



Surveying for geographical and spatial information in the 21st century

monitoring on  
London's busy rail  
network



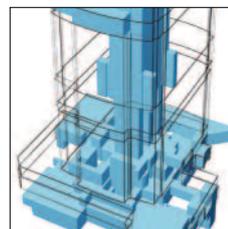
kinematic 3D  
highway mapping  
system



High-res close  
range solution uses  
digital cameras



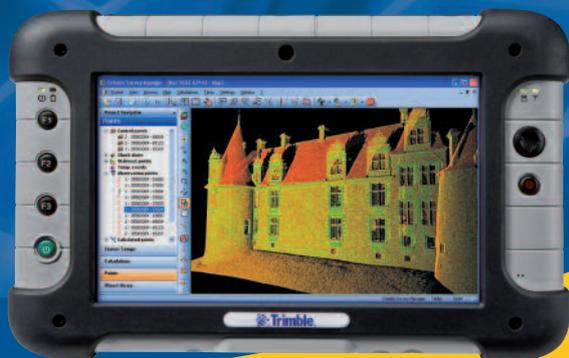
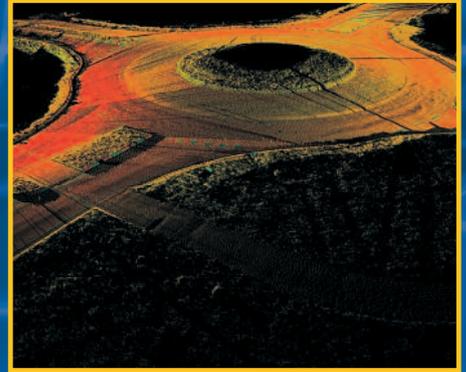
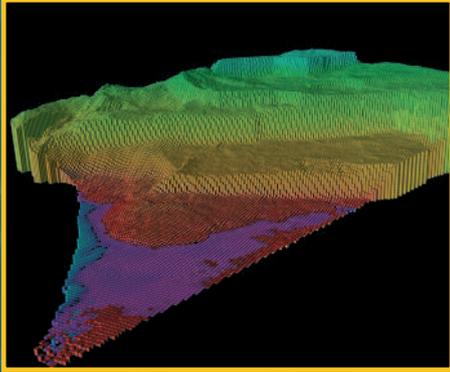
volumetric plots  
help property  
rights in UAE



a big Aussie  
"G'day!" awaits  
in Sydney



# CAPTURE ALL THE POINTS YOU NEED, NOT JUST ALL THE POINTS.



With the latest generation of the Trimble® GX™ 3D Scanner, you can collect millions of points for photo-realistic resolution, or you can collect exactly the number of points you need.

**It's up to you:** Trimble® SureScan™ patented technology lets you scan smarter – and faster.

To find out more, visit:  
[www.trimble.com/trimblegx](http://www.trimble.com/trimblegx)



Authorised Dealer



**KOREC Group**  
Measured Solutions  
Construction | Surveying | Mapping  
Trimble Distributor for UK and Ireland

[www.korecgroup.com](http://www.korecgroup.com) · UK: 0845 603 1214 · IRE: 01 456 4702



Geomatics World is published bi-monthly by PV Publications Ltd on behalf of the Royal Institution of Chartered Surveyors Geomatics Faculty and is distributed to faculty members and other subscribing professionals.

**Editor:** Stephen Booth  
**Technical Editor:** Richard Groom  
**News Editor:** Hayley Tear  
**Advertising:** Sharon Robson  
**Subscriptions:** Barbara Molloy

**Editorial Board**  
 Pat Collins, Professor Michael Cooper, Richard Groom, Alan Haugh, James Kavanagh, Professor Jon Mills, Dr Stuart Robson, Dr Martin Smith, David A Wallis

**Overseas Sources**  
 Roy Dale – New Zealand  
 Nick Day – USA

**Editorial and advertising:**  
 e-mail: editor@pvpubs.demon.co.uk

Web: www.pvpubs.com  
 T: +44 (0) 1438 352617  
 F: +44 (0) 1438 351989

**Mailing:** PV Publications Ltd  
 2B North Road  
 Stevenage, Hertfordshire SG1 4AT  
 United Kingdom

**Material to be Published**  
 While all material submitted for publication will be handled with care and every reasonable effort is made to ensure the accuracy of content in Geomatics World, the publishers will have no responsibility for any errors or omissions in the content. Furthermore, the views and opinions expressed in Geomatics World are not necessarily those of the RICS.

**Reprints:** Reprints of all articles (including articles from earlier issues) are available. Call +44 (0)1438 352617 for details.

**Advertising:** Information about advertisement rates, schedules etc. are available in the media pack. Telephone, fax or write to PV Publications.

**Subscriptions:** Yearly subscription (six issues) is £45 (UK) £49 (worldwide). For more details, including special offers, go to: www.pvpubs.com  
 No material may be reproduced in whole or in part without written permission of PV Publications Ltd.  
 © 2009 ISSN 1567-5882

**Printing:** The Manson Group, St Albans, UK



**PV Publications Ltd**  
 2B North Road,  
 Stevenage, Herts SG1 4AT  
 T: +44(0)1438 352617  
 W: www.pvpubs.com



**COVER STORY**  
 Major civil engineering works continue around London ahead of the 2012 Olympics. One such project is the North London Rail Infrastructure Project (NLRIP), which requires considerable monitoring expertise. Full story begins on page 24.

# Contents

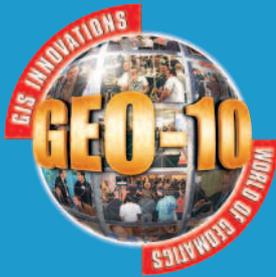
- p.06 News**
  - RICS opens up the profession
  - Smarter government will open up OS mapping
  - UCL gets Faro scanner for large scale civils projects
- p.11 At the “Razor’s Edge”**  
 Lord Curzon’s phrase echoes still in international boundary disputes, as Richard Groom discovered at the IBRU’s 20th anniversary celebrations.
- p.16 A breakthrough for mobile scanning**  
 An advanced 3D kinematic scanning system is described by Alan Barrow of ABA.
- p.21 Texturised 3D models using photo scanning**  
 A new approach to high resolution scanning of objects, using digital cameras, is described by the authors.
- p.24 Construction monitoring in a tough environment**  
 Congested urban environments call for bespoke monitoring systems when upgrading rail networks, explains Gareth Mitchell.
- p.28 A big “G’day” awaits downunder**  
 The four-yearly FIG Congress is set for Sydney, Australia in April and a big welcome awaits for those who can afford the trip.
- p.32 The Sky’s the Limit**  
 Leica’s HDS scanning conference attracted some 250 delegates to hear 38 presentations. Nick Day reports for GW.
- p.36 Mixed use title structures in the Middle East**  
 Detailed volumetric calculations are necessary, explains Alan Fox, to record titles in Abu Dhabi’s complex development hierarchy.

## Regulars

- p.5** Editorial
- p.6** News
- p.9** People
- p.10** Calendar
- p.12** Policy Watch
- p.14** Undercurrents
- p.27** Legal Notes
- p.30** Overcurrents
- p.39** Downunder Currents
- p.41** Products & Services
- p.42** Classified

## Next issue

The next issue of *GW* will be that for March/April 2010.  
 Copy dates are: Editorial: 01 February **2010** Advertising: 12 February **2010**



*a world of geomatics and GIS innovations*

24 & 25 March 2010 @ Ricoh Arena, Coventry

# GEO-10

## THE NO. 1 GEO-EVENT!



- featuring*
- major conference
  - seminars and workshops
  - full trade exhibition
  - gala evening with entertainment

### CONFERENCE

For 2010, the *m3* conference returns with a full programme of sessions over two days with keynote plenaries and a debate. Full details of the programme will be available early in the new year.

mEASURING  
mODELLING  
mANAGING *and applying!*  
geospatial information

### FOR EXHIBITORS

GEO-10 is the complete geo-event and is the UK's only dedicated national geospatial trade exhibition. For details of stand availability call +44 (0)1438 352617

### FOR VISITORS

You can visit GEO-10 exhibition free of charge by registering at [www.pvpubs.com](http://www.pvpubs.com) Further details of the conference will be announced shortly.

[www.pvpubs.com](http://www.pvpubs.com)





Could our skills help sort out the global warming debate?

## Our skills may have wider application

For many of us, we just want to forget 2009. It was a year when nearly all of us felt the blast of recession. Many survey companies felt the pinch. Some failed, many have downsized. There are surveyors out of work. And those that have been busy will be worried about the sustainability of their workload, especially if it is reliant on the public sector.

But the year ended on a brighter note too. As I was writing this, news came from Experian, who closely monitor and analyse these things, that insolvency rates fell in November and financial strength scores for businesses rose. Experian say it's the fifth month in a row that the health of businesses has improved. Let's hope that this is sustained into the New Year.

We know that we face tough trading conditions in 2010 and beyond, but how will the profession evolve over the next decade? We have an incredibly broad range of skills to offer the world (although a strength it can also be seen as a weakness due to a lack of a single industry focus). From land administration, precision monitoring, laser scanning, 3D analysis and modelling, to offshore positioning and hydrography, Geomatics Group members are probably the most diverse group of professionals second only to medicine (just take a look at this issue's Contents page).

Our strength as a profession is not in measurement and data gathering, which increasingly can be done by almost anyone, but in how we analyse and present that data. We are good at calculating statistical measures of confidence in our results but how often do we see "accuracy" and "precision" used without qualification? We should be good at explaining these terms to others, who may take decisions based on the data we have collected and analysed for them.

These skills lead me to wonder what other areas of human industry we might apply them to. Many of you will have taken a close interest in the ongoing debate about climate change and the Copenhagen summit. Despite tens of thousands of scientists telling us that the earth is warming and that there is an inescapable link with man's activities, large numbers of intelligent people refuse to believe it (despite the Intergovernmental Panel on Climate Change's 90% probability conclusion that global warming is likely to be caused by human activity). As Ben Goldacre in his excellent book *Bad Science* points out, 'our attention is always drawn to the exceptional and the interesting' rather than the detail of statistics. This can cause our assessment of evidence to be biased by pre-existing beliefs as we selectively expose the evidence to those

who will validate those beliefs.

Why is this? The reason lies probably in the fact that few of us have really studied statistics in any detail. We continue to see patterns where none exist, from the widespread belief that gamblers and sportsmen have runs of bad and good luck to those who see the Virgin Mary in a cloud or Allah's name spelt out in a slice of aubergine.

The collection and analysis of data not only has to have a systematic approach but the methods used to collect and analyse it need to be assessed and tested. And that's the rigour that surveyors should be able to bring. Now, what on earth is all this nonsense about global warming? As I write the temperature is sub zero in Hertfordshire and we have just had our third consecutive night of snowfall!

Stephen Booth, Editor

### Why oh why can't you both get together?

Several readers and advertisers have been in touch asking why in addition to our show GEO-10, the ICES is running a similar event: 'why can't you both get together?' they say.

It is indeed a shame that it has not been possible to get one exhibition for the whole UK geomatics industry. The reasons for this however were that in the discussions we had with ICES they effectively wanted 50% of our exhibition business. Last year they ran XCES for the first time attracting about 350 people (of which at least 50 were students or came as a result of the TSA's coinciding AGM). At GEO-9 we attracted over 600, a number that we regularly achieve with our events, which have run now for over 12 years.

ICES would only consider a joint show if we went 50-50 with them, which PV Publications was not prepared to do (would you give 50% of your business to a new competitor?). We offered ICES a very good deal whereby they could have run a conference and gala dinner and kept the sales along with the sales of exhibition space to non-geo exhibitors (they previously told us they could bring in many new exhibitors from their QS/project management side).

What is even more disappointing is that despite being well aware of the dates for GEO-10, ICES deliberately chose dates close to ours instead of running at a different time of the year to ease the choices and cashflow of exhibitors. I invite ICES and their trading company SURCO, even now, to call off their event and talk to us.

The editor welcomes your comments and editorial contributions by e-mail: [editor@pvpubs.demon.co.uk](mailto:editor@pvpubs.demon.co.uk) or by post:

Geomatics World  
PV Publications Ltd  
2B North Road  
Stevenage  
Herts SG1 4AT  
United Kingdom

## Typhoons, a tsunami, an earthquake – busy time for MapAction



With typhoon Ketsana hitting the Philippines in September, Manila suffered huge damage that caused flooding of 80% of the city. UK charity, MapAction, deployed a team of GIS volunteers within 24 hours to provide emergency mapping. The team set up in the National Disaster Coordination Council and later experienced typhoon Parma as it caused more devastation. On 30th September, the tsunami hit Samoa and the charity prepared another team to deploy and, although international support was not called for, volunteers provided datasets and expertise for the authorities. At the same time, a double earthquake occurred in Padang on the island of Sumatra. Alongside the UN disaster assessment team, four volunteers established the on-site operations and co-ordination centre in the governor's house where the aid teams came together to coordinate operations. Read more about MapAction at [www.mapaction.org](http://www.mapaction.org).

### Opening up the profession

The RICS has launched a new qualification that aims to open the surveying profession to non-graduate professionals. Carrying the letters AssocRICS, the entry-level qualification replaces TechRICS and offers those working in land, property and construction a progressive, non-graduate route to chartered status. The

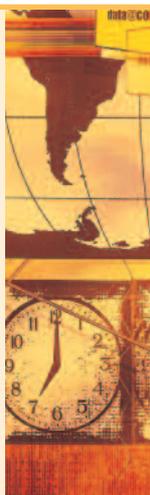
qualification will be rolled out across a number of specialist areas of the surveying profession, starting with quantity surveying and then residential survey & valuation and residential estate agency. The associate assessment process is online and competency based. The qualification is achieved by demonstrating that RICS standards have been met through relevant work experience.



### RICS Geomatics Evening Lectures 2010

RICS Geomatics lectures are CPD relevant and counts towards your CPD/LLL quota as specified within RICS regulations. All lectures are free and open to all (especially students) unless otherwise specified. Lectures take place at the RICS GGS lecture hall unless otherwise stated.

Thursday 28th January 2010 - Geo UK Forum annual lecture - **Vanessa Lawrence**, director general of Ordnance Survey Great Britain.



### Galileo days

The European Space Agency's technology transfer programme office will be the official partner of the first Galileo Application Days to be held from 3-5 March 2010 in Brussels. The event aims to promote the value of the European GNSS programmes and fostering collaboration, especially between SMEs and larger enterprises. The "Application Village" will feature a range of GNSS applications and service demonstrations. The event will cover promising future applications and inspire development in six main fields: location based services; road applications; precise positioning; public services; leisure and navigation systems development. Participation is free of charge and registration is open on a first come basis at [www.application-days.eu](http://www.application-days.eu).

### Smarter government

The public are to have more access to Ordnance Survey Great Britain maps from next year as part of a government drive to open up data to improve transparency. At the Smarter Government seminar, held at Downing Street recently, the prime minister, Gordon Brown, set out how the government and OSGB will open up its data relating to electoral and local authority boundaries, postcode areas and mid-scale mapping information. The government will consult on proposals to make data from the national mapping agency freely available so it can be used for digital innovation and to support democratic accountability. Minister for digital Britain, Stephen Timms, who has responsibility for the "making public data public" initiative, says: 'This is an important step in our public data strategy. About 80 per cent of public sector data mentions a place. Making Ordnance Survey data more freely available will encourage more effective exploitation of public data by businesses, individuals and community organisations'. Source: <http://www.communities.gov.uk/news/corporate/1385429>.

### On the fast track

Opti-cal Survey Equipment Ltd has been recognised as one of *The Sunday Times*' Virgin Fast Track 100 fastest growing private

companies in the UK. The Reading-based company qualified as 65th in the Fast Track league table published in the paper on 6 December 2009. Jim Warner, CEO, says: 'Opti-cal Survey Equipment is going from strength to strength at the moment and we are delighted to win this prestigious award. I would like to thank all the members of our team here at Opti-cal and our loyal and ever supportive clients'.

### CONTRACTS & PROJECTS

### Cambridge consortium win Inspire contract

RSW Geomatics has announced that, with the 1Spatial Group and Rob Walker Consultancy, it has been awarded a contract by the European Commission's Joint Research Centre, Institute for Environment and Sustainability. This contract is to "develop technical guidance for the INSPIRE transformation service" – enabling on-line access to geographically referenced datasets from different countries and different environmental themes. The contract requires: a survey of state-of-the-art transformation services; drafting of the associated technical guidance; prototyping of a schema transformation service; and production of a demonstration video in three languages. The project will last eight months and will be carried out in Cambridge, UK where all three companies of the winning consortium are based. The consortium is also co-operating with national mapping agencies from Ireland, Northern Ireland, Finland, Sweden and Norway. Their data will be used as an integral part of the project.

Robin Waters, director of RSW Geomatics, said: 'We are really proud to have won this contract against strong opposition and we are looking forward to delivering a practical solution to the existing problems of sharing spatial datasets'.

### Monitoring emergencies

RapidEye is to provide the European Space Agency (ESA) with satellite imagery for monitoring and change detection in areas

prone to natural disasters. The contract is based on a list of pre-defined, high-risk areas, for which satellite imagery will be provided before and after an emergency event has occurred. ESA will use the satellite imagery mainly for the project "Safer", a security and emergency project of the Global Monitoring for Environment and Security (GMES) programme in Europe. Michael Prechtel, head of sales and marketing for RapidEye, says: 'To support this project, we offer a special emergency order service to ESA by providing satellite data within 12-24 hours following a request. We look forward to contributing to the success of this project, as it will allow the European community to be better prepared for critical environmental situations'.

### Site survey for tidal turbine

Marine survey specialist, IXSurvey, is using marine mapping and software from SeaZone to assist its hydrographic and geophysical survey acquisition to pinpoint possible sites for the location of a prototype tidal turbine device in Britain. The company conducted a series of geophysical site investigations at five locations on behalf of Scottish Power Renewables and Hammerfest Strom AS as part of the development of offshore renewable energy in Scotland. The marine company's chartered vector data was used in the planning stage of the project providing background mapping, with GeoTemporal Editor software being used for the analysis and interpretation of current profiles and flow data.

Veripos has extended its long-term working agreement with Hamburg-based ship management organisation, ER Offshore. The agreement covers the provision of various precise positioning services and the company has now been contacted to provide services, equipment and software for more of ER's vessels.

Optech has announced Sanborn's acquisition of its Lynx Mobile Mapper. Sanborn provides

geographic and location-based information from data capture through design and development of custom applications including systems integration, spatial analysis and modelling.

**Through the implementation of a fully-integrated map production flowline, 1Spatial has enabled Land Information New Zealand (LINZ) to publish a new 1:50,000 map series. LINZ is the national mapping organisation responsible for providing up-to-date topographic mapping to support the defence, emergency services and constitutional framework in New Zealand.**

### BRIEFS

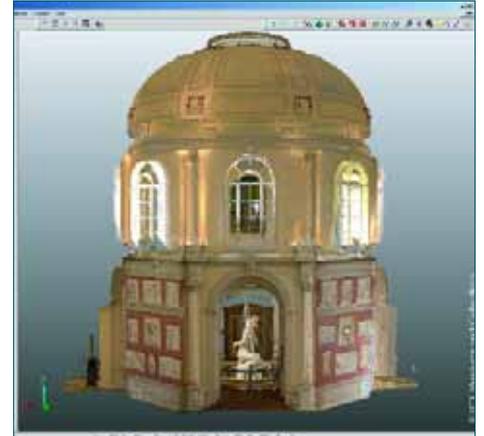
3D Laser Mapping has appointed surveying technology supplier, Geocom, to act as Chilean representative for its laser scanning systems.

Leica Geosystems' Jigsaw360 mine management product has won the category of surface mining – ancillary and analysis at this year's *Mining Magazine* Awards. The award acknowledges innovation and positive technological contribution to the mining industry based on the opinion of industry advisors, online voting and the publishers.

