coffee Break

### 11.00 Oral Session 1-

#### **MEMs Design, Fabrication & Market Review**

Chairman: Prof. Ron Lawes

#### **Commercialising Nanotechnology**

P. Atherton

NanoVentures Ltd, London, United Kingdom

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#### **Dimensional Metrology for Components of Microsystem Technology**

U. Brand, L. Doering, V. Nesterov, U. Neuschaefer-Rube

PTB, Braunschweig, Germany

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#### **High-resistance Micro Components Made by Injection Moulding**

V. Piotter, G. Oerlygsson, R. Ruprecht, J. Hausselt

Institute for Materials Research III, Karlsruhe, Germany

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#### **Microsystems Industrial Infrastructure**

H. van Heeren, P. Salomon, L. Paschalidou, A. El-Fataty

EnablingM3, Dordrecht, The Netherlands

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#### **2-DOF Thin Film Metallic Glass Micro Actuator**

S. Hata, H.W. Jeong, A. Shimokohbe

Precision and Intelligence Laboratory, Department of Mechano-Micro  
Engineering, Tokyo Institute of Technology, Japan

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### 12.45 Lunch

*\*Please note, all page numbers refer to the conference proceedings*

**14.00 – 15.45 Posters: Sessions 1-4**

**14.00 – 15.00 euspen Annual General Meeting**

**15.45 Coffee Break**

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Chairman: Dr David Moore

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Laser Zentrum, Hannover, Germany

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University Montpellier II, France  
High Pressure Research Centre, Polish Academy of Science, Warsaw, Poland  
Experimental Solid State Physics III, University of Nijmegen, The Netherlands  
National Centre for High Resolution Electron Microscopy, Delft University of Technology, The Netherlands

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J.E. Bullema, H.Haitjema, J.P. Krugers, M. van den Hurk  
TNO Industrial Technology, Technical University Eindhoven,  
The Netherlands

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G. Eßer, M. Stark, A. Lamott, M. Schmidt  
Bayerisches Laserzentrum, Erlangen, Germany

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C. L. Chao, C.Y. Shi, S.B. Huang, K.J. Ma, T.T. Chen, Y.M. Liu  
Department of Mechanical and Electro-Mechanical Engineering, Tam-Kang University, Taipei Hsien, Taiwan  
Department of Mechanical Engineering, Chung-Hua University, Taiwan  
Department of Mechanical Engineering, Chung Cheng Institute of Technology, Taiwan

**20.00 Civic Reception hosted by the Rt Hon The Lord Provost of Glasgow and Glasgow City Council, *Glasgow City Chambers, George Square, Glasgow***

# Tuesday, 1<sup>st</sup> June 2004

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Fraunhofer Institute for Production Technology, IPT, Aachen, Germany
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Fraunhofer Institute Production Systems and Design Technology, Berlin, Germany  
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Laboratory of Production Engineering, University of the Federal Armed Forces,  
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Precision Engineering, Eindhoven University of Technology, The Netherlands
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Philips Centre for Industrial Technology, Philips Research Laboratories,  
Eindhoven, The Netherlands

**10.30 Coffee Break**

**11.00 Posters: Sessions 5-7**

**12.45 Lunch**

**14.00 Oral Session 4- Nano/ Precision Manufacturing Processes & Systems**  
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E. Loopstra, H. Butler  
ASML, Veldhoven, The Netherlands

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Nano Corporation, Tokyo, Japan  
Tokohu University, Sendai, Japan  
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Kyushu University, Fukuoka, Japan

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E. Brinksmeier, J. Dong, R. Gläbe  
Laboratory for Precision Machining, University of Bremen, Germany  
Institute for Materials Science, Bremen, Germany

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Jeong Woo Park, Noritaka Kawasegi, Noboru Morita, Deug Woo Lee  
Shigeru Yamada, Noboru Takano, Tatsuo Oyama  
Toyama University, Japan  
Pusan National University, Korea

**15.45 Coffee Break**

**16.15-18.00 Commercial Session and Small Company Profile**  
**Ice-cream refreshment sponsored by Interferomet Ltd**  
Chairman: Patrick Kirwan



