



Surveying for geographical and spatial information in the 21st century

The shape of measurement to come: the IMMS



Leica's world revealed at Arsenal's home



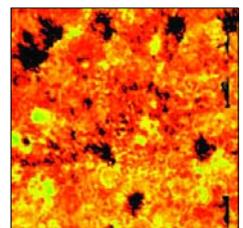
When maps go wrong. Apple's new views



How do you measure up in our Surveyors Survey?



Stonehenge scanning reveals new details



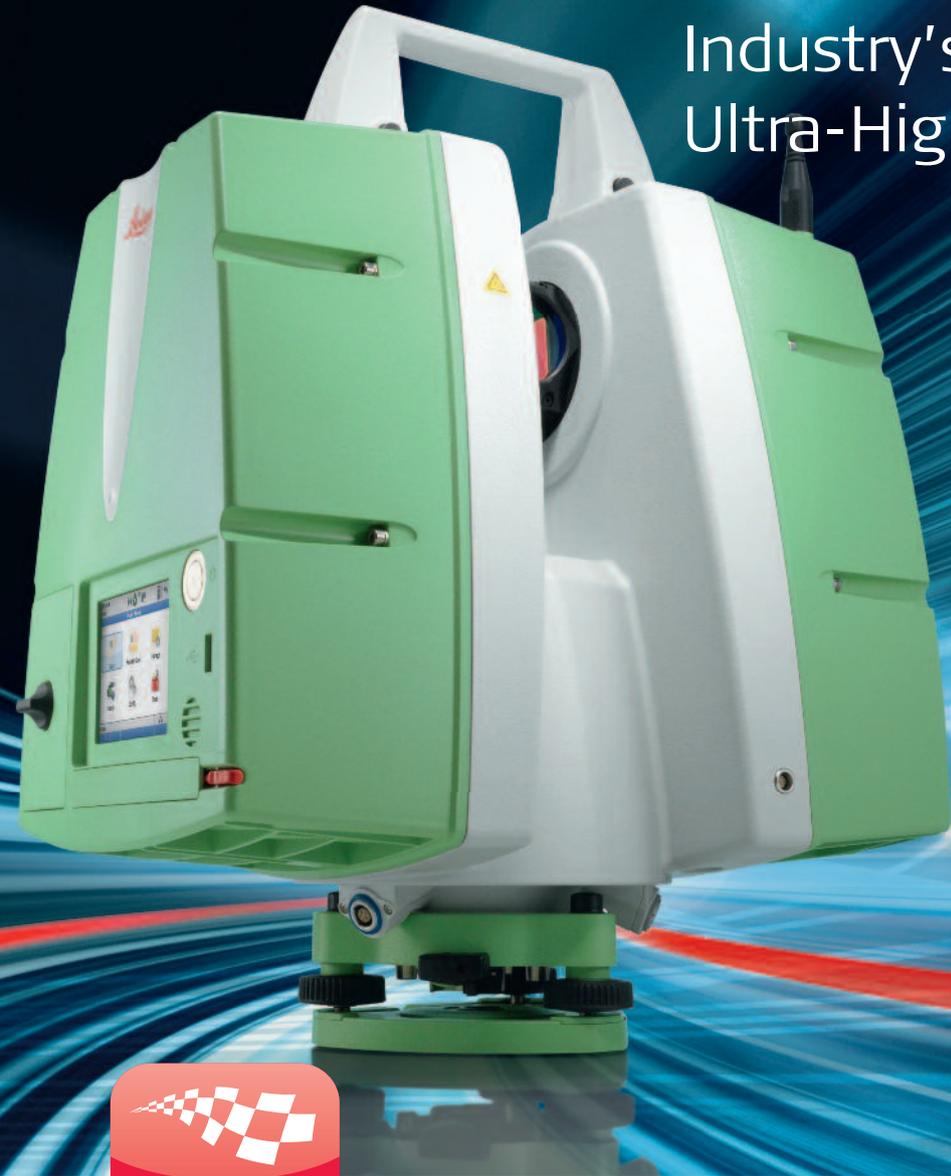
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20th ANNIVERSARY ISSUE

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Email: uk.sales@leica-geosystems.com
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Leica
Geosystems



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COVER STORY

FIG President and RICS member **CheeHai TEO** at the Intergeo argued that "we need to be in the business of providing information and ultimately knowledge." Full story on page 26.

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Would you like to receive the electronic version of GW?

Many RICS members overseas receive an electronic version of GW. To receive the printed edition too overseas members must opt in. If you haven't already advised us please go to:

<http://www.pvpubs.com/OverseasRICS>

and register your requirements. Meanwhile, UK and Irish readers as well as subscribers can also receive the electronic version, which is sent at least a week ahead of the printed copy, by emailing a request to barbara@pvpubs.demon.co.uk

• **NOTE:** the electronic version can now be downloaded as a PDF and printed.

Next issue

The next issue of GW will be that for January / February 2013.

Copy dates are: Editorial: **10 December** Advertising: **19 December 2012**

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An apology and a celebration!

The technologies of the last 20 years have all helped grow the business for geospatial data.

Welcome to the 121st edition of your journal. But before the celebrations I must apologise to several authors whose copy we have had to hold over until the next issue. On the plus side I can promise that we have an excellent issue lined up to start the new year off. It will include a report of the recent ISPRS Congress; an award-winning and ingenious application that combines laser-scanning and multibeam sonar; an assessment of the accuracy of a free software that can create 3D meshes from digital imagery; and an unusual measured building survey involving 200 dead pigeons!

GW began life in November 1992 as *Surveying World* although its origins go back earlier with predecessor publications like *Chartered Land & Minerals Surveyor* (CLAMS). The early 1990s like today were tough. A recession that began in the late 1980s (does anyone remember the Lawson Boom?) was still extant. But recession and tough times often spawn innovation. Who would have predicted the launch and success of a new daily newspaper in the UK last year, the "i"? So it was 20 years ago when RICS teamed up with Dutch publisher GITC to produce *Surveying World*. Your current publisher's involvement dates from 1994 when we came in to support GITC's advertising sales and relieve RICS of finding suitable editorial. We became sole publishers in 2005.

The current recession has been tough for small publishers. Previous revenue streams from classified and recruitment advertising have all but dried up and an abiding belief (foolish in some quarters) that the Internet can provide an acceptable substitute, have contributed to a leaner journal. Nevertheless, RICS has continued to subsidise *GW* and we as publishers have continued to invest in the website which enables all RICS and subscribing readers to access the back archive. Expect some improvements soon on that front as we refresh aspects of the site.

We have come a long way in 20 years. Firms have come and gone and so have individuals including some real giants like **Bomford**, **Cooper** and **Richie**. But it is primarily the technology that has changed; not the professionalism of surveyors. This issue demonstrates this well. In the early 90s close-range orthophotos were certainly capable of capturing the stone surfaces at Stonehenge but not in the detail that laser scanning has revealed. Indeed, 3D laser scanning is arguably the single biggest game changer in the last two decades. It has enabled surveyors

to tackle many tasks that were either impossible or beyond economic possibility.

Despite the recession the world today is one that relies very heavily on geographical information underpinned by accurate geospatial data. Back in the 1960s when the first EDMs arrived many thought they would cause job losses. Like the computer, many believed there was only work for two or three EDMs in the whole country. What we have learnt since then is that EDMs, like GPS and like laser scanners, all help grow the market for geospatial data.

In an interesting piece of late news our colleagues in the Hong Kong Institute of Surveyors have decided to add the prefix "Sr" to their names to denote a qualified surveyor. The move is said to help promote the profession to the public in a not dissimilar way that European engineers prefix themselves "Ing.". I am not so sure that it would work here in UK or in Europe because the prefix also denotes "Mr" in Spain and Italy. It is also the abbreviation for the element strontium. Maybe we should consider "Surv". Answers and suggestions as usual to editor@pvpubs.demon.co.uk

Finally I would like to wish all readers a very happy and peaceful holiday season and in the words of the late Irish comedian Dave Allen, 'May your god go with you'.

Stephen Booth, Editor

TEN YEARS AGO:

GW November/December 2002

A striking cover showed a laser scan of two members of the University of Newcastle's Geomatics team at a BBC *Tomorrow's World* Roadshow.

Meanwhile the RICS, ever at the forefront of cutting edge technology, announced that the Geomatics Faculty Board would hold virtual meetings.

By a poignant coincidence the issue carried an article about Rollei, which followed a visit the editor and **Rory Stanbridge** made to the company's headquarters at Braunschweig, Germany. We were conducted around and entertained by **Jürgen Fahlbusch** whose untimely death we report in this issue.

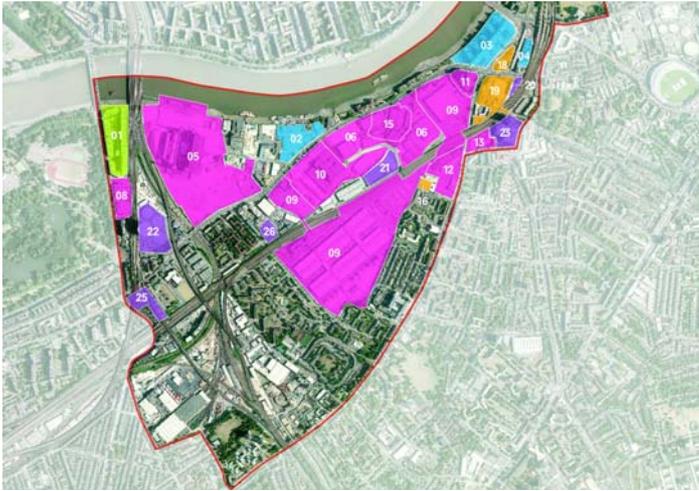
In other articles **Robin Waters** was explaining why RICS Geomatics was raising its standard on the world stage and **Alan Wild** was questioning the outcome of the then recent quinquennial review of Ordnance Survey.

The issue also carried eight recruitment adverts, reflecting the buoyant trading times.

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

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Bluesky maps major London development



Aerial photography from Bluesky has been used to create an interactive map illustrating the massive regeneration project (above) which is transforming London's South Bank. The project is set to metamorphose the Nine Elms district of London from a semi-derelict, light industrial zone into an ultra-modern residential and business district, which incorporates the regenerated Battersea Power Station, the new United States Embassy and the New Covent Garden Market. The online map - www.nineelmslondon.com/map - provides detail for each element of the project using the aerial photography as a backdrop to highlight the position of the district within central London. The tool will be used to promote wider awareness for the programme and is designed to attract investors and end users. It will also be used to keep local people up to date on important developments.

A £1 billion transport improvement package will make Nine Elms on the South Bank as well connected as the rest of Central London. Two new Northern line underground stations will provide fast, direct links to the West End, City and North London. There will also be new riverbus piers, new bus services and a new network of cycle lanes and footpaths. The Vauxhall Gyratory will be remodelled to create a more pedestrian friendly environment and a new bridge across the Thames will link the area to Pimlico on the opposite bank.

Bluesky supplied the full colour, geographically accurate aerial photography to the Nine Elms Vauxhall Partnership. Co-chaired by the leaders of Wandsworth and Lambeth Council, the partnership includes the area's main developers and landowners, the Mayor of London, Transport for London and the Greater London Authority and is supported by a dedicated Programme Delivery Team. The project will provide up to 22,000 construction jobs over the next ten years.

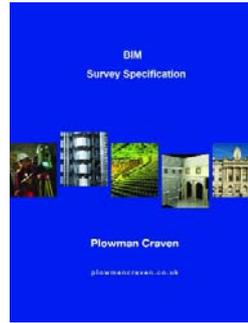


Two GEO-Events for 2013

PV Publications will be running two GEO Events in the UK next year. In response to demand from visitors in the north, GEO-North will take place on 7 March at the Reebok Stadium, Bolton. For visitors in the south GEO-South will again be at the Holiday Inn Elstree on 1&2 May. Registrations for both events will open on 1 December.

For details of exhibitor opportunities please call Sharon Robson or Stephen Booth on +44 (0)1438 352617 or email sharon@pvpubs.demon.co.uk

Survey spec for BIM



Plowman Craven has produced a BIM survey specification available for download via the company's website. It is arranged in three parts: an outline description of surveying for BIM; a checklist to specify what is to be surveyed and; a reference document, aimed at the client's BIM manager on detailed modelling methods and considerations. The specification breaks the surveying process down into five stages: survey control; scanning; high dynamic range photography; using TruViews to collaborate with the client prior to modelling; and modelling for BIM.

Communication is central to the process to ensure that both client and surveyor truly understand what is needed and keep a tight control on the job. The specification defines five levels of detail for BIMs ranging from mass block models through to detailed architectural models, which are related to city model levels of detail. It also gives guidance on suitable point cloud densities for each level.

On accuracy, it draws a distinction between the accuracy of the point cloud data and the tolerance to which 3D entities are modelled from the point cloud data. The latter is defined in terms of maximum deviation between the modelled feature and the point cloud.

The document recommends the Revit modelling process to keep responsibility for geometrical integrity in one place and discusses ownership of the point cloud and the model. There is also a description of the deliverables.

This document is immensely valuable for anyone involved in measured building surveys and can be downloaded from <http://www.plowmancraven.co.uk/bim-survey-specification/>

OGC bid for LandXML

The Open Geospatial Consortium (OGC) has established a Land Information Domain Working Group (DWG) with the aim of bringing the existing Land XML model and schema under OGC's wing. LandXML has been developed over the last decade or so by volunteer organisations and individuals, outside any standards authority. The objective is to bring about comprehensive integration of survey, civil engineering and other land-based data in CAD and GIS databases. This would promote non-proprietary data transfer within and between these industries and could serve as a common standard for recording topographical features.

Organisations wishing to be involved in this process need to be members of OGC. The price for commercial organisations is \$1100 and for government \$500. For the draft charter visit:

https://portal.opengeospatial.org/files/?artifact_id=50172

UK to host 51st Marine Measurement Forum

The Hydrographic Society UK (THS UK) is to host the 51st Marine Measurement Forum event in Southampton on Wednesday 5 December 2012.

The Marine Measurement Forum (MMF) is an established series of one-day, non-profit events providing opportunities for informal exchange of ideas, knowledge, techniques and developments across an extensive range of marine scientific measurement activities. Attendees typically include scientists, surveyors, engineers and business representatives from a wide variety of organisations including institutions and research bodies, academia, societies, manufacturers, survey companies, consultancies, monitoring authorities, dredging companies, port authorities, offshore oil and gas concerns. For more information and registration visit: www.mmf-uk.org or www.ths.org.uk

Blom in emergency response

In May 2012 the Emilia Romagna region in Northern Italy, was hit

by a seismic swarm, which led to a number of earthquakes, measuring upwards of 5 on the Richter scale. Following two earthquakes on the 19th and 28th May, Blom flew and captured 70 km² of ortho imagery at 7cm GSD, and 450 km² of 10/15cm GSD of oblique imagery. The data captured was made available for the Italian Civil Defence and Regional Government and is being used as a resource for damage estimation, rescue planning activities and clear-up operations.

The imagery was rapidly uploaded to Blom's geoserver BlomURBEX in order to further facilitate immediate access to the data required by the local entities affected by the earthquake.

How do you weigh an ocean?

Marion O'Sullivan, blogging in NERC publication, Planet Earth Online reports on the unusual idea of weighing the global ocean at a single point to assess how big it is. The principle of the technique is to use measurements of changing pressure at a single point in the central Pacific to estimate the mass of the world's oceans. The measurements will help oceanographers to distinguish the different causes of sea level change such as melting ice, warmer water causing expansion and greater evaporation. For more visit: <http://planetearth.nerc.ac.uk/blogs/key.aspx?id=1037>

Government committed to Disabled Access

The Government is committed to providing an accessible public transport system in which disabled people have the same opportunities to travel as other members of society. The programme is known as 'Access to All'. In support of the programme Warner Land Surveys have so far surveyed twenty stations. The surveys combine traditional land survey techniques with 3D laser scanning to produce a combination of 2D / 3D AutoCAD products. The point clouds are fully geo-referenced, and supplied to the client in .imj and .pcg formats. Included in

PPP v. DGNS CORRECTION

We apologise to readers of the printed journal for an error in the September/October issue's article on Precise Point Positioning versus DGNS. Table 1, which compares the measurement biases and errors that need to be applied or accounted for in typical PPP and DGNS positioning techniques, was published with only bullet points in the table. The corrected version showing the individual attributes is available on line if you log in at www.pvpubs.com

each site survey is the lifting of the ten most significant manholes in order to photograph, plot and record critical measurements to assist with design considerations.

Using the 3D laser scanner to survey the areas required in 3D, reduces the site survey time and can be carried out with no disruption or delays to the running of the station. Warner's in-house dedicated CAD team then process the data for QA by the Rail Manager, before issue to the client in its various forms.

Altus goes Nordic

Altus Positioning Systems has been selected by the National Courts Administration of Norway, Land Consolidation Court Division, to provide APS-3G series GNSS survey receivers to modernize their existing fleet of about 80 receivers.