Spar Point Research LLC, which runs the annual laser scanning conference in the US, has been acquired by Diversified Business Communications, a US based trade show, publishing and eMedia company. Founder, Tom Greaves, joins the Diversified management team as managing director of the Spar Point Group.

Maps@Mouchel, the project to implement Maps@ within the consulting and business services group Mouchel, has won second place in the innovative project of the year category at the 2009 IT Industry Awards. Maps@ is a map data and licence management application that simplifies the process of managing, storing and serving geospatial data, from

### UCL gains new technology



Laser scanner manufacturer Faro has signed an agreement with University College London (UCL) to provide the university with hardware, computer software and staff training. The agreement covers the loan of a laser scanner for large-scale civil engineering and architectural projects. The initiative will facilitate collaborative projects between UCL Engineering and the UCL Bartlett School of Architecture, particularly for masters level courses. It is anticipated that the agreement will also lead to the development of commercial projects and research. Professor Alan Penn, dean of the Bartlett School, says: 'High accuracy geometry capture is set to revolutionise design processes and workflow. We look forward to working with Faro to explore some of the more radical opportunities for creative design afforded by the new technologies.'

Image is © UCL Museums and Collections.

## apr services

land, buildings and 3d laser scanning

from point cloud to model, drawing or visualisation

mail@aprservices.net

www.aprservices.net

tel +44 208 449 9143

Pointools Software Reseller

DRAW AND MODEL MASSIVE POINT CLOUDS IN AUTOCAD OR RHINO ENVIRONMENTS

POINTTOOLS EDIT AND VIEW PRO POINT CLOUD MANIPULATION SOFTWARE

**POINTTOOLS** free download from [www.pointools.com](http://www.pointools.com)

HIGH PERFORMANCE POINT CLOUD VIEWING, DRAWING AND MODELLING

# SCCS

- the future of surveying today

SCCS For Hire

SCCS For Sales

SCCS For Service

SCCS For Rail Solutions

SCCS For Tunnel Solutions

SCCS For Scanning Solutions

SCCS For GIS Solutions

SCCS For Monitoring Solutions

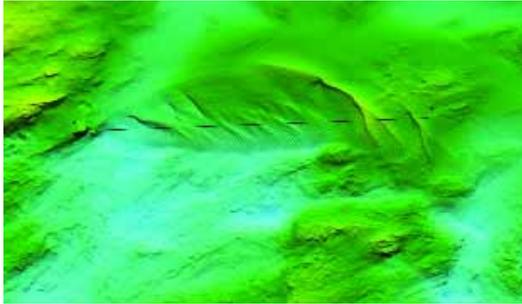
# SCCS

- your measuring partner

01480 404888

[www.sccssurvey.co.uk](http://www.sccssurvey.co.uk)

## Marine mapping



SeaZone and environmental consultants, Aquatera, have teamed up to offer a marine mapping and information product to display and combine different data sources for the offshore energy industry. The software combines different datasets, including the latest marine geographic information data from SeaZone, for areas that may be important for future marine renewable projects. Developed by Aquatera, RADMAPP has been adopted by a number of renewable energy companies to further assist in bidding processes for obtaining seabed leases, during environmental impact assessment projects and for the selection of best technology and sites.

many different data providers, for usage under specific licence agreements.

*Airborne and Terrestrial Laser Scanning* (ISBN: 978-1904445-87-6) provides a comprehensive overview of the major applications of airborne and terrestrial laser scanning. The hardback book focuses on principles and methods and presents an integrated treatment of airborne and terrestrial laser scanning technology. Edited by Professor George Vosselman and Professor Hans-Gerd Maas, the book will be available from Whittles Publishing in January 2010. Watch out for an early review in *GW*.

SeaZone is backing a campaign to establish marine protected areas around the United Kingdom and has donated coastal maps of the UK to the Marine Conservation Society. The company's Chartered Raster maps will help build an interactive website promoting marine reserves at the local, regional and national level, encouraging the general public to vote for sites they believe need protection.

The Institute of Engineering Surveying and Space Geodesy (IESSG) have a new home that they will share with GRACE (GNSS Research and Applications

Centre of Excellence). The new Nottingham Geospatial Building also includes the CGS (Centre for Geospatial Sciences).

Ordnance Survey Great Britain has announced that 180 of its staff are to take voluntary redundancy as part of a cost cutting exercise, reports the BBC. The cuts were part of a plan to reduce costs by 5% a year over the next five years. The national mapping agency employs 1,400 with 1,000 based in the agency's headquarters in Southampton.

## PEOPLE

Two new Fellows (FRICS) have recently been added to an increasingly high profile RICS Geomatics membership. Prof Alan Dodson (FRICS) University of Nottingham, has been elevated from MRICS to FRICS under the RICS eminent professional route. Prof Dodson is currently a professor of geodesy, pro-vice-chancellor and is a former dean of the faculty of engineering, head of the School of Civil Engineering and director of IESSG (Institute of Engineering Surveying and Space Geodesy).

Prof Angus Jamieson (FRICS) has also been admitted as a Fellow of RICS under the same route. Prof Jamieson FRICS is a well known and respected member of the

global offshore and marine survey community and is a globally recognised expert on borehole surveying. Prof Jamieson is also visiting professor of offshore engineering at the University of the Highlands Millennium Institute.

Ken Hall is the new president of the ICES. Ken, who is the immediate past chair of RICS Geomatics is also a former president of the Society of Surveying Technicians. He has vowed to improve industry standards and steer the organisation through the tough economic times.

## Hogarth joins Astrium

Barrie Hogarth has joined Astrium Services' business development team. An industry professional in the GNSS community and an early adopter in the application of GPS into land surveying, Hogarth has been involved in GNSS projects since 1985. For the past twenty years, he has worked with the main GNSS manufacturers in sales director and VP sales and marketing positions. His initial focus will be on international business development for the AXIO-NET subsidiary of Astrium Services, which is part of EADS (European Aeronautic Defence and Space Company).

## Derek Simmons



*GW* was saddened to learn of the untimely death of Derek Simmons a few weeks before Christmas. Derek was one of the great characters of the UK survey industry and a very astute businessman. His son Greg, also a well-known land surveyor, has provided the following pen portrait of his father.

Derek Simmons was a land surveyor committed to the profession throughout his life. As the owner and managing director of Simmons Aerofilms for 41 years, he strived to provide a quality service embracing new ideas and technologies, in often difficult market conditions. Starting out as a field recorder for SWEB, he emigrated to Canada in 1957 when he joined the City of Toronto Survey Department. Returning to the UK in 1963 he worked for JA Storey & Partners before setting up his own company, DA Simmons & Partners in 1965. During his management, the company changed with the market and was among the first to introduce GPS, digital photogrammetry and digital cameras. He was also one of the founder members of The Survey

Association (TSA), recognising that the industry required a governing body if it was to try to improve its position as a professional service.

In his personal life, he spent holidays in Scotland where he loved sea fishing and pottering about. He was always interested in sport and taxied his children around swimming and judo events all over the country, getting to know every sports hall intimately. In Cheddar, Somerset, where he lived for 30 years, he was well known in the village and local pubs where he played cards – often making more money there than at land surveying! As a younger man, he served in the Gloucester regiment and was even a Canadian sailing champion.

Derek would like to be remembered for his dedication to the profession, as being both a comic and candid in his views and for creating a respected business. He sadly passed away on Wednesday 2nd December 2009 and leaves a wife of 50 years, four children and seven grandchildren who will all miss his wit and friendship.

## • SEMINARS CONFERENCES EXHIBITIONS COURSES EVENTS

We welcome advance details of conferences, seminars, exhibitions and other events which are likely to be of interest to the Geomatics community. Please mention the name of the event, venue, date and point of contact for further information by readers. Please send to:

The Editor, *Geomatics World*, 2B North Road, Stevenage, Herts SG1 4AT  
Fax: +44 (0)1438 351989, e-mail: [editor@pvpubs.demon.co.uk](mailto:editor@pvpubs.demon.co.uk)

### 2010

#### Leica & McCarthy Taylor Systems LSS Training

**21 January**, Southern England. *Contact:* Email, [uk.training@leica-geosystems.com](mailto:uk.training@leica-geosystems.com) or [www.leica-geosystems.co.uk](http://www.leica-geosystems.co.uk)

#### DGI Europe 2010

**25-28 January**, The Queen Elizabeth II Conference Centre, London, UK. *Contact:* [www.wbresearch.com/dgieurope](http://www.wbresearch.com/dgieurope)

#### Leica Combining GPS & TPS Training Course

**27 January**, Scotland. *Contact:* Email, [uk.training@leica-geosystems.com](mailto:uk.training@leica-geosystems.com) or [www.leica-geosystems.co.uk](http://www.leica-geosystems.co.uk)

#### Leica TPS for Land Surveying Training Course

**2 February**, Southern England. *Contact:* Email, [uk.training@leica-geosystems.com](mailto:uk.training@leica-geosystems.com) or [www.leica-geosystems.co.uk](http://www.leica-geosystems.co.uk)

#### Leica & Applications in CADD Training

**3 February**, Scotland. *Contact:* Email, [uk.training@leica-geosystems.com](mailto:uk.training@leica-geosystems.com) or [www.leica-geosystems.co.uk](http://www.leica-geosystems.co.uk)

#### SPAR 2010 Conference

**8-10 February**, Woodlands Waterway Marriott Hotel & Convention Center, The Woodlands, Houston, Texas, USA. *Contact:* [www.sparllc.com](http://www.sparllc.com)

#### Leica Combining GPS & TPS Training Course

**10 February**, Northern England. *Contact:* Email, [uk.training@leica-geosystems.com](mailto:uk.training@leica-geosystems.com) or [www.leica-geosystems.co.uk](http://www.leica-geosystems.co.uk)

#### Leica & Applications in CADD Training

**17 February**, Northern England. *Contact:* Email, [uk.training@leica-geosystems.com](mailto:uk.training@leica-geosystems.com) or [www.leica-geosystems.co.uk](http://www.leica-geosystems.co.uk)

#### Leica & McCarthy Taylor Systems LSS Training

**18 February**, Northern England. *Contact:* Email, [uk.training@leica-geosystems.com](mailto:uk.training@leica-geosystems.com) or [www.leica-geosystems.co.uk](http://www.leica-geosystems.co.uk)

#### Leica Combining GPS & TPS Training Course

**24 February**, Southern England. *Contact:* Email, [uk.training@leica-geosystems.com](mailto:uk.training@leica-geosystems.com) or [www.leica-geosystems.co.uk](http://www.leica-geosystems.co.uk)

#### Leica SmartNet – The Future of Network RTK

**25 February**, Twickenham Rugby Stadium, London. *Contact:* Tel, 01908 256547 or email [rekha.voralia@leica-geosystems.com](mailto:rekha.voralia@leica-geosystems.com).

#### Leica TPS for Land Surveying Training Course

**2 March**, Northern England. *Contact:* Email, [uk.training@leica-geosystems.com](mailto:uk.training@leica-geosystems.com).

#### 2nd International Conference on Machine Control & Guidance. Co-sponsored by FIG Commission 5 and 6

**9-11 March**, Bonn, Germany. *Contact:* [www.mcg.uni-bonn.de](http://www.mcg.uni-bonn.de)

#### GEO-10: the complete geo event. A world of geomatics and GIS innovations.

**24-25 March**, Ricoh Arena, Coventry, UK. *Contact:* Email, [sharon@pvpubs.demon.co.uk](mailto:sharon@pvpubs.demon.co.uk)

or Tel, 01438 352617 or [www.pvpubs.com/events.php](http://www.pvpubs.com/events.php)

#### XXIV FIG International Congress 2010

**11-16 April**, Sydney Convention & Exhibition Centre, Sydney, Australia. *Contact:* Tel, (61) 2 9265 0700 or Email, [fig2010@arinex.com.au](mailto:fig2010@arinex.com.au) or [www.fig2010.com](http://www.fig2010.com)

#### Intergeo East

**6-7 May**, Istanbul, Turkey. *Contact:* [www.intergeo-east.com](http://www.intergeo-east.com)

#### GeoCAD'2010 Geodesy, Topography, Cadastre and Land Registry

**14-15 May**, Alba Iulia, Romania. *Contact:* [www.fig.net](http://www.fig.net)

#### POSITIONALE 2010 – International Trade Fair for Satellite Positioning, Navigation & Telematics

**18-20 May**, International Congress Centre, Stuttgart, Germany. *Contact:* Tel, +49 (0)71118560-0

or Email, [info@messe-stuttgart.de](mailto:info@messe-stuttgart.de) or [www.positionale.de](http://www.positionale.de)

#### The International Society for Photogrammetry and Remote Sensing (ISPRS) Commission V Symposium – Close range image measurement techniques

**22-24 June**, Newcastle upon Tyne, UK. *Contact:* Dr David Barber, Email, [isprs\\_sec@hotmail.com](mailto:isprs_sec@hotmail.com) or [www.isprs-newcastle2010.org](http://www.isprs-newcastle2010.org)

#### 2010 Survey & Engineering GIS Summit

**10-13 July**, San Diego, CA, USA. *Contact:* [www.esri.com/events/survey/index.html](http://www.esri.com/events/survey/index.html)

#### International Conference on Spatial Data Infrastructures 2010. Co-sponsored by FIG.

**15-17 September**, Skopje, Republic of Macedonia. *Contact:* Email, [sdiconf2010@agisee.org](mailto:sdiconf2010@agisee.org) or [www.agisee.org/sdiconf2010.htm](http://www.agisee.org/sdiconf2010.htm)



**24&25 March 2010 @ Ricoh Arena, Coventry, UK**

# GEO-10

**the complete geo event**  
- a world of geomatics and GIS innovations

**[www.pvpubs.com](http://www.pvpubs.com)**



# At the "Razer's Edge"

Durham University's International Boundaries Research Unit marked its 20th anniversary last November. **Richard Groom** reports on director Martin Pratt's talk and how the unit has contributed to resolutions and peace-keeping between neighbours.

The IBRU was born just as the last symbol of the Cold War was being toppled – the Berlin Wall. Not a good omen for the future, one might think, but on 3rd November 2009, IBRU invited a group of distinguished people to the Royal Geographical Society in London to mark the occasion of the unit's twentieth birthday.

For the occasion, Martin Pratt, Director of Research at IBRU, gave a talk which he entitled "Still the Razor's Edge? The Significance of International Boundaries in the 21st Century". The term Razor's edge is extracted from a lecture by **Lord Curzon** delivered in 1907 in which he said: "Frontiers are indeed the razor's edge on which hang suspended the modern issues of war or peace, of life or death to nations." These words followed the colonial powers' scramble for Africa and preceded two world wars. Territorial borders were important. By the end of the century, far from discussing the razor's edge, the talk was of globalisation and a world without borders. **Bill Clinton** called it the "age of interdependence". No longer were the effects of a nation's activities felt only within its boundaries but nations depended upon one another regardless of their borders.

In light of this shift, are borders still relevant? It is certainly true that most borders are less effective as barriers to flows of people, capital and ideas than they were. It is however an oversimplification to suggest that they are no longer significant.

To reinforce the point, we were given a tour of some of the globe's land boundary problems with examples from Palestine – Israel, Guinea – Sierra Leone and an intriguing case on the border between Myanmar and Thailand. Here the boundary followed a river, except that it was fixed some time ago since when the river's course has changed. This resulted in the river criss-crossing the border and in pockets of

land belonging to each country on the opposite side of the river. It is a problem that we were assured during questions had been resolved but nonetheless illustrates a point.

IBRU has been undertaking research on river boundaries. They are interesting for several reasons. They are attractive because they are well defined – provided the boundary moves with the river, but also the river is itself a resource; for fishing and drinking water supplies so neighbours have to co-operate. Pratt expanded on this point by saying that boundaries are places where neighbouring nations interact and are magnets for economic activity. The erection of international boundary walls kills this interaction to the detriment of both sides. Such 'solutions' to boundary problems serve a short-term purpose but store up disputes for the future.

At sea, the situation is even more complicated, as nations make claims for maritime and mineral resources under the UN Convention of the Sea (UNCLOS) the delineation of boundaries is governed by principles including the sovereignty of offshore islands or even land that is only visible at low tide.

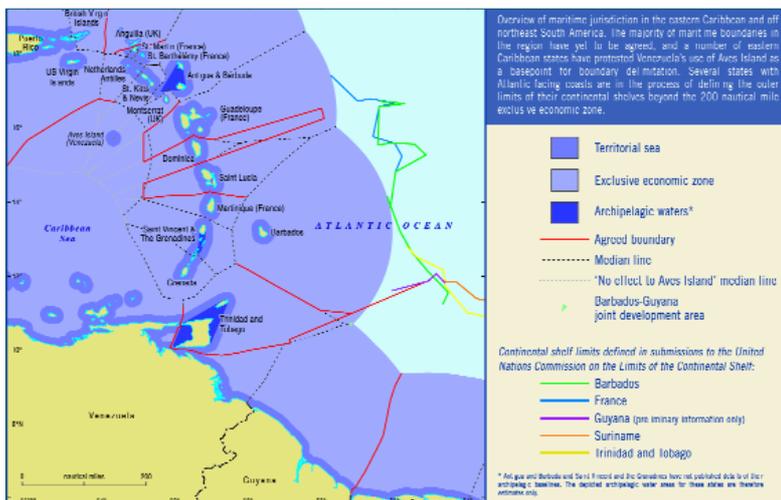
One area commonly perceived as contentious is the Arctic. In 2007, Russia sent a submarine mission under the North Pole in support her view that the pole was part of Russia's continental shelf. This sparked a hostile reaction from neighbouring states and the possibility of a new cold war. IBRU contributed to the debate by preparing a detailed map of the area with briefing notes offering an objective view of the current state of play in the region including agreed boundaries, known claims and disputes.

IBRU's mission is to minimise conflict associated with international boundaries on land and sea around the world. As well as undertaking research and consultancy, the unit runs conferences and training courses on boundary delimitation, dispute resolution, archival research and boundary-making. More recently there has been a focus on border management – how to secure a border against external threats whilst making it as open as possible for beneficial purposes.

The unit was the brainchild of Professor **Gerald Blake** of Durham's Department of Geography and Jim Dening of Archive Editions, whose organisation provided seed funding of £33,000. The success of the unit far exceeded expectations and, judging by the large number of senior diplomats at the RGS, has an assured role to play for the future.

• For more information about IBRU, visit [www.durham.ac.uk/ibru](http://www.durham.ac.uk/ibru)

*Offshore, the delineation of boundaries is governed by principles including the sovereignty of islands or even land that is only visible at low tide.*





A win for the Geomatics Professional Group, updated client guides and major changes ahead for UK geo policy have all meant a busy time for Land Group, reports director **James Kavanagh**.

*“Academics will also find these guides an invaluable learning resource for students at all stages of surveying and mapping education.”*

# RICS Update and Policy Watch

By James Kavanagh, Director of RICS Land Group

**A** brief hiatus last issue but this winter has seen a massive upsurge in UK and EU geo-policy related issues and RICS geomatics news. We have been putting a lot of effort into the complete redesign and update of all of the various land group areas on the main RICS website and hopefully members will be pleased by the results viewable @ [www.rics.org/geomatics](http://www.rics.org/geomatics)

RICS Land Journal and the Land e-brief also help to keep members informed of developments and members can now access the latest quarterly geomatics update at the url above.

It's been an incredibly productive early winter for RICS Geomatics with the ongoing geomatics evening lecture series 2009-10, which saw perhaps the first "standing room only" lecture in decades at RICS. On 10th December Emeritus Professor **Mike Cooper**, FRICS spoke on 'Who did they think we were' – a brief history of over 4000 years of land survey history. Notes of the lecture will be available in due course from [www.rics.org/geomatics](http://www.rics.org/geomatics) but do watch out for the Land e-brief. RICS was honoured to have FIG President **Stig Enemark**, FRICS and ICES President **Ken Hall**, MRICS in attendance along with the international Geomatics board and many others.