**19.30 Conference Dinner, The Arches, 253 Argyle Street**

**Sponsored by Nano Ventures Ltd**



# Wednesday, 2<sup>nd</sup> June 2004

## 9.00 Oral Session 5-

### Nano Metrology, Positioning & Sensors

Chairman: Don Martin

#### **Metrology at the Extremes**

G. Peggs  
NPL, Teddington, United Kingdom

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#### **Design and Optimization of a Magnetic Gravity Compensator**

S.A.J. Hol, J.C. Compter, A.J.A. Vandenput, P. Vreugdewater  
ASML, Veldhoven, The Netherlands  
Technical University of Eindhoven, The Netherlands

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J.K.v. Seggelen, P.C.J.N. Rosielle, P.H.J. Schellekens,  
H.A.M. Spaan, R.H. Bergmans, G.J.W.L. Kotte  
Precision Engineering Section of the Faculty of Mechanical Engineering,  
Eindhoven University of Technology, The Netherlands  
IBS Precision Engineering, Best, The Netherlands  
NMI Van Swinden Laboratorium, Delft, The Netherlands

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#### **Self Calibration of Sensors in Software Datum Methods**

S. Kiyono, Y. Arai, D. G. Chetwynd  
School of Engineering Tohoku University, Sendai, Japan

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#### **A Novel Metrological Large Range Scanning Probe Microscope Applicable for Versatile Traceable Topography Measurements**

G. Dai, F. Pohlentz, H.-U. Danzebrink, M. Xu, K. Hasche, G. Wilkening  
PTB, Braunschweig, Germany

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## 10.30 Coffee Break

## 11.00 Oral Session 6-

### Ultra Precision Measurements

Chairman: Prof. Guenter Wilkening

#### **A Device for Rapid Measurement of 6-DOF Dynamic Motion Errors**

S. Spiewak  
University of Calgary, Canada

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#### **Nonlinearity Measurement and Correction of Metrology Data from an Interferometer System**

D.C. Chu, A.B. Ray  
Agilent Technologies, Santa Clara, United States

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Department of Metrology and Quality Management, Fraunhofer Institute of Production Technology, IPT, Aachen, Germany

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NPL, Teddington, United Kingdom

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X. Liu, J. Zhang, V. Piotter  
Centre for Nanotechnology and Micro engineering, School of Engineering, University of Warwick, United Kingdom  
Institute for Materials Research III, Karlsruhe, Germany

## 12.45 Lunch

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Massachusetts Institute of Technology, Cambridge, United States

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Precision Systems & Manufacturing Group,  
Lawrence Livermore National Laboratory, Livermore, United States

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Katholieke Universiteit Leuven, Belgium

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Kenzo Ebihara, Tomohiko Kawai, Kiyoshi Sawada, Yoshimi Takeuchi  
Fanuc Co., Robomachine Laboratory, Yamanashi, Japan  
Department of Computer Controlled Mechanical Systems, Graduate School of Engineering, Osaka University, Japan

**Development of a Hydrostatic Linear Guidance based on the Design of Ball Bearing Guidance** 376  
C. Brecher, M. Weck, M. Winterschladen, F. Paepenmüller  
Fraunhofer Institute for Production Technology, Aachen, Germany,  
Laboratory for Machine Tools and Production Engineering, Aachen, German

## 15.45 End of euspens Conference

# Posters

**Sessions 1- 4**    **Monday, 31<sup>st</sup> May 2004,**  
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## **Session 1- MEMs Design, Fabrication & Market Review**

- |             |   |    |
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| <b>1.4</b>  | <b>Calibration and Redesign of a Nano Probe Based on MST Technology</b><br>E.J.C. Bos, I. Widdershoven, H.Haitjema  | 17 |
| <b>1.5</b>  | <b>Fabrication of Long-period Fibre Grating Optical Biosensor</b><br>P. J. Chen, H. Y. Lin, D. T. Chen, I. M. Liu , K. J. Ma, H. H. Chien, C. L. Chao           | 19 |
| <b>1.6</b>  | <b>VisionOnline Virtual Institute Laboratory</b><br>S.A. Spiewak  |    |
| <b>1.7</b>  | <b>Nanostructured Surfaces for the Selective Capture of Biological Objects</b><br>Y.P. Yeh and J.J. Ramsden   | 21 |
| <b>1.8</b>  | <b>Determination of Failure Mechanisms in MEMS</b><br>S. Lavu, M. Desmulliez, G. Bell, M. Begbie  | 23 |
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An industrial exhibition will take place during the conference in the main conference hall and will provide a valuable meeting opportunity for customers, scientists and providers of precision engineering and nanotechnology equipment and services.