"The Land Consolidation Court's rigorous tests for the selection process were completed in demanding environments, including under heavy tree canopies," said **Arnt Tore Sund**, managing director of NavSys, Altus sales representative in Norway. "The price-performance relation and the quality of the Altus APS-3G receivers, together with the comprehensive customer support, detailed product knowledge and deep technical understanding of the NavSys team, strongly contributed to this successful outcome."

TopNet live Services for Poland and Sweden

Topcon Europe Positioning and TPI Poland have announced a partnership agreement for a new TopNET live GNSS Network. The network will comprise of 115 Topcon Net-G3A reference station receivers and high-end geodetic CR-G5 antennas, covering both countries. The network service will offer flexible RTK subscriptions for many applications, such as survey, construction, machine control, precision agriculture and GIS, all supported locally by TPI.

In a separate announcement Topcon Europe has also reached agreement with Lantmäteriverket (administrators of SWEPOS) to roll out a TopNET live RTK service in Sweden.

New OS contract for COWI

COWI has won a new framework contract from OSGB covering the next four years. Under the new contract the company will continue to deliver aerial photography, digital orthophotos and digital terrain models as well as updates to the Ordnance Survey's map database. The company has also just completed production of a nationwide orthophoto product for Denmark, has recently won a new mapping contract for the Ministry of Lands and Resettlement in Namibia and is using mobile laser scanning and 360° photography to map 70km of road in Uganda.

Riegl Scanner for BGS

The British Geological Survey (BGS) is to use a laser scanner to map volcanoes, glaciers and other natural phenomena. The Riegl VZ-1000, purchased from 3D Laser Mapping, will be used around the world to collect data that will be used to create photorealistic fly-throughs, 3D height models and highly accurate area and volume calculations.

"When we decided to purchase a new scanner we looked at a range of manufacturers," commented **Lee Jones**, MEng. FGS, Engineering Geologist at BGS. "We chose the Riegl VZ-1000 because it is compact, lightweight,

high speed, has a scan range of up to 1,400 metres and has superior measurement capabilities when compared to rival systems."

Murphy opts for Viva

Purchased through Leica Geosystems distribution partner, Survey Instrument Services (SIS), the Leica Viva solution was chosen as it presented the best and most effective solution for river surveys by surveyors working on the CFRAMS (Catchment Flood Risk Assessment and Management Study) project, one of the largest survey contracts ever let in Ireland.

The order includes Leica Viva TS15i imaging total stations, providing geo-referenced photo documentation augmented with capture, sketch and link capability, and Viva GS15 dual-frequency GNSS receivers with Leica Viva CS15 controllers. Together the TS15i and GS15 provide a SmartPole survey solution.

Leica Exchange software is used to manage the surveyed data and transfer it in a secure manner, quickly and easily between the office and the field and between field teams. This has provided major efficiency and time savings on the project.

Raymond Murphy, managing director at Murphy Surveys Ltd, said 'Our clients depend on us to produce perfect results, every time. Our investment in Leica Geosystems solutions allows us to better serve our clients. We do this through increased productivity giving our clients precision measurement together with value for money.'

Trimble takes over Ref Tek

Trimble has announced that it has acquired the assets of privately-held Refraction Technology, Inc. a leading provider of seismic sensors and high-frequency data logging systems. The asset acquisition is expected to extend Trimble's infrastructure solutions for scientific research and monitoring applications.

Ulrich Vollath, general manager of Trimble's Infrastructure Division says, 'By

combining GPS, seismic sensors and associated software, Trimble will be able to provide complete solutions that serve as a central data integration hub for multiple sensors to address a wide range of monitoring applications.'

3D Laser Mapping is Australian distributor

Terrasolid, the Finnish software specialist, has appointed 3D Laser Mapping as a specialist re-seller for the Australasian region. Setting high standards for airborne and mobile LiDAR data and image processing, Terrasolid offers a complete range of software solutions for processing and viewing laser scanned data. 3D Laser Mapping is already working with Terrasolid supporting new and existing clients across

the UK and the appointment as Australian partner follows 3D Laser Mapping's recent expansion in the region.

Hi-res scan at Stonehenge reveals more on construction

A comprehensive high-resolution laser scan of Stonehenge has revealed significant differences in the way the stones were shaped and worked. The study also shows that the techniques and amounts of labour used vary from stone to stone. These variations provide almost definitive proof that it was the intent of Stonehenge's builders to align the monument with the two solstices along a NE/SW axis.

You can read more about the new laser scanning and analysis at Stonehenge on page 16.

Events Calendar 2012/13

• SEMINARS • CONFERENCES • EXHIBITIONS • COURSES

SPAR Europe 2012

12-14 November,
The Hague, The Netherlands.
Contact:
www.sparpointgroup.com/Europe/

8th FIG Regional Conference

26-29 November, Montevideo,
Uruguay.
Contact: www.fig.net/uruguay/

European LiDAR Mapping Forum

4-5 December, Salzburg, Austria.
Contact: www.lidarmap.org/ELMF/

Defence Geospatial Intelligence (DGI) 2013

21-23 January, QEII Conference Centre, Westminster, London, UK.
Contact: www.dgieurope.com

International LiDAR Mapping Forum 2013

11-13 February 2013, Denver, Colorado, USA.
Contact:
www.lidarmap.org/ILMF.aspx

GEO-North

7 March 2013,
Reebok Stadium, Bolton, UK.
Contact: Sharon Robson
sharon@pvpubs.demon.co.uk or
www.pvpubs.com/events.php

GEO-South

1-2 May 2013,
Holiday Inn, Elstree, UK.
Contact: Sharon Robson
sharon@pvpubs.demon.co.uk or
www.pvpubs.com/events.php

PEOPLE

Robert "Bob" M Stirling

It is with sadness that we report the passing of Bob Stirling on 6th September following a short illness, at the age of 62.

Bob was the eleventh person to graduate with Honours in Topographic Science from the University of Glasgow in 1972. His initial employment came with Decca Surveys, gaining experience in the North Sea and the Middle East. After the mid 70s and a brief spell as a freelance hydrographic surveyor, he joined BNOG (later to become Britoil) in their new Glasgow headquarters. During this time he qualified to become an RICS member in 1981 and later a Fellow in 1988. He was an important figure in the thriving offshore survey industry, contributing to numerous industry publications through the UKOGA Survey and Positioning committee.

After BP acquired Britoil, Bob worked in the London and Aberdeen offices while maintaining his family life near Glasgow by commuting home at weekends. After various senior survey appointments with BP and having gained an MBA, he departed with early retirement in 1994. It was then that he started BSI Consulting and continued his

active role with the RICS, sitting on the Land and Hydrographic Divisional council from 1991 to 1997. In 2001 he was elected chair of the RICS Geomatics faculty in Scotland and was the first chair of the new board following 'Agenda for Change'.

Although some previous corporate colleagues had wondered if, like Captain Mainwaring, the "Dad's Army" character, there really was a Mrs Stirling, it was during the years of consulting that Mr and Mrs Stirling – Bob and Maggie – would often travel together.

Bob was a character. Not afraid to air his views, make a comment or to ask that awkward question in his distinctive accent, he was extremely capable and saw through many testing projects during his survey, management and consultancy years.

Bob was Alan Haugh's deputy at BP in the London HQ for two years. Alan comments: He was a knowledgeable questioning surveyor, always looking for problems and focusing on detail, perhaps a source of irritation to those more concerned with the practicalities. As a member of the generation following mine I was greatly shocked at the news of

his death. Our condolences and sympathies are with his wife Maggie and their children Fiona and Bobby.

Jürgen Fahlbusch, 1959 – 2012



Jürgen Fahlbusch, latterly of Carl Zeiss, died unexpectedly in August 2012 reports Rory Stanbridge. Jürgen was still a relatively young man with a bright future; a really cruel blow for his family and his colleagues. I first met him about twenty years ago when Photarc Surveys was working with Jenoptik and providing technical support for photogrammetry. One of the products that we worked on was the range of RolleiMetric photogrammetric cameras and software. Jürgen was the main salesman for the company and we

immediately hit it off when we first met.

We shared two passions; one was photogrammetry and the other was football. Both these topics provided many hours of debate, not least over dinner one night when Manchester United were beaten in the Champions League by a German side. This really made Jürgen's evening and, to be honest, the whole of the following week. I continually reminded him of the 1966 World Cup Final but to no avail.

Whilst working with Jenoptik and Rollei, Nigel Harding (Jenoptik) and I made a number of visits to the Rollei offices in Braunschweig and were christened Statler & Waldorf from the Muppets by Jürgen. Jürgen had a great sense of humour and both Nigel and I felt our new name was given in the best possible taste. Jürgen had an extensive knowledge of multi-image photogrammetry and he never ceased to amaze me with his love of the topic. I did not always agree with his sometimes myopic views but I always had the greatest respect for his opinions. "You must see it in this way" became his stock phrase and one which made me smile

every time I heard it. It still makes me smile now! Nigel and I introduced him to a number of police forces in the UK and they were won over with his knowledge and general bon homie. He had worked extensively with European police forces and I was privileged to see him address an international police conference on the subject of photogrammetry for forensic work. He was always great fun to be around and he is still the only person that I have met who could fall asleep in a car before it had even moved off.

Jürgen left Rollei at the end of 2002 when new owners came in. He then worked at home doing bits and pieces of consultancy and probably watched lots of football until he joined Carl Zeiss in 2006. We met a number of times during this period and it was clear that Jürgen missed the day to day involvement of business. Although he retained his interest in photogrammetry he was employed by CZ to sell lenses for specific technical applications. He died much too young and left a wonderful wife and companion in Andrea who I also know very well. He has left so many memories and those that met him will not forget him. As one of my colleagues said recently: "There goes one of life's real characters." That sums him up perfectly and I for one will really miss him both as a colleague and as a good friend.
Rory Stanbridge

Kevin Moore



September 10th 2012 saw the sad passing of one of the most colourful characters of the surveying equipment business of the last 30 years. Kevin Moore, founder of Toposell and later Managing

Hunting – 25 years on



Hunting Surveys closed for business twenty-five years ago. To mark the occasion, on 8th October a large group of ex-employees headed to the countryside for lunch and a leisurely afternoon amongst friends. John and Moira Leatherdale organised the event and assembled a slide show of photos from then and now. Everyone is getting older and this time there was even a table of 90-year olds! Some have however passed on and John made special mention of Mary Grierson. She worked at the Photo Reconnaissance Unit at Medmenham, Buckinghamshire, during the second world war, then Hunting and then, almost by accident, became a distinguished botanical artist - visit <http://www.telegraph.co.uk/news/obituaries/culture-obituaries/art-obituaries/9134740/Mary-Grierson.html>

Director of Topcon (Great Britain) Ltd lost his long battle with cancer. He was 60 years old.

For many years Kevin's Toposell was a relatively small specialist business manufacturing early distance measurement devices and importing well known Swiss instruments on the grey market and selling them into the UK survey industry.

After the acquisition of the Crawley office of Sokkia UK in 1993 Kevin resolved to create a national hire, sales and repair business. The aborted attempt to acquire the well known Watts Optronics business led to Toposell being appointed the UK agents for Topcon in 1995 and the eventual sale of the business to Topcon some years later.

Kevin's unique style and drive was the foundation for this growth and creation of many jobs. Ask anyone who worked for him or did business with him, Kevin Moore epitomised the phrase "once met, never forgotten"!

David Price

The Publisher adds:

I have fond memories of Kevin. He was a strong supporter of ours from back in the 1980s when we designed a series of adverts with the strapline "You'll be wild about our prices" – a play on words from Kevin's grey imports from a certain Swiss

manufacturer. He was also the first to back our World of Surveying exhibition when it launched in 1997, booking a whole hall in the National Motorcycle Museum.

RICS Fellows

A group of distinguished members invited to be Fellows by chief executive Sean Tompkins and past President See Lian Ong attended a celebration reception in London in September, which was held in recognition of their achievements. Fellowship is the highest level of RICS membership

and is only awarded to professional members who are major achievers in their field. This was the first time members from across the globe have been invited to join this grade in this way. Current President Alan Collett and Sean Tompkins both formally recognised the contribution of the new group of Fellows in speeches at the reception, which was attended by around sixty UK members. For the full listing of recipients visit: <http://www.rics.org/uk/join/fellowship/honoured-fellows/>



UKHO announces next National Hydrographer

Commodore Tom Karsten RN is to be the next UK National Hydrographer, Deputy Chief Executive (Hydrography). He takes over from Admiral Nick Lambert, who will be retiring following two years in the post on December 17th. Karsten will be integral to continuing the key role the UKHO plays in working with the International Hydrographic Community, leading on defence matters and supporting the discharge of the UK government's responsibilities for the Safety of Life at Sea, a task held by the Maritime Coastguard Agency with which UKHO works closely.

Speaking about Karsten's appointment, chief executive Ian Moncrieff CBE, said: "I have known Tom for 30 years and he will bring much experience and a sea-goer's perspective to this key role. I am delighted to see Tom come onboard UKHO and know that he will follow-on the excellent work and contribution made by Nick."



Rock'n'roll, mapping and archaeology from the air

By Malcolm Draper

We were half way to somewhere looking at photos when the RGS called.

The editor and I usually put these columns together over somewhere interesting, like the V&A museum in Kensington where we can also get a reasonable lunch. This time, both of us sharing a life-long love of rock 'n' roll, we had to visit the museum's exhibition of photos from that era. "Half Way to Paradise" is the title of the exhibition and is a trip down memory lane for all old rockers. **Harry Hammond's** photos begin in the early fifties with stars like Frankie Lane, Alma Cogan, Ted Heath and his band, then Eddie Cochran and Gene Vincent and through the sixties with the Beatles, Cliff Richard, Dusty Springfield and umpteen more. And the really great bit is that the exhibition is accompanied by a soundtrack of all those great hits. Don't miss it if you're in town and of that era. It's on at the V&A until 3 March 2013 and there's even a book to accompany it (*Half Way to Paradise*): it's on my Christmas list.

Back in the RGS

Surveyors have always been involved in archaeology. Some have even developed a keen amateur interest like the late Ian Mathieson who pioneered non-intrusive techniques like radar in Egypt for sites like Saqqara. Ian died in 2010; I wonder if anyone knows if his work at Saqqara continues? I hope the revolution hasn't disrupted things.

Archaeology was at the heart of one of the best RGS lectures we've had for awhile. Aerial photography is something surveyors know about. Prof. **Bob Bewley** traced the history from the military whose early aerial photos from balloons provided amateur archaeologists with the first glimpse of what was invisible from the ground, through to modern times and English Heritage. In between Aerofilms and the RAF (and Luftwaffe I suspect) have left an archive of millions of plates and negatives for the experts to pour over for generations.

The lecture covered not only England but

Jordan too where there are treasures dating from prehistory where archaeologists have worked out that odd looking features involving rounds and tracks were Neolithic gazelle hunting grounds and pens. Roman and Islamic era structures are also widely scattered over the landscape. Sadly much gets lost due to modern developments, like the poorly performing EU-funded olive groves planted over ancient structures.

Prof Bewley explained that aerial photography is not allowed in many parts of the world. Mapping too is neither available or allowed in countries like Saudi Arabia, Greece, Russia and Tajikistan so we have to rely on Google Earth.

Mapping the subcontinent

Another lecture and another country well mapped but until recently unavailable to its citizens, is India. Dr **Manosi Lahiri** introduced her book *Mapping India*, which traces the subcontinent's mapping from early contacts with European traders in the 15th century to the partition into India and Pakistan. Mapping back then was often a matter of fill in the blanks based on reports, hearsay, guesswork or even the imagination. A great lake in northern Bengal, which was assumed as the source of many rivers, appeared on several maps but never existed.

Dr Lahiri talked about the many military maps including Clive's campaigns (the battle of Plassey) and the intricate detail of coastal mapping by the 18th c. when British, Dutch, French, Portuguese and others had established trading posts and factories producing goods for the European market. The earliest maps also revealed that India already had well established towns and cities at the time of the European contact.

The partition was a particularly interesting topic. A hurried exercise from all accounts, apparently only two copies of the final mapping were made: one for each country. This seems a puzzle as surely to draw those red lines that chopped what was India into three, they must have had many other source maps? I wonder where they are; with the India Office records perhaps?

Staying with mapping, did you read about the hash Apple made of the mapping in the new iPhone 5? Towns in the wrong place or completely lost and jagged highways looking like they'd once been elevated but had now

*A job for MapAction?
Apple's latest mapping
seems to lack the surveyor's
touch.*

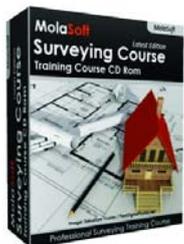


collapsed as though struck by an earthquake. I wonder how it happened? Could it be that once again no one thought to bring in real surveyors?

