Geomatics World

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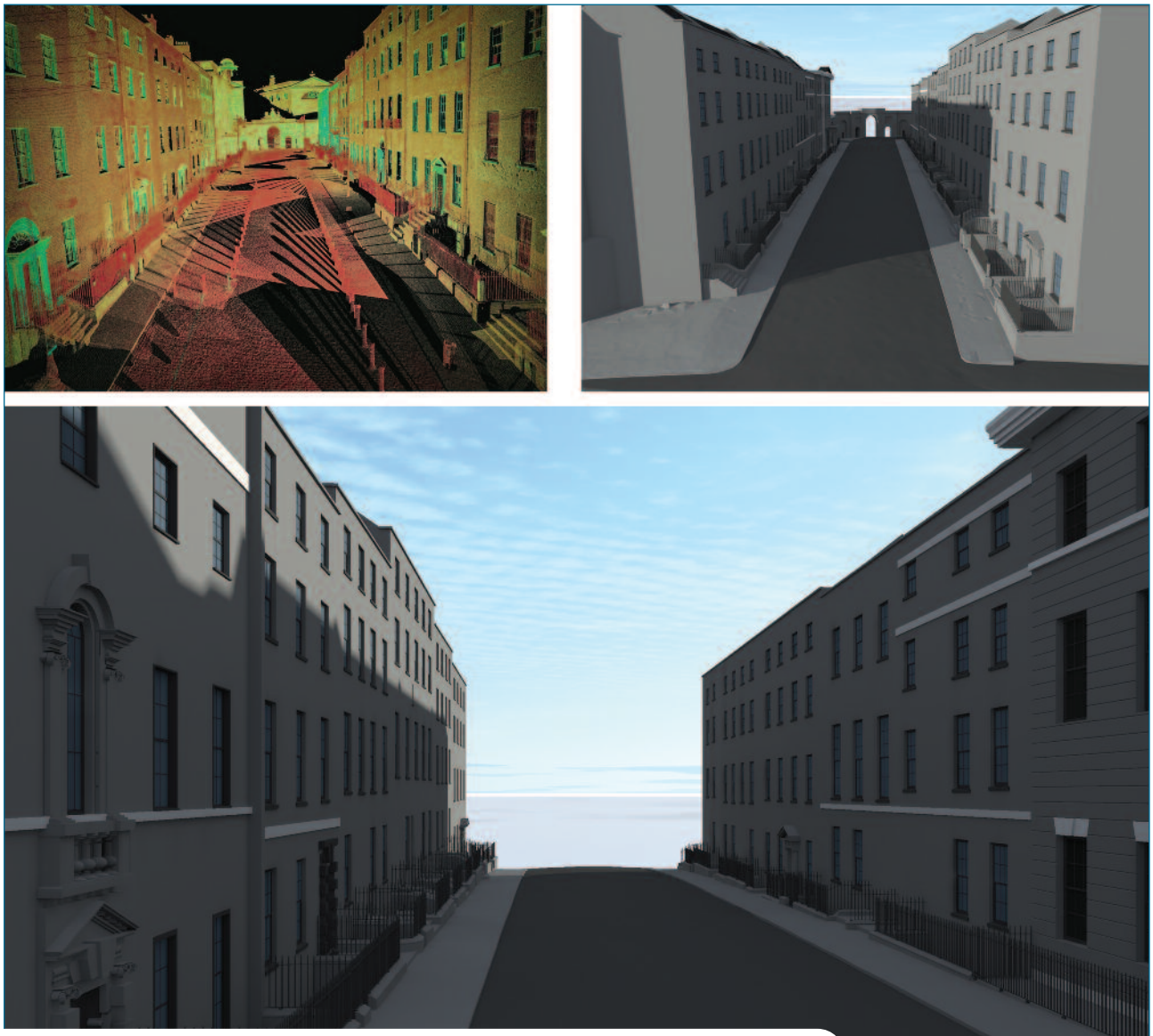
Issue No 1 : Volume 24



Surveying for geographical and spatial information in the 21st century

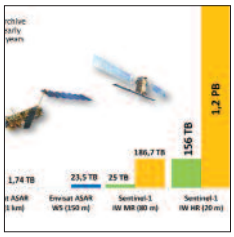
Geomatics: 3D Heritage Modelling

Scanning for Heritage BIM modelling

Laser scanner proven for topo survey

3D-Icons project captures Ireland's heritage

Uberisation for geospatial services, UAVs for tripods?



Surveyors Rendezvous on USA / Canada border

RICS

FREE DIGITAL SUBSCRIPTION FOR PROFESSIONAL SURVEYORS see page 3

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Editor: Stephen Booth

Technical Editor: Richard Groom

Advertising: Sharon Robson

Subscriptions: Jason Poole

Editorial and advertising:
e-mail: editor@pvpubs.demon.co.uk
Web: www.pvpubs.com
T: +44 (0) 1438 352617
F: +44 (0) 1438 351989

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

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PV Publications Ltd
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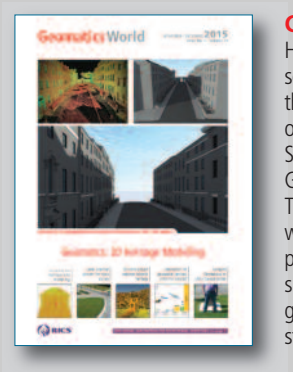

COVER STORY
High-resolution laser scanning has created these impressive images of Dublin's Henrietta Street, a terrace of Georgian town houses. The imaging helped by working from a parametric library of shapes to automatically generate the façade structure.

Contents

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Engineering surveying*showcase*2015 ISSUE TWO

Issue No 2 of *Showcase* for 2015 is now available, including:
- **UAVs: models compared, a guide to operation and regulations.**
- **Full report of the Stuttgart InterGEO**
- **Monitoring and preserving the Mary Rose**
- **The AiC story: 30 years of survey software development**

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IN THE NEXT ISSUE of GW...

Ordnance Survey GB: we talk to the new man at the head

GIS: a resilient future? We find out at GeoCom 2015

Copy dates for January/February 2016: Editorial: **01 December** Advertising: **16 December**

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A horrible word is the twist that enables web viewing

Photogrammetry is at the heart of so much geospatial modelling but will the surveyor of the future need a tripod? And what became of a company that devised a way of asking questions across the web?

Two articles in this issue, both from Ireland, highlight the rapidly growing popularity across the globe of high-resolution 3D modelling in the heritage sector. Critical to both projects has been the availability of 3D laser scanners. In Scan to HBIM (heritage building information modelling) **Conor Dore** describes how the creation of a library of classical architectural parametric objects helped create a 3D model of an entire street in Dublin. To learn about this turn to page 14.

Meanwhile, **Robert Shaw** describes the 3D-ICONS project, funded by the EC, to capture some of Ireland's iconic archaeological sites from a list of candidates for UNESCO world heritage status. The interesting aspect of this project for surveyors is the integration of technologies: airborne LiDAR, RTK GNSS, terrestrial laser scanning and optical scanning. The result, of course, produces very large files but the twist, as they say on the cookery programmes, is that in order to view the imagery on the web the files have had to be "retopologised" (horrible word!). Turn to page 18 to learn more.

Planning for the worst

The drive to capture the world's great heritage sites, whether in war-torn Syria or earthquake-prone regions, is laudable. A detailed record of these sites can only contribute massively to their restoration when the worst happens. In the meantime researchers and the general public can view the sites in glorious detail. To help with this development a project backed by Oxford and Harvard archaeologists intends to distribute some 5000 cameras around the world for residents to capture their historic monuments in case of natural or manmade destruction. Again, very laudable.

But should we be worried that as technology progresses and is able to deliver ever better viewing experiences, we might lose sight of the value of actually visiting the site? To some extent it has already happened at Stonehenge where you can no longer wander amongst the mighty Sarsen stones but have to be content with the "visitor centre" experience (incidentally a visitor centre is the best description yet that I've heard as to why the ancients created the great henge!).