## Professional Group of the Year 2009

RICS Geomatics has been awarded the 2009 RICS award for professional group of the year. All 17 RICS international professional groups were in the running including the behemoths of Valuation, Commercial Property, Building Surveying and Quantity Surveying. That Geomatics coming out on top of this field is a testament to the strength in depth and professional output of the international professional group board, the MAPPP, B&PWVG, UK FIG delegation and all of the other panels and groups that help RICS deliver geomatics output to our global membership. This award brings a nice finale to the 60th anniversary year of the division/professional group.

## Updated client guides

RICS Geomatics and the Mapping and Positioning Practice Panel (MAPPP) have now updated the entire series of groundbreaking geomatics client guides. These guides are designed and formatted to quickly and concisely explain the sometimes complex and often opaque world of geomatics and surveying to a non-surveyor audience. Related professions such as engineers, architects, developers and

planners will find them invaluable and the guides can also act as an aide-memoire for professional and technical members of RICS.

The guides are also useful for helping clients and potential clients better understand the nuances of subjects such as map projection scale factor, scale, calibration and accuracy amongst others. In many cases it may also be appropriate to include a guide within a tender application or to be sent directly to prospective clients. RICS members are encouraged to actively use these guides, to request hard copy versions from [cmallett@rics.org](mailto:cmallett@rics.org) and to distribute the downloadable pdf versions throughout their practices and organisations. Academics will also find these guides an invaluable learning resource for students at all stages of surveying and mapping education.

The first updated guidelines are available from [www.rics.org/geomatics](http://www.rics.org/geomatics) :

**Map projection scale factor – avoid the potential dangers of scale factor** This client guide seeks to explain in lay professional language geo-related concepts such as localised grid systems, scale error/distortion and the effects of linking into national mapping co-ordinate systems.

**Scale – avoid tripping up over step changes in scale** This guide deals with the often misunderstood concept of scale and its relationship to spatial accuracy, survey specifications (including a quick topographic survey specification) and client needs.

**Reassuringly accurate – controlling accuracy for better results** This guide deals with the critical issue of calibration and its relationship to accuracy, precision and project outcome. This guide offers essential advice for all survey clients and is an excellent aid-memoire for all surveyors. RICS has been keeping a keen eye on developments within the UK, EU and global geo-policy areas with a number of issues coming suddenly to the fore.

## Smarter government ahead for some

The winter session of the UK Parliament has been eventful to say the least. Internationals will no doubt have been bemused by the continued revelations on MPs expenses, horrified by the Chilcott inquiry on the Iraq war and excited by the much anticipated pre-budget report which kick-started several geo-related issues being rapidly driven to the top of the political agenda.

UK prime minister, **Gordon Brown** recently

released an in-depth document, Putting the Frontline First: smarter government, which outlines £3bn of government savings over the next three years. Amongst a range of proposals, surveying and mapping, addressing information and geographic information are mentioned in several instances. Attention is specially drawn towards public access to government datasets and the role of agencies such as Ordnance Survey and Land Registry.

To quote: in order to drive 'transparency, effective government and innovation' the report mentions 'radically opening up data and public information. . . including Ordnance Survey Mapping. . . and making them free for re-use'. The report also underlines the Digital Britain initiative, which was the subject of the keynote speech at the recent RICS Telecoms annual conference.

The document also includes a forward plan which states that government will: 'Consult on and release valuable public sector datasets - including mapping and postcode, Public Weather Service, detailed government expenditure, various transport and health datasets' and to 'Enable a single point of access for government held data through data.gov.uk'

This latest UK Cabinet Office release follows on the earlier announcement on Ordnance Survey by the Prime Minister in November 2009 and further highlights the central role that mapping and geo datasets play in UK government information policy.

RICS welcomes this release and looks forward to further clarity on issues such as what free mapping datasets are being targeted, what is meant by "freely available data", what are the implications for related government agencies and how will the "definitive" addressing dataset come into existence after so many false starts. RICS is also concerned that the re-engineering of the Ordnance Survey business model as launched in early 2009 has not been taken into consideration and what effects this new document will have on the already formed Location Council.

RICS will monitor all these developments and intends to play a full and active part in the pending consultation on Ordnance Survey. This will run between mid December 2009 and early March 2010.

*Smarter Government release*

<http://www.hmg.gov.uk/frontlinefirst.aspx>

*Full report*

<http://www.hmg.gov.uk/media/52788/smarter-government-final.pdf>

*Location Council*

<http://www.defra.gov.uk/location/governance.htm>

### **The real meat**

Those keeping a close political eye on developments would have quickly realised that it is the release of the "Operational Efficiency Programme - Asset Portfolio" report that contains the real meat.

The Operational Efficiency Programme

report has been published at <http://www.hmg.gov.uk/media/52715/oep-assetportfolio.pdf>. This report includes a number of key RICS stakeholder bodies including British Waterways, Land Registry, Ordnance Survey, Public Forest Estate, and the Met Office within the "Asset Portfolio". The document highlights an ominous range of "alternative asset options" for organisations including a suggestion of "outsourcing all Land Registry mapping and GI capabilities to Ordnance Survey" and a real push for private sector involvement in both agencies. Although RICS was pleased to note that OS's publicly stated policy objectives underlined the "maintenance of a definitive three-dimensional geodetic reference framework".

Members will also have noted that the successful bedding down of the Land & Property Agency in Belfast has signalled that the three agencies of LR, OS and VOA (valuation office) can be successfully combined into one department, in essence a cadastral agency but with a small 'c'. The smart political money is on the same initiative being followed through in Dublin in 2010, then who knows – but the Asset Portfolio report is a potential milestone in the move towards a combined UK land and property department. As always, RICS will be closely watching developments.

### **Marine and coastal access bill**

As if all of the above wasn't enough to be getting on with, Nov 2009 also saw the passing into legislation of the UK Marine and Coastal Access Bill 2009. RICS has recently launched a Marine virtual community to help bring together members from the marine environment, if you would like to get involved please send your email details to [jkavanagh@rics.org](mailto:jkavanagh@rics.org)

There were no real surprises with the final bill and the full RICS response and other news can be found at [http://www.rics.org/site/scripts/news\\_article.aspx?categoryID=339&newsID=1039](http://www.rics.org/site/scripts/news_article.aspx?categoryID=339&newsID=1039)

### **Geomatics for Oceanology**

RICS Geomatics will be exhibiting at *Oceanology 2010*, Excel, London in March 2010 and we hope to have our two marine client guides available for distribution soonest.

### **And finally – EGNOS**

RICS Geomatics is in the final editorial processes before releasing the *Use of GNSS in surveying and mapping GN 2nd Edn*. The updated GN features the use of SBAS (Satellite Based Augmentation System) amongst many other upgrades and is expected for full release in early 2010. This release should also be accompanied by the updated 5th edn of the industry standard *Vertical Aerial Photography and Derived Digital Imagery GN*. Those members involved in GNSS survey in the EU and beyond will have noted that the EU SBAS geo stationary constellation EGNOS is now operational.

Have a great start to 2010.

*Attention is specially drawn towards public access to government datasets and the role of agencies such as Ordnance Survey and Land Registry.*



## A new year: maybe we should Not Rear Pigs!

It's been a tough year for the industry but help may be on hand if we switch to not farming. . .

*As you can see I had the honour of meeting Mike Catt, MBE, recently, one of England's team that won the World Cup in 2003. I had just suggested to Mike that we needed his skills the next day as England were playing New Zealand!*



**W**ell I do hope 2010 is not just the start of another decade but the beginning of much better times for the survey industry. Last year was awful for just about everyone I've spoken to; it was about survival. The turnover of most firms has been as bleak as the weather; we could all do with a little global warming!

Unfortunately things are no better in many other parts of the globe, even if the weather may be better. My old friend **Ian Waller** is in contact from Dubai saying that a lot of the big building sites are standing completely still and 'Haven't seen any action for at least six months on the majority of sites at which we were involved.' He adds that many of those iconic projects that were on-going at the time the crisis kicked in, such as the Burj Dubai (world's tallest building) and the underground are on-going, albeit at a third of the tempo before the crash. He says that many people he knew just suddenly ended up without jobs and had to move back to wherever they came from. He concludes, 'I have always been an optimist when it is applied to Dubai, but I was forced to become a realist after October 2008'. Ian says the majority of his work is now in Abu Dhabi, which is much busier with projects like the fabulous Formula 1 track.

On a more positive note the autumn/winter session at the RGS ended with several excellent lectures. **Ben Fogle** was brilliantly entertaining, telling us about his training and adventures for the *Marathon des Sables*, a 254km run across the Moroccan desert. Ben also told us all about his adventures with **James Cracknell** in rowing across the Atlantic setting a new record for the East-West trip. He followed this up with a race to the South Pole with Cracknell pulling sleds. Someone asked him what he thought about all day as they trekked onwards. Ben said he did massive mental exercises in which he thought about going out and meeting friends for a meal and going into great detail about the journey and what was on the menu and wine list. What did Cracknell think about? He just worried about the angle of his skis, said

Ben, 'Our difference is that I like to *complete* and James likes to *compete*!' An interesting analysis.

Another fine lecture was that given by the travel writer and photographer **Nick Danziger**, who rather put the climate change shenanigans into perspective with his 'Around the world in 80 photographs'. The majority of images showed the dire straits that most of humanity endure with inadequate food and water.

### Reunions

Just before Christmas we had a very small reunion of current, former and people who'd been involved with WS Atkins in one way or another. Many of us first new the firm long before it became a global Plc employing 17,000 people. We remembered it when Sir **William Atkins** still presided and interesting times they were. I recall him sending me off on a survey of a neighbouring property to his; only for me to discover he was not on very good terms with his neighbour and I was approached with colourful language, dogs and a shotgun! **Don Martindale** (the only one currently working for the firm) has vowed to make the gathering bigger for next year. In the meantime I can tell you that **Don**, **Pat Collins**, **Stephen Booth** and I all enjoyed an excellent lunch in the Bleeding Heart Tavern in Clerkenwell (check it out when your next in the big city <http://www.bleedingheart.co.uk/tavern>)

**Derek Browning**, amongst others, has been in touch asking when we're going to have another "Jasbeens" reunion. Jasbeens are those surveyors who worked for **JA Story & Partners** before its untimely demise. The last was at the Brighton FIG Congress in 1998 and was very well attended. Derek, who is a sprightly 83, went on to form the other half of the very successful Longdin & Browning. He also reports lunching recently with **John Chiswell**, FRICS and a Jasbeen of 1958-1962 vintage.

2009 has been a rather sad year what with the terrible economic situation, the collapse of long standing survey firms and the loss of some great surveyors. We said farewell to **Alan Rhodes** and **David Haslam** but I also have to report the death of **John Gwaspari** who worked for the PSA (for younger readers, the Property Services Agency and for older readers, The Ministry of Public Buildings & Works) before it was privatised under Tarmac, now Carillion. John was a great surveyor and a really likeable social

bloke. A sad loss. But news came as we were putting Undercurrents together of yet another blow. **Derek Simmons**, who founded Simmons Survey (now part of Blom Aerofilms) died on 2nd December. Derek was a brilliant surveyor but perhaps more importantly, he was a clever and astute businessman. He was one of a number of surveyors who served their apprenticeships at JA Story & Partners and went on to set up successful businesses in the 1960s. Do make sure you read his son Greg's tribute on page 9. Do send in your recollections of John Gwaspari and Derek Simmons, we'll try and find space to publish them in the next issue.

### Miscellany

A wonderful letter came our way recently, which is just a bit too long to publish in full. It comes from a prospective pig farmer, who has seen the success of a friend, already a pig farmer, in getting funding from the Rural Payments Agency (part of Defra) for "Not Rearing Pigs". Now you will of course recall that there are several EC and government cash incentive schemes to discourage farmers from over-producing – the so-called set aside schemes. The letter is to the secretary of state and seeks advice on the best kind of farm not to raise pigs on; whether Saddlebacks or Gloucester Old Spots are the best not to rear; whether there are any training courses that

*Andy Roberts has sent in this little howler. I understand the project is way behind schedule and it's not just down to the bloke on the lettering equipment.*



might help in "Not Rearing Pigs"; and whether, as there's another scheme for not growing cereals, it is possible to get additional compensation for not feeding the pigs that haven't been reared. He then outlines his plans for growing the business of Not Rearing Pigs from an initial 50 animals to 40,000. His conclusion is that as he won't actually be working surely he is entitled to unemployment benefit. An hilarious micky-take on subsidies.

\* \* \* \* \*

We've published several of those dumb answers from quiz programmes but **Ian Hislop**, editor of *Private Eye* and longstanding player in Have I got news for you, recalls an answer he once heard: *Questioner: What was Hitler's first name? Contestant: Heil*

### Got a tale to tell?

Please send letters for publication by e-mail to the Editor: [editor@pvpubs.demon.co.uk](mailto:editor@pvpubs.demon.co.uk) or contact Undercurrents, in strictest confidence if you wish (we promise to change names, places, etc to protect the guilty!), via e-mail: [rentamal@aol.com](mailto:rentamal@aol.com)

## Letters

The Editor welcomes letters from readers on relevant topics. Please endeavour to keep them brief and to the point. We reserve the right to edit for clarity and brevity. email: [editor@pvpubs.demon.co.uk](mailto:editor@pvpubs.demon.co.uk)

### You have to get out there

I was very interested in that article in the latest GW about Boundaries and Titles (War and Peace – abridged! GW Nov/Dec 2009). It seems that boundaries depend on landmarks, which may or may not be mapped in the correct position. It was interesting that Ordnance Survey admit to generalisation so that large scale mapping can be produced.

Why is it then that any trees shown on detail surveys seem to take Land Registry out of their comfort zone? Trees can be the mark of alignment of old banks, but even these are not necessarily the boundary, when ditches are dug and the spoil thrown "to home", so the actual boundary is the far side of the ditch. How wide is a ditch?

I can see it is a very complex subject: no wonder the Land Registry cannot be definite about boundaries. You cannot sort it out on paper, you have to get out there and walk the bounds. Although, if there is a good detail survey, it should help in keeping mud off one's feet.

*Richard O'Neill-Roe*

### UK does have substantial involvement

I felt I should make a short response to the final point made in Alan Thunhurst's (excellent) review of the XXII CIPA Symposium held in Kyoto during October (GW Nov/Dec 2009). In his closing paragraphs Alan lamented the lack of UK involvement in the Symposium, questioning "where it places us in respect to the sustainability agenda". However, as the article points out, CIPA was established in association with the International Society for Photogrammetry and Remote Sensing (ISPRS), and as such the UK therefore has a substantial input into preservation of cultural heritage through the hosting of Technical Commission V on "Close-range sensing" for the

period 2008-12. Moreover, the UK is currently taking the lead role in chairing Working Group V/2 on "Cultural heritage data acquisition and processing", with Paul Bryan (English Heritage) at the helm. Indeed, one of the terms of reference for WG V/2 is to work in "close co-operation with related disciplines, national/international groups (e.g. CIPA)", and both Paul (as WG Chair and UK CIPA Representative) and myself (as Commission V President) would have been at the CIPA Symposium in October were it not for unavoidable personal commitments that same week.

Nevertheless, with the next CIPA Symposium not until September 2011, what can the UK do in the immediate future to improve its worldwide profile in cultural heritage preservation? The obvious answer is to engage in the forthcoming ISPRS Commission V Symposium, to be held in Newcastle upon Tyne from 22-24 June 2010. As well as technical and poster sessions hosted by WG V/2, there will also be a one-day "Heritage 3D" pre-symposium tutorial on 21 June. Organised in association with the Heritage 3D project (see <http://www.heritage3d.org>), this tutorial will give an introductory overview of sensors, data acquisition and processing techniques for terrestrial 3D modelling and cultural heritage 3D documentation. Further information on all aspects of the symposium can be found at <http://www.isprs-newcastle2010.org>. To close, if UK delegates come to Newcastle for the Symposium by rail then, even if they don't receive the same quality of service as provided by the Japanese bullet trains, they can also feel good about their personal impact on the current climate, not to mention economic, sustainability agenda – more so than flying to the Far East anyway!

*Jon Mills*

# A breakthrough for mobile scanning

By Alan Barrow

ABA has pioneered high-speed 3d data capture using laser scanners. They have now taken this a stage further with an advanced kinematic system for highway mapping, explains **Alan Barrow**.

**H**igh speed data capture, high density dataset, high accuracy – these are the goals that ABA Surveying set when the decision was taken to develop our highway mapping system over a year ago. This is an account of the development of the system, the obstacles that have been overcome and the results that can now be routinely achieved.

## Rail to road?

Underpinning the decision was our experience gained by developing scanning technology since the year 2000 when we were the first UK company to introduce it for routine surveying. Ever since we introduced 3d scanning from rail trolleys for railway infrastructure surveying some five years ago we have routinely carried out kinematic scanning of railway corridors and developed 3d point clouds for trackside detailing.

Surveying in the railway environment may be challenging logistically but technically it is very simple. After all, we have the perfect trajectory to hang the scan data on – the track itself – and this we can survey very accurately. No such trajectory exists for highway surveying and the challenge for ABA was to create one.

## Air to ground?

The airborne application of 3d data capture by lidar had been steadily developing in the civilian field for over ten years and had shown

that a combination of GNSS and Inertial Navigation Systems (INS) could be integrated to produce point accuracies on the ground in the range of 5-10cms at the one sigma confidence level.

At the time there were two such airborne systems that had been ported to vehicle applications and their performance specifications were looked at very carefully in late 2008. The conclusion was that the systems were more suited to the Google end of the marketplace than for ABA's engineering clients.

Airborne data capture has a heavy reliance on GNSS simply because it is available 99.9% of the time. Only if the pilot engages in some serious manoeuvres will the signal be lost and outages occur. In the airborne solution then, the INS should play its part in QA of the GNSS solution but it is rarely asked to fill any outages. For this reason an airborne system does not translate readily to terrestrial highway surveying. Buildings, bridges, cuttings and trees all combine to give at best a degraded GNSS solution and at worst a complete GNSS outage.

## Using INS to fill GNSS gaps

The INS in highway surveying is therefore not only required to QA the GNSS solution but must also be capable of bridging significant GNSS outages at the accuracy levels we require. It has to be a high end INS with the potential to reverse compute the trajectory after periods of GNSS outage.

This then was the motivation for ABA's decision to develop a system with the target of achieving an absolute accuracy of better than 10mm at highway speed. Such accuracy is considered unlikely to be bettered in the foreseeable future if at all.

## Scanner configuration

Firstly there was the choice of scanners and configuration. ABA required the system to support the wide range of applications that clients demanded. Whether the purpose of the survey was to be runway or highway management, topographical corridor surveys or accurate architectural street scenes, the system should be capable of being configured to suit.

A configuration of three scanners was decided upon such that the vehicle could be mounted with optionally one, two or three scanners depending on the purpose of the



*Part of a typical highway or motorway interchange - this one is the A3 at Cobham and is one of an experimental series being done for forensic uses.*

dataset. The centre scanner is inverted and scans a nominally vertical plane at right angles to the vehicle trajectory. This effectively emulates the railway trolley based kinematic scanning and results in a helix of points forming a point cloud.

The only problem with this configuration is that only the face of roadside objects is scanned and any face running perpendicular to the road is missed. This is fine if the only purpose of the data is for surveying the highway pavement. However, many of our projects require the street scene to be recorded including the building facades fronting the highway.

For these purposes the design incorporates two additional scanners mounted to the left and righthand side of the centre scanner. These scanners are mounted normally, arranged at a skew angle to the vehicle trajectory and at a rake angle to the vertical.

The skew angle ensures that the scanners capture detail of the building returns and the depths of street furniture etc. The reason for the rake angle is simply that a vertical scan at speed might miss the actual corner of a building or even a complete asset like a lamppost if the vehicle were to be driven too fast.

The Leica 6000 scanner has a field of view of 310° leaving a dead sector of 50°. The left and right scanners, being mounted vertically, therefore have a dead sector of approximately 1.5m directly below them that would only be scanned by the other two scanners.

If densification of scan data in these sectors is required then the simple expedient of making a second run in the opposite direction (or from the next lane) will ensure that all data is captured a minimum of five times and most of it will be captured six times.