Exhibitors:

**Agilent Technologies**

Stand No.- 3  
[www.agilent.com](http://www.agilent.com)  
USA

**Cranfield University**

Stand No.- 17  
[www.cranfield.ac.uk](http://www.cranfield.ac.uk)  
UK

**Alps Electric  
Technology Centre (UK)  
Ltd**

Stand No.- 32  
[www.alps.com](http://www.alps.com)  
UK

**Elsevier**

Stand No.- 39  
[www.elsevier.com](http://www.elsevier.com)  
The Netherlands

**Bal-Tec**

Stand No.- 38  
[www.precisionballs.com](http://www.precisionballs.com)  
USA

**euspen Ltd**

Stand in foyer of  
Loch Suite  
[www.euspen.com](http://www.euspen.com)  
UK

**Contour Fine Tooling**

Stand No.- 2  
[www.contour-diamonds.com](http://www.contour-diamonds.com)  
UK

**Fabreeka**

Stand No.- 21  
[www.fabreeka.com](http://www.fabreeka.com)  
UK

**Coors Tek**

Stand No.- 36  
[www.coorstek.com](http://www.coorstek.com)  
USA

**FEI Company**

Stand No.- 24  
[www.feicompany.com](http://www.feicompany.com)  
UK

**Cranfield Precision**

Stand No.- 23  
[www.cranfieldprecision.com](http://www.cranfieldprecision.com)  
UK

**Heidenhain GmbH**

Stand No.- 1  
[www.heidenhain.com](http://www.heidenhain.com)  
Germany

**Hembrug BV**

Stand No.- 22  
www.hembrug.com  
The Netherlands

**Lion Precision**

Stand No.: 4  
www.lionprecision.com  
USA

**Hidden Analytical**

Stand No.- 40  
www.hiddenanalytical.com  
UK

**Loadpoint Ltd**

Stand No.- 16  
www.loadpoint.co.uk  
UK

**IBS Precision**

**Engineering**  
Stand No.- 4  
www.ibspe.com  
Netherlands

**Logitech**

Stand No.- 34  
www.logitech.com  
Scotland, UK

**IDC**

Stand No.- 15  
www.idc-ch2m.com  
Scotland

**Moore**

**Nanotechnology  
Systems, LLC**  
Stand No.- 11  
www.nanotechsys.com  
USA

**Image Metrology Aps**

Stand No.- 6  
www.imagemetrology.com  
Denmark

**MST News**

Stand located in  
foyer of Loch Suite  
www.mstnews.de  
Germany

**Institute of****Nanotechnology (ION)**

Stand No.- 35  
www.nano.org.uk  
Scotland, UK

**Nano Corporation**

Stand No.- 9  
www.nanowave.co.jp  
Japan

**Interferomet**

Stand No.- 8  
www.interferomet.com  
UK

**NanoFocus**

Stand No.- 30  
www.nanofocus-ag.com  
Germany

**New Way Airbearings**  
Stand No.: 4  
[www.newwayprecision.com](http://www.newwayprecision.com)  
USA

**NPL**  
Stand No.- 20  
[www.npl.co.uk](http://www.npl.co.uk)  
UK

**Optiwa BV**  
Stand No.- 14  
[www.optiwa.nl](http://www.optiwa.nl)  
The Netherlands

**Philips CFT**  
Stand No.- 12  
[www.cft.philips.com](http://www.cft.philips.com)  
The Netherlands

**Physik Instrumente  
GmbH & Co. KG**  
Stand No.- 26  
[www.pi.ws](http://www.pi.ws)  
Germany

**PLADE**  
Stand No.- 41  
[www.plade.com](http://www.plade.com)  
UK

**Precitech Machine  
Systems**  
Stand No.- 7  
[www.precitech.com](http://www.precitech.com)  
The Netherlands

**Professional Instruments  
Company**  
Stand No.- 5  
[www.airbearings.com](http://www.airbearings.com)  
USA

**Queensgate  
Instruments Ltd**  
Stand No.- 25  
[www.queensgate.com](http://www.queensgate.com)  
UK

**Renishaw Plc**  
Stand No.- 13  
[www.renishaw.com](http://www.renishaw.com)  
UK

**SIOS Messtechnik  
GmbH**  
Stand No.- 27  
[www.sios.de](http://www.sios.de)  
Germany

**Solartron**  
Stand No.- 31  
[www.solartron.co.uk](http://www.solartron.co.uk)  
UK

**Sony Precision  
Technology  
Europe GmbH**  
Stand No.- 29  
[www.sony.com](http://www.sony.com)  
Germany

**SSSF Scottish  
Semiconductor  
Supplier Forum**  
Stand No.- 37  
[www.sssf.org.uk](http://www.sssf.org.uk)  
Scotland, UK