As we get closer and closer in being able to capture absolute reality – form, colour, texture, even the typical ambience of the site – in the finest of detail and the majority of people become content with the visitor centre's digital experience, how long will it be before a developer suggests that we move say St Paul's Cathedral to a more convenient location freeing up valuable city real estate? After all, with 3D imagery and immersive reality and perhaps the ability to touch surfaces, why would you want to bother travelling and wandering around a chilly old building?

Mind the tripod!

In all of these 3D projects the key technology is actually not laser scanning but photogrammetry, a once esoteric technique used mainly by surveyors for mapping. Today, photogrammetry is at the heart of turning data into useful information for applications as disparate as landslips, land cover, satellite trajectory determination or interior mapping. Prof **Ian Dowman** reports from two recent events, PhoWo and Geospatial Week in Stuttgart (something of a centre for photogrammetry) which reveal that while photogrammetric techniques are certainly behind the software, the popular platform for capturing data is rapidly becoming the UAV. Someone has even posited that in future the surveyor's tripod will be the UAV. Interesting how something that essentially had to be securely positioned and levelled has suddenly become highly mobile.

It seems that at almost every academic event Google is never far away. At Geospatial Week **Ed Parsons**, the company's geospatial technologist, showed how that with the acquisition of Skybox Google now has a constellation of small satellites with short revisit times.To learn more about all of this and discover what "voxels" are, turn to page 22.

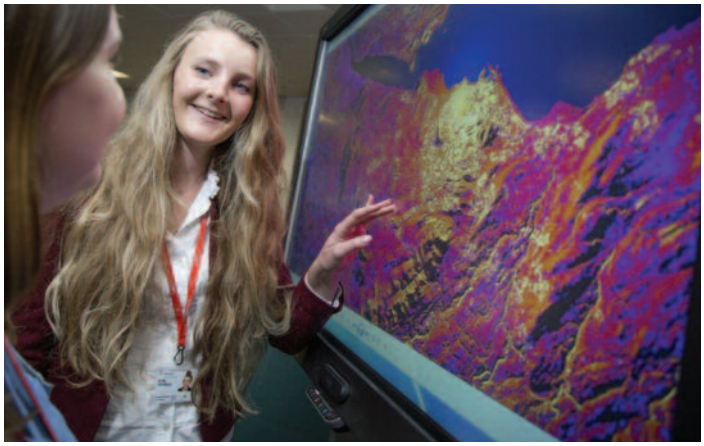
Happy holidays

This issue of *GW* is the last for 2015 so I wish readers a pleasant and peaceful holiday period and new year. We shall be back with the first issue of 2016 in early January.

Stephen Booth, Editor

The editor welcomes your comments and editorial contributions by e-mail:
editor@pvpubs.demon.co.uk
or by post:
Geomatics World
PV Publications Ltd
2B North Road
Stevenage
Herts SG1 4AT
United Kingdom

Gap-year student wins award



The top award for the 'Future Industry Leader Awards' 2015 has been won by Katie Archibald, a gap-year student from East Lothian, Scotland, who embarks on her degree in General Engineering at the University of Cambridge next month.

Katie, a former Knox Academy pupil who studied for 'A' levels at Fettes College in Edinburgh, has been taking part in the 'Year in Industry' programme, where gap-year students are placed for up to a year with top industrial employers. This enables them to gain valuable business experience and work on real commercial projects which benefit their companies.

Her placement was with Finmeccanica-Selex ES, an international leader in electronic and information technologies for defence systems, aerospace, data, infrastructures, land security and protection and sustainable solutions. During her time with the company, Katie developed a project where she significantly enhanced the accuracy of predictions of modern radar modes, by developing an advanced clutter model which simulates expected clutter (radar reflections from the ground), using free Ordnance Survey map data.

RICS Geomatics Evening Lectures 2015-16

RICS Geomatics evening lectures are free and open to all (especially students) and we would ask that all those wishing to attend contact our PG support team **pgsupport@rics.org** to guarantee a place. Evening lectures have proved increasingly popular over the last few years and are often oversubscribed. All details on future evening lectures and for the latest from RICS Geomatics can be found at **www.rics.org/geomatics**. Online resources from the 2014-15 session can be accessed @ **https://communities.rics.org/connect.ti/Wikigeo/groupHome** Do please feel free to pass these details onto colleagues.

Thurs 12th Nov 2015 – Joint lecture with CICES & RICS – University of East London. *Survey4BIM – 5 big geospatial issues.*

Tuesday 08 Dec 2015
Michael Barrett award 2015 – RICS Christmas lecture
Responsible Guidelines for Land Governance
Speaker and award winner: Paul Munro-Faure

Tues 26th Jan 2016 – *UK Geo-forum annual lecture*, Topic and speaker TBC.

Thurs 25th Feb 2016 – *Measured buildings and property measurement standards* Speaker: Tom Pugh MRICS

Thurs TBC April 2016 – Scottish lecture
Title: Measured surveys 3rd ed guidance and spec – at the heart of every good survey is a strong specification.
Speaker: James Kavanagh MRICS, Director Land and Resources RICS Location: TBC

Chartered engineer status for surveyors?

A new scheme to enable members of the Chartered Institution of Civil Engineering Surveyors (CICES) to achieve chartered engineer status was launched recently at the Institution of Civil Engineers (ICE). CICES has worked closely with ICE to ensure the scheme is acceptable to the Engineering Council, which grants chartered engineer status to suitable candidates. The move comes as the construction industry is setting its sights on becoming 'world class' by 2025. Backing the move, rear admiral Nigel Guild of the Engineering Council said "Society needs to know that engineering is done by professionally competent people. Peer review is at the core of the Engineering Council's work and underscores the diversity of engineering".

Ian Cowling, CICES's chief examiner, introduced the process for candidates, which has been audited and approved by ICE and is based on an Individual Report Route to professional registration that takes as its starting point three primary points one of which specifically says that to be eligible candidates do not "require a specific academic qualification". This may come as a surprise to many who dutifully followed cognate courses approved by CICES (and RICS) in the past but is a reflection, according to one speaker at the launch, of changing times which now offer more varied routes, including apprenticeships, to professional qualification.

Loom to the Moon!

Supporting a very worthy cause, Glanville Consultants provided the expertise for a world record attempt at the longest ever Loom Band Bracelet. Measuring 41,106 feet (nearly 8 miles), the Loom Band Bracelet was painstakingly measured by the Geomatics team and successfully registered as a new World Record on 23rd July 2015. Blue Skye Thinking is a Charity which supports research so that all children diagnosed with brain tumours will have a better chance of survival and a better quality of life post-treatment.
http://www.blueskyethinking.org/loom-to-the-moon/

Big neigh from HMRC for surveyor

A chartered surveyor, who attempted to steal almost £213,000 in Income Tax and VAT by failing to declare his earnings and submitting false repayment claims for the upkeep of racehorses has been jailed for 18 months. Lawrence Conway from London was investigated by HMRC after he submitted fraudulent VAT repayment claims of £135,325 for the cost of keeping a racehorse from 2003 to 2013. However, HMRC's investigation revealed that the horse had failed to race since its ninth place at Lingfield Park racecourse in 2001.

HMRC also discovered that Conway had worked as a chartered surveyor, but never declared his earnings for ten years, evading over £61,500 in Income Tax and National Insurance Contributions. He had also charged VAT on invoices, even though he was not VAT registered, to pocket a further £16,000 of taxpayers' cash. On the plus side there's no record of Conway having practised in geomatics!