ABA already had three Leica 6000 scanners and, at the close range (less than 50m) that they would be operating over, their accuracy – in the order of 2–3 mm – is well proven, and would therefore contribute little to the error budget.

### A stable rig

With a multiple scanner set-up like this a most critical factor is the stability of the rig on which the scanners and the GNSS/INS are mounted. Aluminium was considered not to have the strength after welding and was soon discounted in favour of a rigid welded steel fabrication. The scanners are first fitted into steel protective cages that are then mounted onto the frame using locating dowels. The whole system can be operational within a very short time after arriving on site.

### Avoiding a black box solution

Having decided what our objectives were, the next consideration was how were we going to put it all together. Experience of being at the leading edge of technology has taught us that we did not want a black-box solution. Things

will go wrong and it is vitally important to be able to recover from every eventuality and this invariably means having access to the data at all stages of the processing.

During our search for a suitable software solution we were introduced to QPS, a Dutch company, who had specialised in integrating sensors in the offshore hydrographic sector for many years. QPS had developed a data-logging package called Qinsy that had achieved worldwide acceptance and which it was thought could be adapted to suit our requirements.

Discussions with QPS over the possibilities and our requirements for ongoing development led to them being appointed as our system integration partners. Our two companies are of the same mindset and we are pleased to give them recognition for the part they have played in our development.

So now we had four pieces of the jigsaw – the scanners, the system design, the data capture software and our partners for the system integration. It only remained to select our GNSS and INS systems and put them all together.

### INS

The choice of INS was made after very careful evaluation and experimentation. There are only a handful of suppliers offering high-end INS that are capable of achieving the results that we were looking for. After all, only a few years ago these systems would have been highly classified and used for guiding ballistic missiles. The French manufacturer Ixsea were found to have ticked all the right boxes and they were selected for their FOG (Fibre Optic Gyro) device known as the LandINS system.

### GNSS

The choice of GNSS receivers was even more problematic. Every one knows that all GNSS geodetic quality receivers will provide similar accuracies when used normally. However, the kinematic solution we seek can hardly be considered normal and other characteristics quickly assumed prominence. In particular, sensitivity and the time to re-acquire after a break in signal became the deciding factors, because at 80kph a vehicle covers 22 metres in just one second. Receivers from the major suppliers were subjected to exhaustive tests and found to re-acquire in between ten and twenty seconds. More importantly they came back first with a good x,y solution followed some time later by the z solution.

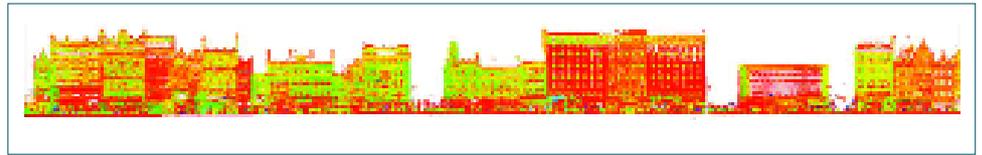


ABA's scan van.

*“ABA required the system to support the wide range of applications that clients demanded.”*



Above: typical street scenes captured by the system - this one shows part of the north side of Oxford Street in London and was part of the Near Global project.



Only a board from Javad was found to consistently re-acquire in less than four seconds and come back with x, y and z simultaneously, so the choice was really a no brainer.

### The control centre

All this hardware comes together in the control centre in the vehicle and with the potential of three Leica scanners running at 50Hz a serious amount of computing power is needed to enable the processing to take place in real time. It was not only the processing that needed to be up to speed.

With the potential to capture up to 1.5 million points each second the data storage could easily become the bottleneck.

The final configuration of the control centre therefore included a rack-mounted computer with an i7 processor, 4 gbyte of RAM, 2 terabytes of hard disk storage and a further 256mb of solid state disk. The operating system has now been changed from 64bit XP to 64bit Windows 7, only because Windows 7 supports the trim command that is essential to maintain SSD performance. Mission Control is exercised through a conventional keyboard, mouse and two 20" flat screen monitors set up in the back of the van.

All aspects of the mission can be monitored and controlled from here including the availability and accuracy of the RTK solution; the speed and density of the scan data; and even the area of coverage being obtained in real time. The whole system came together in late August and from September onwards has been continually improved, tested and developed further.

### Going live

Being a commercial company, it is inevitable that much of the development work has been

done following experience gained on live projects. Indeed, the first live project was probably the most demanding that we could have had – scanning of a large part of central London for Near Global as part of their project to create a virtual city.

High density scanning with a point spacing of nominally 15mm was the target and the mission was planned accordingly. Low forward speed was called for. Unfortunately urban canyons resulted in RTK outages that were longer than we would have preferred and although the INS holds the trajectory together it does inevitably start to drift resulting in steps when the RTK is re-acquired.

I was very much reminded of a comment once made to me by an overseas surveyor when I criticised the height accuracy of his contour survey of a desert area: 'Oh no sir, they are very accurate levels – maybe just in the wrong place'. So it was with early results in urban canyons and long RTK outages. Our system design and the ability to get at the data at all stages proved its worth and was fundamental to our being able to solve the problem.

Having the ability to access the scan data from each scanner separately we were able to register cloud to cloud and then to very limited ground control features in order to recover the situation. Having had this experience of operating in an extremely "hostile" environment we have now been able to develop procedures that minimise the chance of this type of problem occurring and techniques that enable us to recover should it happen in the future.

Since our baptism of fire the system has been used on other projects, including regular topographic surveys and highway junction surveys that, by comparison, have proved to be like a walk in the park.

### Accuracy – three options

So, just what accuracy will the system deliver? All surveyors will know that accuracy comes in two flavours – relative accuracy and absolute accuracy. Relative accuracy for our system is entirely dependant on the relationship between the scanner(s) and the INS and we have developed software that enables us to calibrate the rig even on site and before a site survey is undertaken. Relative accuracy with a single mounted scanner is at the 2-3mm level. When more than two scanners are mounted there is a degradation of relative accuracy to the 5mm level simply because the scan coordinates derive from different GNSS epochs.

Absolute accuracy is dependant on the GNSS / INS solution and its relationship to the

*"...sensitivity and the time to re-acquire after a break in signal became the deciding factors..."*

Mission Control



# Leica ScanStation C10

The laser scanner  
you always hoped for.



## No one has packed more capabilities and value into a single unit.

Versatile time-of-flight scanners from Leica Geosystems have consistently been the industry's most popular. The portable, All-in-One ScanStation C10 is our biggest leap forward yet - in versatility, productivity, and value. For your organisation, ScanStation C10 means a faster payback and reduced business risk as you start to reap the benefits and competitive advantages of High-Definition Surveying™ (HDS™).

- Major versatility and productivity advances make scanning attractive for even more as-built, topographic and monitoring surveys
- Up to 10x faster full-dome scans: now, just minutes!
- Incremental upgradeability and reduced ownership costs
- Standard workflows: onboard total station-like interface, tilt compensation, data storage and batteries
- GPS and prism options
- Auto-adjusting, internal, high-resolution zoom camera/video for even faster scene selection and target location

Test area paving. This image shows eight runs observed at varying speeds and demonstrates the consistency that can be achieved with accurate timing.



reference framework. For the simplest solution we can rely entirely on the National RTK Network in which case the absolute accuracy will be at the 20mm level. Relative accuracy will remain as before and the trajectory is smoothed, so that there is not 20mm of "noise" in the data.

To move to the next accuracy level we use a local GNSS base station with a telephone data link to provide corrections at a refresh rate of at least 50Hz. The base station should have known coordinates and elevation and the mobile system should be operated within a five km radius. Operating in this way, we have achieved absolute accuracies at the 10mm level with relative accuracies as before.

For the most accurate surveys we can combine the dataset with ground surveyed

control points that have the advantage of orthometric height values, thus removing any inaccuracy that might be inherited from the use of OSGM02 interpolation. With a close interval of control, say every 100m or so along the route, the absolute accuracy in height can be brought down to between 5 and 10mm – as good as conventional surveying.

Ironically the worst accuracy of the system is achieved in the horizontal direction and not the vertical direction. Quite the opposite of conventional GNSS wisdom.

The positional accuracy is entirely dependant on relating the scan data to the trajectory and this is a matter of timing. We are routinely using timing accuracies of one millisecond – that is 1/1000 second. In one millisecond a vehicle travels approximately 22mm at 80kph so there exists the potential for datasets captured in opposite directions to mis-match by up to 44mm and therefore the timing can be critical.

Recent independent tests of a section of highway scanned 22 times in both directions produced an accuracy of 8mm vertically and 20mm in the horizontal position. Both these figures are, incidentally, quoted at the two sigma (95% confidence) level.

Realistically though, the only time we will be travelling at 80kph will be for highway surveying and then only for motorways. Most motorway projects will be for pavement management and it is the value rather than the position of the level that assumes most importance thus making any positional error rather academic. For all other applications the project may be planned at an appropriate speed to achieve the desired results.

**In production**

Now that the system is operational, the learning curve is over and we know we can achieve our objectives, we are focused now on streamlining the processing and procedures and in particular the recovery from GNSS outages. The objective now is to have a deliverable dataset as soon as possible after acquiring the data and preferably the next day.

We can only foresee a major improvement to the system coming when scanners are brought out that improve on our existing scanners by the introduction of RGB values. Now that would be a 3d world!

• Acknowledgments to QPS Holland and Near Global for some of the content in this article.

**About the author**

Alan Barrow is a Chartered Surveyor and has been a Fellow of CICES since 1976. He left college in 1963 and over the years has accumulated a wealth of survey experience in the UK and on international projects. He formed ABA Surveying Ltd in 1990. The company pioneered the use of 3D laser scanning techniques and now has a leading position in this market.

“... the first live project was probably the most demanding that we could have had...”



**HARRIS Wheeler Lifter**

Worcester, England Tel: 01905 763361 Email: [mark@mhsurveys.co.uk](mailto:mark@mhsurveys.co.uk)

[www.mhsurveys.co.uk](http://www.mhsurveys.co.uk)

**Reduces Costs & Injuries**

	
	
<p>Universal Keys £100 per pair</p>	<p>Wheeler Lifter £330</p>
<p><b>Plus P&amp;P</b></p>	

**Cover Lifting equipment**

**Designed by a Surveyor for the Surveyor**

**Why risk injury?**

# Texturised 3D models using photo scanning

By Domenico Santarsiero and Marco Ghezzi, Menci Software Srl

The authors describe a remarkable system for the capture in high resolution of objects in 3D. Based on digital cameras and software, the technique can serve as a useful complement to existing laser scanning.

Nowadays, the documentation of an artefact through 3D modelling techniques implies reliance on the latest technologies dedicated to cultural heritage. Until recently, laser scanning has been seen as the most effective and innovative solution but now there is a new approach. Photo scanning uses imagery as a single information source, in order to obtain metrically valuable and widely extensive exploitable data directly from the chromatic features of the artefact itself.

The photo scanning approach has been developed and set up by Menci Software over two years, and has led to the design of several tools addressed to help the user in the survey and 3D modelling fields. The Z-Scan class of instruments, to which all of these tools refer, covers different application domains, dependent upon whether the application is the subject of study or the operating context. One of these domains is cultural heritage.

Z-Scan technology provides the generation of point clouds through the exploitation of the imagery obtained by the use of common and professional digital cameras. The shooting system depends upon a particular camera and lens calibration technique that has been developed by Menci Software, and on a precision slide bar with forced-centering and default positions. The analysis technique and the software for the point cloud generation is supported by an innovative multi-focal image analysis algorithm, that provides high accuracy in terms of geometry and chromaticity.

The handiness of the system, the robustness of the components and the reliability of the results, make Z-Scan technology a perfect complement for use in fields such as cultural heritage and in wider application areas that focus on the preservation of architectural, monumental and archaeological heritage, as well as in the museum field.

The system allows the creation of a 3D copy of the object through an indirect metric survey, which is carried out without "touching" the object and does not require photogrammetric control points. There is no need for any additional instrument to

complete the survey: Z-Scan is completely autonomous. From image acquisition to the measuring phase, the system is totally supported by software developed in Italy.

The system was initially designed for non-expert users operating in the cultural heritage sector, but soon it gained visibility in several other fields.

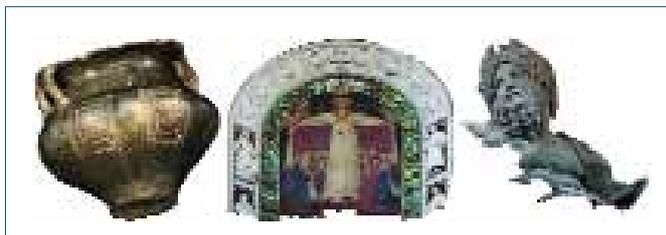
## From pixels to coordinates: reversing the 3D modelling paradigm

Z-Scan, which can also be used for documentation purposes, is designed to measure an artefact through imagery in order to better understand the object in three dimensions. The support of imagery makes the system particularly suitable for surveys in the cultural heritage field where the chromatic informative component is often decisive in comprehending degrade phenomena or for assisting in interpretation, techniques of hand working or dating issues.

The result of a survey conducted with the Z-Scan is a high-resolution 3D point grid that, together with the texture component of the image, represents a 3D raster documentation of the surveyed artefact. On this digital object, it is possible to carry out measurements, produce graphical thematic classification of the model, create hyperlinks to information collected in geo-databases, connect stratigraphic information within the excavation record, define 3D representations in CAD and GIS environments and also generate high performance ortho-images and photo-mosaics.

The real benefit brought by the photo scanning approach refers directly to methodological issues. The Z-Scan system allows one to reverse the survey paradigm that defines the current use of laser scanning, especially when surveying historical artefacts. The traditional 3D modelling of texture has always been seen as connected with the flux of data generated by a laser scanner; this flux of created data is based on a geospatial grid of single points that pertain to the final point cloud. A laser scanned 3D point cloud does not contain information about the space between neighbouring points. It also relies on a second data source – a camera – to assign RGB values to each point in the cloud. In order to obtain accurate ortho-images, it is then necessary to georeference images or portions of a single image, and apply them to the model following the reference points.

Z-Scan uses a single data source, the photographs, and reverses the above



Some 3D models created with Z-Scan

Some Z-Scan systems for acquisitions in different application environments: a standard system, a micro system and a rotating plate.



mentioned process: the single geospatial point information is generated directly from the image pixels that represent the actual object, creating a bidirectional relationship that allows the production of extremely accurate and reliable models.

In these conditions, a unique texture representation of the surveyed 3D model is possible. The object is represented as a mesh of elements, typically of resolution five to ten pixels, in which every single face in the model depicts the original chromatic elements acquired by the digital camera, and not just the interpolation typical of laser scanner RGB points or those encountered when dealing with the generation of ortho-images on the basis of interpolated DTMs. Therefore, taking a single georeferenced point on the final 3D model of the artefact, it is possible to spot the actual correspondence between the photo scanned model and the real object. This would be impossible using laser scanned data, even if dealing with high quality images.

It is also worth considering the continuity and contiguity of the chromatic information. These features are impossible to guarantee with laser scanner systems because the result of a point cloud is, by definition, made up of small standalone elements. A digital picture instead depicts an object by its pixels. One of the main trademarks of pixels is the proximity with other similar elements, the totality of which is the representation of the entire image.

The objective of this argument is not to downgrade laser scanner technology as somehow inadequate for the accuracy purposes of a survey. In the case of very widespread surfaces, it is still necessary to rely on a topographic or laser scanner survey, especially in order to gain a good zero order reference frame. Explained in this way, Menci Software's innovative solution based on photo scanning, clearly integrates with other techniques.

### Z-Scan system: technical details

Z-Scan solutions operates between acquisition ranges which can vary from a few centimetres to ten metres; this consequently affects the accuracy of the models which are themselves affected by several variables like the quality and resolution of the lenses being used or the distance and the lighting of the subject of the survey.

The photo scanning approach is entirely based on images, their production is extremely

important and functional to a correct development of the work; it is also useful to consider that, in the presence of surfaces with consistent chromatic values it would be necessary to use a system with pattern projection. Photo-scanning systems have proved their capabilities on the different chromaticity of close pixels, and this condition is essential to succeed in the work. Solutions based on Z-Scan are easy-to-use, light weight, simple photogrammetric systems. The system is perfectly suited for the needs of non-expert users, allowing them to create 3D models with just three digital camera shots (without any further intervention) as it is not necessary to have any control point or preliminary measurements.

Recently, Menci Software's R&D department put a lot of effort into simplifying the post-processing phase of the system. This led to a totally automated solution capable of joining multiple Z-Scan point clouds by registration of overlapping data using only the photographic texture. It is however possible to make use of control points, if available, to both ease up model registration and allocate them within the general reference system of the project.

Utilising various 2D-3D creation modes it is possible to generate orthoimages and web-based VRML models, or simply to digitize surfaces related to complex 3D models.

### The operating tools

Z-Scan systems require data obtained using a suitably calibrated digital camera and a dedicated slide bar with length that can be changed to suit the type of survey or the dimensions of the artefact. Sometimes, it is possible to take a succession of images of a small object on a rotating plate that is interactively managed by the acquisition software.

The operating range of the instrument is variable based on the lens used. The default configuration generally relies on a Nikon or Canon camera, even though the user may choose different cameras. The accuracy of the image is directly linked to the acquisition distance and to the type of lenses used, whereas the camera can mount more than one calibrated optic, depending on the kind of survey carried out.

The camera must be set on a ball rail runner precision sledge (length 500-900mm) with tilt head, to guarantee the accuracy of the "shoot base". These data acquisition devices are fully supported by the Z-Scan point cloud generation software.

### 3D model generation

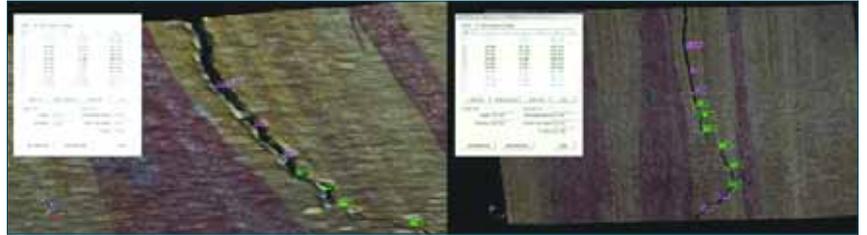
Post processing begins with the introduction of values concerned with image distortion. These values are collected during the calibration phase carried out in Menci Software's labs and are essential to avoid lens distortion.

Images are analysed by an operator in order to find a number of dependent features according to dimensions. The features'

*Photo scanning uses imagery as a single information source. . .*

displacement affects the following calculation phase. It is necessary that all the features are distributed on all the photograms and that it is homogeneously textured. An algorithm for the analysis and the filtering of the equivalent features based on epipolar geometry leads to the restitution of the orientation of the three photograms. The angular values of the shot trim are close to zero and their size depends on the building tolerance of the sledge, on the position of the camera on the rail runner, on the oscillation of the bar and, eventually, of the structure supporting it. Correct orientation is a fundamental prerequisite to guarantee the success of the photo scanning process.

Once the orientation is known, it is possible to proceed to trinocular rectification using data from the three camera images, aimed at the simultaneous removal of the vertical parallax on the three photograms. Rectification is particularly complex because of the shot condition: close to perfect alignment, it represents an anomaly for the trifocal tensor. For this reason a specific trinocular rectification algorithm not dependant on trifocal tensor has been set up. Surface reconstruction takes place through image matching, using dynamic programming methods. Cross-correlation calculation is simultaneous on the three images and takes advantage of the RGB chromatic components.



3D detail of a fresco aimed to measure the size of a crack.

### Conclusions

The 3D documentation methodology based on the Z-Scan system and on the photo scanning approach, represents a valid complement to work usually carried out using laser scanners. Moreover, it is the perfect system solution when the laser scanner approach is not applicable (for example if there are space problems or due to the size of the object to be surveyed). Z-Scan is a multifunction system, as it can work with the same hardware but with different focal lenses, making it possible to survey objects directly on site, in museums (e.g. capitals, columns, decorations and bas-reliefs) or in external areas.