Let's pause for a recce

All surveyors recognise the importance of reconnaissance ahead of a survey. You look at the lie of the land, identify key features and work out what the best approach will be in terms of people, equipment and overall modus operandi. I was involved in many pinch point surveys including several for moving very large objects by road. It's made a whole lot easier today by using 3D laser scanning. This was indeed the technology used by a survey firm in the US to plan the progress of the Space Shuttle through downtown Los Angeles. Apparently they did the survey for free, presumably for the free advertising exposure. Admittedly the thing got stuck once or twice but that was probably the result of those driving the enormous powered platform that the Shuttle rested on. Just remember, a little bit too much 'left-hand down a bit' can send you heading for a tree and a lengthy reversing exercise. For the record, wingspan: 78.06 ft (23.79 m), height: 56.58 ft (17.25 m) and empty weight: 172,000 lb (78,000 kg). There is an excellent piece of mainly speeded up video showing the move on YouTube – look for "Space shuttle Endeavour's trek across L.A."

Miscellany



Jon Bylo draws our attention to an Ebay item that surveyors need to be aware of. For the vast expenditure of £3.98 you can buy the *Land Surveying Engineer Training Surveyor Course* on CD. For those that feel £3.98 is bit too much in these straightened times how about £2.49? For this sum I downloaded an iPhone app called *Theodolite* which turns your phone into a survey tool 'based on a centuries-old navigation instrument' to quote the vendors. It seems to have a following. It's already on version 3.1 and "Scoobedoob" and "A Baggie" recommend it. I'll update readers in due course when I've had time to put it through its paces but I don't think Leica or Trimble need to hold their breath.

A US contact has sent me an interesting suggestion. He suggests calling up guys over 60 to fight America's wars on the following grounds and says:

- Researchers say 18-year-olds think about sex every ten seconds. Old guys only think about sex a couple of times a day, leaving us more than 28,000 additional seconds per day to concentrate on the enemy.
- Young guys haven't lived long enough to be cranky, and a cranky soldier is a dangerous soldier. 'My back hurts! I can't sleep, I'm tired and hungry.' We are normally bad-tempered and impatient, and maybe letting us kill someone that desperately deserves it will make us feel better and shut us up for a while.
- If captured we couldn't spill the beans because we'd forget where we put them. In fact, name, rank, and serial number would be a real brainteaser.
- They could lighten up on the obstacle course. I've been in combat (says my friend) and never saw a single 20-foot wall with a rope hanging over the side, nor did I ever do any press-ups after completing basic training.
- Actually, the running part is kind of a waste of energy, too. I've never seen anyone outrun a bullet.
- An 18-year-old has the whole world ahead of him. He's still learning to shave, to start a conversation with a pretty girl. He still hasn't figured out that a baseball cap has a brim to shade his eyes, not the back of his head.
- And hey!! How about recruiting women over 50... in menopause! You think men have attitudes? If nothing else, put them on border patrol. They'll have it secured the first night!

"Dear Abby"

Finally, a few items from a US agony aunt: *Dear Abby*, A couple of women moved in across the hall from me. One is a middle-aged gym teacher and the other is a social worker in her mid-twenties. These two women go everywhere together, and I've never seen a man go into or leave their apartment. Do you think they could be Lebanese?

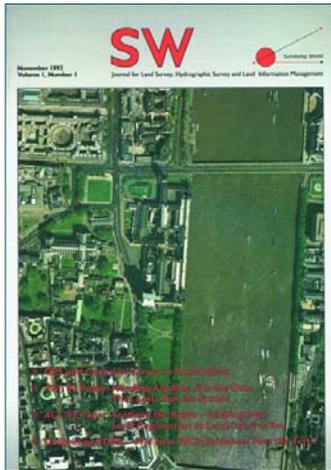
Dear Abby, I have a man I can't trust. He cheats so much, I'm not even sure the baby I'm carrying is his.

Dear Abby, I joined the Navy to see the world. I've seen it. Now how do I get out?

Dear Abby, I was married to Bill for three months and I didn't know he drank until one night he came home sober.

Got a tale to tell?

Please send letters for publication by e-mail to the Editor: 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



20th anniversary: 20 years of SW and GW

This is the 121st issue of the journal. We are marking our 20th anniversary of publication. Launched in 1992 as **Surveying World**, we became **Geomatics World** in September 2001. Below we describe some of the contents of the first issue and chart the changes that have taken place over the last two decades.

1992 was a memorable year and not always for happy reasons. The UK was in the grip of a recession. Surprisingly the Conservative Government under John Major was re-elected in April. But in September the UK was forced out of the European Exchange Rate Mechanism (Black Wednesday) by currency speculators. November saw the election of President Bill Clinton. It was also HM The Queen's "annus horribilis" when Windsor Castle caught fire, her daughter Princess Anne separated from her husband, followed by the Prince and Princess of Wales breaking up.

On the plus side, some brave surveyors at RICS, with the help of a Dutch publisher, decided to launch a bi-monthly journal for members of the Land & Hydrographic Division. Its first editor was RICS staffer Peter Gilbert and the first edition featured an Aerofilms image of Westminster including the Thames and RICS headquarters. The film image was captured by a Wild RC30 forward-motion compensating aerial camera.

Back in 1992 differential GPS services were in their infancy. Offshore contractors Brown & Root had just established a network in the Middle East. Elsewhere in that region Saudi Aramco announced the use of a software package called ArcInfo from Esri in preparation of a company-wide GIS. Survey firm Longdin & Browning had just concluded a deal with a Californian company to use their Clear Cone highway inspection survey system and Intergraph had just won a £2m contract for workstations and software for the new Hong Kong Airport project.

The first issue also had an excellent report from the late **John Wright** on a boundary disputes conference addressed by **David Powell**. John pontificated on a new role for land surveyors:

"Land Surveyors see themselves as scientists; and the general public also have this boffin image, when they are not regarding us as technicians in yellow waistcoats holding up the traffic. Indeed, in the happy days before satellites, when we as geodesists (not geologists please) could determine the shape and size of the Earth, we had a few Fellows of the Royal Society. Now some prefer the manipulation of data to the drudgery of collecting it. So what is this new scientific role?"

It is as psychologists; because a small but growing number of UK land surveyors have gone into what is their main preoccupation overseas: settling boundary disputes. However, in this country, with its sloppy system of general boundaries and untidy physical features instead of precise corner pegs, actual measurement is often the least important part of this process."

The issue featured two papers from the 1992 AGI conference. One from **Andrew Coote** and **Les Rackham** highlighted the significant cost of data collection in building a GIS as much higher than the software and hardware: 20% against 80% in the lifecycle. Another paper from **Nondas Pitticas** of Paisley University's Land Value Information Unit focused on Scotland's move from land registration to land information.

In a precursor of his Europhile column in GIS Professional, **Robin Waters** reported on the Madrid meeting of CLGE; and Prof **Alan Dodson** explained the calibration of the then newly accredited Thames Water Ashford baseline using a "Two-colour Terra Technology Terrameter EDM", the only instrument substantially free of atmospheric propagation delay error. And **Ross Christie** was explaining Ordnance Survey's new control framework based "Modern Space Techniques".

On the technology side the issue reported on a "New Portable DGPS" with "dynamic real-time accuracy of 1 - 5 metres". Its portability relied on two substantial aluminium cases. Meanwhile Trimble was promoting their "Totally new station" and Leica their "Wild GPS System 200" which seemed to rely on a controller with a bewildering array of buttons that even the bloke in the advert seemed puzzled by. For companies like Carl Zeiss it was the business of selling "advanced tacheometry". While Ashtech claimed their compact GPS receiver gave "accuracy equal to the dimensions of a dime". Both the latter firms now absorbed by Trimble.

In the meantime. . .

The last 20 years have seen the launch and maturing of several technologies. The move (long resisted by some) from GPS to GNSS has ushered in a golden age of point positioning for surveyors,

especially in those countries with RTK network services. Photogrammetry and image processing have come of age thanks to the massive increase in processing power and storage and the arrival in the late 1990s of the laser scanner. Offshore, remotely operated vehicles have become autonomous and high resolution bathymetry captured by side-scan sonar and multi-beam echo sounding, coupled with image processing technology, are delivering extraordinarily accurate and detailed views of the seabed.

Overarching these changes and advances almost every business in the developed world has benefited from cheap mobile phones and the Internet, two serious game-changers for our business as much as any. The Internet has consequences still too unclear to predict but for sure cloud technologies and the rise of big databases will be significant.

In our business I would suggest that the big game-changers have been digital camera technology, network RTK services and the laser scanner. All of these have not yet run the course. The arrival of Galileo will further improve positioning and offer new machine control and tracking possibilities. Laser scanning has a way to go yet but devices like the Faro Focus3D herald a future mass market perhaps linked to digital cameras and 3D printers. For aerial survey, the recent arrival of cheap programmable UAVs will usher in many new possibilities for mapping and imagery.

Over and literally above these developments are the ever growing number of satellites that silently watch over, warn and guide us. While 24/7 news demands instant images, there is still much to be done in analysing and researching the data already there to improve prediction of extreme weather events and climate change.

The Timeline, which begins below, may help jog memories. We have had to be brief with a selection of events chosen for each year mainly for their impact on the world though occasionally for levity.

TIMELINE

1993

Launch of the European Single Market.
Blizzard hits the eastern half of the US killing 184.
An IRA bomb kills two children in Warrington.
Microsoft releases Windows 3.11 for Workgroups.

1994

Channel Tunnel opens after 7 years of construction.
Nelson Mandela becomes South Africa's first black president.
Three times F1 world champion Ayrton Senna dies.
Microsoft announces end of MS-DOS support.
Car ferry sinks in the Baltic, killing 852 people.
A conference is held in San Francisco on the commercial potential of the World Wide Web.

1995

Barings Bank collapses after broker Nick Leeson loses \$1.4 billion.
Bombing of building in Oklahoma kills 168.

continued on page 14

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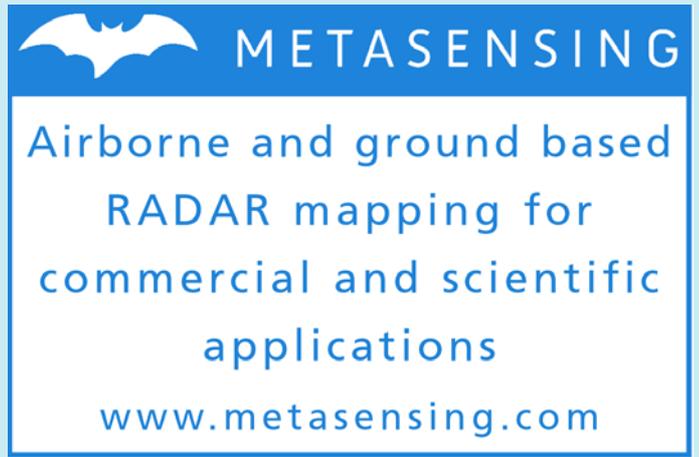
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The DVD is announced.

Israeli premier Yitzhak Rabin assassinated at peace rally in Tel Aviv.

1996

Massacre of 16 infant children and their teacher at Dunblane in Scotland.

The X Prize Foundation launches a \$10m prize for the first non-government launch of a reusable manned spacecraft.

Göran Kropp cycles from Sweden and climbs Mt Everest without oxygen.

Taliban capture Kabul

Bill Clinton wins second term.

1997

Labour Party return to power in the UK after 18 years, with Tony Blair as Prime Minister.

IBM's Deep Blue computer defeats chess champion Garry Kasparov.

UK hands sovereignty of Hong Kong to the People's Republic of China.

Diana, Princess of Wales dies after a car accident in Paris.

1998

Bear Grylls, 23, becomes the youngest British climber to scale Mt Everest.

May: Tower Surveys formed

A petroleum pipeline explodes in Nigeria killing about 1200 people.

New Hong Kong airport Chek Lap Kok opens.

France beats Brazil 3-0 in FIFA World Cup final.

Second Congo War begins. 3,900,000 people are killed before it ends in 2003.

First section of International Space Station launched.

1999

Hungary, Poland and the Czech Republic join NATO. The euro is launched.

Bill Gates personal fortune exceeds \$100bn.

Lance Armstrong wins his first Tour de France.

Millennium bug widely predicted to end civilization as we know it.

2000

Ohmex Ltd formed as a separate manufacturing subsidiary company.

New Zealand first to welcome the millennium year.

Bashar al-Assad becomes Syria's leader.

Air France Concorde crash in Paris.

Tsar Nicholas II and his family, murdered in 1917, are canonized by the synod of the Russian Orthodox Church.

George W. Bush wins US presidential election.

2001

Wikipedia, the internet encyclopaedia, launched.

Foot and mouth disease breaks out in UK.

Taliban destroy Afghanistan's Bamiyan Buddhas.

Two hijacked airliners fly into the twin towers of the World Trade Centre in New York killing nearly 3,000 people.

Apple launch the iPod.

2002

Golden Jubilee of HM The Queen.

Queen Elizabeth the Queen Mother dies aged 101.

Euro notes and coins introduced.

US and Britain invade Afghanistan.

2003

Last signal from NASA's Pioneer 10 spacecraft, some 7.5 bn miles from Earth.

Space Shuttle Columbia disintegrates during re-entry killing all 7 astronauts on board.

Despite global protests Iraq war begins.

Last commercial flight of Concorde, ending supersonic air travel.

Saddam Hussein captured in Tikrit.

2004

A whale explodes in Tainan City, Taiwan, while being transported to a university for autopsy.

Expansion of EU to include Poland, Lithuania, Latvia, Estonia, the Czech Republic, Slovakia, Slovenia, Hungary, Malta and Cyprus.

Bombings in Madrid kill 191, leave 1800 injured.

First transit of Venus since 1882; the next will occur in 2012. See Down Undercurrents, page 30.

SpaceShipOne wins the X-Prize of \$10m.

9.3 earthquake hits Indian Ocean region generating an enormous tsunami. Official death toll stands at 186,983; more than 40,000 missing.

2005

January: Trimble S6 Total Station unveiled. Sets a new standard for optical surveying.

George W. Bush wins second term as President.

Saudi Arabia holds first ever municipal elections.

Pope John Paul II dies; over 4 m travel to the Vatican to mourn him.

Prince of Wales marries Camilla Parker Bowles in civil ceremony at Windsor's Guildhall.

Superjumbo Airbus A380 makes its first flight.

International Olympic Committee awards 2012 Olympics to London.

Bombs in London kill 52 and injure over 700.

Hurricane Katrina hits New Orleans causing severe damage and 1,836 deaths.

2006

250th anniversary of birth of composer Mozart.

Italy win their fourth FIFA World Cup title.

Twitter is launched.

Pluto demoted to dwarf planet status.

Jackson Pollock's painting No. 5, 1948 is sold for a record \$140 million.

2007

Launch of iPhone

IPCC say global climate change is "very likely" to have a predominantly human cause.

British child Madeleine McCann goes missing.

French bank BNP Paribas in the UK blocks withdrawals from three hedge funds heavily committed in sub-prime mortgages, heralding the global financial crisis.

2008

Phoenix Surveying & Safety Equipment first exhibits at the GEO-Event show, cementing a commitment to promoting the latest technological advancements into the growing GIS market.

Stock markets plunge amid fears of recession, fuelled by the subprime mortgage crisis.

India sets world record by sending ten satellites into orbit in a single launch.

Bill Gates steps down as chairman of Microsoft to concentrate on philanthropy.

African-American Barack Obama elected the 44th President of the United States

2009

Icelandic government and banking system collapse.

Deadliest bushfires in Australian history kill 173, injure 500 and leave 7,500 homeless.

A Russian and an American satellite collide over Siberia, creating a large amount of space debris.

Albania and Croatia join NATO.

After more than a quarter-century of fighting, the Sri Lankan Civil War ends.

Entertainer Michael Jackson dies.

2010

At 830m the tallest man-made structure to date, the Burj Khalifa in Dubai, is officially opened.

A deadly 7.0-magnitude earthquake in Haiti, devastates the capital and kills over 230,000.

Ash from the Iceland volcano Eyjafjallajökull disrupts air traffic across northern and western Europe.

May 25, Esri Launches ArcGIS.com, a website for finding and sharing geographic information system (GIS) content, organizing geographic information into groups, and building communities.

Spain wins the FIFA World Cup in South Africa.

WikiLeaks releases a collection of more than 250,000 American diplomatic cables.

2011

Tunisian street vendor Mohamed Bouazizi dies after setting himself on fire, sparking anti-government protests across the Middle East.

Earthquake and subsequent tsunami hit Japan, killing 15,840, leaving 3,926 missing and damaged nuclear power plants.

An estimated 2 bn people watch the wedding of Prince William and Catherine Middleton.

Osama bin Laden killed in Pakistan.

Arab Spring triggers collapse of Libyan regime and death of leader Muammar Gaddafi.

2012

February: Applications in Cadd celebrating 25 years.

August: MetaSensing's FastGBSAR, the fastest radar for deformation monitoring with submillimeter accuracy.

October: Leica P20 - the worlds first million points per second time of flight scanner.

October: Trimble's R10 from KOREC breaks the mould for design and performance.

November & December: ?



Stuart Edwards,
Chair, Geomatics
Global Professional
Group Board
reviews his two
years in office and
the many changes
that have taken
place in that time.
He signs off with
some cautionary
advice of his own
as RICS strives for
global recognition
and leadership in
the profession.