Geovation Topic will be Water

The ninth Geovation Challenge launches in November. The topic will be Water. Use your geospatial imagination to think of innovative solutions that globally recognise problems. The prize is funding and expertise to help realise the most promising ideas. Along the way there's a boot camp, which is great for personal development. See **www.geovation.org**

Recording threatened monuments

The BBC website reports that 3D cameras are being given out to record ancient monuments that may be at risk of destruction. Residents will be asked to capture images as part of a project by Oxford and Harvard

archaeologists. The project intends to distribute up to 5,000 cameras in conflict zones across the world and capture about one million images of at-risk objects by the end of 2016. The initiative has renewed urgency following the destruction of a temple in Palmyra. See **http://www.bbc.co.uk/news/uk-34085546**

Galileo launch

Europe's own satellite navigation system has come a step nearer to completion today, with the launch of Galileo 9 and 10, which lifted off together at 02:08 GMT on 11 September from Europe's Spaceport in French Guiana, atop a Soyuz launcher. All the Soyuz stages performed as planned, with the Fregat upper stage releasing the satellites into their target orbit close to 23 500 km altitude. Two further Galileo satellites are scheduled for launch by end of this year.

"Production of the satellites has attained a regular rhythm," said Didier Faivre, ESA's director of Galileo and Navigation-related Activities. "At the same time, all Galileo testing performed up to now – including that of the ground segment – has been returning extremely positive results."

Next year the deployment of the Galileo constellation will be boosted by the entry into operation of a specially customised Ariane 5 launcher that can double, from two to four, the number of satellites that can be inserted into orbit with a single launch.

Boundary dispute resolution Bill

The Property Boundaries (Resolution of Disputes) Bill received its second reading in the House of Lords on 11th September. The Bill provides for boundary dispute cases to be referred to technical experts first, rather than to litigators. It would intercept certain existing cases before the courts as well as providing a trigger mechanism where, before action has been commenced, a boundary issue has arisen. It then provides for a dispute-resolution process similar to that in the Party Wall Act of 1996, under which surveyors are appointed and charged with objectively considering the issues and producing a document, known as an award, setting out their agreement and determination. Visit: **http://services.parliament.uk/bills/2015-16/propertyboundariesresolutionofdisputes.html** .

Satellite imagery growth

DigitalGlobe has a geospatial industry report entitled Engage 2015. In it the company gives the results of a survey of 150 senior professionals. The report sees the availability of affordable cloud services and in particular 30cm resolution imagery as key factors in the growth in use of satellite imagery and forecasts rapid growth in the next few years. Visit: **http://go.digitalglobe.com/e30gBW03000BHS0050OH80R**

Drone survey at tube station

Lanes Group in partnership with UAV firm, Unmanned Aerial Technology has used a UAV to survey the roof of Amersham London Underground station. Rail Division planned maintenance manager Mark O'Leary said: "We believe we have shown that drone roof surveys represent a viable and cost-effective alternative to conventional roof survey methods." Surveying the 4,500 sq ft roof conventionally would have taken a team of four operatives up to five nights, using a range of access and safety equipment, including scaffolding towers.

Hexagon Wichmann winner

Leica Geosystems parent company Hexagon, was awarded the first- and second-place prizes in the Wichmann Innovations Award programme held during the InterGEO conference and trade fair in Stuttgart, Germany. The main criteria for the award were innovation, user-friendliness and practicality. The first prize went to Leica for the Pegasus:Backpack. Second place was awarded to Intergraph Security, Government & Infrastructure's Green GIS,

featuring the patented ECW (Enhanced Compression Wavelet) data compression format and ERDAS APOLLO software.

Autonomous Vehicles

Jaguar Land Rover and EPSRC have announced a jointly funded £11 million autonomous vehicle research programme. The research will take place at ten UK universities and the Transport Research Laboratory.

OS Grad Scheme

Ordnance Survey's graduate recruitment scheme for 2016 has launched, offering graduates the opportunity to lead the way on developing innovative and inspirational solutions for digital data. Working at Southampton, the recruits will join a structured two-year programme where they will get experience working with different teams across the business, delivering projects, and meeting our customers. The starting salary for each role is £27,000.

UKMap maps St Helena

The UKMap team within The GeoInformation Group has been commissioned by the St Helena Government to create a cartographic database for the island's new 1:25,000 and 1:10,000 scale mapping. The South Atlantic island currently relies on Ordnance Survey maps dating back to 1990. The development of an international airport, a major road and a wharf have rendered the existing maps out of date. The aim is to print the maps in time for the first flights in late February 2016.

UAV freezer

Called the Anti-UAV Defence System (AUDS), Liteye Systems' anti-drone laser is certainly not what you would consider portable, though it certainly looks like a weapon, with desert camouflage, a targeting system and what looks like a rifle barrel. The AUDS uses the radar and optical trackers connected to proprietary software to detect, track, and identify drones at distances of up to 8 km.

BRIEFS

The Open Geospatial Consortium (OGC) is calling for public participation in its newly-established Point Cloud Domain Working Group (Point Cloud DWG). The purpose of the Point Cloud DWG is to assess the current state of standards and best practices in the management of point cloud data and to guide OGC activities in working with or developing standards for point cloud data interoperability, discovery, and dissemination.

Details on the Point Cloud Domain Working Group can be found at: http://www.opengeospatial.org/projects/groups/pointclouddwg. Interested parties can join the e-mail list at: lists.opengeospatial.org/mailman/listinfo/pointcloud.dwg.

Mark Hudson has set up a new company focused exclusively on providing high-end land surveying and geospatial engineering consultancy. Geoterra has been launched to enable Hudson to pursue a new direction in advising consulting engineers, building and civil engineering contractors, architects and the legal profession on all aspects above ground and below surface surveying.

Ogilvie Geomatics has teamed up with Cyberhawk, a leader in remote aerial survey and inspection. Complementing Ogilvie's existing range of survey services, the firm can now offer UAV surveys utilising state-of-the-art fixed-wing and multi-rotor UAV platforms.

Intergraph's Security, Government & Infrastructure (SG&I) division has re-branded globally as Hexagon Safety & Infrastructure. The new name more closely aligns the business and its solutions with parent company, Hexagon. The new company will continue to use the Intergraph name in product branding.

UAV Show takes off at Excel

Under 20kg focus for UAVs in the UK but sense-and-avoid systems may herald larger craft

The second Commercial UAV Show took place over two days in October at Excel in East London. It did not take over the whole hall but, with eighty-five exhibitors, it covered most aspects of the UAV market. The system manufacturers, software suppliers and service providers were there as well as training companies and insurers. A conference ran over both days as well as a programme of free seminars on the exhibition floor. With everything under one roof, this was clearly the place to be for any aspiring UA owners.

In Britain the focus is inevitably on small UAs (under 20kg) because the aviation rules for operation are less burdensome than for larger drones. But there were several companies presenting larger UAs. They are using them in less-crowded places such as Australia, the US and Antarctica. One of those on display had a range of over 1000 km. In crowded airspace the key factor holding up use of the larger UAs is the need for 'sense and avoid' systems, although one supplier suggested that we are only a couple of years away from maturity of the technology for use in Europe. If and when this happens, more notice will surely be taken of the larger aircraft thanks to the heavier payload, and therefore more sophisticated sensors, that these aircraft can carry.

The insurance companies did not seem too stressed about the risks posed by UAs. One insurer said that the only third-party claim they had handled was a dent in a car. This makes one wonder if the fears of drones falling out of the sky and on to the heads of innocent passers-by is exaggerated. They do fall out of the sky, but the insurers are currently more concerned about damage to the drone.

EVENTS CALENDAR 2015

• SEMINARS • CONFERENCES • EXHIBITIONS • COURSES • WORKSHOPS

GW welcomes advance details of events of interest to the Geomatics community. Details to: **editor@pvpubs.demon.co.uk**

For details of the current RICS lecture programme turn to page 06.