### For more information:

[domenico.santarsiero@menci.com](mailto:domenico.santarsiero@menci.com) or  
[marco.ghezzi@menci.com](mailto:marco.ghezzi@menci.com)

*The object is represented as a mesh of elements. . .*

**Video Robotic: Rework eliminated**

## surveying Learn more about the new Trimble® VX™ Spatial Station

- Gain productivity - Use video assistance and remote measuring for inaccessible points
- Share the Vision - Site panorama with RealWorks Station View
- Quality assurance - Store an image of the points you just set out
- Documentation - Keep the images of measured points for survey archive records
- Reduce rework! - Leave site with the confidence that the job has been done right
- To find out more and to request a free on-site consultation please visit [www.korecgroup.com](http://www.korecgroup.com)



Tel UK: 0845 603 1214  
Tel IRL: 01 456 4702



# Construction monitoring in a tough urban environment

Bespoke monitoring schemes are inevitable in congested urban areas. The network of rail lines and other infrastructure in North London presents exceptional challenges for surveyors, as **Gareth Mitchell** explains.

*... almost all monitoring schemes are bespoke in nature. . .*

**T**he North London Rail Infrastructure Project (NLRIP) aims to deliver increased passenger capacity for train services between Richmond in the west and Stratford in the east of London. Network Rail is working together with Carillion on the construction phase. This project forms part of the 2012 Olympic development programme for Transport for London and will connect with other lines to create an orbital railway network around London's centre.

## History of instability

The core area of works is located within the railway corridor surrounded by residential and commercial properties between Camden Road and Dalston Kingsland overland stations. Within this core area is a section of retaining walls 500 metres long that requires stabilisation works. The walls have a history of instability, due to bomb damage dating back to the second world war, and a lack of detailed as-built records. Works within this canyon section include installation of a four-track alignment, new track and sewer drainage routes and new overhead line equipment that will require the track to be lowered. New sub-surface concrete struts, spanning the floor of the cutting, will be placed to stabilise the base of the retaining walls.

In today's construction environment we must recognise that almost all monitoring schemes are bespoke in nature and careful attention to the accuracy requirements and local environmental conditions is key to producing a suitable scheme.

## Cramped Conditions

The task for the NLRIP was to design, install and maintain a wall monitoring scheme that measures three dimensional movements, to account for potential rotation or sliding in the retaining wall. Any movement must be detected in a timely fashion to ensure the safety of trains, passengers, workers and adjacent residential properties. The situation is made more difficult due to the large number of workers and heavy plant working within the confined railway corridor and the two operational railway lines that run at 95% capacity, preventing access to the south wall for six days a week. Whilst most works are being undertaken during a full line blockade, lead-in and early works progress during operational hours.

The accuracy limits for this project demand sub 3mm relative positioning and repeatability. The scheme also requires real-time monitoring when works are being undertaken and a back-up 24-hour automated system to monitor and provide alarms outside work hours.

TPS and equipment suppliers, SCCS created a final design using many different off-the-shelf components, which combine to achieve the desired result, these included laser scanning technology, semi-automated total station measurements, precise levelling, tilt sensors, Leica GeoMOS software and Excel reporting.

## Baseline Scan

Laser scanning is the most efficient way to collect large quantities of data and provides a snapshot in time with a measurable 3d model.

A full 3d point cloud containing over 950 million points was created for the full length of the cutting and retaining walls, using an Amberg 5003 laser scanner in terrestrial mode. This information was referenced to the NLRIP survey grid coordinates to provide a baseline snapshot of the environment prior to any construction. As the monitoring scheme would only measure movements at the locations where sensors were installed, analysis of the laser scan will enable checks to be made at any point along the full extent of the wall, with an accuracy of 3-5mm. The laser scanner can be re-deployed at any stage in the future to create a second point cloud model, which can be compared against the baseline



*Leica TS30 total station monitoring from control pillar within the canyon site.*

scan to produce a difference analysis highlighting any changes or wall movements that may have occurred.

### Automatic monitoring observations

Leica's latest monitoring technology, the TS30 total station, is being used in a semi-automated fashion to take readings to over 180 mini prisms attached using 'L' bar brackets to the retaining walls at high and low level. The TS30 is set up on specially installed concrete survey pillars and a wall-mounted bracket to ensure stability and repeatability. The presence of the High Speed 1 (HS1) running tunnels beneath the site meant that piled control stations could not be installed in the tight schedule available, so it was agreed with the Network Rail project survey systems engineer that specially constructed control pillars built on 1.25m cubes of concrete would provide sufficient stability for the monitoring exercise. The station coordinates are checked by observations to at least three Leica GPH1P precision reflectors. The reflectors are attached to the abutments of overbridges as these were deemed stable and were not connected to the retaining walls. All prisms are measured and compared to baseline readings to determine any movements that may be caused by construction activities in real-time. Additional readings are taken and recorded into GeoMOS for further analysis. GeoMOS has a further advantage of allowing the automation and analysis of the total station readings should the need arise.

### Level and tilt measurement

Precise levelling double runs are completed using a digital sub millimetre DNA03 level with bar-coded invar staff, removing the possibility of human error involved in manual booking and reading. Measurements are recorded directly to the instrument's compact flash card and can be processed using a spreadsheet or through Leica Geo-Office software. Fundamental benchmarks have been established outside the area of works and influence. In addition a combination of BRE sockets and digital levelling strips have been installed along each wall. The digital levelling staves attached to the southern wall enable readings to be taken while the lines remain open to traffic, without the need for manned entry and all the inherent risks associated with this.

Thirty five Leica Nivel 220 tilt sensors, with a measuring accuracy of  $\pm 1.51$  mm per metre, have been installed along the retaining walls utilising specially designed mounting bars and

*Right: View of the canyon from above.*

*Below: 3D Scan Point Cloud model of the canyon.*



cabling. These tilt sensors are set to record measurements at a frequency ranging from 20 seconds to 2 hours. The sensors are connected in four serial strings of between six and eleven sensors per string, logging temperature and inclination in X and Y directions. This information is fed back to a central computer processing the data with GeoMOS software. Movement trigger levels can be set into GeoMOS and email and text alerts issued should the trigger levels be breached. In addition, movement trends can be analysed in real time by accessing a central computer over the web. In this way a constant stream of data is available, without the need for personnel to be present on site. The monitoring system has

*... analysis of the laser scan will enable checks to be made at any point along the full extent of the wall...*

*Leica Nivel 220 Tilt sensor on designed mounting bar.*





Combined system -  
Leica TS30 monitoring  
with tilt sensors in the  
background.



Levelling strips for  
monitoring the inaccessible  
south retaining wall.

additional smaller micro monitoring schemes in other locations across the project.

**Understanding the effects of construction**

Monitoring systems are becoming vital components of all construction projects to ensure the safety of both the built and natural environment. Clear and concise monitoring reports allow the effects of construction methods to be measured and understood. This information is vital to continuous improvement in construction techniques. This system has overcome unique challenges to provide a solution that helps to drive the project forward by maintaining safety for the operational railway, the workers, adjacent properties and members of the public.

The author would like to acknowledge the technical input and support of Stewart Harrison from SCCS and Richard Winthrop, Project Survey Systems Engineer from Network Rail, without whom the scheme could not have been implemented so successfully.

enabled Carillion to benefit from out-of-hours monitoring and alerts, while saving money and reducing the workforce requirements.

**Monitoring 24/7**

Bespoke Excel reporting sheets have been designed so that people without a technical surveying background can interpret the data. These spreadsheets allow for temperature and baseline corrections to be applied and make the raw data viewable in a simple, clear format. Hourly updates of the tilt sensor data can be downloaded over the web from any home or office location and reduced in the Excel reporting front sheet.

The result of these components, installation and support is an accepted 24-hour a day, 365 days a year monitoring scheme. This allows all construction activities within the retaining walls to be monitored and any movements identified. In this way any adverse conditions can be identified in a timely fashion and mitigated without delay.

The implementation of this scheme has provided the methodology and confidence for



**About the author**

Gareth Mitchell, BSurv Otago University New Zealand, works for TPS Consult as a principal land surveyor. Since 2004 Gareth has been responsible for TPS projects including permanent control and trackside monumentation for the Channel Tunnel Rail Link; establishing primary control for Thames Water on the Lee Tunnel project. Monitoring, setting out, and as-built surveys for construction projects on London Underground and track renewal surveys on Network Rail. Gareth is currently employed as Carillion's contractor responsible engineer for Survey on the North London Line Project.

Email: [garethmitchell@gmail.com](mailto:garethmitchell@gmail.com)

*Movement trigger levels can be set into GeoMOS. . .*



Applications in CADD Ltd,  
21 Britannia Street,  
Shepshed,  
Leicestershire, LE12 9AE



enquiries@appsincadd.co.uk

www.appsincadd.co.uk

# 4Site

## Survey Software for AutoCAD™

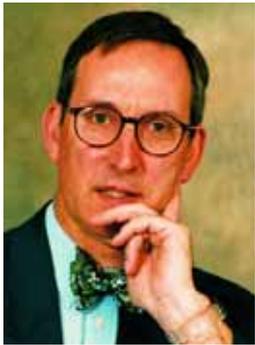


Tel: +44 (0)1509 504 501



Fax: +44 (0)1509 600 079





## Small breaches can lead to fundamental ones with IT contracts

By Carl Calvert

The recent case of *Centrica v. Accenture* could have led to bigger gas bills, proving that it was not just hot air, explains our legal columnist.

THE CASE OF *Centrica v. Accenture* was brought to my notice because of the importance of IT to businesses and consequently contracts for IT.

Firstly, what was the quarrel about? Centrica is claiming £182 million in respect of an alleged failure in a system, which was to be created and installed by Accenture, to provide a billing system for Centrica's customers.

The claim was that there had been a 'fundamental breach' to the contract whilst the defence was that any breach was too small to be a fundamental breach. In any event, once Centrica had notified Accenture of a fundamental problem Accenture failed to react. Accenture claimed that no single 'fundamental breach' had occurred and so were not liable.

This begs the question of how is a fundamental breach defined? In the House of Lords hearing of *Photo Productions Ltd v. Securicor Transport Ltd*<sup>1</sup> Lord Wilberforce stated that:

*"In no circumstances. . . any injurious act or default by any employee. . ." These words have to be approached with the aid of the cardinal rules of construction that they must be read contra proferentem [an ambiguous term will be interpreted against the party imposing the term] and that in order to escape from the consequences of one's own wrongdoing, or that of one's servant, clear words are necessary. I think that these words are clear'.*

In the Centrica case the definition of fundamental breach included the words 'and/or', which the court held were sufficient to enable a sum of small breaches in the contract to constitute a fundamental breach. Accenture who had argued that the small breaches were not fundamental lost on nine of the ten points at the trial of preliminary issues. Some of these points are:

- One can aggregate individual breaches of warranty into a single fundamental breach of

warranty for the purposes of its claim. Accenture had argued that none of the individual breaches was serious enough to cause a fundamental breach. The judge said, "I can see nothing in the agreement that prevents Centrica from asserting that a breach is a fundamental defect when to begin with they thought that the effects of the breach did not justify such an assertion."

- No need to have to prove that a fundamental breach of warranty had caused a severe adverse effect at the time it notified Accenture of the breach. Centrica had only to prove that the breach would have caused a severe adverse effect if left unremedied.
- One can claim damages for the costs of fixing the problems, the direct losses of caused by any fundamental defect, and damages for the effects before Accenture was told of any defect.
- One can claim other losses, such as compensation to customers.
- One can claim for hardware. Centrica says it bought millions of pounds worth of extra hardware to remedy the slowness of the system.

So where does this leave us? Peter Clough of lawyers Osborne Clarke claimed that this Centrica case indicated that IT suppliers are liable for the cumulative effects of a series of faults.

My own opinion on the matter is based on the House of Lords' ruling in *Photo Productions* which led to the explicit rejection of the doctrine of fundamental breach under English law and was the high water mark of Lord Denning's attempts to remould the law in a manner that he perceived to fit the justice of the situation before him and a constructive view of the contract is required rather than looking for fairness.

### References

- 2 [1980] UKHL 2, [1980] AC 827, [1980] 1 All ER 556  
1 [1980] UKHL 2, [1980] AC 827, [1980] 1 All ER 556

• Carl Calvert, MA, MSc, MRICS, MBCS, PgDLaw, FRIN is the sole principal of Calvert Consulting, specialising in Boundary litigation. He also lectures part-time in GIS law. Email: [carlcalvert@aol.com](mailto:carlcalvert@aol.com) or 023 8086 4643.



**MOVING ON?**  **RICS**

If you are changing your address, then let us know and we will update your subscription, but. . .

. . . please remember that if you receive *GW* as part of your RICS membership, you must inform the Institution of any change of address – we cannot change the RICS membership database. Call +44 (0)870 333 1600 or write to: RICS Contact Centre, Surveyor Court, Westwood Way, Coventry, CV4 8JE, UK or email [contactrics@rics.org](mailto:contactrics@rics.org).

Otherwise, subscribers can call Barbara on +44 (0)1438 352617, email: [barbara@pvpubs.demon.co.uk](mailto:barbara@pvpubs.demon.co.uk) or write to PV Publications, 2B North Road, Stevenage, Hertfordshire, SG1 4AT, UK.



# A big "G'day" awaits in Sydney



© Tourism Australia

Surveyors should be packing their bags in April for the four-yearly FIG Congress. This year, a big welcome awaits in Australia explains **Mark T Gordon**, Assistant Congress Director.

**A** very sincere "G'day" to all readers of Geomatics World and a warm, collegiate invitation to travel "Down Under" in 2010 to attend the FIG2010 Congress in Sydney Australia on 11-16 April.

It is very rare for a FIG Congress to provide you with the wonderful opportunity to visit the Southern Hemisphere. Registrations are open now on the Congress website [www.fig2010.com](http://www.fig2010.com). This website contains complete details of the Congress and all associated activities.

FIG Congresses are like the Olympics for Surveyors: they occur every four years and there is a great deal of competition in being chosen to host one. For our Sydney "Olympics" Congress, we have already struck gold with a record breaking 837 technical paper abstracts being received: over 200 more than any previous FIG Congress. This number of submissions will guarantee that only the best quality papers will be delivered and only current topics will be discussed, ensuring a congress that is relevant to all delegates.

### Young ambassadors

For four years, our Young Ambassadors – in their distinctive red polo shirts – have been travelling the globe encouraging you to venture to our island continent for this magnificent event. Our Congress is a joint venture between the Surveying & Spatial Sciences Institute (SSSI) and the International Federation of Surveyors (FIG). National associations such as SSSI provide a forum for surveyors to protect and promote their interests nationally. Organisations like FIG provide this at the international level by becoming involved in international trends and issues.

The Fédération Internationale des Géomètres, FIG, (or International Federation of Surveyors) is the international, non-government organisation whose purpose is to support international collaboration for the progress of surveying in all fields and applications. FIG was founded in 1878 in Paris as a federation of national associations and is the only international body that represents all surveying disciplines. The mission statement of FIG is to ensure that the disciplines of surveying and all who

practice them meet the needs of the markets and communities they serve. Over 110 countries are now represented on FIG and there are some 250,000 members worldwide.

The technical work of FIG is led by commissions covering the key surveying disciplines. There are ten commissions which, under the guidance of their chairs, are responsible for pursuing FIG's professional and technical objectives. The ten commissions are:

**Commission 1** – Professional Standards & Practice

**Commission 2** – Professional Education

**Commission 3** – Spatial Information Management

**Commission 4** – Hydrography

**Commission 5** – Positioning & Measurement

**Commission 6** – Engineering Surveys

**Commission 7** – Cadastre & Land Management

**Commission 8** – Spatial Planning & Development

**Commission 9** – Valuation & the Management of Real Estate

**Commission 10** - Construction Economics & Management

I am sure that at least one of these commissions is relevant to the work you do. There will be technical sessions dedicated to each of them.

### Challenging keynotes and plenaries

The Congress keynote will be delivered by Professor **Tim Flannery**, who is one of Australia's leading thinkers as well as an internationally acclaimed scientist, conservationist, author and 2007 Australian of the Year. Consistent with our Congress theme of Facing the Challenges, Tim will speak about climate change and our profession's role in sustainable development: arguably the greatest challenges facing our world in the 21st Century.



FIG young ambassador Kate Fairlie in front of Sydney's iconic Opera House.

*FIG Congresses are like the Olympics for Surveyors. . .*

Plenary speakers from the international scene include **Daniel Fitzpatrick**, the UN's land rights adviser for tsunami-affected Indonesia, who is currently finalising the UN's guidelines on addressing land issues after natural disasters. His presentation will focus on land systems that are vulnerable to natural disasters due to poor land use planning and weak land administration systems. **Santiago Borrero**, Secretary General of the Pan American Institute of Geography and History, will concentrate on the key challenges being faced in Latin America as they work towards building spatially enabled government. Paul Munro-Faure, chief of the land tenure & management unit of the Food & Agriculture Organisation, is yet another internationally renowned speaker who will detail the crucial role played by good land governance in the work of FAO.

And where would a "spatially enabled" Congress be without Google? **Ed Parsons**, Google's Geospatial Technologist for Europe, Middle East and Africa, will outline his vision for organising the spatial component of the world's information systems using tools such as Google Earth and Google Maps.

Also consistent with our congress theme, one of the key features of FIG2010 will be the workshop on 'Small Island Developing States and the Millennium Development Goals'. This Workshop is being held specifically due to the location of the Congress on the doorstep of the Asia/Pacific Region and will focus on the issues confronting island nations as they face critical land governance issues.

The Congress will also include a special Forum for chief executive officers of national mapping and cadastral agencies, giving them the opportunity to network and discuss organisational trends and policy issues.

### Tours and trips

Prior to the Congress, our young ambassadors have arranged pre-congress tours to the very heart of our island nation. One of these tours, for the adventurous surveyor, commences at Alice Springs and commemorates the 150th Anniversary of the raising of the Union Jack over the geographical centre of Australia, and includes a helicopter ride to the top of Central Mount Stuart. Another tour, for the refined surveyor, examines the use of spatial technology in the famous Barossa Valley wine region of South Australia: and of course there will be time to sample the very best the region has to offer!

### Two-day history study

A pre-congress two day History Workshop has also been arranged for those with an interest in both Australian and worldwide surveying history. During the Congress, technical tours include a float on a boat to Fort Denison in the middle of the magnificent Sydney Harbour; watching 'Big Brother' watching you at the impressive Transport Management Centre, fighting bushfires at the emergency operations

centre of the Rural Fire Service and a tour of the SNAP (Satellite Navigation And Positioning) laboratory at the University of New South Wales.

The local Institution of Surveyors has recognised how difficult it is for delegates to concentrate on technical papers and tours for a whole five days, and has organised a little distraction on day four of the Congress: golf at the magnificent Lakes Golf Course. An extra special discount has been organised for delegates but due to limited numbers on this exclusive diversion, you'll have to be quick to book!

An attractive feature of this Congress is "at cost" optional tours for delegates and their families: because our professional congress organiser Arinex is also a travel agent, there is absolutely no Congress mark-up on tours. Arinex will also staff the registration desk each day to help delegates organise last minute tours and activities. Planned activities include a BridgeClimb along the top of the arch of the iconic Sydney Harbour Bridge, a guided tour of the famous Sydney Opera House and a coffee cruise on the waterways of Sydney Harbour. More adventurous diversions for those delegates and their families include a Hunter Valley Wine Tour, a trip to the world heritage area of the Great Barrier Reef and a journey into the "aboriginal dreamtime" of the Red Centre of Australia.

There is a whole range of accommodation options available in Sydney, from sharing a tent on Cockatoo Island in Sydney Harbour to luxurious five star hotels close to the Congress venue in Darling Harbour. A new Youth Hostel has just opened in the historic 'Rocks' area of the city, with magnificent harbour views that cannot be beaten for the price.