Stuart Edwards
welcomes your comments
and thoughts so please
email on the following
address
geochair.rics@gmail.com

Milestones, change and personal thoughts

In September 2010 my first Chair's column appeared on these pages. Now in October 2012 I sit to write my last. In December I will be stepping down from the role and handing on to a worthy successor. Where have those two years gone, and what has the Geomatics GPGB achieved during that period? Well, to its credit rather a lot.

Scanning the minutes of our PGB meetings and my previous columns the sheer volume of work undertaken and completed is quite staggering. Milestone achievements include: a complete overhaul and refreshing of PGB membership, which has seen a significant increase in active participation from the world regions; two highly topical and successful evening lecture series embracing new technologies for dissemination; considerable movement, in wholly the right direction, on closer collaboration between RICS and the Chartered Institution of Civil Engineering Surveyors; establishing/re-establishing links and sharing best practice with other leading Geomatics professional associations e.g. Chartered Surveyors Ireland (SCS); key contributions to RICS core activities in relation to professional accreditation, e.g. two new geomatics AssocRICS pathways launched; input into the ongoing APC review; development and publication of standards and guidance notes of the highest quality; a lively geo e-community; a dynamic geo-wiki as opposed to staid 'coloured' books and myriad other activities that continue to raise the profile of geomatics within the RICS executive structure and the global geomatics community. All these activities require the dedication of RICS staff but also the vital ingredient of the enthusiasm, energy and engagement of the PGB membership and I thank them all again for their support.

So what of the future?

[The following views expressed are my own and may not reflect those of RICS. That said I hope they provide some food for thought for the reader and perhaps my successor!]

During the past five years RICS has increasingly turned its attention to global markets and to increasing its presence internationally. Indeed, one of its main strategic goals is to gain market recognition of RICS standards in the key economic and political centres of the world. A rather grand objective and the challenge will be the translation of strategy into action and in the process of pursuing its global ambitions RICS must ensure that it remains relevant to its membership. Without relevance to the very

professionals it was born to serve the reality may be nothing more than a house of cards! That said, I and the Geomatics PGB board recognise that there is a need for the Institution to change just as we realise that our professional lives are changing and are now set against the backdrop of a global geomatics industry. It is how we manage the change that determines the outcome. Perhaps in an attempt to better communicate its strategy RICS has recently drafted a paper on thought leadership outlining the challenges for international professional practice.

Closer to home, relevance can be identified as a key issue surrounding a number of ongoing initiatives. As previously mentioned, the PGB has been closely engaged in the recent review of the APC route to membership. The early papers that the PGB reviewed seemed to be attempting to transform the core specialisms of 18 faculties into a 'one size fits all' approach, which to my mind would neither inspire increased applications for membership nor serve potential candidates well. Thankfully, the Knowledge Board recognised this too and the whole process of APC review, which I do not disagree with, is to be reworked. For our part the Geomatics PGB is again ahead of the curve and has undertaken its own re-mapping of APC competencies in a way that addresses the requirement for simplification and flexibility, recognising changing markets and increasing professional standards.

On a more upbeat note I am delighted to report that our beloved *Geomatics World* is celebrating its 20th Anniversary. Those like me who have been in the business for some time will recall *GW* launched in 1992 as *Surveying World*. As the only PGB with its own dedicated publication we can be proud of this achievement and I thank Stephen Booth and PV Publications for their tireless efforts to ensure the continuation of the journal. Here I can report that *GW* will continue in its current format until 2014 at least.

In closing I record that it has been a pleasure to lead the PGB during the past two years and I wish my successor continued success. I would also like to thank **James Kavanagh, Valarie D'Silva, Chrissie Mallett** and **Gary Strong** for their support and for making the job less painful than it otherwise might have been!

Finally, I offer you all my best wishes for the coming holiday season and a prosperous 2013. Whilst I will not be penning the next Chair's column I invite your comments as ever to geochair.rics@gmail.com and I will ensure they are passed on to the next author.

Stonehenge 2: Analysing the Stones

By Paul Bryan, Geospatial Imaging Manager, English Heritage

The application of cutting-edge analysis of the Stonehenge point cloud data is bringing significant new discoveries.

Previous articles in *Geomatics World* (Nov/Dec 2011 and Jan/Feb 2012) reported on the detailed survey of Stonehenge undertaken by English Heritage in 2011. Although not the first time this site has been the subject of survey activity, the accuracy, resolution and comprehensive coverage achieved within last year's project has resulted in the most comprehensive and accurate digital model ever produced for the UNESCO world heritage monument.

Since receiving the complete dataset from the appointed contractor, Greenhatch Group, English Heritage has commenced applying it within the conservation, presentation and management of the site as well as two new research projects aimed at enhancing our knowledge of the monument. However, one of the most encouraging and exciting aspects is that even though the site has been the subject of decades of extensive study, the application of cutting-edge technology is now bringing about significant new discoveries at Stonehenge.

Digital filtering of lichen

The stones at Stonehenge are extensively covered by numerous species of lichen. During the last survey in 2003, 77 species were recorded which can be divided into three forms - fruticose which has a more shrubby, plant-like structure and grows out of the surface; foliose which has a flatter, leaf-like appearance; and crustose which forms a tightly attached mosaic over the surface that can't be removed without causing damage. Although some have been dislodged by visitors, particularly those below head-height, their sensitivity to the surrounding environment and changing climatic conditions makes them ecologically and historically important to the site. However, their typically dense nature does form a natural barrier to viewing of the host surface and potentially masks areas of stone-working and prehistoric carvings that may be hidden below.

Given the high-density of scan data acquired in 2011 and the provision of both laser intensity and RGB values for the majority of 3D points, a separate research project (6456) was commissioned by English Heritage, which would attempt to digitally filter out the lichens from the existing scans and thus improve the dataset for later archaeological analysis. As with the previous project (6048) a formal tender process was undertaken, funded through the National Heritage Protection Commission's Programme (NHPCP), which resulted in the work being awarded to CyArk, the non-profit organisation located in California engaged in digitally preserving world culture and heritage. Following supply of the data by English Heritage, the CyArk team, led by **Justin Barton** (technical services manager), **Elizabeth Lee** (director of operations) and **Landon Silla** (manager of software development), started work in February 2012. Their original project design outlined the testing of three data filter methods (existing filters, RGB filters and intensity filters) which would be applied to samples of the 0.5mm resolution data.

Existing filters are used within the aerial lidar industry to create bare earth models from point data. Such filters are typically based on calculating deviations in slope and height with any points beyond the user-defined tolerance being removed. One example is the MCC-LIDAR utility for processing discrete-return data in forested environments. Although the tolerances needed to be scaled down to fit a terrestrial application, it was tested with the Stonehenge data. However, the high density of data acquired in the 2011 survey created problems

Figure 1 – the variety of lichen coverage across many of the stones, highlighted here on stone 5 (image © English Heritage)



for the software and although a decimated version could be used, this removed too much of the existing dataset.

Two filters were specifically developed for the project that allowed the user to select samples of RGB or intensity associated with each 3D point, which represented different areas of lichen growth across each stone. Any 3D points which had values within these ranges would then be filtered out of the dataset.

Given the apparent distinction between the RGB values for lichen and stone, the RGB filter was most promising, particularly if sufficiently high-resolution imagery is co-axially recorded from the same precise location as the scanner. Unfortunately low-medium resolution CCD's are still typically used in terrestrial scanners requiring separate DSLR or HDR imagery to be acquired when high-resolution textures and precise colourisation of the 3D point data is needed. Although both types of imagery can be later registered with the point data, any slight errors in image registration introduce a shift in the user-selected filter values, which in turn leads to inaccurate filtering and final surface depiction. Therefore the intensity filter was chosen for the remainder of testing due to its simultaneous, coaxial acquisition with each 3D point.

The subtle distinction between intensities for both lichen and stone introduced a delicate balance when user-selecting an appropriate range of values, which was difficult to achieve consistently across each stone. Therefore, although both filters succeeded in identifying lichen, and showed promise for further development, neither was completely successful in removing it without also removing elements of the underlying stone surface and with it, possible new archaeological evidence.

Archaeological Analysis

The second research project commissioned by English Heritage was a detailed archaeological analysis of the existing dataset. This would follow on from the preliminary assessment carried out by **Caroline Hardie** from Archaeo-Environment Ltd, which highlighted great potential in using the data to draw new archaeological conclusions about the stones of Stonehenge. Once again, a formal NHPCP tender process was undertaken which resulted in ArcHeritage, the Sheffield based archaeological and heritage practice being awarded the contract. The specified outputs included a detailed stone 'biography', catalogue of graffiti and carvings, digital graphical record and a written report aimed at addressing four research questions about the monument:

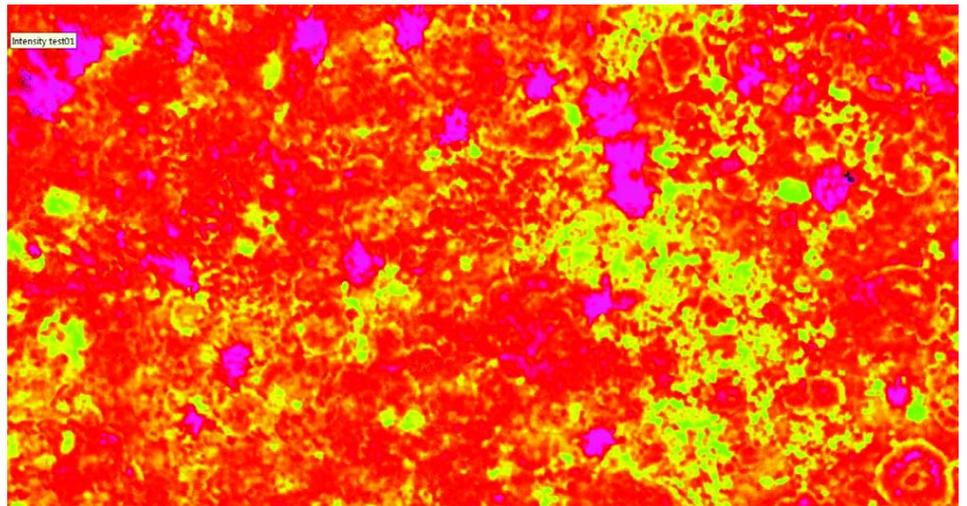


Figure 2 - several intensity values for the fruticose lichen on stone 29 were sampled, distinguishable as bright pink areas (image © English Heritage)

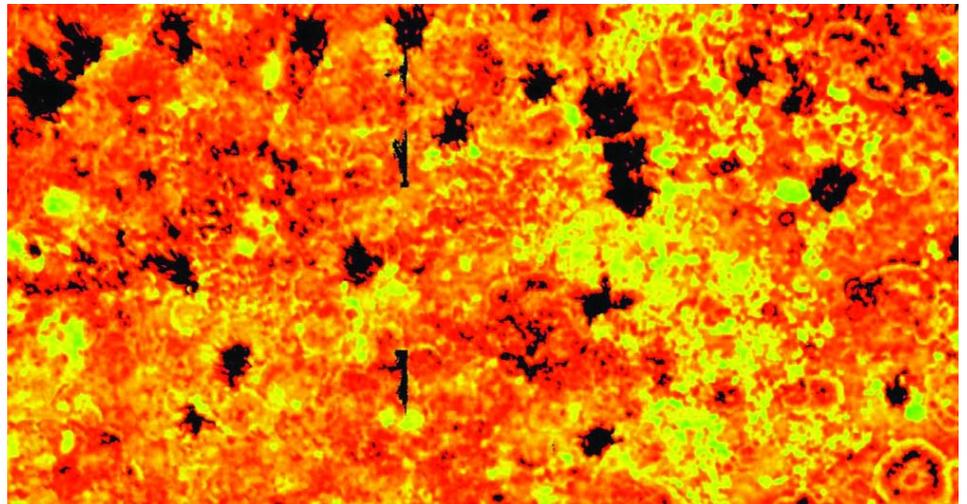


Figure 3 – intensity filtered data where the pink areas representing fruticose lichen growth have been successfully removed (image © English Heritage)

1. Evidence for the methods employed in building Stonehenge, in particular shaping the stones
2. Evidence for prehistoric carvings on the stones
3. Evidence for later alterations to the stones and graffiti
4. Evidence for architecture and sequence at Stonehenge

Following supply of the data by English Heritage, the ArcHeritage team, led by **Hugo Anderson-Whymark** (freelance lithics specialist) and **Marcus Abbott** (head of geomatics and visualisation) started work in May. They used a number of analysis and visualisation methods to undertake the detailed assessment and two field visits to clarify and check the results before delivering their completed report and agreed outputs in August 2012. These methods were:

Visualising the stones in a 3D environment - using the 1 mm data to provide a basic

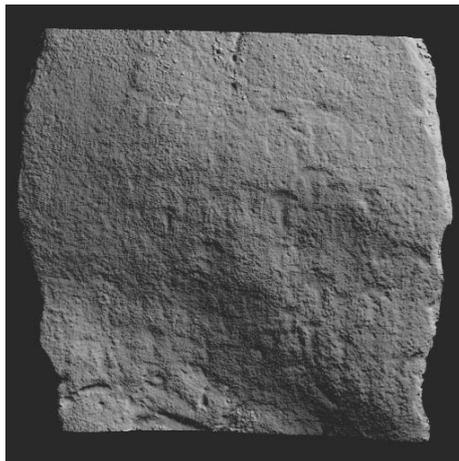


Figure 4 - PTM image highlighting fine surface detailing on Stone 4 (image © English Heritage).

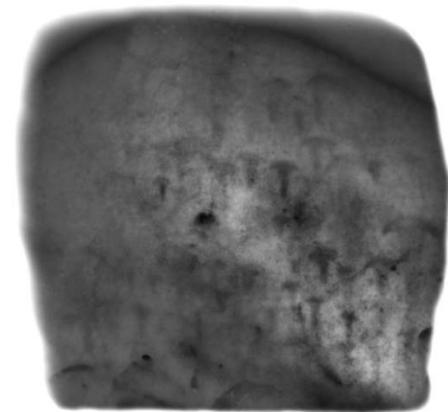


Figure 5 - Luminance Lens image for Stone 4 (image © English Heritage).

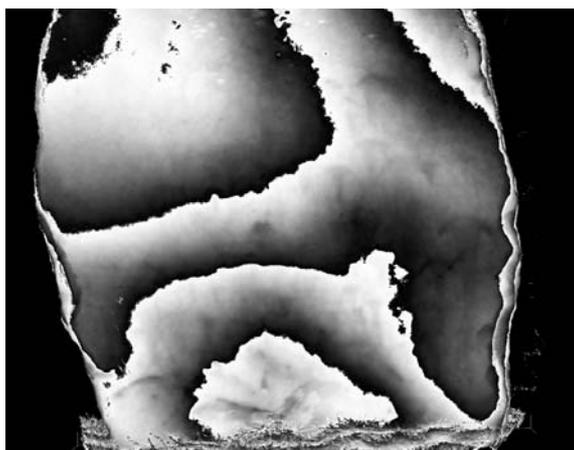


Figure 6 - greyscale 'plane-shading' image for Stone 4 (image © English Heritage)

template onto which additional archaeological information could be later added.

Examining the 1 mm mesh data in a virtual environment -

experimentation with different textures, lighting techniques and shadow decay values to define the best combination for surface feature identification on the stones.

Examining the interaction of light and shadow within the 0.5 mm mesh data –

visualisation of the finer surface variations of the stones using Reflectance Transformation Imaging (RTI) and Polynomial Texture Mapping (PTM).

By importing sections of the data into the interactive virtual environment provided by such multi-light imaging tools, it was possible to discern numerous previously unknown features forming panels of rock art, although the nature of the stone surface made it difficult to define their exact shape. However, it was obvious such features extended beyond what had previously been recorded.

Using Luminance Lensing to examine the luminance values within the 0.5 mm mesh data –

this tool was a creative idea developed in-house by the ArcHeritage team, which uses a custom shader to adjust the luminance channel of material applied to the 3D mesh.

By allowing real-time visualisation on the base 3D mesh, an objective representation of rock-art was generated that contributes to the overall interpretation provided by all the analysis and visualisation methods.

Examining the point cloud data – the point cloud data, in XYZ format, was visualised within Pointools using the plane shading function in an attempt to confirm the outline of any newly discovered features.

By moving a greyscale band through the data at 1 mm intervals the differences in values between neighbouring points revealed subtle changes in the stone surface that could

be mapped onto the graphical template.

Findings exceed expectations

The results of the project have exceeded expectations and successfully addressed all of the original research questions. Significant differences have been revealed in the way the stones were shaped and worked, which show that Stonehenge was not only aligned with the solstices but the view of the monument from the Avenue, its ancient processional route to the north east, was particularly important to its creators. Stones on the solstitial axis were most carefully shaped and dressed to provide a more dramatic and obvious passage of sunlight through the stone circle on midsummer and midwinter solstices. Many more prehistoric carvings have been discovered including 71 new axe-heads raising the total number for this type of carving in Britain from 44 to 115, doubling the number of Early Bronze Age axe-head carvings known in Britain.