The Capturing Reality Forum
23-25 November 2015 Salzburg, Austria.
www.CapturingRealityForum.com

AGI GeoCom: Resilient Futures
23-25 November Chesford Grange, Warwickshire. www.agi.org.u

Geo BIM
10-11 December 2015 Novatel Amsterdam City
www.geo-bim.org/Europe

Maps, Charts, and Intelligence
16 January 2016, the Geospatial Building at the University of Nottingham.

SkyTech 2016
27-28 January, Building Design Centre London
http://www.skytechevent.com

GEO Business
24-25 May 2016 Business Design Centre, Islington, London.
www.geobusinessshow.com

mrdpike@hotmail.com
Geospatial World Forum
23-26 May 2016 Rotterdam, The Netherlands.
info@geospatialworldforum.org

12d International Conference
24-26 July 2016 Brisbane, Australia
http://www.12d.com

InterGEO 2016
11-13 October Hamburg
http://www.intergeo.de

Think differently: collaborate!

As **Chris Preston**, chair of RICS Geomatics Professional Group steps down, he reflects on the last three years which have seen unprecedented collaboration between professional bodies.

As I write this I am conscious that it will be my last column for your delectation! My time as Chair of the RICS Geomatics Professional Group comes to an end in early December as I hand over to the capable hands of **Gordon Johnston**.

It is usual at such times to reflect on what has been achieved during my tenure but I prefer to look forward rather than back as we seek to build on what has been achieved.

It is clear that if nothing else has come from my time at the helm, the most important thing is that "collaboration" has been engendered between our kindred professional bodies and industry colleagues. I consider that this is now starting to be achieved without the finger of suspicion being pointed.

2016 GEO Business looms

GeoBusiness has been a fantastic success thanks to the hard work of many and has now been established as a fitting showcase for the industry in the UK. However, there is still work to do on this, the easy part is starting out but as the concept matures where do we go next? By the time you read this a meeting will have been held to pilot the way forward for the 2016 conference and exhibition and things will be up and running again.

Important showcase

The work of Survey4BIM is ongoing and really needs your support to make the impact that it deserves. The group is now working on the Big5 Geospatial challenges. The digital plan of work has now been published and this augments the work done on the RICS *Measured surveys of land buildings and utilities specification 3rd Edition* and that related to the *International Property Measurement Standard* for buildings. This suite of documents is now beginning to build up to being a very useful showcase of the importance of geospatial surveying in many areas of business.

Most are aware but will BIM deadlines be met?

Where are you or your organisation on the road to BIM 2016 Level 2? A recent survey completed by Pinsent Mason's in Spring of 2015 of over 100 so called "industry experts" showed that 19/20 were aware of UK Government's target to use Level 2 BIM by 2016 on all centrally procured projects and 7/10 actively investing in BIM." However, less than 30% think the industry will achieve it and the Civil Engineering contractors association's recent survey found that 74% believed that deadline would not be met. The earlier survey identified a lack of understanding of BIM (33%, especially in the supply chain) and collaboration (24%) to be key issues (it is that word again!). Existing forms of construction and engineering contract are still being used that are not appropriate to the BIM-enabled world, especially when it comes to how collaborative contracting can be achieved. Changes are obviously needed especially as the industry looks to Level 3 BIM. What is your view on this?

An honour to serve

It has been a great honour to chair the professional group; I have met and been introduced to so many interesting people and different projects in the many different facets of geomatics. It has simply reinforced my view that this is a fascinating industry that with your help, can go from strength to strength to build a digitally enabled world.

As a final thought I quote **Ben Davis** in *GW* May/June: "the dynamics needed to solve today's problems: think differently, lose self-interest and collaborate."

Chris Preston *welcomes your comments and thoughts so please email to the following address* ***geochair.rics@gmail.com***

Open house and going back to school via Sorrento

by Malcolm Draper, Rentalength

Our columnist heads south to the Bay of Naples, goes back to school, celebrates an orifice (steady!) and finds plenty to keep readers chuckling.

Life has been hectic since my last column. Late August found me in Sorrento in the Bay of Naples for my son's wedding. I couldn't resist taking a trip to Herculaneum, the sea port near Pompeii engulfed by a gigantic tsunami of hot ash from the volcano Vesuvius in AD 79. Horrible as it was for the inhabitants, it sealed for two millennia exactly what life had been like for this sophisticated Roman town and its inhabitants.

Open house

Open House London weekend is a fantastic opportunity to look around many important buildings, which are not normally accessible to the public, including No 10 Downing Street but alas I was not successful in the ballot. Instead I visited the private apartments at Hampton Court Palace and my old school, Emanuel.

The apartment was not as grand as I had expected, indeed it was rather ordinary despite being built during what was described as "Henry VIII's building phase". For many years occupied by housekeepers. Today it is occupied by the chief executive of Historic Royal Palaces. Before that it had been Lord and Lady **Birdwood**. The former having risen to the rank of Field Marshal was responsible for evacuating the Anzac forces after the disastrous Gallipoli campaign (not Churchill's finest hour) and getting them to France. He died in 1951 and was buried at Twickenham with full military honours and a 19-gun salute. The Australian Government still pays for the upkeep of his grave, presumably in memory of the lives he saved at Gallipoli.

School days

Going back to my old school after too many years I was amazed to learn several things that I either never knew, forgot or more like didn't pay attention to. The school was set up in 1594 by Lady **Anne Dacre** (Maid of Honour to Elizabeth I) to educate 20 poor children. I think I might have been the last of those as today it's quite a posh fee-paying school.

In the school's grounds there is a poignant memorial to the Clapham train crash of 1988 when boys and several teachers from the school climbed boundary fences to be the first responders.

Old boys include Sir **Tim Berners-Lee**, the inventor of the world wide web and the Sultan of Brunei's nephew, Prince **Hakkim** who was always keen for the school to excel at sports. The problem was he often recruited obscure people to the old boys cricket team who later turned out to be Ian **Botham** or **Viv Richards**. For golf, **Nick Faldo** joined the team.

***Right**: the fine Roman town of Herculaneum looking much as it did on 24 August 79 AD before volcanic ash engulfed and preserved it. The town's Nemesis looms in the background, Mt. Vesuvius.*
***Below**: the Romans were also rather good at engineering surveying as this road confirms.*

Orifice helped dogfights

We've also been marking the 75th anniversary of the Battle of Britain when Hitler's Luftwaffe took on the RAF's Hurricanes and Spitfires. Beginning to lose the battle, the Fuhrer is reported to have asked Göring, the Luftwaffe commander, what he needed to beat the RAF. 'A squadron of Spitfires' was the reply.

Now there are many unsung heroes of the second world war whose work made not just a difference but a real battle-winning difference. One such was **Beatrice** ('Tilly') **Shilling**, a young female engineer working at Royal

Aircraft Establishment at Farnborough. It seems that early Spitfires couldn't do an outside loop (amongst other manoeuvres) as their Merlin engines suffered fuel starvation in negative G.

Miss Tilly came up with a simple solution. A flow restrictor: a small metal disc much like a plain metal washer. The restrictor orifice was made to accommodate just the fuel needed for maximum engine power, the power setting usually used during dogfights. While not completely solving the problem, the restrictor, along with modifications to the needle valve, permitted pilots to perform quick negative G manoeuvres without loss of engine power.

Once the modification was approved Miss Shilling travelled with a small team around the countryside to RAF bases fitting the restrictors, giving priority to front-line units. By March 1941 the device had been installed throughout RAF Fighter Command. Officially named the 'R.A.E. restrictor', the device was immensely popular with pilots, who affectionately named it 'Miss Shilling's orifice' or simply the 'Tilly orifice'. Perhaps the unmodified ones could have been given to the Luftwaffe. . . Source: https://en.wikipedia.org/wiki/Miss_Shilling%27s_orifice

Things you didn't know

Following a question from one of our Scottish parliamentarians we learn that the coastline of Scotland is estimated to be about 10,250 miles long. Ordnance Survey has said that the coastline of Britain—Great Britain, not including Northern Ireland—is approximately 19,491 miles. Scotland has disproportionate importance, given that it has more than half the coastline of Britain. Hmm, would be a shame to lose half our coastline even before global warming takes its toll.