**Taylor Hobson Ltd**  
Stand No.- 33  
[www.taylor-hobson.com](http://www.taylor-hobson.com)  
UK

**Tecan Ltd**  
Stand No.- 28  
[www.tecan.co.uk](http://www.tecan.co.uk)  
UK

**TNO TPD**  
Stand No.- 19  
[www.tpd.tno.nl](http://www.tpd.tno.nl)  
The Netherlands

**Veeco  
Instruments Ltd**  
Stand No.- 10  
[www.veeco.com](http://www.veeco.com)  
UK

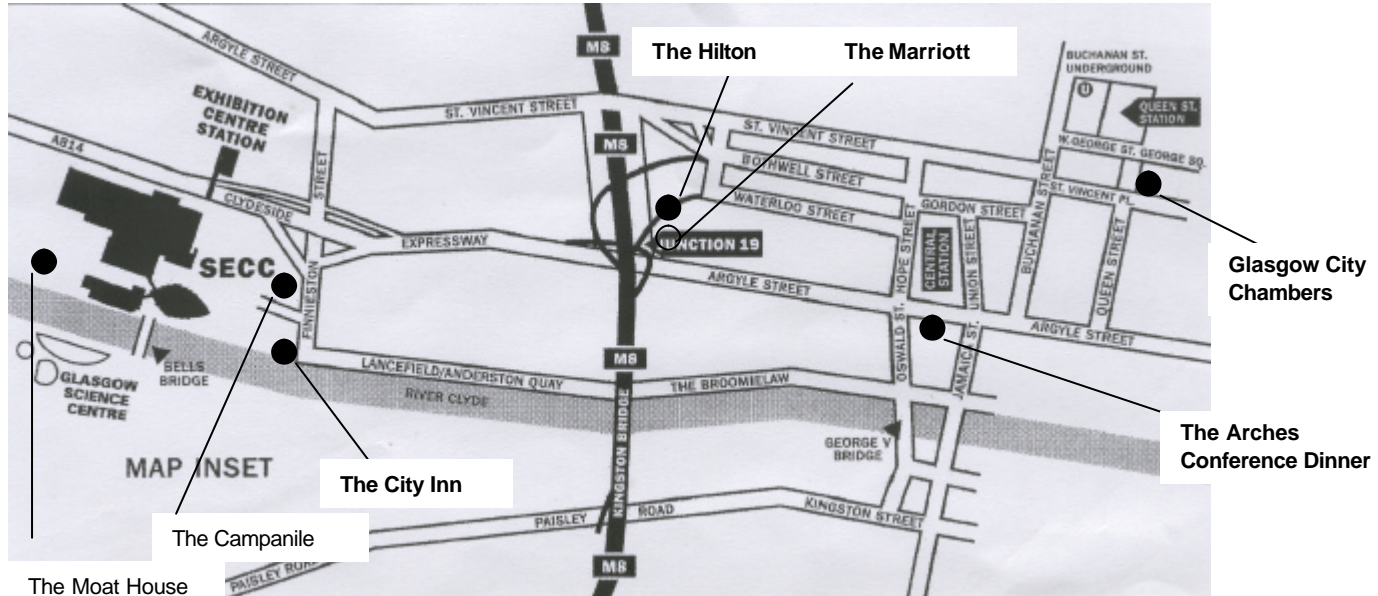
**Zygo LOT GmbH**  
Stand No.- 18  
[www.zygot.de](http://www.zygot.de)  
Germany

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## Location map



The Moat House

### Addresses

#### The Conference

The Loch Suite  
The SECC  
Glasgow  
G3 8YW

#### Civic Reception

Glasgow City Chambers  
George Square  
Glasgow

#### Conference Dinner

The Arches  
253 Argyle Street  
Glasgow  
G2 8DL