Finally, a surprise concept being trialled at this congress is the introduction of after-lunch sessions led by the major spatial thinkers of our generation, providing their vision of the future of our geospatial technologies and the role of our profession in providing our unique contribution to society. These sessions will inspire and challenge you, and should not be missed. They do, indeed, emphasise the value of international congresses: providing delegates with direct access to those who influence our profession and its place in society. Congresses provide the perfect opportunity for people to publicise their research, voice their opinion and to obtain support for their ideas whilst also being able to challenge and influence the direction of the global community.

This is your Congress: you owe it to yourself to attend and we look forward to seeing you "down under".



*Above: The Sydney Convention Centre where the congress will take place.*



*... and the view you'll get from the terrace of the Sydney Convention Centre.*

The Congress website  
[www.fig2010.com](http://www.fig2010.com)  
 has all the details.  
 See you at the Congress!



# Lists, dinosaurs and predictions: they follow us to the grave

By Nick Day

*"The important thing is not to stop questioning."* – Albert Einstein  
*"What if there were no hypothetical questions?"* – Unknown

Undertaking new business is what we're all looking for in 2010 but has it come to this? *GW's* North American columnist runs a jaundiced eye over what may happen in 2010.

## Rags to riches?

Who says there's no money to be made in mapping? Every year *Forbes* magazine publishes its list of the 400 wealthiest Americans. Last year the price of admission was \$1.3 billion, but for 2009 it was a mere \$950 million (I still missed the cut!) thanks to the "Great Recession." One must feel extreme sorrow for the likes of **Bill Gates** and **Warren Buffett** – the top two – down \$7 billion (to \$50bn) and \$10 billion (to \$40bn) respectively. Ah, 'tis a cruel world! But, we learn that the charismatic and innovative founder of ESRI, **Jack Dangermond**, made it into 158th place on the *Forbes'* 400 list with a personal fortune of \$2 billion. Just keep that ArcView, ArcGIS, and all the other little Arc suffices rolling, ESRI – the house that Jack built!

## Dead giveaway?

It's not that I'm particularly drawn to the macabre, but a recent story piqued my interest. Seems the dead, or rather their living kith and kin, are feeling the effects of the recession so much that they are trying anything to cut the costs of funerals and burials. Benjamin Franklin may have said it best, "There are only two certainties in life: death and taxes." In the US, costs can run upwards of \$10,000, as some funeral directors take advantage of the recently bereaved. Cremation, which is on the increase, can keep costs down, but they're still too high for many. Now we are hearing of "Do-it-yourself funerals" and "Green funerals." Apparently there are about 20 "green"

*Below: GPS maybe the only way you will be able to find your lost loved one.*



cemeteries in the US at present. They're basically open fields where grave markers are simply made from local rock. Now, here's the kicker (of the bucket?), some families are even dispensing with these in favour of GPS coordinates! We're not told if they're using a simple handheld GPS that places their dearly departed within  $\pm 5m$ , or opting for cm accuracy using RTK. I'm wondering if there are any surveyors out there yet who've been commissioned to do this kind of work? (*Sounds dead easy* – Ed)

## New way to spend your weekends!

While in the UK last summer, I was surprised how few people had heard of Craigslist. Over here, especially in California, Craigslist is a household word, maybe as well known and used as E-Bay. Founded by local lad Craig Newmark in March 1995 as an email list for San Francisco and Bay Area events, it has expanded beyond everyone's wildest imagination. In June 2000, he added Boston, and by February 2008 had expanded into 450 cities in 50 states, and 50 different countries. In June 2009, revenues topped \$100 million – this from only 25 employees all in San Francisco. The listings include local classifieds, discussion forums, job opportunities, housing for rent and sale, personals, services, and local community events. At least 30 million new classifieds are created each month. Craigslist carries no ads and stresses a non-corporate culture.

Now, in America, we have yard sales, equivalent to the UK's car boot sales, where you try to sell as much as you can over a weekend – all the accumulated stuff you've bought over the years, and probably subsequently regretted – to other hoarders or those even less discriminating than yourself. So, at weekends, many Americans cruise around neighbourhoods in their big gas-guzzling cars looking for yard sales (garage and front lawns). But now, we hear, they can do it more efficiently, saving time, petrol, and therefore the environment! By visiting [www.YardSaleTreasureMap.com](http://www.YardSaleTreasureMap.com), they can enter their starting address, plug in the maximum miles they want to travel, plus which day, and up pops a Google map showing area yard sales that have been posted on Craigslist. It's free and even gives a recommended driving route. A listing of what's for sale, where, and time of sale, can be found by clicking on the red balloons shown on the Google map.

## Read all about it!

So, what newspaper do you read? Are you a Times guy, or a Guardian gal? Maybe the

Independent, Telegraph, or FT? Or maybe you just like to be titillated by the Sun! Are you independently minded enough to read a different paper to what your parents took? Do you read the same paper every day, the same one you've bought for the past umpteen years, safe in the knowledge that you know the layout, know how the crossword puzzler's mind works? A paper that reflects your views and political leanings? Something that's comfortable, doesn't require you to think too much, or challenge the status quo? Do you ever buy a different paper just to see how the other half thinks, or is that too scary? Might you just find out your convictions have been wrong all along? As **Friedrich Nietzsche** noted, "Convictions are more dangerous foes of truth than lies." Or, as eminent economist **John Kenneth Galbraith** put it, "Faced with the choice between changing one's mind and proving there is no need to do so, almost everyone gets busy on the proof." Not that routine can be a bad thing, far from it – for Flaubert said, "Be regular and orderly in your life like a bourgeois, so that you may be violent and original in your work." More food for more thought!

### Dinosaurs

Nobody is really sure how or why dinosaurs died out. The large scaly ones that is, not the odd one or two in your office who still insist on doing their calculations on an abacus. Some say their brains were too small for their bodies. But if that were truly the case politicians, insurance, bank and auto company executives, treasury officials, and sub-prime mortgage lenders would no longer be roaming the earth, trampling all in their path and wreaking havoc. Others believe dinosaurs were overcome by a new and sudden ice age. Doubtful that would work today with our new breed of dinosaurs as we're supposed to be undergoing global warming. Actually, I prefer the term "climate change" as last winter in California and the Northeast we experienced one of the coldest on record. And skating on lakes and canals returned to the UK and Holland.

These have not been good times for those living al fresco in the tent cities that have sprouted like unwanted weeds up and down our Golden State. For the supposed richest country in the world – I'm not sure how that jives with our trillions of National Debt, and in hock to the Chinese and Japanese – it's a poor reflection on our form of brutish capitalism. As of this writing – it could change drastically by the time you read this – the average house price in the US is down to \$152,000. In the UK it's about £163,000; this would have been the equivalent of \$326,000 in the summer of 2008, and \$264,000 now thanks to the pound's free fall.

What is sure is that the two-legged variety of dinosaur tends to die out because they're

inflexible, unable to change, lack vision, or don't see the writing on the wall.

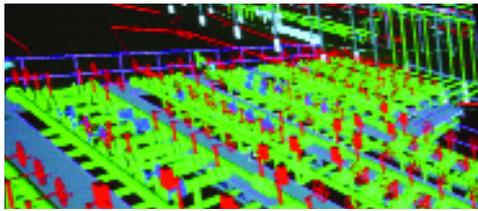
### Predictions

In the hope that 2010 will be better than 2009, I'd like to start the New Year off with a little serious humour. I've gazed into my crystal ball, as I do at the end of each year, and for the first time in this column, bring you my top ten predictions.

1. Apple invents a hybrid I-Phone car so that people can talk and drive to their heart's content while it charges itself.
2. Trimble introduces all-in-one robotic total station/scanner/laptop/CAD processor the size of your thumb – the Trimble thimble! From the comfort of your sofa, you tell it where to go and topo. Using embedded Google Earth it finds its way to site, switches on, and starts scanning. It will do its own calcs, analysis and drawings, and relay files through onboard email to the client. California version recharges its batteries from the sun; UK model charged via microchip that measures intensity of the rain.
3. Latest NASA moon shuttle discovers it really is made of cream cheese. McDonalds immediately applies for permit to build first pizza parlour next to the Sea of Tranquility (later renamed Sea of Inhumanity).
4. Sub-prime mortgages will still be loaned to those using the money to fill their petrol tanks.
5. "Yer know, kinda, like, I mean, totally, and brilliant," banned from the English language in public. What is said in privacy of own home between consenting adults still permitted.
6. Walmart drives every other store out of business in US by selling rubbish made in China for 1 cent. When no alternatives remain, they jack up prices so that a T-shirt costs \$999.99 + tax. Taxes add another 115% to help pay for ongoing wars in Iraq and Afghanistan, plus new ones in Brazil, Mexico, Russia, Bermuda and Somerset.
7. Unemployment rises to 99%. Politicians finally correct in promising it won't get any worse. Other 1% of Americans employed in Iraqistan.
8. Barack Obama hounded out of office by a sufficient number of paranoid Americans who believe him to be a commie pinko Moslem. He will be invited to be UK's next prime minister. Sarah Pain (sic) becomes extreme right's nominee and sails into the White House. I emigrate again to somewhere safer, such as Somalia or Afghanistan, where I take my chances with the pirates or Taliban, who may be slightly more dangerous but at least not stupid.
9. Tony Blair offered vice-presidency of the US if Rush Limbaugh turns it down.
10. After being ousted by the Green Party, Gordon Brown returns to Scotland to study writing at Edinburgh University.

*... so that you may be violent and original in your work.*

*Nick Day, FRICS, FRGS, PLS, is retired from the California Department of Transportation (Caltrans). He can be reached at feasibility.nick@gmail.com*



## The Sky's the Limit

From monitoring to cellphone masts, crime scenes and lost Leonardos, high density scanning has come of age. **Nick Day** reports for *GW* from San Ramon, California on Leica's annual HDS user conference.

It's 1456, and one day, over a pint at the local tavern, old Bart, who grows mangle worzels on a small plot of land, tells neighbour Jeb about the shiny new cart and horse he's just bought. Jeb ridicules him for having bought the model with solid wooden wheels, when, if he'd wait a little longer he could get one with spokes. A real visionary, if not much of an entrepreneur, Jeb rubs it in by mentioning that if Bart waits even longer – about 500 years! – he can get a Range Rover with spokes, the horse being redundant! So, what's the moral of this story, if there is one? How about early adoption of ground breaking new technology if you want to get a leg-up on the competition, develop new markets, add value, and stay ahead by upgrading when it makes economic and technical sense?

With papers from Korea to Turkey, Norway to UK, and Netherlands to USA, 250 attendees came from 20 different countries to Leica's fifth worldwide scanning conference, their enthusiasm undaunted as ever, eager to network, see what new and wonderful techniques others were using, and hoping, through osmosis, a little entrepreneurial spirit would rub off.

As always, **Geoff Jacobs**, Leica's senior vice president, strategic marketing, opened the conference, and announced that for the first time it would be webcast. This meant that online video and audio of speakers and Powerpoint slides would be available of the 38 presentations to attendees (\$95), the press (\$49), and non-attendees (\$195). Next **Juergen Dold**, president of Leica's geospatial solutions division, set the tone for the three-day event. He stressed opportunities in times of changes, changes such as those effected by mother nature. Can we foretell them, he asked? No. Can we understand them? Maybe. Changes by humankind – these we can plan for. Can we

predict the economy? Perhaps, if we don't bury our heads in the sand. Go into the future with eyes wide open. It's all about solutions, he said, terabytes of data; but it must be understandable.

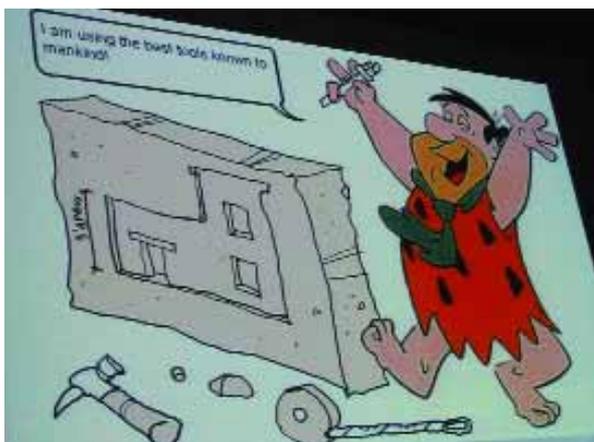
Taking centre stage was the new Leica ScanStation C10 (for more on the C10 turn to the last issue of *GW*, "Leica drive Viva at Emirates" p.34). Those who already had one were quick to sing its praises; others either have it on order and can't wait for it to arrive; or want it but can't justify buying right now. Dr Greg Walsh, one of Leica's masterminds behind the C10, gave a very comprehensive review of its design, construction, and capabilities during a morning session on the first day. He could hardly contain his enthusiasm in highlighting its new features, accuracy, and speed. This is clearly another pedigree in the Leica scanning stable.

### What it will and won't do

**Todd Beers** (Nolte Assoc) gave a presentation on monitoring subsidence of 335 wide flange columns in a 480,000 sq ft warehouse using HDS. Targets were required on all the columns, a task in itself, with 23 ScanWorlds needed over three days. He noted vertical accuracy of 5mm – 7mm. The scans were repeated six months later and detected maximum settlement of 38mm. It is doubtful whether the scanning accuracy will detect trends and it would almost certainly have been quicker and cheaper to have used levelling rather than HDS. As the Dutch say "You don't need an elephant to kill a mosquito."

**Seth Goucher** (Cianbro Constr, Maine) showed how they scan refinery expansion modules as plant fabrication QA prior to shipment by barge. These modules are enormous, and by doing a visual vs. quantitative analysis, they ensure the new module will fit right in to the existing refinery upon delivery. In a similar presentation the following day, **Stein-Erik Mitchell**, Aker Solutions, Norway, noted that despite the recession they were busier than ever. Their main business areas are the oil & gas industry, and they have 40 surveyors, 10-12 of whom work with laser scanning. He showed a typical day scanning on an oil rig in the North Sea, the work flow, and subsequent office modelling.

**Doug Brown** (StarNet Geomatics, Scotland) provided some rare humour as he explained their success in developing a niche market scanning cell and broadcast structures / sites in the UK. With a staff of about 42, and annual turnover of \$4 million, they appear to have cornered the market in what is essentially asset



*If you want to get a leg-up on the competition you've got to be an early adopter. . . and follow Fred Flintstone!*

sale auditing and due diligence for telecoms. Coining the name "Vertical Real Estate," Doug explained that structure owners make money from selling space on their sites. An explosion in requests from cell carriers over the past ten years – to put dishes etc on these structures – has put an enormous strain on the record system maintained by the large site portfolio companies, such as Arqiva in the UK. Costly mistakes are being made when selling space. Each structure takes about 1 ½ days, with 4 or 5 scan set-ups outside the cell site compound, and 6 or 7 inside. The two-man scanning team also identify who owns what on the mast, at what height and the space it occupies. Deliverables include: a registered point cloud, with equipment tagged; embedded panoramics and photographs; CAD plans and elevations; equipment schedules and tower face images; structural CAD drawings; and future planning/design.

### They heard it on the radio

**Richard Lasater** (SmartMultiMedia, Texas) takes a non-traditional approach to scanning, probably because most of their employees have technical multi-media and education backgrounds, rather than surveying or engineering. Started in 2006, they provide specialized educational and technical information to defined audiences. For example, using 3D visualization and video-based games to make it fun, they taught cancer patients what to expect with an MRI scan, and Hewlett-Packard engineers to learn products.

They heard about HDS scanning on a local radio station and thought it sounded "really cool." They figured that most people just didn't know they needed HDS, so translated their skills into teaching them about the technology. In one off-the-wall application they scanned sandcastles for an annual competition of 79 teams of design, engineering, architecture, and consulting firms. After posting the top five castles online – Truviews and raw point clouds – website traffic increased by 1500%. Line work was then pulled off the winning sandcastle to show "2D architects" how they can use HDS. He advised attendees to learn about the GSA Laser BIM initiative, learn Autodesk Revit, check out Google Analytics, visit [www.laserscanning.org.uk](http://www.laserscanning.org.uk), and to "Go scan something local!"

In the first of two forensics presentations, **Valentine Vanhecke**, dressed impeccably in the uniform of the Dutch National Police, showed the importance of scanning for major criminal incidents. As they can seldom return to the scene of a crime, everything, even evidence in hindsight, must be captured in one go. Their job he said is "finding the truth." He reconstructed the scene of the Queensday tragedy in Apeldoorn where a crazed motorist tried to ram the Royal Family's open bus. They were able to incorporate a bystander's video of the occasion into the scanworlds. They supplemented their scans using a 360° Spheron

*One of America's iconic heritage sites: a scan of The Alamo, San Antonio, Texas.*



camera that can lighten dark areas to help detectives; regular DSLR cameras; and total stations. RTK GPS, with centimetre accuracy, ties all data to the Dutch national grid.

### Geotechnical monitoring

**Pierre Gouvin** (GEO-Instruments, Rhode Island) showed how they're using two fixed ScanStation2s for the automatic geotechnical monitoring of a retaining wall in Seattle – apparently a world first. Specs called for 2mm accuracy. The SS2s have been specifically programmed for remote, unattended use. In addition, two automated motorized total stations have been set for 3D discreet point monitoring, along with the first large-scale WiSe (Wireless Sensor) installation in North America. Four in-place vertical, and four horizontal inclinometer arrays round out the equipment. The required project data is sent real-time to a web-based database – almost an industry standard now.

**Siro Kim** (WIPCO, South Korea) explained how vibrant the heritage market is in his country. WIPCO, with 10 employees, got into scanning of small objects with desktop scanners as far back as 1991. In 1999 they acquired a CyraX 2400, and now have a C10. In addition to heritage, they use scanning for architects, plant, consulting, and movie/entertainment apps. One particularly interesting project he showed was the Sungnyemun ("Gate of Exalted Ceremonies"), built in 1398, and Korea's no 1 national treasure. It is an ornately tiled, two-tiered, wood and stone pagoda. Partially destroyed by an arson fire on Feb 10, 2008, WIPCO immediately set about documenting the state of destruction to assist restoration. Fortuitously, and with vision on someone's part, WIPCO had originally scanned this treasure in 2002, but at the time no one recognized the importance.

**Carlos Velasquez** (Epic Scan, Oregon) with a staff of twelve, showed how TruView bridges the gap as a project communication and education tool. Starting off in archaeology and oil & gas, using GeoMagic and CloudWorx, they soon realized that the sky's the limit with applications. Like several other presenters, they believe client and market education will drive scanning to unprecedented levels. He noted that

*They were able to incorporate a bystander's video of the occasion into the scanworlds.*

90-95% of potential service clients have never heard of it, and that the construction industry could be a major beneficiary due to incredible inefficiencies at present. TruView is embedded in the work, even if the client doesn't ask for it – they get paid for it as it's all in the contract price. They point out value by asking the client how often in the past they returned to site for additional information. Charges for TruView deliverables provided via Epic Scan's web portal, [www.epicscan.com](http://www.epicscan.com) are good for up to a year for additional data, but they haven't yet figured out how to price beyond that. Webex brings it all together, and everyone should create their own portal. Epic Scan believes the future of TruView is that it: supports all web browsers, has polyline and polygon mark-up tools, has the ability to upload files, has increased image resolution, and can be operated from a cellphone.

*Tim gave kudos to his mum, Margaret Beach, BSc, MRICS, for having the vision to see scanning as the future.*

### Scan induced moratorium

Attending the first paper on the second day was a "no-brainer" for me, as Dr **Gurcan Buyuksalih** (BIMTAS/IMP) described scanning for one of my favourite, spectacular, and exciting world cities – Istanbul. City planners wanted to see everything in perspective, so 3D was necessary. Four HDS4500s and one HDS3000 were used, much data being captured using a mobile mapping system (VISIMIND AB-Sweden) through narrow streets at less than 5 kp/h. Interestingly, during the period of the survey, the city placed a moratorium on new buildings while they had a chance to analyse the data and plan for future development and restoration of existing buildings.