Miscellany

The last two months have seen quite a flood of amusing material. I do rather like this one as a response to unwanted phone calls:

I do like the Canadians. Very practical and common sense people. Printed on the side of a paper coffee cup from Canada are the words "*If this were another country, we'd have to tell you that this coffee may be hot. Good thing this is Canada!*"

1999, when this pic of Her Majesty the Queen was snapped, was rather a good year for her it seems, even if the Leica Geosystems' name had still to become better known. Acknowledgements to the BBC's website. http://www.bbc.co.uk/news/magazine-34150885

You can tell a lot about a woman's mood just by her hands. If she is holding a gun, she's probably angry.

Last year I joined a support group for procrastinators. We haven't met yet. . .

With expanding waistlines, have you noticed that the Roman Numerals for forty (40) are "XL"?

Jon Mills saw the safety poster opposite and couldn't resist snapping it. That's the sort of safety advice I like.

IgNobel Awards

The annual IgNobel awards have been published. These awards, you may recall, go to academics (usually but not always) whose research and papers seem particularly pointless. Here are a few by category:

Chemistry: Callum Ormonde (University of Western Australia) and colleagues, for inventing a chemical recipe to partially un-boil an egg.

Physics - Patricia Yang (Georgia Institute of Technology, US) and colleagues, for testing the biological principle that nearly all mammals empty their bladders in about 21 seconds (plus or minus 13 seconds).

Economics: The Bangkok Metropolitan Police (Thailand) for offering to pay policemen extra cash if the policemen refuse to take bribes.

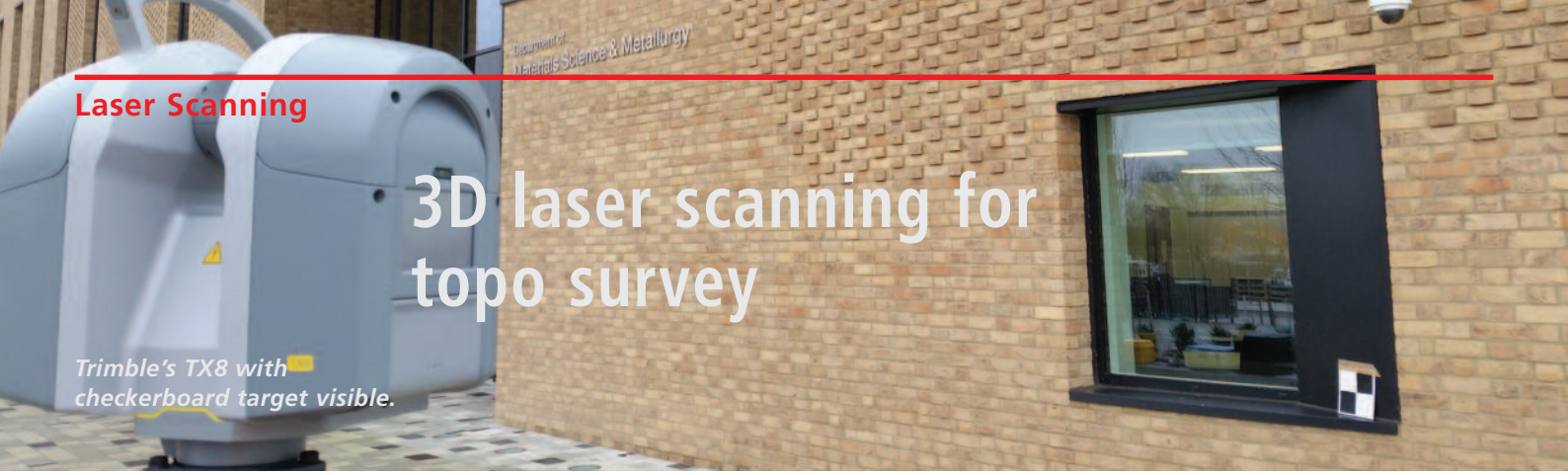
Mathematics: Elisabeth Oberzaucher and Karl Grammer (University of Vienna, Austria) for trying to use mathematical techniques to determine whether and how Moulay Ismael the Bloodthirsty, the Sharifian Emperor of Morocco, managed, during the years from 1697 through 1727, to father 888 children.

Biology: Bruno Grossi (University of Chile) and colleagues, for observing that when you attach a weighted stick to the rear end of a chicken, the chicken then walks in a manner similar to that in which dinosaurs are thought to have walked.

• *More of these intriguing awards next time possibly.*

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: rentamalc@aol.com

3D laser scanning for topo survey



Trimble's TX8 with checkerboard target visible.

A recent project carried out by J Breheny Contractors on behalf of Cambridge University showcases the economics of using a high definition 3D laser scanner for topo surveying.

The rate at which geospatial technology is changing is increasing, and with it, our ability to collect more data more rapidly. 20 years ago it would have taken several seconds and possibly minutes to get a single point using GPS; today we can collect one million points per second using a 3D laser scanner.

The methodologies and workflows of data collection by total station, GNSS, video, images, laser scanning, terrestrial and mobile are now becoming simpler, faster and more cost effective. This evolution in data capture methods, data storage and handling mean that we are moving beyond a digital world that is composed of map and CAD layers to a world full of 3D and 4D models.

According to the "Future trends in geospatial information management: the five to ten-year vision – United Nations Initiative on Global Geospatial Information Management" report, this trend of moving from 2D to 3D and on to 4D visualisations is both user and technology driven and will accelerate in the next five years. Users are likely to expect more complex and realistic 3D models to enable better planning and decision making. In short the report states that 3D will increasingly be an intrinsic part of core geospatial data, rather than a distinctive add on as it is now.

It is these expectations that have driven the demand for 3D laser scanning, which in turn have pushed manufacturers to develop scanners with higher specifications to meet these demands, typically:

- a desire for increased speed of data capture, breaking the million points per second barrier.
- a scanning capability beyond the 100m mark AND a consistent level of accuracy across the entire dataset, no degradation of accuracy with range.
- usability, key to maximizing take-up of scanner use.

Consequently we have seen several new products on the market that meet these new trends, Trimble's TX8 being an example with its incredibly high scan rate and very low scan times. Its usability is key to its performance and the J Breheny Contracting case study reproduced below illustrates this perfectly.

However, the question is always "Where next?" and one of the stronger opinions to emerge at this year's Intergeo is that we are suffering from a data overload and creating more data than we can efficiently handle. For this reason we can expect to see huge growth in anything that helps us to better process and model what we've generated from automatic edge detection, breakline detection, asset extraction and simply processing huge datasets, all of which will enable us to extract even greater value from our surveys.