The full report, which can be downloaded from the English Heritage website at <http://www.english-heritage.org.uk/about/news/stonehenge-solstitial-function/>, concludes by stating that “The intelligent use of high definition survey data as a non-intrusive investigation tool has the potential for a wide ranging and exciting impact on the way archaeologists and heritage professionals perceive and utilise technology on future projects”. This project has successfully demonstrated that current laser scanning technology can provide a wealth of valuable digital information for heritage sites and monuments but by using cutting-edge analytical and visualisation tools, provide scope for detailed interrogation beyond original levels of expectation. However, given the rapid development of convergent, multi-image photogrammetric solutions, commonly referred to as ‘Structure from Motion’ (SfM) or ‘dense image matching’, the base 3D data for such future projects may have alternative, lower-cost origins.

Although reliant on acquiring a large redundancy of overlapping, convergent imagery of the subject in question any camera can potentially be used to acquire it, be it calibrated or uncalibrated, DSLR or smartphone. Low-cost software, typically less than £200, can then be used to automatically register the images together and provide the geometric details needed for 3D surface generation by pixel correlation. Such approaches are reliant on varying surface texture appearing in each image, so are not appropriate for all heritage subjects. However, for sites like Stonehenge they look extremely promising for extracting mesh and point cloud data at closer macro-scales and even greater resolutions than the scan data.

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About the author

Paul G Bryan BSc is the Geospatial Imaging Manager within the Remote Sensing Team of English Heritage. Based in York, he heads up the Geospatial Imaging team which assists in the implementation of the National Heritage Protection Plan (NHPP), principally relating to identification of potential. He also takes the corporate lead on the application of modern image and laser-based metric survey applicable to cultural heritage. Paul has extensive knowledge of image based survey approaches, including photogrammetry and laser scanning, and is co-author of the *Metric Survey*

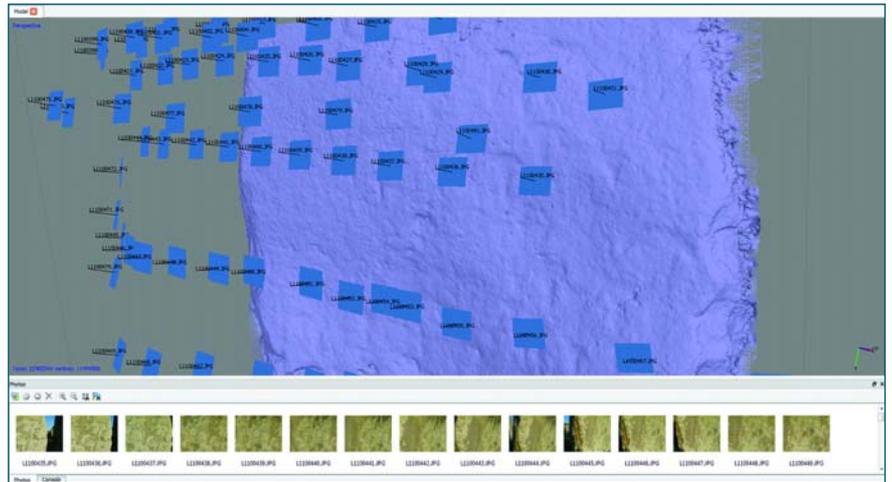


Figure 7 – example SfM processing for Stonehenge (image courtesy of Marcus Abbott, ArchHeritage)

Specifications for Cultural Heritage which sets the standard for metric surveys across the heritage sector. He is co-chair of the 'Cultural heritage data acquisition and processing' WGV/2 working group within ISPRS (International Society for Photogrammetry and Remote Sensing) Technical Commission V, concerned with the development and application of close range image measurement techniques, and UK representative for CIPA (The International Scientific Committee for Documentation of Cultural Heritage).

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Engineering: a very short introduction



By David Blockley
Published by Oxford
University Press, ISBN978 0
19 957869 6

I have to confess that I was never a big fan of George W Bush and his coterie of lieutenants.

a little volume that provides simple explanations but with surprises too

Nevertheless, I suspect that long after the President has become a minor historical footnote one of the sayings of his Secretary of State for Defense, Donald Rumsfeld, will remain a source of enquiry. It's worth repeating, as the author of this book has done. "There are known knowns – these are the things we know we know. There are known unknowns. . . these are the things we know we do not know. But there are also unknown unknowns; these are the things we don't know we don't know."

So it is with STEM – science, technology, engineering and mathematics, which is at the core of this little volume.

Containing over 300 titles, the

book is part of a series published by Oxford by way of a handy introduction to a subject. GW reviewed Bill McGuire's introduction to *Global Catastrophes* some years ago.

Notwithstanding the title, the book manages in less than 130 pages to succinctly cover all the branches of engineering, tracking their history and evolution, beginning around 11,000 years BC, as well as explaining concisely the underlying science.

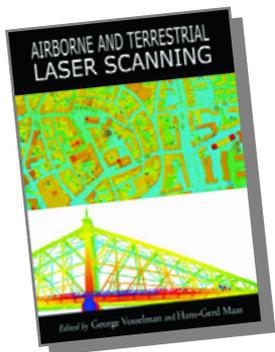
Professor Blockley, with the guidance of various experts, divides the subject into five ages: gravity, heat, electromagnetism, information and systems. Perhaps the most interesting of these is systems, a new branch of

engineering that has only come of age with the Internet. You will be introduced to the concept of 'soft' and 'hard' systems – human and electronic. If you thought engineering was a very precise and predictable thing then be prepared to be surprised. Systems engineering is scratching away at those unknown unknowns all the time.

For those who want a basic understanding of the knowledge and application of what our colleagues the engineers do, this little volume provides the explanations in relatively simple terms even if you may need to refresh your physics.

Reviewer: Stephen Booth

High Resolution Satellite Imagery



by Ian Dowman, Karsten Jacobsen, Gottfried Konecny and Rainer Sandau, Whittles, 230pp, hardback, ISBN 978-184995-046-6

The preface for this book states that it is intended for students, people working in map production, and scientists working in fields other than mapping. Whilst students will treat it as one of several sources, the latter two categories will be looking for a single book to fill gaps in their knowledge.

Does it fulfill that purpose? The answer is a wholehearted 'yes'. It describes the differences between the perspective projection of the analogue camera and the geometry of the push-broom and other electronic sensors. It explains the terms surrounding

not a book for the lazy student but for professionals with a gap in their knowledge

image resolution, ground sampled distance (GSD) and so on. It gives a fascinating insight into the constraints on development of the technology – data transfer speed, the need for sufficient energy to be received at the sensor and 'dwell' time (a wonderful self-explanatory term) - amongst others. It concentrates, quite rightly, on the very high resolution sensors, which can be used to produce ortho imagery at scales down to 1:4000. There is plenty of information that will assist people who need to order data acquisition missions and produce DTM and orthoimagery products.

The reader is treated to a gentle overview of the subject in the introductory chapter which leads into a section which provides an historical background. There is a chapter on the principles of high resolution optical sensors followed by chapters firstly on sensors with a GSD between 1 m and 16 m and secondly on very high resolution sensors with a GSD of less than 1 m. There are useful tables giving the characteristics of each sensor currently operating and a guide to the sensor orientation angle for particular applications. There are only six sensors in the sub 1 m

GSD category and the authors give plenty of detail on each one.

The chapter on calibration, sensor models and orientation, goes into radiometric and geometric calibration. The chapter explains exterior orientation of the sensor using onboard systems, such as GNSS, star sensors and inertial measurement units and recounts the difficulties encountered when the first sub metre GSD sensors were launched and the sensor operators withheld information about their orientation. The idea was to encourage users to buy orthoimagery from the data supplier (at a substantial premium). Undaunted, the researchers did some cunning reverse-engineering to find out the orientation parameters for themselves and with subsequent launches the sensor operators eventually started to provide the navigation and sensor orientation data. There is a section on approximate orientation methods and a particularly useful few pages on selection of ground control on satellite imagery – the requirements are not the same as for aerial photography.

The book then moves on to processing and products in which

the reader is given an overview of image matching applied to stereo pairs of satellite imagery to produce digital surface models and ortho imagery. The authors provide a table showing the heighting standard errors that can be expected from various high resolution sensors. This chapter is certainly very useful and, as well as describing how orthoimagery is produced from satellite sensor data, even describes how a stereo partner image can be produced from a single orthoimage and a DTM.

The final chapter is a glimpse into the future and concludes that satellite imagery is now a mature technology. The chapter follows the trends towards smaller more agile satellites, co-ordinated missions and higher resolution data.

This is not a book for the lazy student and this particular lazy student will have to read it several times to gain maximum benefit from its pages. As with most books written by an array of authors, there is some repetition. There are clear illustrations throughout, many references, an excellent index and a glossary of terms.

Reviewer: Richard Groom



Over two hundred surveyors turned out for the Leica myworld Roadshow, when it pulled in to Arsenal football club's Emirates Stadium on 18th October. **Richard Groom** looks at the latest technology and hears a dire warning.

Lawrence Dixon: honing efficiency.



Scanning for monitoring, a dire warning and is the traverse dead?

The day started with a bacon roll, a coffee and a catch up with all the people who you only ever see at Leica roadshows!

Proceedings began with **Mark Concannon**, giving a potted history of Leica's current owners Hexagon which operates in 41 countries. Leica contributes 40% of Hexagon's revenue. 17% of the workforce is employed on R&D with 2,500 active patents, increasing by around 200 per year.

New products

Leica's aim is to manufacture products that enable its customers to hone their efficiency and maximise their return on investment.

Laurence Dixon (Geomatics sales manager) made the point that such efficiencies at the base of the supply chain work their way up and, for many infrastructure projects, result in benefits for the nation.

Flexline is the name for Leica's mid-range total stations. These have been upgraded and suffixed 'Plus' with enhanced performance including improved reflectorless measurement, communications and software. They also include a new cloud-based security feature.

GNSS and total stations work together on Leica's Viva platform via SmartStation and SmartPole. This technology brings greater flexibility to the observation of survey control. Laurence threw a pebble in the pool by asking if there is now a better way to survey control than traditional traversing. Is the traverse dead? Answers to the GW letters page, please!

The GS14 is a new GNSS receiver with integrated GSM and a radio option for base and rover RTK surveying. The GS08 GPS-only receiver has been improved so that it is now 30% smaller and weighs only 2.6 kg. An audience poll found 30% using GNSS for setting out and 21% for control surveying.

For GIS, Leica have the new handheld, the Zeno 5, which has a large screen and 2m position accuracy. The Zeno CS25 has an integrated dual-frequency receiver which can give 10cm positioning (using network RTK) as a handheld or 1 cm positioning with an external antenna.

GNSS update

SmartNet is now operating in 14 European countries using 1536 reference stations. **Simon Mears** updated us on GNSS with a focus on the recently-published TSA network RTK guidance. He asked if delegates had modified their data collection procedures in

the light of the TSA reports (1 and 2). The answer was alarming (but not quite 'dire'). Only 13% said 'yes', 48% said 'no' and 39% said the question was not relevant. Perhaps they interpreted the question as referring only to the second report, or perhaps at least 48% of surveyors have decided to shun best practice.

Mobile comms are often seen as the weak link in network RTK. **Mick Kennedy** from Vodafone spoke about moving unimaginable quantities of data around the planet at ever faster speeds and about the rapid shift towards machine-to-machine (M2M) data communication. One problem is the coverage of individual networks. To help ease this, Vodafone has developed an M2M SIM card which can access any network to make a connection. Leica's business partner, Evolve can provide the service at a cost of £25 per month for 100 Mb of data.

P20 Scanner

The ScanStation P20 is billed as a breakthrough in technology. It is a time-of-flight scanner (eye-safe) with a range of 120 m giving better precision than phase-based scanners over longer ranges. The scanner observes a million points per second, has 8" angular accuracy and sub-millimetre noise over a range of 100 m. It includes a check and adjust function enabling users to check the accuracy of their ScanStation themselves and apply corrections. The instrument also operates over a temperature range from -20°C to +50°C.

Tim Badley, HDS Sales Manager can see laser scanning starting to emerge as an accepted technique for monitoring surveys. Leica's Cyclone software is now on version 8 and was launched at the same time as the P20. It features dramatic improvements in performance and it is now possible to embed geotags (links to external documents, pictures etc) into TruView files.

Where are you?

Now for the dire warning. Dr **Anne Kemp** spoke on "The what, why and how of BIM". Her talk was, as ever, excellent. She outlined the state of BIM, its use for building and for infrastructure and the importance of survey in the BIM process. She sees the need for a "single point of truth" in the federated models that make up a BIM project. Anne Kemp's talk back in April at GEO-12 showed the opportunities that BIM can bring surveyors but six months later the question was a stark one: 'where are you?', and a warning that either surveyors have to become engaged with BIM or they will lose out.

FIG Working Week, Rome Part 2 Laser Scanning, Geodesy and Monitoring

In this, the second part of GW's review of the papers presented in Rome, **Richard Groom** focuses on laser scanning, geodesy and monitoring. The full papers can be downloaded from <http://www.fig.net/pub/fig2012/techprog.htm>

Datums and reference frames

With GNSS it has become possible to measure geodetic positions and the velocity of their movement due to tectonic effects with very high accuracy. Whilst this is immensely useful for scientists, it poses a dilemma for survey folk. How do we deal with the fact the every control point is moving with respect to the international reference frame? Several sessions at FIG Rome discussed this and other geodetic problems.

Peterson and **Sarib's** paper "A New Geodetic Datum for the Northern Territory" (TS1B) looks at Australia's Northern Territory where there has been considerable investment in GNSS infrastructure both in the establishment of national continuously operating GNSS stations and territory-wide and local networks. They are now able to define a new accurate datum and see many benefits in this approach. Their argument is that customers will soon want centimetre level positioning, but clearly it is not practical to be forever changing the coordinates of points on the ground which, so far as most users are concerned, are not moving. The paper goes over the issues in detail and even puts a monetary value on the geodetic improvements – \$3.5m.

TS02B featured a paper on dynamic datums by **Kevin Kelly** from Esri. The company is developing software to enable data from different ITRF epochs to be combined. The author points out that in this field, there is also a need for standardisation and that GIS is the obvious platform both for calculating transformations and for applying them.

Also in TS02B, **Stanaway** et al link international, regional and local reference frames. Secular movement can be expressed using a 14 parameter transformation: scale, translations and rotations with their velocities. But in this paper, the authors present a technique using nested grid (patches) to model local deformations caused by seismic events, where high resolution grids are used near active faults. This was also the subject of a paper in TS07L by **Grant** and **Crook**.

Monitoring

TS01F focused on dams. **Marco Di Mauro** and **Joel Van Cranenbroeck** stressed the value of co-locating deformation monitoring sensors, which measure the geometry of the outside of a structure with met sensors and geotechnical sensors measuring the inside. **Maria Henriques** et al, described the use of optoelectronic tilt sensors to measure inclination in the Cabril Dam, in Portugal. Measurements were made in conjunction with a temperature sensor. **Sunantyo Tarsisius** et al from Indonesia described the design and installation of multi-

sensor equipment on Sermo Dam, Yogyakarta, Indonesia. The dam is measured using a combination of continuously operating GNSS receivers and a total station observing to prisms on the structure. In this case one GNSS station is co-located with the total station and the other with a back-sight reference prism.

Artur Adamek et al, looked at the possibilities of using laser scanning for inspection of concrete water dams. They concluded that laser scanning is currently only suitable as a supplement to conventional and photogrammetric methods of measurement. However, they see the laser intensity as a useful means of studying the condition of the concrete.

A major difficulty with monitoring is assessing what observed movement is significant. **Seyfullah Demirkaya** and **Muhammet Balcilar** from Turkey described how artificial intelligence can be used for this purpose. In an example they describe how, during a nine-year period of dam monitoring, the first seven years were used as a 'train and validation dataset and the following two years were treated as 'test' datasets. A comparison of the predicted model with actual observations in the test years showed a remarkable correlation.

In TS05F **Ceylan** and **Ekizoglu** described the creation of a "Dam Information System". The GIS holds bathymetric data as well as water temperature, dissolved oxygen, pH and water clarity in the water body and geology and vegetation around the lake.

Mining subsidence was a popular topic. **Hakan Akcin** et al (TS01F) describe the use of InSAR and GNSS to monitor ground surface subsidence arising from coal mining. The InSAR data came from the PALSAR and RADARSAT satellites. PALSAR uses L-band microwaves, which are less affected by vegetation and atmospheric effects than the C-band microwaves used by RADARSAT. This makes it easier to provide high coherence between master and slave images in densely vegetated areas. Unfortunately comparisons were made at different epochs so it is difficult to draw solid conclusions. The paper also mentions the value of contoured subsidence plots for planning the orientation of buildings. Along the contours is good, perpendicular to the contours is asking for trouble.