Another well-received paper came from **Tim Beach** (Multi-Limn, UK) who proved that you don't have to be big – how about a two-person outfit – to embrace new technology. In a disarming, and refreshingly candid presentation, Tim gave kudos to his mum, Margaret Beach, BSc, MRICS, for having the vision to see scanning as the future. 'Why a scanner,' he asked, rhetorically? Versatility, cuts down on staff, efficient, and perfect for QA. Tim uses their scanners on a daily basis, and followed with 'why scan everything?' Answer: If you have an expensive piece of equipment available it does

no good keeping it in the box; you might as well use it. Extra detail is captured; it doesn't just focus on the item of interest but detail that may be needed further down the line. It also aids in registration, puts the main item in context, and is a snapshot in time. Currently the breakdown of their work is: Topographic – 50% (80%); Building Surveys – 30% (100%); Setting Out – 10% (none); GIS – 5% (30%); and Boundary – 5% (80%). Figures in brackets are the percentage of projects on which HDS is used.

With emphasis on point cloud animations, **H. Devejian** (Precision Civil Eng, Inc, California) showed how they use them for effective marketing and client deliverables, and how they create high-end, small file animations using freeware. He covered Virtualdub, how to stream videos in hi-or-lo-res, and set filters. A typical 2½ minute video would take up about 300Mb, and stressed the importance of density and quality of exposure for a marketing video that could play on a 720 or 1080 HDTV.

### Mapping on the move

Mobile mapping was a popular subject, and Dr **Gunnar Graefe** (3D Mapping Solutions, Germany) showed how they're using HDS6000s along with eight cameras to do five city modelling projects in Munich. Their MoSES kinematic road mapping system consists of:

- *Module Trajectory – continuous determination of 3D position and orientation.*
- *Module Multi-Camera Documentation – digital images of road corridor and surface using multiple cameras.*
- *Module Multi-Camera Photogrammetry – overlapping images used for post-mission photogrammetric measurements.*
- *Module Laser Scanner – digital survey of road surface using multiple scanners.*

Originally inertial specialists, this expertise came in useful for providing control while scanning in railway tunnels – done from 2–4am. Scanning highways with high sound walls caused multi-path problems with the GPS signals, but they always drive the same stretch twice. At up to 100 km/h, coverage ranges from 100-400 km/day. All details, such as road markings, signs, traffic lights, guard rails, walls, trees, etc are captured, and relative measurements derived – width of lanes, clearance of underpasses, etc.

### Scanner fits the crime

The last day, Wednesday, started with a bang as **Sarah Watson**, a forensics expert from the Los Angeles Sheriff's Dept Crime lab, explained clearly how they are using HDS to help investigate many annual incidents. Their two ScanStation 2s, acquired in Sept 2007, are accessible 24/7 by four people (out of 22 crime scene staff). They also use the Nodal Ninja camera for 360° digital photos, and usually require soft lighting at night. A generator is used for prolonged scenes as they

*Below: Several large mosques in Istanbul were included in the scanning project.*



*Above: Dr Gurcan Buyuksalih, BIMTAS/IMP, Turkey.*

are often out for up to 18 hours. There is only one chance to gather all information in an active crime scene.

SWECO, Sweden, has 5300 employees in ten countries, and ongoing assignments in 80 countries. **Mattias Jansson** and Ivar Andersson noted that 70% of their work is for industry (steel & paper mills, nuclear plants, etc), 20% tunnels, and 10% buildings. They have 50 surveyors, 25 in each of two offices, and despite the recession, are having their best year ever. They described how they are using HDS for tunnels, controlled by a laptop, scanning every 10m for as-built documentation, and comparing actual results with theoretical. A ball prism is placed on the scanner for tie-in using a total station. Additionally, volume calculations are made for material removed, sprayed concrete layer thickness determined, and spatial deformations. Some of the benefits include: minimum impact on tunnelling operations; results of profile controls directly on site; and precise quantities for billing. They also scan other projects by helicopter, use a laser tracker, and are just starting mobile mapping.

While not exactly a rags-to-riches story, **James Hall** (VTN Consulting, Nevada) described how they managed to turn around an ugly situation in one of the worst hit housing markets in the US – Las Vegas. In 2006 they bought an HDS3000 for doing a topo of McCarran international airport. After that their bread and butter work – housing subdivisions – dried up. But with the experience gained at the airport, and seeing the potential of HDS, they upgraded to a ScanStation2, diversified their workload, and applied where appropriate. They used it for power line sags, cell towers, pumping plant piping, roads & bridges, and even a golf course, providing considerable cost and time savings to their clients.

### On the trail of a lost Leonardo

Leica always like to end their conference with something a little out of the ordinary, and this year was no exception. **Mike Olsen**, is part of CISA3, or the Centre of Interdisciplinary Science for Art, Architecture & Archaeology at UC San Diego/Oregon State University. He gave us a fascinating talk on how scanning has played an important, even if small part, in finding Leonardo Da Vinci's lost painting "The Battle of Anghiari". The lost Leonardo is believed to be hidden beneath later frescoes in the Hall of Five Hundred (Salone dei Cinquecento) in the Palazzo Vecchio, Florence.

Computer science and engineering researchers completed laser depth ranging, multi-spectral imaging, x-ray back scattering and acoustic analysis radar scanning to create a 3-D, virtual reconstruction of the hall. Then, non-invasive techniques, such as high-frequency, surface-penetrating radar and a thermographic camera were used to determine that Vasari had built another wall in front of



the east wall where the original fresco was reported to be located. There was a gap of 2-3 cm between the two walls, large enough for the older fresco to be preserved. T-rays, (terahertz frequencies) are found between microwave RF and far infrared – sometimes referred to as being "between electronics and optics" – are now being used to view murals hidden beneath centimetres of plaster. Billed as something out of the Da Vinci Code, I think the history (the mafia was involved in a bombing next door) has more of Angels & Demons about it, or even the Thomas Crown Affair.

*There was plenty of time for delegates to mingle and network during the San Francisco Bay dinner cruise.*

### Final Notes

On an educational note, **Lem Morrison**, who owns Mercator Land Surveying, and also teaches scanning at CUNY (College University of New York) told me that the number of students taking his course has grown from about 180 to 450, such is the extreme interest in the technology. And, Prof **Hong-Gyoo Sohn**, from Yonsei University, Korea, explained to me that the reason they had such a high percentage of women faculty/students in their programme was that scanning was seen as the softer side of engineering and surveying.

A scanner is a bit like a digital camera in that it costs virtually nothing to operate once you've bought it, so there's no point keeping it in the box. Get out and use it, and keep using it! And, no matter how competent you are in its use, and how good the instrument, it's no good if you don't have any work and don't market yourself. The true definition of a successful business/person is if they can survive and thrive during a recession. Anyone could make money in the boom times.

One person said they'd come away from last year's conference with two good ideas, and that was enough. I had mentioned in my 2008 report that if you come away with just one idea that gets you new business and helps you be competitive then it's worth attending.

• *The above is an edited version of Nick Day's report. For more information about the presentations described here and others not mentioned, Nick's original is available to subscribers, RICS and IIS members at [www.pvpubs.com](http://www.pvpubs.com)*

*T-rays, (terahertz frequencies)... are now being used to view murals hidden beneath inches of plaster.*

# Complex mixed use title structures in the Middle East

In the last issue of *GW* Mark Griffin introduced the unique system of property division based on strata being developed in Abu Dhabi. Here, **Alan Fox** explains in more detail how this is carried out in practice.

THIS PAPER addresses surveys in Abu Dhabi and Dubai for flat land, community title, volumetric title, strata and jointly owned property developments with an emphasis on development. This is intended as a generic document, not dealing with detailed survey processes, accuracies or drafting formats but as a general statement of survey requirements in complex mixed use developments.

### Foreign land ownership

Abu Dhabi and Dubai have only recently encouraged real estate sales to foreigners but with some title restrictions. These restrictions generally are that non UAE nationals may only buy real estate in designated areas, and that in Abu Dhabi the title issues a right to use land or buildings but does not transfer ownership of the land. This does not impact greatly on the survey requirements. We note that the survey regulations implementing these changes have not been passed as law at present.

The scale, style and scope of developments in Dubai and Abu Dhabi is beyond the comprehension of most people in other parts of the world, with most developments being very large master community developments.

### Community structure

Typically, master communities are mixed use developments and are planned and staged to be rolled out over a period of time. The term "uses" in communities and in buildings is used to describe the primary market that is being targeted. For example, residential, commercial, retail, hotel etc. Surveying for these projects is as much an exercise in developing a workable management structure as it is in creating titles for registration for

consumer level products.

Figure 1 details the typical hierarchy of a master development. The purpose of this hierarchy is to allocate management, control and costing of infrastructure to the appropriate level and to allow individual developers to complete their own projects within a regulated environment that provides certainty of service, cost and management structure from the master developer to the individual unit owner.

At each level the surveyor will create not only new plots for each of the management levels but will assist in creating other plans and documentation that will allow the on-going maintenance and management of the community through management documentation. Each level may create not only plots but common areas with the rights and obligations of each level being inherited by lower levels.

Each level will typically have an owners association that will manage the common area and the rights and obligations of that level.

### Master Community

Title to all land in Dubai and Abu Dhabi traditionally vests with the ruler and is usually gifted to the major developers.

Title to a master community plot is usually a flat land plot and the surveyor provides a coordinate based cadastral plan on the relevant coordinate system. In Dubai this is the Dubai Local Transverse Mercator System and in Abu Dhabi this is either Abu Dhabi Spatial Data Infrastructure or the Clarke 1880 Nahrwan datum & UTM projection.

Both Dubai and Abu Dhabi now have a network of continuously operating GPS stations and it is probable that all systems will soon be based on WGS 84 and UTM.

### Precinct and Neighbourhood levels

These levels create the management structure of the development. Depending on the size and structure of the development only the precinct level may be required. At this level the development is split into manageable mixed or single uses according to the master plan with each use or area being a separate plot.

Precinct or neighbourhood plots may be developed by the master developer or perhaps developed by sub-developers but conforming to the requirements of the master plan.

The plots are generally standard

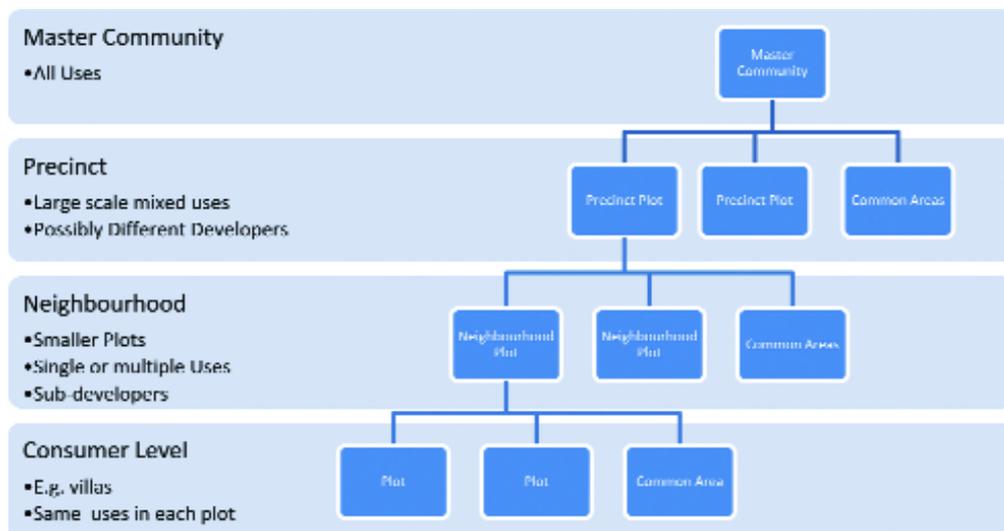


Figure 1: The typical hierarchy of a master development.

land plots unlimited in height but volumetric plots may be used when appropriate. Common areas can be left as a balance parcel but may also be defined by a plot to assist in calculating service charges. For instance, parks may be placed in separate lots but noted as being a common area to assist in the calculation of cost and to facilitate management.

The master community design dictates the use of precincts and neighbourhoods. At the root of the design decision is management and equitable cost sharing. A precinct may house several residential areas such as town-houses or high-rise apartments that are separated into neighbourhoods to better allocate the different maintenance costs. Another example would be where a precinct includes a central feature such as a golf course along with residential, or commercial neighbourhoods. The neighbourhoods would be used to separate the different uses and to control the type of housing around the golf course by means of neighbourhood management statements. These would also, for example, allow all neighbourhoods access to the golf course facility.

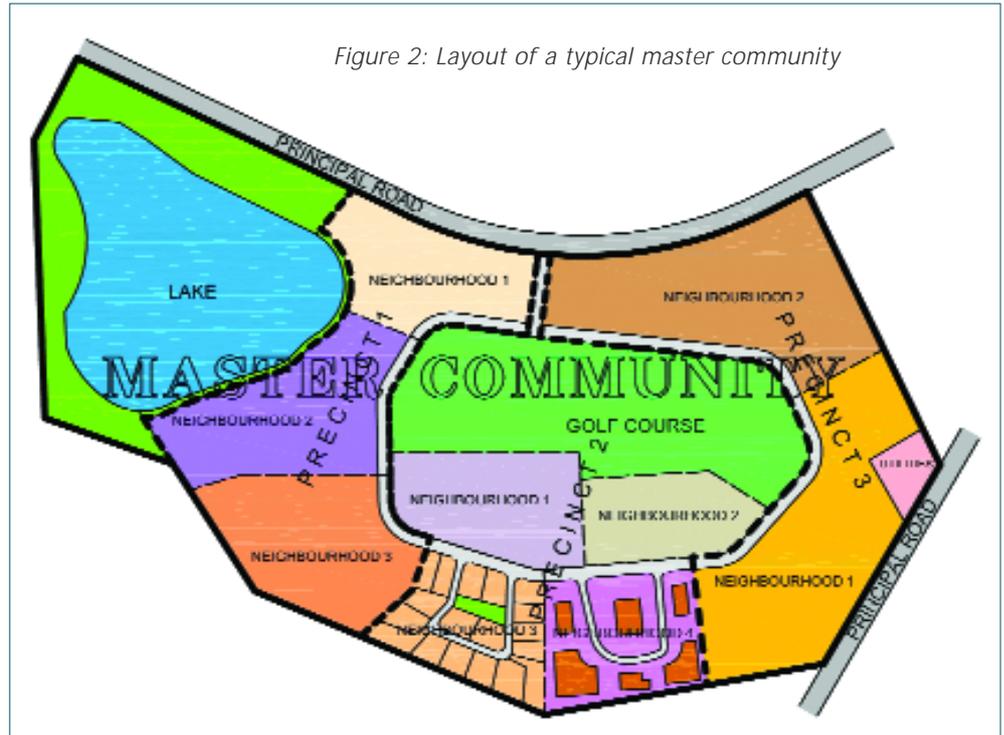


Figure 2: Layout of a typical master community

**Consumer level**

This level is where the final product is delivered to the end user. The titles produced at this level inherit all the rights and obligations of the previous levels, are guaranteed, have management structures in place and owners have democratic control of their units through representation on the owners' association.

Depending on the development and the use that has been defined for the neighbourhood, this title may be a plot for a villa or a strata plot within a high-rise building.

**Options for buildings**

It is usual to have several large buildings with shared podium, car parking and other facilities within each plot but with a diversity of uses. For example, it is common to have buildings with the upper levels being hotel, residential or commercial with the lower street levels being retail. Each of these uses has different costs and management requirements.

**Volumetric plots**

As with the master community, a separate title for each separate use is created so that there are a series of owners' associations with common rather than conflicting needs. Dissimilar uses in the one owners' association

usually results in management and equity issues. Where a standard plot is used to divide uses in a flat land subdivision, we use a volumetric plot to excise the different uses in a building, as shown in figure 3.

A volumetric plot is a plot with all the features of a standard plot but is simply limited in height and depth. It may itself be a subdivision of a volumetric or a standard plot and can be any of a variety of geometric shapes so that horizontally and vertically neighbouring titles and features join along common surfaces. A volumetric plot may also be composed of 'part plots' that are not physically connected.

The balance plot after the subdivision, is called the remainder plot. This is not common property but is a separate plot in its own right containing all areas above and below the volumetric excision.

While a standard land plot is defined purely by geometry, it is proposed in legislation that a volumetric plot may be defined by geometry, physical structure or a combination of both, as is the case for strata units. For buildings, this is a sensible approach as the boundary within a building is then easily identified by a physical monument.

*At the root of the design decision is management and equitable cost sharing.*

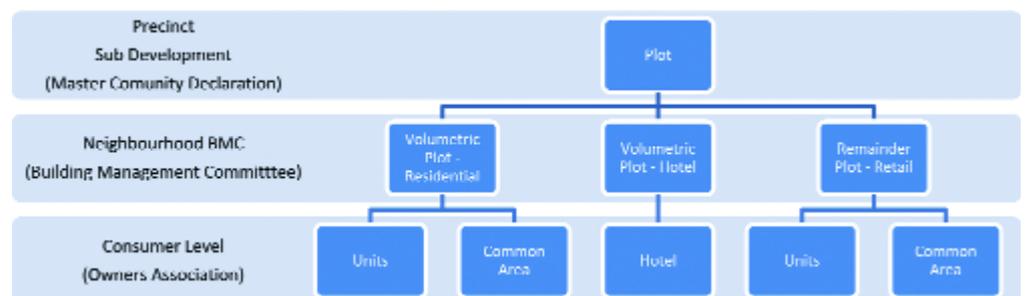


Figure 3: Volumetric plots for different uses within a building.

**Building Management Committee (BMC)**

Where a building is subdivided volumetrically, a management structure called the Building Management Statement is put in place to define the rights and obligations of the various plots in the building. These rights are administered by the building management committee (BMC). Another of the surveyor's tasks is to create the plans and documentation for the Building Management Statement, which describes the rights, obligations and costs of each plot in the building. This includes plans showing rights of access, volumetric boundaries marked on architectural plans and area calculations to be used in the allocations of costs.

**Strata unit subdivision**

There is a common misconception that a strata unit subdivision is a subdivision of a building. It is in fact a subdivision of a plot, which may contain all or part of a building, the strata title boundary being defined by the building structure. Strata subdivision, while a subdivision of a plot, uses the structure of a building to define the extent of the units being subdivided. Dimensions are treated as ancillary information only, with the monuments such as walls defining the plot boundary.

The strata subdivision creates units and common areas that are administered by the owners association. Common areas in buildings are the same for common areas in a master community subdivision whereby they are owned by all members of the owners association in common and managed by the association on behalf of the owners. It is important to note that generally common areas cannot be subdivided.

The purpose of the survey of a unit is to

verify the shape of the unit and to calculate and certify an area. Common area within a unit is excluded from the area calculation. The unit survey plans typically show some dimensions, areas etc and the common areas excluded within a unit.

As well as the strata survey plan, the surveyor prepares other plans that define the common property and rights of use in common property. For instance, an exclusive use plan may be prepared to show the car parking allocated from common area to a unit on an exclusive use basis.

Rights and obligations of all of the hierarchy above the strata unit, that is master community, precinct, neighbourhoods, building and owners association, are inherited by the unit and are noted on the title.

**Author's note**

I have not gone into great detail about survey accuracy standards, marking boundaries, which part of a building determines the boundary, inclusion and exclusion in strata titles, drafting procedure as these have yet to be finally accepted as law in Dubai and Abu Dhabi. However I hope the paper shows the survey requirements for complex large scale mixed use developments.

**About the author**

Alan Fox has been licensed as a surveyor in Queensland, Australia since 1962 specialising in land and building subdivision and titling. His company, LandPartners Middle East Pty Ltd has written the draft survey regulations for the Dubai Jointly Owned Property Legislation. LandPartners Middle East has been consulting on titling for over 7000 units in the Middle East since 2007. *Email:* [alan.fox@landpartnersmiddleeast.com](mailto:alan.fox@landpartnersmiddleeast.com)

*A volumetric plot is a plot with all the features of a standard plot but is simply limited in height and depth.*





# Amongst the bigger heads

By John Brock

Our columnist has been to Easter Island and to Chile for the International Cartographic Conference, taking in Machu Picchu, Cusco and other highlights.