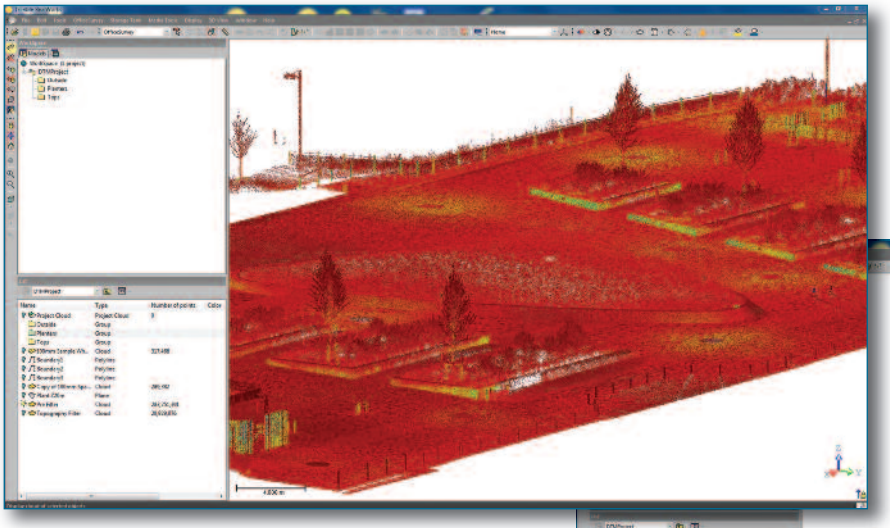
Right: *Scan area for the project.*

Case Study - An educated decision

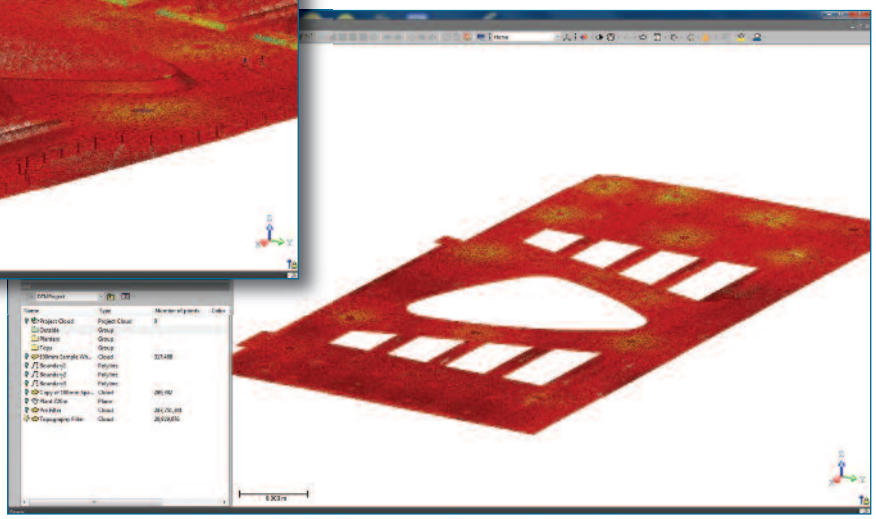
Cambridge University's 63 hectare West Cambridge campus is undergoing a 15-year development programme to provide new faculty and research & development buildings for the engineering and science disciplines and related commercial research and development organizations. Phase 3 works were completed in 2012 and Phase 4 in August 2014.

Post-completion of the works, it was noted that sections of a paved area (5,340m²) needed the levels re-affirming to the designed/as-built levels. J Breheny Contractors Ltd were therefore contacted to undertake a survey of the terrain on a rigid 0.5m grid interval to allow a digital representation of the area in question to be reviewed.

As the work needed to be carried out and the deliverables sent within a fortnight, a Breheny engineering surveyor was sent to



Left: Screen grab before data has been cleaned in Trimble RealWorks.



Right: Screen grab after data has been cleaned in Trimble RealWorks.

the site with a Trimble S6 robotic total station to complete a traditional optical survey. However, after establishing a set-up, the first row took an hour to survey and with over 90 rows to survey in total, the company felt that this was not a great use of resource and began a discussion on other methods of data capture.

Minimal site time required

Familiar with Trimble's TX8 time-of-flight laser scanner and its reputation for the fast capture of high resolution, noise free, data even over its full range of 340m, Breheny contacted KOREC to assist with the survey and post-processing and registering of the data.

With control already established on site, checkerboard targets were positioned around the area and the TX8 set up for an initial scan. The location is open to the public and home to much street furniture including cycle racks and ornate flower filled planters which resulted in more set-ups than would normally be required. Despite this, the site work was completed in just 2.5 hours compared to up to two weeks if the work had been completed with a total station.

Breheny's client required a digital terrain model for interrogation and a CAD drawing showing the levels of paving. The scan data was registered and post-processed using Trimble RealWorks, software specifically designed for point-cloud processing and analysis. The software automatically registers the scan and office work was further speeded up by the RealWorks sampling tool which semi-automatically removes points in the cloud above ground level. The end result was a clean scan of just the paving stones with all noise such as weeds, street furniture, bollards etc removed.

Andrew Dobrucki, senior land surveyor at Breheny concludes, "The survey took just 2.5 hours to complete compared to the two weeks of a total-station survey, which is a vast saving of field time. With data collected at 100mm intervals, the TX8 provided far more data than a traditional survey would have done, which is particularly useful for our client. Additionally, we were able to view on site the data that was scanned, which is a great way to quickly verify that the correct area and data is collected as intended before moving on to the next set-up location. The TX8 performed perfectly and we were able to provide our client with their requested deliverables on time."

All information and images kindly supplied by Andrew Dobrucki, senior land surveyor, Breheny.

About Breheny

Formed in 1963, J Breheny Contractors Ltd have grown to provide civil engineering services to almost two thirds of the country from offices in Suffolk, Cambridgeshire, Kent, Lincolnshire, Buckinghamshire and Yorkshire.
Web: **www.breheny.co.uk**
Twitter: **@BrehenyCivils**

Breheny's diverse expertise has been undertaken predominantly as main contractor but also as subcontractor and includes:

- Highways & Bridges
- Rail
- River & Marine
- Environmental
- Utilities & Energy

"The survey took just 2.5 hours to complete compared to the two weeks of a total-station survey. . ."

Scan to HBIM:
parametric objects and procedural modelling

A project to create a library of classical building elements to ease the creation of high-resolution architectural 3D models is described with practical case studies from Dublin's fine Georgian architecture. PhD candidate **Conor Dore** explains.

Historic Building Information Modelling (HBIM) is a new approach for modelling historic buildings which develops full Building Information Models (BIMs) from remotely-sensed data. This article describes current research being carried out in the Dublin Institute of Technology (DIT) which attempts to increase the level of automation for scan-to-BIM projects involving existing and historic buildings. HBIM, originally developed at DIT (Murphy, M. et al, 2013), is a plug-in to existing BIM software that contains a new library of parametric objects specifically for historic structures and a system for mapping these objects to remotely-sensed survey data.

Library of objects

One of the most time-consuming parts of a scan-to-BIM project is manually creating bespoke components for each project. This is necessary as most BIM software is focused on modern buildings and has limited library objects suitable for existing and historic buildings. In order to speed up the modelling of historic buildings, HBIM provides a new library of classical architectural elements which can be easily edited and fitted to survey data. These library objects represent architectural elements that are repeated throughout classical European architecture and are therefore very well suited to parametric modelling. The design and detail for the parametric objects are based on architectural manuscripts ranging from Vitruvius to Palladio, to the architectural pattern books of the eighteenth century. The use of historic data introduces the opportunity to develop detail behind the object's surface concerning its methods of construction and material make-up.

These objects were implemented as parametric BIM components using the Geometric Description Language (GDL), an embedded programming language within the ArchiCAD BIM software. Dynamic geometric objects created with GDL are classified as an element type using the Industry Foundation Class (IFC), which assigns semantics, additional attributes and relationship information to a created object. A sample of the HBIM library objects can be seen in Figure 1.

***Figure 1 below**: Sample of HBIM parametric library objects]*

Automation

Although the use of parametric library objects speeds up the modelling process it still requires manual combination and mapping of individual components to survey data to create a complete HBIM. Steps towards automating this final part of the HBIM process are also being researched at DIT. An automated approach to 3D modelling which has previously not been adopted or implemented for Scan to BIM is procedural modelling. Procedural modelling uses a sequence of generation instructions, rules or algorithms that can be repeated with varying characteristics to automatically generate 3D geometries. Procedural modelling has traditionally been used in applications such as film and gaming where content can be randomly generated based on rules and algorithms.