In TS03F, **Adrian** and **Gheorghe Radulescu** propose a "Structural Monitoring Handbook". It is a practical and useful read for anyone working in that sphere. Also in this session were a number of useful deformation monitoring case studies and a paper by **Zhang** and **Schwieger** who explore the possibilities for monitoring using low cost GPS receivers and communications via a

"... customers will soon want centimetre level positioning..."

wireless mesh network. They report some encouraging preliminary results.

In TS05H, **Needham** and **Dash** describe the use of photogrammetry (with a Canon EIS 1000D DSLR camera and PhotoModeler software) for deformation monitoring of a destruction test on an overhead power line tower. Precision is in the 2–5 mm range.

In TS08B, **Bo** et al, show how crustal deformation can be monitored precisely with levelling and GNSS to give some advance warning of earthquakes. **Radicioni** (Italy) et al, compare long-term GNSS and SAR data for deformation monitoring of the Assisi landslide. GNSS can of course measure deformation in three dimensions whereas InSAR measures only the component along the line of sight to the satellite. The researchers calculated the line of sight component from the InSAR data. There is broad agreement, but they will be extending the research into other areas and comparing with levelling data.

In TS09I, **Frukacz** looked at the calibration of precise levelling rods: perhaps the driest of dry subjects! One interesting point though is that the mean error in determining the coefficient of thermal expansion is much lower for new barcode staves than for “classical rods in a wood lining”. The author describes some anomalies, including a rod with positive corrections for readings up to 1.5m and negative corrections above 1.5m. The cause, he suggests, is deformation of the aluminium body of the levelling rod caused by fixing handles.

Guillaume et al, take us into the world of metrology for particle accelerators. QDaedalus is a total station modified so that the eyepiece image appears on a CCD sensor instead of a human retina. The instrument is trained to recognise targets so that it can operate without human intervention. QDaedalus is one of several methods used and described in the paper. Remaining at the precise end of the geomatics spectrum, **Meier** et al describe the use of hydrostatic levelling to monitor 192 high precision level sensors distributed around the circumference of the Swiss Light Source (SLS) accelerator simultaneously. The real-time results are used as a monitoring tool for re-alignment of the SLS.

In Session TS02F there were two papers on the lab measurement of beam deformation under load. **Ioanna Chounta** and **Charalabos Ioannidis** use an automatic photogrammetric technique while **Xiaojuan Qi** and **Derek Lichti** use range cameras (Swiss Ranger SR4000). A single range camera can perform 3D measurement of entire surfaces, they are compact and their cost is an order of magnitude less than a laser scanner. With the increasing use of non-metric cameras, lens calibration is important. **Pinar Karakus'** paper in TS02F was on the evaluation of distortion error using fuzzy logic.

Laser Scanning

In TS03D **Reiner Jager** et al describe

Simulation of Multisensor Arrays (SIMA) software for the development and validation of algorithms for GNSS and MEMS based multi-sensor navigation platforms. **Winne Shiu** and **Kam Biu Tam**, from the Hong Kong Housing Department, describe a pilot study using mobile laser scanning to survey potential and existing housing projects. The system is not mobile in the accepted sense because there is no IMU and data is collected when the scanner is stationary. The system was tested when mounted on a car, scooter and even a roving person (see Figure 1). They concluded that the technique is suitable (with limitations) and in particular in providing source data for tree surveys.

In TS07A **Bertacchini** et al describe the results of their investigations into the use of laser scanning to monitor landslides. They used total station and radar observations for comparison and conclude that laser scanning can be used for analysing slope instability. **Harmening** et al, consider the use of least squares co-location to determine a trajectory observed by GNSS and compare this method with other interpolation methods. **Sebari** and **Moutaouakkil** consider the use of laser scanning for volume calculation and compare with observation by total station. Laser scanning wins!

In TS08C, **Castagnetti** et al, use laser scanning to analyse the structure of Modena Cathedral. The survey revealed geometric anomalies which helped with the interpretation of previous deformation monitoring surveys. They used a Leica ScanStation2 and scan resolution of 8mm. Registration was carried out using at least three targets in each scan with the aim of achieving sub-centimetre accuracy in the overall 3D model. Verticality was analysed by cutting sections out of the model where required. Tilting of the outer walls and columns has been confirmed by comparison with the results of periodic precise levelling over 27 years, of monitoring points around the cathedral.

Chow et al, investigated the accuracy of the Faro Focus 3D and the Leica HDS6100 scanners (see Figure 2 over). They use the ‘self-calibration’ approach to determine systematic errors which they state “can drastically deteriorate the point cloud quality”. Comparison showed what the authors describe as “significant systematic errors” in the Focus 3D. Even after self calibration, random noise is still higher than in the Leica instrument.

Hancock et al use laser scanning to detect fire damaged concrete. The results of their



Figure 1: The surveyor as a one-man band.

“Along the contours is good, perpendicular to the contours is asking for trouble.”

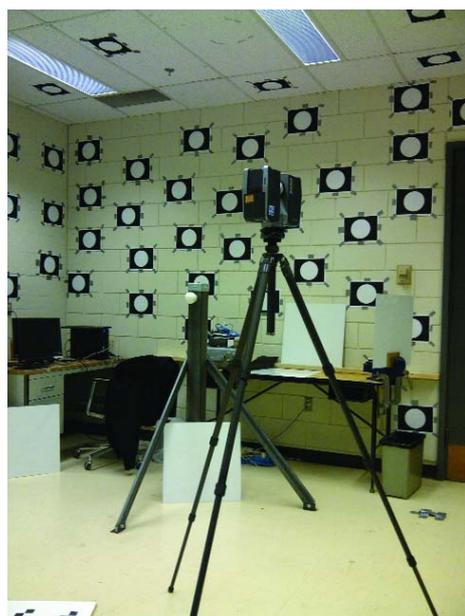


Figure 2: Laser Scanner Calibration Room.

preliminary experiments indicate that the intensity of the return signal might be used to determine the temperature to which concrete has been heated during a fire and assist in assessing structural damage.

Height

TS04B includes papers by **Avsar** and **Ustin** on analysis of the GRACE satellite's ten-day gravity data for analysis of mass changes within the Earth and water and ice on the surface. **Halicioğlu** et al describe the use of a vertical zenith camera for determining astro-geodetic vertical deflections in Turkey and most obscure of all is a study of Stoke's kernel by **Rabehi** et al. However, with feet

more firmly on the ground, the session also featured two papers on the North American Height Datum. Both **Shields** and **Gallagher** and **Roman** and **Weston** describe how the US is moving towards a datum realised through GNSS. Canada is going to adopt the resulting new datum in 2013 but the US will continue to collect gravity data with a view to publishing a centimetre-level geoid model in 2022.

In Session TS04K **Hanna** and **Bell** describe the use of discontinuous tide gauge records to determine sea level rise in New Zealand. They compared these with the continuous records maintained at the country's four main ports and found that the trends are consistent at 1.7 ± 0.1 mm per year.

Davis et al, describe the use of satellite altimetry to determine and monitor sea level in the Caribbean. The sea surface determined in this way has to be corrected by applying models of tidal variations, atmospheric pressure loading etc. To achieve sub-millimetre accuracy for annual rate of sea level rise, the authors acknowledge, is a challenge. When tested at tide gauges, the mean sea level generally agrees to 2cm with 5cm RMS. However, satellite altimetry works best in the open ocean, so the authors are looking at a means of integrating it with tide gauge data (see Figure 3). **Dodd** and **Mills** describe FIG work on establishing 'best practice' for ellipsoidally referenced hydrographic surveying. Separation models linking the ellipsoid and chart datum are proving to be the greatest challenge: challenges that have been overcome in the UK by the development of VORF and in the US by Vdatum.

UAVs

TS04H included a number of papers on data capture using Unmanned Aerial Vehicles (UAVs). **Dominelli** et al describe using an 8-rotor helicopter to record damage following the L'Aquila earthquake and production of

photogrammetry. **Arthur** et al presented a method for automatic generation of orthophoto mosaics using the Scale Invariant Feature Transform (SIFT) approach to overcome difficulties that many commercial systems encounter with automatic image matching using UAV imagery, due to high variability between scenes. **Sun** et al have been working on integrating GPS, pressure and low cost IMU MEMS sensors on board small UAVs. At present computing capability on the UAV limits what can be done.

GNSS

In TS05B, **Blick** and **Donnelly** ask if it is possible to entirely replace the role of passive survey control stations with CORS in the context of the recent earthquakes in New Zealand. For a summary on the latest developments in modernisation of global GNSS services, refer to a paper delivered by **Lau** and **Roberts**. The paper also covers simulation tests including the new constellations and GPS frequencies. **Mader** et al describe the upgraded OPUS online positioning service, known as OPUS-Projects and **Maras** et al describe an online processing service called Selcuk, which they have tested using IGS station data. Finally in this session, **Martin** and **McGovern** (Ireland) presented a report on the performance of the Irish Network RTK services, which is essential reading for surveyors working there.

In TS06E, **Cranenbroeck** and **Lui** analyse the factors that cause CORS networks to succeed or fail. They take a high-level view of the products and ask various questions regarding the economics and sustainability of the technology, including the 'threat' posed by precise point positioning (see also *Precise Point Positioning v. GNSS*, *GW* September/October 2012).

In TS07H, **Kallio** et al look at GNSS antenna calibration. It is generally assumed that the published antenna calibration values for a particular model of antenna can be used for the individual antennas but, following an experiment using individually calibrated antennas from two manufacturers, the researchers found that there were residual errors, particularly in the L2 height component, of several millimetres. Their preliminary conclusion is that the differences are down to the 'near field' effect, caused by the difference between the antenna mounting used in lab calibration and the concrete pillars on which the antennas were mounted for the experiment.

Baiocchi et al describe an innovative method for GNSS data processing which they call a "multiconstellation" approach. The premise is that, by using GPS and GLONASS satellites, there are now sufficient satellites to divide the available satellites into two groups and use one group to compute baselines out from one station and the other to compute independently the remaining baselines in the network. Under current operating procedures, two observing

“...the US is moving towards a datum realised through GNSS.”

sessions would be required to measure all available baselines, so there is potential time saving with the multiconstellation approach.

Zhang looked at surveying accuracy in terms of cost-benefit. For engineering applications it is reasonable to assume that higher accuracy surveying will result in higher surveying costs but lower engineering costs, but is the surveying cost less than the engineering benefit? An interesting question that is well worth exploring. Zou et al, describe the development of a GNSS receiver that can record data from a number of antennae, thus potentially reducing the cost of GNSS monitoring networks.

Session 09B was devoted to Precise Point Positioning (PPP). GW covered this in our last issue, in an edited version of a paper presented in Rome by Chris Rizos et al. Vladimir Seredovich et al from the Siberian State Academy of Geodesy gave a paper on GNSS precise point positioning (PPP) in Nigeria. With dual frequency and carrier phase observations standalone receivers can achieve post-processed positioning using the precise ephemeris with centimetre to decimetre accuracy. The authors used the technique to compute a survey station on Nigeria's Jebba Dam by submitting their data to the on-line GNSS computation sites, AusPOS and CSRS. The results agreed to within a few centimetres. A Trimble TRM41249 antenna was

used to collect one-second data for six hours. The paper concludes that surveyors in Nigeria should embrace PPP instead of using existing geodetic control.

Alcay et al report on their investigations into the use of GPS with GLONASS for PPP using the magicGNSS web-based software for processing. They conclude that the addition of GLONASS observation data improves positioning quality. Elsobeiey and El-Rabbany introduce an improved PPP model which rigorously accounts for all GPS errors and biases including second-order ionospheric delay. In particular, they found that the NOAA Trop model for tropospheric signal delay is superior to the widely used Saastamoinen and Hopfield models. Sanlioglu and Kara have analysed data for four IGS CORS and observed that the time series of the height component shows an annual variation which is proportional to temperature and inversely proportional to pressure.

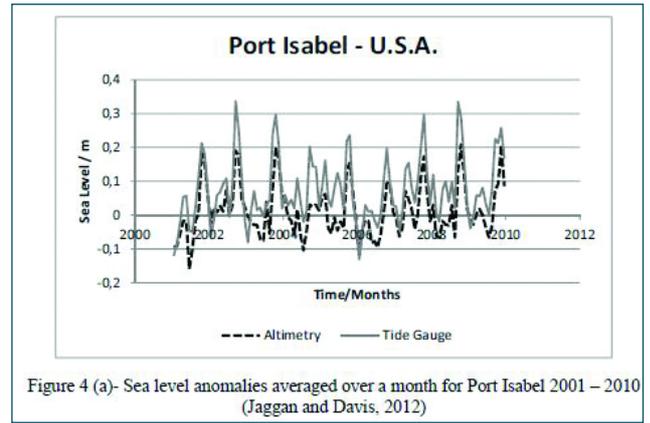


Figure 4 (a)- Sea level anomalies averaged over a month for Port Isabel 2001 – 2010 (Jaggan and Davis, 2012)

Figure 3: Sea level anomalies averaged over a month for Port Isabel 2001-2010.

SURVEY REVIEW

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Autumn break in Hannover



It's autumn again. Time for a thicker coat and winter woollies, especially if you're off to northern Germany and the Intergeo, the world's largest geo event.

This year's show was in the lovely city of Hannover with its attractive centre, Maschsee (a manmade lake to which lovers lock themselves to its bounding railings) and the Sprengl Museum of modern art. Alas I cannot get so excited about the Messe centre located so far from the city centre that even by public transport you will be lucky to make it in under an hour. I am told that it is the biggest expo centre in the world. Looking at it on Google, one visitor remarked, '**** me, it's bigger than Edinburgh!'

The three-day event attracted some 16,000 visitors to see the wares of over 500 companies, many of them addressing the German market with its cadastral land registration system. It also included a conference with a secondary event for CLGE, the European federation that represents some 100,000 surveyors.

A press conference on the first day (with simultaneous English / German translation depending on speakers' nationalities) heard six pundits discussing a range of topical issues from open source, whether there should be a European agency for geodata to the US presidential election ('political discussion has ceased until after the election!' quipped Trimble CEO **Steve Berglund**).

What stays is data

The meeting was presided by **Hagen Graeff**, chief representative of the German Surveyors

body, DVW gGmbH, who teased some interesting responses from his fellow panellists. **Arnulf Christl**, president of the Open Source Geospatial Foundation, observed that many companies were unaware that their base softwares were open source. But for Christl the issue was opening up government data: 'software comes and goes, what stays is data'. Aha! But if there is more and more data, what about quality, asked Graeff?

Trimble CEO **Steve Berglund** asserted that quality depends on use. For infrastructure it will need to be near perfect but if you're looking for an address then near enough maybe enough.

For **Chee Hai TEO**, president of FIG, the international surveyors body, the answer was simple. 'Surveyors should be in the business of being solution providers.' But surveyors are too often comfortable in their local environment: 'we put a peg in the ground – it's a core competence.' But we need to be in the business of providing information and ultimately knowledge'.

Responding **Jean-Yves Pirlot**, president of CLGE, argued that we had to 'get on the radar' of the policy-makers in Brussels. 'CLGE is mentioned in the INSPIRE Directive in connection with the measurement of buildings – a breakthrough for us.'

Another reminder of the significance of Brussels came from Prof Dr-Ing **Karl Thöne**, president of DVW e.V: '80% of all legal applications in Germany have an EC content'.

Collect, collate, collaborate

Discussions turned to the Internet, which it is argued will be the driver for the third industrial revolution. Steve Berglund reminded us that it is an enabler in the same way that highways and harbours were in another age. While for Prof Thöne 'Geodata connects everything to everything in some way' and Teo CheeHai asserted that efforts must begin locally, then nationally. Without these we cannot cooperate internationally.' For Teo, it was about 'collect, collate, collaborate'. A view endorsed by Prof Thöne, 'better that we talk with each other, rather than about each other' – a variant of Churchill's 'better jaw-jaw than war-war.'



Above: CheeHai TEO: "we need to be in the business of providing information and ultimately knowledge".

Right: Hannover's Maschsee and National Football Stadium in the distance, viewed from the Sprengl Museum.



Turning to the floor of the exhibition, all of the leading survey equipment manufacturers had new offerings though only Topcon ran a press conference so let's consider first what they had to say.

It's all too easy to think that positioning technologies like GPS and optical instruments are tools for surveyors and engineers. In reality there are emerging markets that could outstrip demand from infrastructure projects. One such is agribusiness where Topcon has made 'huge investments' says **Ewout Korpershoel**, the company's chief marketing officer but acknowledged that for the moment the best markets are where there's big infrastructure spending.

Topcon, marking its 80th year in 2012, was an \$800m business back in 1993. Like its competitors it has profited on the back of growing computing power during the last two decades and technology leaders like Google and Navtech. **Ray O'Connor**, president and CEO of Topcon Positioning Systems acknowledges that 'competition creates a much bigger market'. It has helped make Topcon a \$5 billion business today.

Keeping insurance premiums down

Responding to equipment theft problems Topcon launched TSshield earlier this year for its total station range. Integrated with cell phone and GPS technology that can exchange data and update onboard software, a TS Shield equipped total station can warn when it is in unauthorised hands. **Ian Stilgoe**, geomatics business unit manager, believes the move will help keep insurance premiums down.