The last two months have been packed solidly with my procurement of new work now that I am once again acting as a sole trader, as well as Topp Tours to the south coast town of Nowra, Dangar Island (named after surveyor Henry Dangar), the excellent mansion Yaralla, the underground coastal Fort Scratchley at Newcastle (2.5 hours north of Sydney) and a four-day classic to Orange. I also showed a spectacular Powerpoint presentation of "Ancient Wonders of the Holy Land" to the Parramatta Branch of the National Trust of Australia.

orders to discover and map the east coast of Australia. Unfortunately when we visited the site of this historic event the monument erected to it had had its plaque stolen so there is not actually any written memorial to pay tribute to it.

Our next port of call was Easter Island or Rapa Nui in the native tongue and Isla de Pascua in the Spanish of the occupying country, Chile. This is the island famous for its monolithic carved stone heads, which was discovered on Easter Sunday April 2 in 1722 by Dutch mariner **Jacob Roggeveen**. James Cook also recorded a stop at this enigmatic isle in March 1774 during his second voyage of discovery on Resolution accompanied by Adventure between 1772-75. Not much is known about the Polynesian culture which sculpted the huge lava stone heads but they were carved and erected before the late 1700's back maybe as far as 1400. All the heads which are standing upright were re-erectations because all of the originals were either pushed over by the subsequent inhabitants of the island or washed down in the tsunami of 1960. They are indeed an imposing spectacle along with volcano top stone dwellings from the late 18th century to the early 1800's. I had my picture taken next to one of the giant heads as I like getting my picture taken alongside anything which makes my own head look smaller!

Right: Spot the big head



## Parramatta inaugural foundation day lecture

Noted Australian historian Professor **Geoffrey Blayney** delivered a rousing initial Foundation Day lecture on Sunday November 1 in which he highlighted the contribution of Australia's second oldest city (1788) to the ultimate survival of the New South Wales colony.

## Big heads and Inca strongholds

En route to the International Cartographic Conference at Santiago in Chile, Kerima-Gae and I cobbled together a brilliant trip via Papeete in French Polynesia, Easter Island and Peru. Tahiti is the place where Lieutenant **James Cook** set up a temporary astronomical observatory at Fort Venus to make observations of the Transit of Venus in 1769 just prior to fulfilling his secret

## The lost Inca haven

Even though the existence of the mountain-top sanctuary of the Incas, Machu Picchu (which means "old mountain") was well known to the local indigenous families, it did not become a worldwide attraction until the American **Hiram Bingham** made a report on his 1911 findings in the National Geographic magazine. Since that time millions of visitors have marvelled at the hilltop haven that had been home to religious scholars, part of the Inca elite between the 1200's and mid 1500's. The astronomical knowledge of this civilization was extremely advanced as it formed the basis for their worship of the Sun God who by nature was the ultimate controller of their survival through the cycle of the agricultural seasons. Walking around the site is not overly difficult but the bus trip up and down the side of the mountain has to be one of the scariest rides on earth.



Above: Chief Brocky doing the Easter Island war dance before joining a happy band of Easter Island warriors.



Back in Cusco, which is a 3.5 hour train trip from Machu Picchu, we were able to take tours to the many Inca sites which surround the former capital of the great empire. One



Above: in the mists of Machu Picchu and right: with Colonel Juan Vidal Garcia-Huidobro at the International Cartographic Conference in Chile.



strange sensation that I experienced was slight altitude sickness as Cusco sits at 3400 metres above sea level which is nearly 1200 metres higher than Australia's highest mountain Mount Kosciuszko. Unperturbed we forged onward through Saqsaywaman, Qenqo and Písac all of which demonstrate the incredible masonry skill of the Inca craftsmen along with their amazing feats of engineering to quarry, transport and assemble massive granite building blocks up to 600 tonnes each for

• John Brock is a Registered Surveyor in Australia and is a stalwart of FIG and its Permanent Institution for the Art and History of Surveying.

distances of many kilometres up and down precipitous mountainsides.

**Military cartographic might in Chile**

The Escuela Militar (Military School) in Santiago, Chile was our most gracious host for the International Cartographic Conference being held for the first time in South America from 15 to 21 November 2009. Along with an excellent selection of papers on cartographic topics there was a brilliant international map and atlas exhibition and the Barbara Petchenik Children's Map Competition showcasing the interest and high quality of mapping education in high schools all over the world. The President of the ICA is an Australian Professor from the RMIT in Melbourne, **William Cartwright** while the Congress Director was Colonel **Juan Vidal García-Huidobro**, Director of the Escuela Militar. We were treated to an Equestrian Gala by the elite horsemen of the Military Academy as well as a cultural show at the Lo Curro Military Club on the hillside outside the city. Our hotel was in the next street from the house of the Presidente de Chile, **Michelle Bachelet** in the elegant suburb of Las Condes, which is close to the congress venue. All in all, a wonderful success for which it was most pleasing to be in attendance. Warm congratulations to all involved.



**ProMark 500 + ProFlex 500**  
**MAXIMUM FLEXIBILITY**

**Multi-constellation RTK Surveying by Magellan**

Designed by our GNSS experts, ProMark 500 survey solution delivers state-of-the art RTK features in a light, rugged cable-free rover that gives you maximum mobility and flexibility in the field. Its unique GNSS engine insures fast initialization, long-range accuracy, robust signal tracking, and secures future constellation evolutions.

ProMark 500 and now the new ProFlex 500 for backpack and remote antenna applications bring the best Magellan technologies for the survey market. These receivers include all the features that users expect for productive and reliable RTK GNSS positioning.

Embedded BLADE technology provides the best possible measurements from three constellations GPS+GLONASS+SBAS and full interoperability with any vendor's reference station transmitting GPS+GLONASS L1/L2.

To learn more about the unique BLADE technology, and take full benefit of any available GLONASS corrections, visit [www.ormtec.co.uk](http://www.ormtec.co.uk) today

**Ormston Technology Limited**  
 Beverley Business Centre  
 St Nicholas Road  
 Beverley HU17 0QT  
**Telephone** 01482 677655  
**Fax** 01482 677650  
**E-mail** sales@ormtec.co.uk  
 Visit us at:  
[www.ormtec.co.uk](http://www.ormtec.co.uk)



©2009 Magellan Navigation, Inc. All rights reserved. Magellan, the Magellan logo, ProMark, ProFlex, BLADE and FAST Survey are trademarks of Magellan Navigation, Inc.

## Software for CAD

Based on IntelliCAD software, GStarCAD provides OpenDWG file compatibility (a similar environment to AutoCAD) plus full support for AutoCAD commands, menus, scripts, styles, patterns etc. Distributed by South Survey, the software offers Windows integration and productivity features including the ability to open multiple drawings (MDI) at a time; a drawing explorer, which lets you review and exchange drawing content with drag-and-drop ease; and visual customisation of menus and toolbar. In addition, when an existing AutoCAD file (AutoCAD2.5 to 2009) is opened, there is no file conversion or data loss. The software comes in various versions: a free 30-day trial is available for both the standard and professional versions; a Dongle version, allows use on any computer at any time; and network versions are available. Prices start at £352.00 for a single license. Call 01200 429870 or visit [www.southsurvey.co.uk](http://www.southsurvey.co.uk) for more information.

## Waveform digitiser

Leica Geosystems has introduced a full-waveform digitiser designed for use with its ALS-series of airborne lidar systems. The Leica WDM65 is offered for new ALS60 system controllers as well as for existing ALS60 and ALS50-II systems. The company's approach to incorporating the digitising function means no additional external hardware is needed to record return signal waveforms. Control of the digitiser is integrated into the company's flight and sensor control management software (FCMS) for ease of use and data output is fully compliant with the latest LAS 1.3 standard. In addition, the incorporation of solid-state recording media as part of the upgrade allows the system's operational envelope to increase to the ICAO (International Civil Aviation Organisation) 25,000 foot level for unpressurised aircraft.

## NetView user experience zone

LFM NetView is a web-based application that allows users to access, review and mark-up laser scan data remotely via the "BubbleView" interface. The BubbleView provides a three dimensional, 360° photographic perspective of the laser-scan data, with full colour support and in high resolution to make the finest details visible. The application from Z+F UK can benefit customers in the fields of cultural heritage and archaeology, forensics, architecture, engineering and construction, and asset management. Benefits of the application include: a range of measurements and annotations; ease of navigation – users can navigate between BubbleViews via the key (floor) plan; resolution and accuracy are guaranteed – NetView works by connection to the underlying point cloud database in LFM Server. Visit the user experience zone at <https://netview.zf-uk.com/> to access fully functioning demonstration projects.

## Upgrade for point cloud software

In addition to a new point cloud engine for Cyclone that is 3-4x faster for importing datasets, Leica Geosystems has announced three new software products for scan data import, forensic scene mapping and modelling complex 3D surfaces. A standalone Cyclone Importer module is now part of the Cyclone 7.0 software suite. This "open systems" module enables the direct use by Cyclone of scan data – including registration parameters – from various third party scanners. ForensicMap Pro, developed by MicroSurvey, builds on the developer's existing software for mapping forensic scenes and incidents and takes advantage of Leica's point cloud engine technology. Developed by Technodigit SARL, 3DReshaper software enables users of laser-scan data to create smooth surface models of very complex 3D geometry surfaces.

## New manhole cover lifter



Designed by a surveyor, for the surveyor new lifter the latest manhole lifter from MH Surveys is the Wheeler Lifter. The device, which weighs only 9 kgs and is rated to lift 200kgs, has been designed to enable the safe lifting of covers at a lower price – only £330.00. The lifter also folds flat for storage and is easy to operate. Developer Mark Harris of MH says: 'In this tough economic climate, companies need to reduce costs and the Wheeler Lifter is a good way of achieving this. A single person can lift covers quickly and safely. This lifter will also allow you to comply with current health and safety manual handling regulations.' For more information, call 01905 763361 or visit [www.mhsurveys.co.uk](http://www.mhsurveys.co.uk).

## BRIEFS

Improvements in Maptex's latest release of I-Site Studio 3.3, a laser scan modelling software, are designed to streamline routine mine surveying tasks. Automatic toe and crest detection aims to save time in open pit surveys and a new global registration tool uses a single step process to register multiple scans and objects together. Plus, when viewing sections through scanned data, an interactive tool allows users to arbitrarily place and manipulate section planes.

The Leica mojoMINI 3D lightbar guidance system comes with standard street navigation for daily use in any on-road vehicle. With the company's SmartAg antenna and GLIDE technology for improved in-field accuracy, the product has a 4.3-inch, touch-screen display with multiple guidance options and a calculator feature for calculations on the go.

Designed as a technology

platform that exploits application niches, the Pegasus is the latest member of OpTech's airborne laser terrain mapper (ALTM) product family. The company sees this system as a new paradigm in lidar mapping and imaging technology offering a multiple look-angle approach to data collection and fully embedded digital camera solutions ranging from 5 to 60 megapixels.

Chaos Systems' Topocad version 12, a CAD system for survey, design and mapping, contains new features including: an enhanced edit properties function; an associative dimensioning function where the dimensioning comes along when the object is edited; and users can handle system files differently – save them in XML-files and they can be saved as one file, easier for everyone to handle and to send to other users.

Blue Marble Geographics announced the release of a beta version of GeoTranslate 5.1 with Spatial Connect along with GeoTransform 6.1.

**EMERGENCY RELIEF**



**MapAction**  
Supporting humanitarian operations with real time mapping

**THE EMERGENCY MAPPING CHARITY**  
How can your company help us?  
[www.mapaction.org](http://www.mapaction.org)  
Charity Reg. No. 1075977

**GIS CAPTURE DEVICE**

VISUAL TECHNOLOGIES  
**spheronvr**

for demonstrations  
tel UK - 01525 242140



[www.spheron.com](http://www.spheron.com)

**LASER MAPPING**

Suppliers of the latest laser scanning technology for high precision, 3-dimensional surveying and mapping.

**3Dlaser mapping**



+44 (0)870 4429 400 [3dlasermapping.com](http://3dlasermapping.com)

**GIS SOFTWARE**

**Cadcorp SIS®**  
Spatial Information System®

- OpenGIS® certified compliant
- Reads 100+ formats in native form
- Middleware free access to databases
- Desktop to Web solutions

Cadcorp: (44) 01438 747996  
[www.cadcorp.com](http://www.cadcorp.com)



**IMAGERY**



**bluesky**

- Aerial Photography
- Height Data
- 3D Modelling
- Thermal Imagery
- ProximiTREE™
- Historical Data

T 01530 518 518  
E [info@bluesky-world.com](mailto:info@bluesky-world.com)  
W [www.bluesky-world.com/gw](http://www.bluesky-world.com/gw)

BS051AD/GMW/0110

**SURVEY**

**Geomatics Group** Integrated spatial data

Geomatics Group, a leading provider of high quality, integrated geospatial solutions.

- Aerial LIDAR surveys
- Aerial photography
- Bathymetry
- Thermal imaging surveys
- CASI
- Lynx Mobile Mapper™



[www.geomatics-group.co.uk](http://www.geomatics-group.co.uk) or call us on 01225 487637

**PUBLICATIONS**

# SURVEY REVIEW

**Survey Review is a leading and prestigious journal published quarterly by Maney Publishing on behalf of Survey Review Ltd.** The journal brings together an unrivalled body of knowledge in the land and engineering survey profession, with papers on research, theory, practice and management.

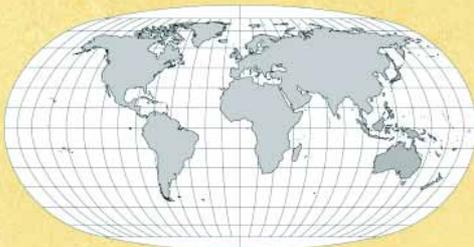
All papers are refereed and drawn from world-wide sources; government, private industry and academia. The journal is invaluable to practitioners, academics, researchers and students alike anxious to maintain the currency of their knowledge in a rapidly developing field.

Further information and abstracts of recent issues can be found at [www.surveyreview.org](http://www.surveyreview.org). Orders and specimen copy requests should be sent to:

**Subscriptions Department, Maney Publishing,  
Suite 1C, Joseph's Well, Hanover Walk,  
LEEDS, LS3 1AB, United Kingdom.  
(email: [subscriptions@maney.co.uk](mailto:subscriptions@maney.co.uk))**

**January 2010 contents**

- The perspective from Asia concerning the impact of Compass/Beidou-2 on future GNSS
- An integral for geodesic length after derivations by P.D.Thomas
- Land subsidence using absolute and relative gravimetry: a case study in central Taiwan
- Space resection in photogrammetry using collinearity condition without linearisation
- Semi-automatic building extraction in dense urban settlement areas from high-resolution satellite images
- The least-squares estimation of adjustment model constrained by some non-negative parameters
- Integrated GPS and Pseudolite Positioning for deformation monitoring
- Network code DGPS positioning and reliable estimation of position accuracy
- Measurement of cross-slope of roads: evaluations, algorithms and accuracy analysis



[www.surveyreview.org](http://www.surveyreview.org)

**SURVEY cont'd**



**3i Surveys**

- Measured Surveys
- Site Surveys
- CAD Drawing Bureau
- Project Management
- FM Data Services
- Asset Audits
- GPS Surveys

www.3iSurveys.com

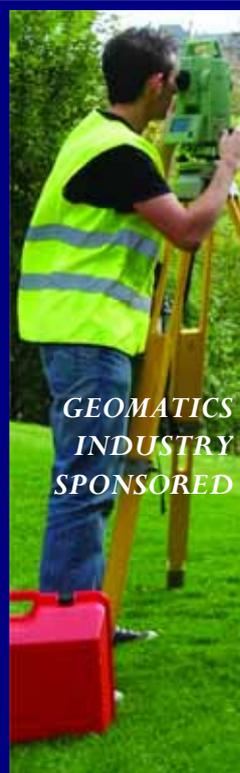
Autodesk  
Gräbert  
iil

3i Surveys Ltd. T +44(0)845 675 5055

**ADVERTISERS' INDEX**

Applications in CADD	p.26
APR Services	p.7
GEO-10	p.4
Korec	p.23
Leica Geosystems	p.19
MH Surveys	p.20
Ormston Technology	p.40
SCCS	p.8
Survey Review	p.42
Topcon	backcover
Trimble	inside frontcover

**COURSES**



**RICS & CInstCES accredited Geomatics Programmes**

**MSc, PGDip, PGCert or CPD**  
(part time or full time from 5 weeks to 3 years)

**Geospatial & Mapping Sciences (RICS, CInstCES);**

**Geoinformation Technology & Cartography (RICS);**

**Landscape Change Monitoring and Mapping**

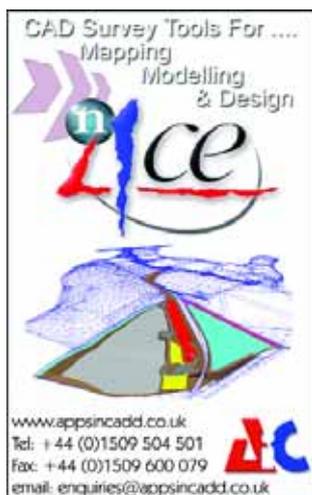
**Commencing each September**

For further information contact:  
**Jane.Drummond@ges.gla.ac.uk**  
or  
<http://www.ges.gla.ac.uk:443/degrees/postgraduate/courses>

**GEOMATICS INDUSTRY SPONSORED**



**SURVEY SOFTWARE**



CAD Survey Tools For ....  
Mapping  
Modelling  
& Design

**Lace**

www.appsincadd.co.uk  
Tel: +44 (0)1509 504 501  
Fax: +44 (0)1509 600 079  
email: enquiries@appsincadd.co.uk



**LSS**

Surveying and terrain modelling software from £250

See it in operation  
[dtmsoftware.com](http://dtmsoftware.com)

**RECRUITMENT**

**Mapping Sales Consultant - North West**

KOREC is a well-established company providing a variety of solutions for the Construction, Survey and GIS markets. We are one of Trimble's largest distributors worldwide and have offices in the UK and Ireland. Trimble applies technology to make field and mobile workers in businesses and government significantly more productive. Solutions are focused on applications requiring position or location—including surveying, construction, fleet and asset management, public safety and GIS.

**The Role**

KOREC has enjoyed excellent sales growth for the last 5 years and is looking to build upon this success with the appointment of a Mapping Sales Consultant in the North West (M6 Corridor). The successful candidate will be responsible for maximising the sales of Trimble Hand Held GPS Data Collection products for a wide range of applications.

**The Candidate**

The right candidate will be a self-starter, with a will to succeed in a business-to-business sales environment. You will have experience in GIS Data Collection or Land Surveying GPS products, be ambitious, tenacious and have a 'sense of urgency'.

You will have excellent communication skills, written and verbal, and outstanding negotiation and presentation abilities at all levels. Above all you will have the confidence, commitment and ability to sell innovative positioning solutions.

This is an outstanding opportunity to join a company with market leading positioning solutions. A substantial package comprising Salary, Incentive, company car and pension is available to the right candidate.

All applicants should forward a letter of application marked Private & Confidential to HR Manager, KOREC, Blundellsands House, 34-44 Mersey View, Liverpool L22 8QB, or by email to [hr@korecgroup.com](mailto:hr@korecgroup.com). Closing date end of January.



**Measured Solutions**  
Construction | Surveying | Mapping



**GLS-1000**



- New Scanner technology
- Easily creates 3d point clouds
- Image integration with built in camera
- Internal batteries for optimal portability
- Eye Safe Class 1 Laser
- Site-ready scanning solution



**GLS-1000 Laser Scanner**

Only from Topcon, the pioneer of Digital Imaging Surveying.

[www.topcon.co.uk](http://www.topcon.co.uk)