As part of this research, concepts from procedural modelling have been adapted and applied to HBIM to speed up the HBIM workflow. Using procedural modelling techniques, a new set of rules and algorithms have been developed to automatically combine HBIM library objects and generate different building arrangements by altering parameters. This results in a semi-automatic process where the required building structure and objects are first automatically generated and then refined to precisely match survey data. The use of procedural modelling techniques with HBIM library objects introduces automation and speeds up the slow process of combining and plotting individual library objects to survey data.

In order to generate the initial building structure, inputs from survey data are used. A single polygon defining a building footprint can be used to create vertical walls or a series of cross sections at different heights can be used if walls are not perfectly vertical. The procedural rules will then automatically convert this data into BIM wall objects which can include both straight and curved wall geometry both of which can also be non-vertical when created from a series of cut-sections. User-defined parameters are then altered to automatically generate the desired building arrangement. This includes parameters to automatically set the number of

storeys and the type and number of objects on each floor and building side.

The HBIM library of objects described in the previous section is used in conjunction with existing BIM objects to automatically generate the required building details. Once parameters are altered, all objects on the building will be automatically generated. When generating objects their initial position and size are first estimated with classical proportions and architectural rules. After this, users can graphically refine parameters to more precisely match the generated geometry to survey data. The use of architectural rules to position and size objects relating to a particular building style can greatly reduce the amount of further editing required. Efficient methods for graphical editing of objects are provided to edit objects in groups or individually. This could include editing the width of all windows on a particular floor or editing a particular window width. These edits can be made graphically by selecting and dragging hotspots on objects while overlaid with original survey data such as a point cloud, cut-sections or orthographic images.

These new procedural rules for automatically generating building arrangements with HBIM library objects have also been developed as a plug-in to existing BIM software. As part of this plug-in, tools are available for generating both building façades and complete building models. An initial prototype has been developed for the ArchiCAD BIM software which was implemented using the Geometric Description Language and the C++ programming language in conjunction with an Application Programming Interface (API) from Graphisoft. A number of case studies have been undertaken to test the newly developed HBIM libraries and procedural modelling rules with real conservation and documentation projects.

Henrietta Street

The first case study chosen was Henrietta Street, an 18th century Georgian Street, located in Dublin, Ireland. In order to show the efficiency of modelling with HBIM the entire street was recorded using laser-scanning and image-acquisition methods. Eight scans were carried out with 10mm resolution using a Trimble GS200 terrestrial laser scanner. A number of pre-processing steps were carried out on the scan data before modelling with BIM software. These pre-processing steps included registration, segmentation/filtering, triangulation, texturing, orthographic image creation and the generation of cut-sections. All processing of scan data was carried out using Trimble Realworks software. Next, data from the survey including segmented point clouds, orthographic images and cut-sections were imported into the ArchiCAD BIM software for modelling.

The new HBIM plug-in was then used to generate as-built BIMs from the survey data.

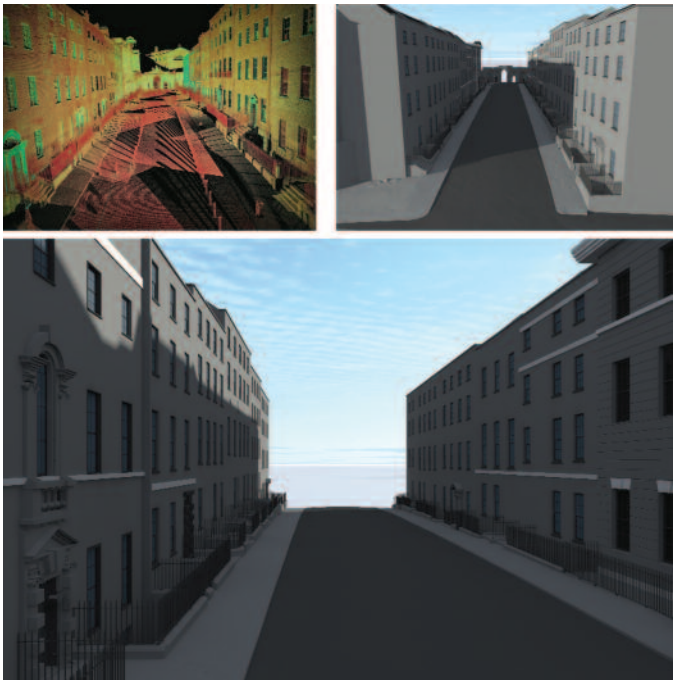


***Figure 2 right**: Point cloud & HBIM of Henrietta Street Dublin.*

Manual modelling of each individual façade on this street would be a very time-consuming task and would involve measuring, positioning and adjusting hundreds of objects to reconstruct the street. Instead, each façade structure was automatically generated with the new procedural rules for generating façade geometry. Parameters were adjusted for each façade to automatically generate the correct building arrangement with the correct number of storeys, number of openings, door position and types of objects. Once each façade was automatically generated the position of façade elements were quickly refined using efficient group or individual editing as required. Point clouds and orthographic imagery acquired from the scan data were used for refining the generated geometry of each façade. Figure 2 shows the point cloud and generated HBIM for this case study of Henrietta Street.

Many of the door cases found on this street such as the Doric door cases contain similar and repetitive elements that were quickly and easily modelled with the HBIM library objects. Once the HBIM was generated it could then be used to automatically generate 2D and 3D documentation for conservation analysis. This included plans, elevations, sections and 3D views, schedules and lists of objects for each building.

"...each façade structure was automatically generated with the new procedural rules for generating façade geometry."

A restoration project of Ireland's main courts building

The Four Courts was used as a second case study to test the new HBIM developments. The Four Courts is a late 18th century classical building in Dublin, Ireland. The building was partially destroyed in 1922 during the civil war, which took place during the early establishment of the Republic. The effects of the civil war damage to the building are once again a threat to the structural stability of parts of the

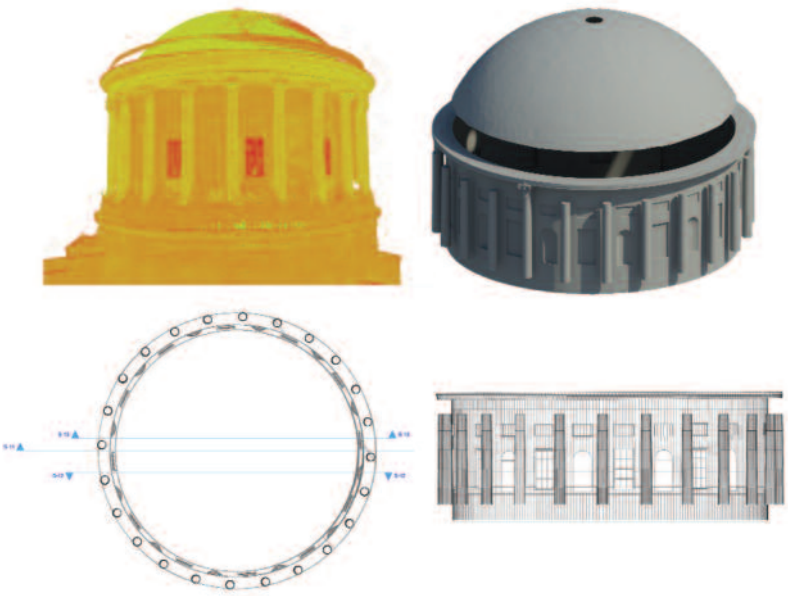


Figure 3 above: Point cloud, HBIM and automatically generated 2D documentation of the Four Courts dome and drum, Dublin.

building. The intention is to use HBIM to illustrate, virtually, the current extent of the damage/decay and as a basis for the proposed conservation interventions. A complete laser scan was carried out of the internal and external structure using a Leica HDS C10.