Topcon has a long history of being amongst the first to see the value of integrating the Russian Glonass navigation satellite system with GPS in their receivers. Their new Vanguard chip offers 226 channels and the firmware can be updated as new systems come on stream such as the Galileo and Chinese Compass systems.

Network RTK is making positioning into an "anywhere, anytime" technology. Topcon's offering, TopNet, which is established in many countries, is in the process of being amalgamated into an international service. Stilgoe acknowledges that coverage is not complete yet in Europe, some like France and Germany due to existing state networks.

Drive-by surveying?

For laser scanning, Topcon has three mobile offerings the latest of which is the IP-S2 Compact, available with either three or five scanners. It can collect data at the rate of up to 150,000 points per second to a range of 40-50 m and the first sale has gone to Swedish company Viascan AB in Gothenburg. However, Topcon has only limited products for static scanning. The latter market is one closely addressed by their competitors and which Topcon can currently only address



through a marketing deal with FARO that allows Topcon dealers in Europe to distribute the Focus 3D (in the UK, Trimble dealer Korec is the supplier).

Despite Stilgoe's 'why put it on a tripod when you can drive past it' approach, this is a market they will need to address. O'Connor, acknowledging that development is ongoing ('Who will make the iPhone answer for laser scanning?') and added 'we want to see it as part of the survey business.'

Topcon's latest. **Above from left to right:** the Sokkia FX series with TSshield, the IP-52 Compact mobile scanning system and the tiny B110 GNSS board with the new Vanguard chipset.

Aerial innovations abound

Moving on let's take a look at one or two of the smaller players had to offer.

SenseFly has updated its UAV range. The hand launched eBee offers a 45 min flight time with a range that can capture 1.5-10 sq kms. The unit weighs 630 g at take off and carries a 16 Mpx camera enabling it to capture images with a ground resolution as low as 3 cm/pixel.

Microsoft company Ultracam announced the Falcon, a digital airborne camera system with image footprints of 14,430 or 17,310 pixels and the ability to change storage units in flight. Image capture varies depending on footprint but up to 5,200 images can be stored.

Another aerial camera system was duly unveiled by Optech. The latest uses SOMAG AG Jena's GSM 3000 gyro-stabilization mount with a multi-sensor frame and platform for its line of ALTM airborne laser terrain mappers and digital metric cameras. The mount is compatible with all Optech Orion lidar sensors and CS-series digital mapping cameras.

Back on the ground

I was interested to see that Riegl laser scanner dealers 3D Laser Mapping have added a handheld laser scanner to their range. The Mantis Vision MVC-F5 is ideal for close range applications and for capturing intricate detail otherwise undetectable by large scanners. The unit weighs 1.7 kg, is eye safe and captures data at a resolution

"competition creates a much bigger market'. It has helped make Topcon a \$5 billion business today."



UAVs were in abundance including SenseFly's new eBee (above) but is that golden UAV scheduled for a Bond film?



Above: The answer for facility managers? Viаметris' I-MMS indoor mobile mapping system.

of just 0.5mm. Battery power provides at least an hour of continuous use.

One of the most interesting pieces of technology on show, indeed in action you could hardly miss it as it was constantly travelling around the aisles of the show. Viаметris' I-MMS indoor mobile mapping system, housed in a simple three-wheel trolley, comprises two high density lidar sensors with a range of 50 m and an optional panoramic camera. An onboard processor and real-time data capture display are included. There is no GNSS or INS; the user simply completes acquisition by returning to the start point to ensure closure. Centimetre level accuracy is aided by the Viаметris SLAM algorithm, developed from gaming applications. An extraordinary development that should find plenty of applications in facility management.

Trimble

Let's see what Topcon's competitors have been up to. First, Trimble, which we must remember also includes the Spectra Precision brand, of which more anon. Intergeo launches this year included the R10 GNSS Surveying System, a lightweight system incorporating several new technologies including Trimble's HD-GNSS processing engine. This, say Trimble, will provide a more accurate assessment of error estimates than traditional GNSS processing engines allowing surveyors to collect data in challenging environments.

TX5 = Focus 3D

Earlier this year Trimble announced a deal with FARO to sell the Focus 3D laser scanner as a Trimble OEM product. Trimble have acted swiftly on this and the Trimble TX5 3D is the result. The TX5 is able to measure at speeds of up to 976,000 points per second, up to a range of 120 m. An update to Trimble's RealWorks software (v7.2) offers improved data management, streamlined registration tools and support for data from the TX5, via the SCENE software.

For aerial mapping a medium-format, directly georeferenced imaging system, the Trimble DSS 500 was announced. Capable of producing full-resolution, ortho-rectified imagery in real time, the digital sensor system (DSS) is designed as a high-productivity, mapping-grade solution for colour orthophoto and vertical mapping applications. The DSS 500 is also fully compatible with Trimble's INPHO 5.5 photogrammetric software for unmanned aerial systems

and aerial LiDAR data production. New versions of eCognition image analysis software and Trident Analyst office software for remote sensing were also announced. The DSS 500 is also available as an OEM board set for custom integrations.

For GIS applications Trimble announced the Geo 5 and Juno 5 handheld GNSS devices. Both are optimised for GIS field workflows, including Trimble's TerraSync field software. Complete with wireless comms options, integrated cameras and bright, sunlight-readable screens, both devices are built for the field and rugged enough to withstand shock, vibration, water and dust.

The return and rise of a brand

The Spectra Precision brand has allowed Trimble to reach markets that might have regarded the company's mainline offerings as too expensive or too sophisticated for their needs. When the brand was first launched (or revived, as old hands may prefer to say, SP having been acquired by Trimble more than a decade ago along with the then advanced Aga Geotronics brand) it seemed to be targeted at construction and particularly the Asian and Eastern European markets; it's available just about everywhere including the US. So what's new?

Another brand acquisition is Ashtech, now only featuring as the engine in Spectra Precision's GNSS offerings. The new ProMark 120 and ProMark 220 GNSS receivers replace the ProMark 100 and ProMark 200 models. Both come with an updated hardware platform that includes the latest Ashtech GNSS chipset with Z-Blade GNSS-centric technology. Both models have updated software and the ProMark 220 is dual-frequency and dual constellation with Glonass L2 capability. In addition, both come with the MS windows embedded handheld 6.5 professional operating system, which includes a language options permitting users to select locale-specific settings.

A new handheld data collector, the T41, comes with a high-resolution outdoor display with a capacitive touch-screen protected by Gorilla Glass. The unit has 3.75G cellular data capabilities for use with VRS networks, plus cellular voice and SMS capabilities. An 8 Mpx camera can be set to automatically include time and location data from the integrated GPS receiver while a 1 GHz processor with 512 Mb of RAM supports large datasets. The unit comes with Survey Pro field software.

An entry level products, the MobileMapper 10 is now part of the Spectra Precision portfolio, both as a GIS handheld and as a data collector running surveying or construction field software.

Resisting the challenge and staying true

I have to confess that I was eagerly awaiting Leica Geosystems's new scanner, the P20. News leaked out about a week ahead of Intergeo and I had long thought it might take Leica a couple

"... the T41, comes with a high-resolution outdoor display with a capacitive touch-screen protected by Gorilla Glass."

Below: The Focus 3D now starring in Trimble's TX5.



of years to challenge the size and price of the FARO Focus 3D. I was wrong. What Leica has done is remain true to the market they pioneered and instead of trying to compete at what has to be seen as the bottom end, they have launched a worthy successor to their previous Scan Stations, introducing some novel technology along the way.

The ScanStation P20 is very much targeted at surveyors and those who understand that there are a number of essential features if you are to capture survey quality data. Leica are claiming three world firsts: onboard check & adjust functionality, sub-millimetre range noise at 120 m, and by combining time-of-flight range measurement and modern waveform digitizing (WFD) technology the P20 can deliver 1 million points per second.

So there you have it. Not a revolutionary device or a game changer but steady evolution enabling users to capture 3D scenes more quickly and to higher accuracy for a range of applications where these features are essential. You can read more about the P20 in **Richard Groom's** report of the recent myWorld event at the Emirates stadium on page 21.

Viva and Zeno evolve

Let's take a look at the latest GNSS offerings. Readers of our *Engineering Surveying Showcase* publication will already have been introduced to the Leica Viva GS08plus, a small and light cable-free high-accuracy GNSS system. Offering flexible set-up options and equipped with Leica's SmartWorx Viva LT onboard software, the GS08plus provides access to dual-frequency RTK surveying at relatively modest cost. Equipped with the GS08plus SmartAntenna and CS10 controller on a carbon telescopic pole, weight is just 2.6 kg.

Moving on, a new mid range series of total stations were announced ahead of Intergeo. The Flexline plus range offers distance accuracy on prisms of 1.5 mm + 2.0 ppm, measure to any surface (non-prism mode) with an accuracy of 2.0 mm + 2.0 ppm. Angle measurements are compensated with quadruple axis compensation. This is a

three-model range – TS02, TS06plus and TS09plus – each with a choice of angle accuracies from 7" down to 1". For extreme conditions all instruments are available as Arctic versions allowing operation down to -35°C. Let's hope that won't be necessary for too many of us this winter.

For GIS applications Leica were showing the Zeno CS25 GNSS, a 7-inch screen tablet computer running Windows 7 with full GNSS functionality and incorporating a compact L1/L2 antenna.

Leica has a long pedigree in airborne mapping. The latest development is the RCD30 Oblique, a medium format camera designed for high accuracy 3D urban mapping and 3D corridor mapping applications. Based on Leica's RCD30, the world's first 60 Mpx multi-spectral medium format camera, the Leica RCD30 Oblique allows a trio and penta head configuration for corridor mapping and urban mapping applications. Customers have a choice of CH61 RGB only and CH62 multispectral RGBN camera heads. For highest image quality the RCD30 Oblique provides multi-directional motion compensation.

There were many other new products addressing the survey and geo markets at Intergeo, many of them from far eastern manufacturers but few offered anything new. The majority, while probably well made and perfectly reliable, simply ape the GNSS systems and total stations of the big three manufacturers. If we find anything we'll let you know.



Top: Leica's new P20 time-of-flight scanner
Below: the Zeno CS25 tablet with 7" screen.


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Planetary diversion precedes Viennese outing

By John Brock

A trip to Tahiti to observe the Transit of Venus, an Egyptian dinner, the Mountain of Death and off to Vienna to meet the last of the Hapsburgs, have all kept our columnist busy.

As the Transit of Venus is not scheduled to recur until 2117 I thought that I better make this one memorable. I went to Tahiti to watch this cosmic phenomenon first-hand within 20 metres of where Lieutenant **James Cook** saw it on 3 June 1769 at Point Venus, named by him before he left to circumnavigate New Zealand and “bump” into the east coast of New Holland.

Apart from a dozen star nerds, who were part of an Astronomical Conference on the island, I was the only other observer with a high powered telescope with a sun filter so I let all of the Tahitian school children take a peek at the tiny planet as it sailed across the face of the much larger solar body. Something they will never forget, or me, considering that there was no transit in the 20th century at all and two within eight years this century.

ACE Dinner and Lord Sydney, the Book

At the Australian Centre for Egyptology annual dinner one of my classmates in the MA (Egyptology) degree at Macquarie University, **Kim McCorquodale**, gave a great illustrated talk about marriage and the law in ancient Egypt to show that things have not changed much in 2000 years. Hot on the heels of this we had the annual conference which brought us up to date on recent finds in Egypt during the last dig season.

Andrew Tink presented a précis of his recent publication at the City of Sydney Historical Association meeting in Sydney. Most appropriately it set the record straight on the individual after whom Australia’s most populated city was named. Often falsely painted as a servile sycophant to King George III, the man known as Lord Sydney was reinstated as a champion of the convict settlement of New South Wales.

Our columnist with Archduke Dr Michael Salvator Habsburg-Lothringen and his wife Pia.



The Mountain of Death

We recently took a bus tour with the Prospect Heritage Trust to the historic mining village of Mount Kembla which nestles near the top of the mountain of the same name overlooking the Pacific Coast of Wollongong (100 miles south of Sydney). The village is infamous for the 1902 cave-in which

killed 96 men and boys in the worst industrial tragedy in Australia’s history. Tragic hero **Henry Osborne MacCabe** was waiting on the Bulli platform for the return train home to Sydney when he heard the explosion at the colliery and went to help.

Already a hero for his fearless rescues of survivors in the 1887 Bulli mine disaster, which claimed 81 souls, he perished in his courageous dive to help any still alive in the mountain pit. His father, **Francis Henry MacCabe**, had been the Mt Keira mine manager from 1857 to 1890 as well as the Lands Department surveyor responsible for the border survey between New South Wales and Victoria with the westernmost corner point named MacCabe corner in his honour. His biography by grandson **Michael MacCabe** has just been released by the NSW Land and Property Information: *Surveyor Francis Peter MacCabe – The Man Behind the Corner*.

IMCoS 30th Annual Symposium in Vienna

Just before we left for Vienna we listened to the President of the International Map Collector’s Society, **Sarah Tyacke**, give a superb talk at the NSW State Library about the English mariner Sir **Robert Dudley** who measured and charted Australia in the 1640s. We met up with Sarah again in Austria at the IMCoS 30th Annual Symposium. A brilliant event was staged under the leadership of Stefaan Missinne, his family and team with great presentations about Austrian mapping adding to the celebratory talks about **Gerhard Mercator** on the anniversary of his 500th birthday.

Among the honoured speakers were our own **Jan De Graeve** as well as the Archduke Dr **Michael Salvator Habsburg-Lothringen** who was accompanied by his wife Pia. On Monday night we were graciously entertained by the Belgian Ambassador, Mr **Frank Recker** and his wife Anna at their official residence. Along with first class presentations we were taken to fascinating map exhibits at the Museum of Vienna, Globe Museum and especially the stunning Monastery of Melk before the farewell Gala Dinner at Loibnerhof on the Danube in the UNESCO listed Wachau region. Day trips to Prague, Budapest and Bratislava topped off a most rewarding week’s sojourn.

• *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. He also recently gained a granddaughter.*



Enlarging maps by digital or other means, as we all should know, does not mean that you get a map to a larger scale. Not only is OS clear on this now the law is too, reports our legal correspondent **Carl Calvert**.

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It's all a matter of scale, and it's not trivial

By Carl Calvert

This case of Judicial Review brought by The Trail Riders' Fellowship (TRF), *The Trail Riders' Fellowship & Anor v R & Dorset County Council* [2012] EWHC 2634 (Admin), concerned five routes over which they (the Claimants) maintained that the public enjoyed vehicular public rights of way (including with mechanically-propelled vehicles), which were not recorded on the Definitive Map Statement (DMS).

There are three types of public rights of way: footpaths, bridleways and byways open to all traffic (BOATS) and these are recorded on the DMS which is a legal document and evidence of a right of way. To add a right of way to the DMS an application has to be made to the Surveying Authority, which in nearly all cases is the County Council.

The application to Dorset County Council, the Surveying Authority, was made on a map which had its basis on an OS 1/50,000 scale map enlarged to 1/25,000. The Wildlife and Countryside (Definitive Maps and Statements) Regulations 1993 (the 1993 Regulations) state:

"2. Scale of definitive maps

A definitive map shall be on a scale of not less than 1/25,000 but where the surveying authority wishes to show on a larger scale any particulars required to be shown on the map, in addition, an inset map may be used for that purpose. . ."

This begs the question as to what is a 1/25,000 scale map? The claimants' counsel argued that, 'In a letter dated 5 June 2009 the Department for Environment, Food and Rural Affairs ("DEFRA") expressed the view that an application that was accompanied by a map that has been photographically enlarged could be a "qualifying" application under the *de minimi*¹ principle'.

Here note the 'could be'. I do not know from whom DEFRA sought advice but earlier that year (19th March 2009 and 10th December 2009) the OS had stated in letters to the Defendants, the Dorset County Council (DCC), that they [Ordnance Survey] had set out their comments and in particular their description of the application map as a facsimile copy of an enlarged image taken from the Ordnance Survey digital raster mapping originally produced at a 1:50,000 scale. The data had been supplied to Anquet whose software had been used to enlarge the picture (raster image) to 1:25,000 scale.

Questions asked by the Defendant and answers provided by Ordnance Survey included the following:

"(1) **Question 1** (first part) *Where:*

1.1 digital raster mapping is originally produced by the OS at 1:50,000 scale ("the Original Product");

1.2 an image is taken from the Original Product and enlarged to a 1:25,000 scale; and

1.3 a facsimile copy of that enlarged image is produced in printed form ("the Map") is the Map properly to be regarded as being at a scale of 1:50,000 or 1:25,000?"

Answer: "As described in the question the map would be properly to be regarded as a 1:50,000 scale Ordnance Survey map enlarged to a 1:25,000 scale."

(2) **Question 1** (second part): *If not properly regarded as being at a scale of 1:25,000 is the Map regarded as equivalent to a map produced at 1:25,000 by the Ordnance Survey?*

Answer: "It is not regarded by Ordnance Survey as equivalent to a map published by Ordnance Survey at 1:25,000 scale, since it does not conform to the standard cartographic style and content used by Ordnance Survey for national series maps and data products published at the 1:25,000 Scale."

Question 6: *What are the differences between an OS 1:25,000 map and an enlarged (by the method described by the Claimants) 1:50,000 product?*

Answer: "The differences are those already expressed as the differences between the specifications of the two data sets published by Ordnance Survey. They are most apparent visually in the different levels of content simplification, generalisation, symbology and conventions of depiction of the two map series.

These include, for example, the inclusion of land enclosure boundaries, separate depiction of a greater number of individual buildings, and depiction of various roads widths for certain categories of road within the 1:25,000 scale OS Explorer Map and 1:25,000 Scale Colour raster, compared with the more heavily simplified and generalised content of the 1:50,000 Scale OS Landranger Map and 1:50,000 Scale Colour Raster which has standardised road width depictions, far fewer individual buildings identified and minimal land enclosure boundary information."

Supperstone L J stated that:

"In my judgment, none of these matters alter the fact that the applications were accompanied by a map that was not a 1:25,000 scale map."

In other words an enlargement of a 1:50,000 raster image cannot be a 1:25,000 scale map.

i De minimis non curat lex can be loosely translated as, the law ignores trivial matters.

GW Surveyor Survey – the results



Back in the summer GW emailed 700 people to invite them to complete a statistical survey of the current state of the survey profession. Nearly 80 responded. Here are the high level results. We will be drilling down into the data to provide more insight for the next issue.

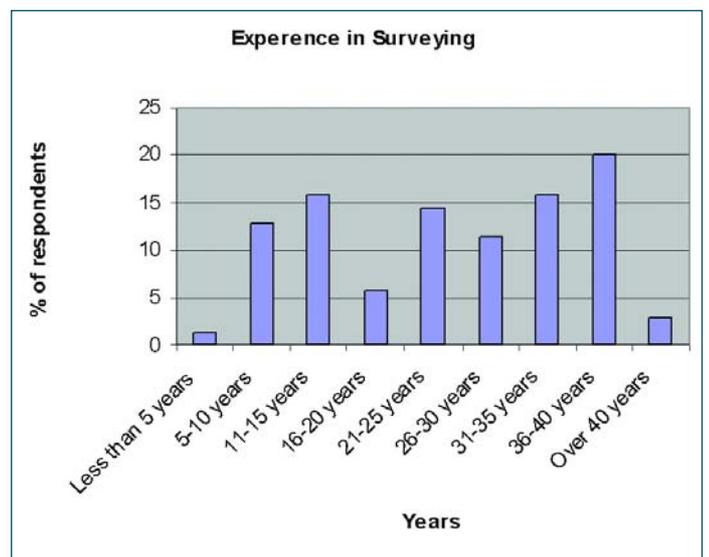
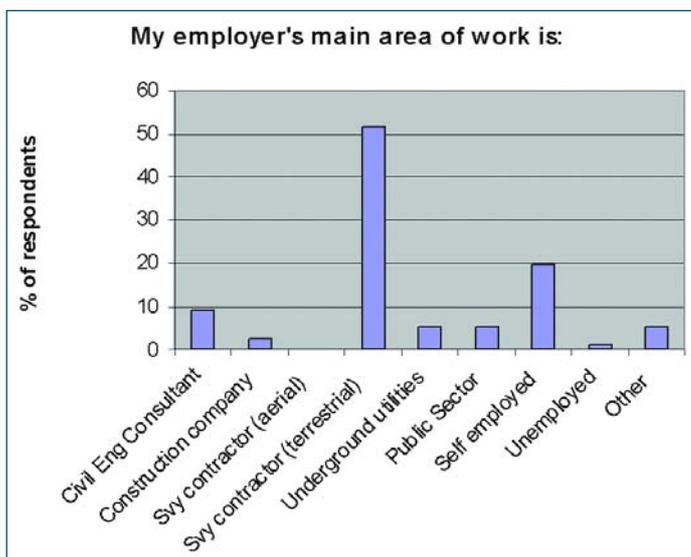
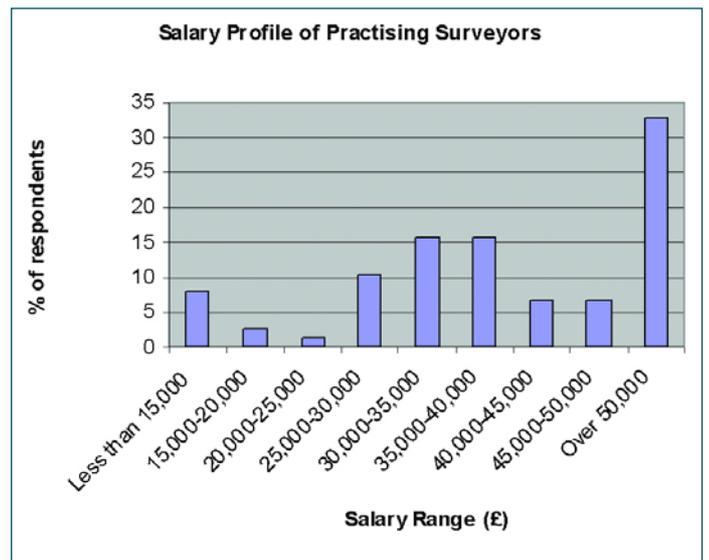
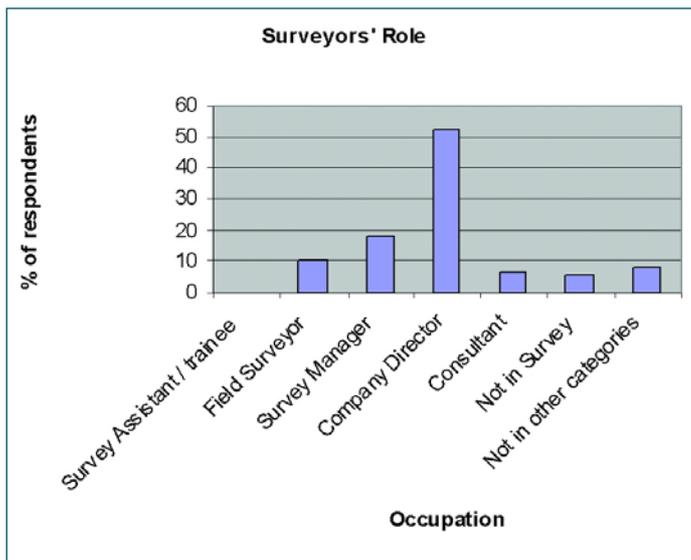
There are perhaps not too many surprises concerning the age profile of our respondents, reflecting worldwide concern about the lack of young surveyors entering the profession. The chart for length of experience is rather more balanced. It was however rather surprising that over 50% of respondents said that they were company directors (which might explain why over 30% of respondents earn a salary of over £50k!), whilst no survey assistants responded. It seems unlikely that these responses reflect the state of the profession – mainly small practices, one-man businesses or solitary practitioners embedded within large organisations. Perhaps the invitation to take part in the survey did not reach the lower levels of companies where

survey technicians dwell.

We found that only 50% of respondents work for firms carrying out land surveys, and interestingly, none were employed by aerial survey companies.

In response to the question about professional surveying qualifications, the ratio FRICS:MRICS is almost identical to FlntCICES:MInstCICES, with a slightly higher number of responses from CICES members. However, RICS appears stronger than CICES when it comes to technical and student membership. It is perhaps rather alarming that over 30% of respondents did not state their professional qualification, implying that they do not have one.

Moving to educational qualifications, 30%



of the respondents have an HNC qualification or similar. Perhaps surveyors with HNCs do not go on to gain professional qualifications. Respondents' opinions about the value of their professional qualifications could also raise some alarm: 37% consider qualifications to be unimportant or irrelevant when they are looking for work. But on a brighter note, over 70% of respondents believe that it is vital or important to receive a professional magazine.

The final question of the survey was an invitation to comment. Here are some extracts:

- "I think that the RICS etc. should open their doors to membership for non-degree educated geomatics surveyors."
- "The professional bodies' attitude to other nationalities with far higher academic achievement criteria than UK universities is poor which makes these organisations sadly redundant. Standards are very mixed across the UK as a whole as a result of the failure of these organisations to lead the profession rather than act as an old boys network."

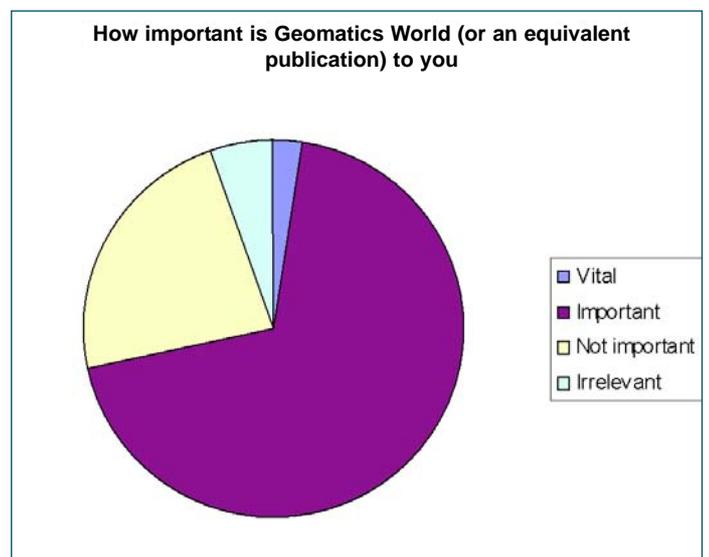
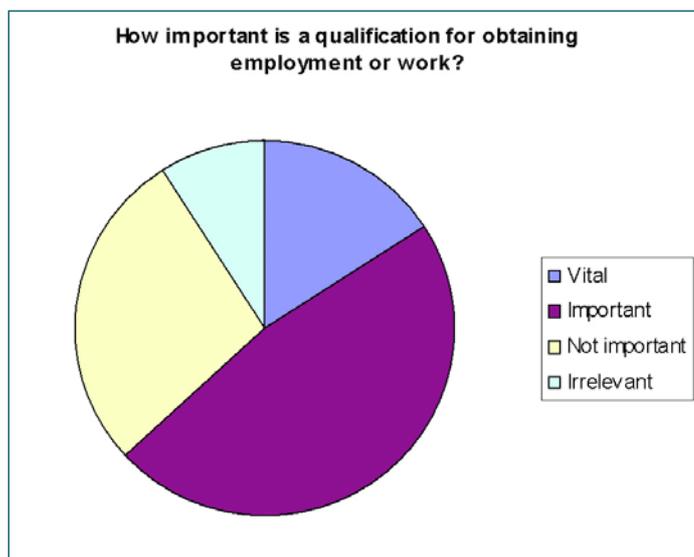
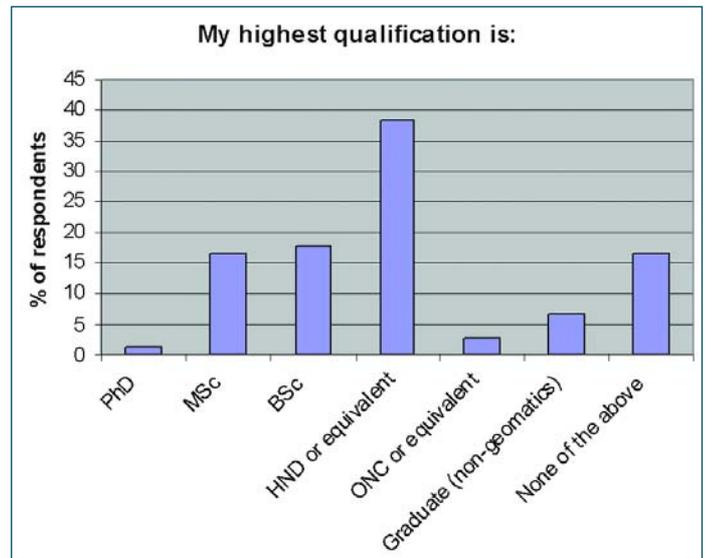
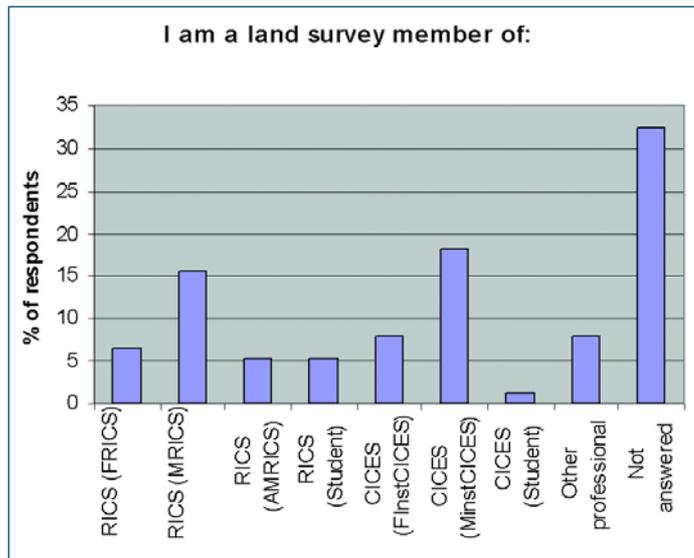
- "Significant skills shortage in land and hydrographic surveyors with expertise to work offshore and in the office on Oil and Gas Projects."
- "Not sure if a lack of a university education would bar anyone from progressing to company director today!"

Conclusions

Traditionally, we think of land surveying as a profession practised for love rather than money so the finding that a large proportion of respondents are earning a salary of over £50,000 comes as quite a surprise - particularly during a recession. If we really are seeing the tide turn this is most encouraging, not just for those at the top of the profession now, but also for those starting out, because it demonstrates that there is the prospect of a reasonable salary if they are prepared to stick with it.

- Many thanks to all who took part in the survey.

"... over 70% of respondents believe that it is vital or important to receive a professional magazine."





KOREC and Trimble show their Know How

The 3 October saw the final date in the 2012 Trimble Express and KOREC road shows. It was a chance for some hands-on experience of the new Juno 5 (above) and the Sensefly UAV (below) reports **GW's Sharon Robson.**

Held at the newly refurbished Huntingdon branch, we received an immediate friendly welcome by the Korec sales team who were on hand with kit outside ready for demos. After a coffee and informal chat with other attendees we were escorted into a purpose-built seminar room complete with built-in projector, screen and blackout blinds.

David Bennett, Korec's marketing manager, welcomed us all with a brief run through of the agenda for the day and then swiftly handed over to **Martyn Palmer.**

Palmer is Korec's GIS mapping sales consultant and was keen to demonstrate the Swinglet cam by Sensefly, a UAV (unmanned aerial vehicle). The presentation's slides showed that the Swinglet could cut down project time frames from 4-6 weeks down to a matter of days on as little as three flights. An example was shown of a large area that had been affected by forest fires and the rough and dangerous terrain staff would have struggled to navigate on foot, compared with the ease of the Swinglet. The UAV has the ability to take off and land unaided, can follow a set flight plan, can capture up to 4 images per second with a resolution of 2 cm, has an average of 30 minutes flight time per battery and can cover around 100 hectares in that time.

The next session was presented by **Peter Holland** (another mapping and GIS consultant).

Holland demonstrated the features and benefits of the Trimble JUNO handheld and the presentation was rounded up with an outside demo of the JUNO 5 in action.

This handheld device has wireless connectivity, can provide a GPS location down to 2-5 metres in the field, has 2 Gb built-in memory with expansion up to 32 Gb, has a 10-hour battery life and in-built 5 Mpx pixel camera. There are mobile phone capabilities on newer versions. The JUNO is promoted as a "one device does all" solution, reducing the need for a camera, mobile phone and laptop.

Next up was **Anthony Mills**, sales account manager for Trimble Survey, who talked us through a selection of slides covering Trimble's news. He talked enthusiastically about Trimble's latest acquisitions, Google Sketch-up and Gatewing (earlier in 2012) and the news that in addition to Korec, Trimble will also become a distributor of the FARO Focus 3D laser scanner as an OEM product (see also our Intergeo report on page 28). He continued with an overview of the Trimble range.

Case Studies

The majority of the day was dominated by the Focus 3D and next to present was **Andrew Maltby**, director of Maltby Land Surveys, who advised that their company had recently purchased three of the Focus 3d scanners. He took us through a series of case studies demonstrating projects where the scanner has been used and how the data captured can be worked on various software packages in addition to the FARO Scene package.

Rounding up the presentations was **David Southam**, FARO account manager who followed on nicely with a more detailed look at the Scene software and the cloud capabilities and was on hand to answer many technical questions attendees had about the scanner.

The day was rounded up with a tour round the refurbished premises and the option to see more of the scanner and other products in action.

Right: the Sensefly Swinglet Cam. See also Engineering Surveying Showcase 2011, issue No 2.



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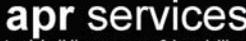


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