For this case study the accuracy of the resulting HBIM was crucial in order to perform structural analysis on the damaged dome and drum. For this reason the irregular circular walls of the drum which support the dome needed to be modelled, representing its true condition, in order to show up any areas of deformation or bulging. This was possible with the new HBIM prototype plug-in. A series of horizontal cut-sections at different heights were taken from the point cloud of the drum and used as input data for the HBIM procedural rules. The HBIM procedural rules were then able to automatically generate the BIM wall objects, which connect each horizontal cut-section. This allowed the non-vertical circular walls to be accurately and automatically modelled representing the drum's true condition.

It would not be possible to model this wall as accurately with existing ArchiCAD BIM tools as it is not possible to model non-vertical circular walls within this software. Once the walls were generated further parameters were then adjusted to automatically generate the required arrangement of objects. Parameters were set to create one floor with alternating arch-top niches and sash windows. The positions and sizes of these objects were then graphically refined in a group and also individually as required. Additional objects, such as columns, were also automatically generated from cut-sections with HBIM objects added to complete the detail. Once this HBIM was created, accuracy tests were carried out using Cloud Compare software. When comparing the original point cloud with the final HBIM, the resulting mean error for the complete model was 7mm with a standard deviation of 12mm. The final HBIM was used to produce various 2D and 3D documentation such as plans, section and elevations (Figure 3). It was also possible to identify from the model the extent of the deformation and the areas most affected by deformation. The HBIM could also be used for further structural analysis with Finite Element Modelling (FEM) software.

Validation & Testing

End-user scenario testing was carried out to evaluate the current HBIM prototype. The aim of this scenario testing was to assess and validate the prototype under the following headings: usefulness, efficiency, usability and accuracy. The test was carried out with participants from industry and academia and included surveyors, conservation architects, construction managers, researchers and students. Participants were experienced in BIM, 3D modelling and architectural conservation and the complete group was representative of the end-user profile for the HBIM plug-in. As part of the test, they completed a typical end-user scenario for the plug-in that involved generating building models and refining the models to survey data. Participants then completed an online questionnaire to provide feedback on the HBIM prototype. The results from this testing indicated that users found the workflow with the HBIM prototype to be much more efficient than existing scan-to-BIM workflows. Participants also found it easier to generate models with the HBIM prototype when compared to existing manual workflows. The testing also indicated that users were satisfied with the accuracy of the results and also found the results to be suitable for conservation and documentation projects.

Conclusion

The HBIM plug-in provides two new developments to improve current workflows for scan-to-BIM projects. The first is a new library of parametric objects specifically for existing and historic buildings. The second development is a set of tools to automatically generate complete building models with procedural modelling techniques. This results in a semi-automatic process, where the required building geometry is firstly automatically generated and then manually refined to precisely match survey data. Initial tests show that the HBIM approach is more efficient than existing workflows for creating BIMs from survey data. The HBIM prototype also provides an easier solution for generating BIMs when compared to existing manual methods. Non-specialist users who may not have a lot of experience in 3D modelling can easily generate and modify a façade or building model by altering parameters graphically or from a dialogue box.

Reference

Murphy, M., McGovern, E., Pavia, S., (2013), Historic Building Information Modelling – Adding intelligence to laser and image based surveys Elsevier, ISPRS Journal of Photogrammetry and Remote Sensing.
https://www.academia.edu/5932333/HBIM

About the author

Conor Dore is a PhD candidate in the School of Surveying and Construction Management at the Dublin Institute of Technology. His current research focuses on developing methods for digital recording and 3D modelling of historical building. Conor previously completed a BSc degree in Geomatics at DIT along with working for a surveying and a GIS software development company. Email:
conor.dore@mydit.ie
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Bringing heritage to the public: Ireland's 3D-ICONS project

Intensity shaded pointcloud data of Staigue fort, Co Kerry

Robert Shaw describes the techniques used by The Discovery Programme to simplify dense point-cloud data for web viewing.

Throughout the world many important heritage and archaeological sites are vulnerable and exposed to threats. Natural disasters, such as earthquakes and violent storms, have led to the destruction of countless important sites, and this has been exacerbated in recent times by deliberate acts of aggression - ideologically driven or mindless acts of vandalism. Once destroyed these important parts of our past are lost forever.

Over the past decade, there has been a growing recognition that 3D surveying methods can play an important role in recording cultural heritage structures and objects through a process of 3D digital documentation. High resolution 3D surveying techniques – such as terrestrial laser scanning – are ideal for recording heritage sites where straight lines and regular geometries are often a rarity. Projects such as Cyark (**cyark.org**) and the ScottishTen (**scottishten.org**) have championed this approach and have played a major role in raising the profile of 3D digital documentation.

In light of such projects a three-year collaborative EU co-funded pilot project called 3D-ICONS began in February 2012 with the objective of creating a range of 3D models of the iconic archaeological monuments and architectural buildings of Europe, which would be made available online to the general public. Core to the project was the development of a pipeline for the production of such models including: capture methodologies, 3D modelling and presentation processes, metadata, licensing and 3D data IPR; and finally the potential application of the data in sectors such as education, tourism and conservation.

Figure 1 - Field survey - capturing data using a Faro Focus 120 terrestrial laser scanner at the monastery, Skellig Michael, Co Kerry.

Diverse sites

The Discovery Programme, an archaeological and innovation research centre, was the partner assigned the task of generating the content for Ireland. Working from the UNESCO world heritage sites list and those proposed on the tentative list for Ireland, twenty-one cultural heritage sites were selected for documentation, ranging from complete ancient landscapes such as Brú na Bóinne, the location of spectacular megalithic tombs, to detailed carved high crosses such as those preserved at the medieval monastery of Clonmacnoise.

The survey methodology depended on the scale of the site. The production of 3D landscape models was achieved through the use of existing airborne laser scanning data (ALS) both from fixed-wing and helicopter-based systems (FLI-MAP 400). Upstanding monuments and architectural buildings were surveyed using a Faro Focus 120 terrestrial laser scanner with georeferencing provided via a Trimble 5800 GPS using VRSnow NRTK corrections. Detailed objects such as carved stones and architectural details were recorded using an Artec EVA handheld optical scanner.

Although these are three very diverse techniques, they all result in high volume, high resolution 3D point cloud data. These are scientific datasets of exceptional value to engineers and architects and they can play a major role in monitoring and conservation of cultural heritage sites.

The data volume problem

Point clouds are an increasingly common survey output and most geomatics professionals are now comfortable viewing and manipulating such data in specialist software. However, to the general public such data can be very difficult to access and understand. Interaction normally requires installing third-party viewers, and then navigating through the point cloud; an unusual environment for the inexperienced, where solid walls can appear transparent. In addition, 3D models have relatively large file sizes, commonly 10-20 Gb, which can be difficult to distribute via the web and a challenge to display on a standard PC.

Rather than viewing point clouds, inexperienced users generally find it easier to interpret and interact with surface mesh

models, particularly when photo textures or enhanced visualisations are added. However, web access of such mesh models is again not practical. If the model retains an appropriate resolution then the file size is likely to be excessive and not appropriate for accessing via the web.

The researchers at the Discovery Programme – working within the 3D-ICONS project – set about finding a solution to this problem, i.e. to generate 3D models which retain a high level of detail in their appearance whilst also having a suitably small file size to enable online access through the average internet connection.

Retopologise!

The solution came from looking at techniques and software more commonly associated with the gaming industry. In brief, the process enabled us to extract the high-resolution surface model of an object and store this as a normal map which would be subsequently applied to a retopologised low-resolution polygon model recreating the appearance of the higher resolution 3D model. A relatively simple concept but one requiring access to and experience with a diverse range of software.

It is easiest to explain the solution using a case study, St Kevin's Church, a small structure in the monastic settlement at Glendalough, Co. Wicklow. This small eleventh or twelfth century church with a stone roof presented the typical challenge encountered in the project in terms of modelling.

St Kevin's was surveyed using a Faro Focus 120 with the final segmented and geo-referenced point cloud containing 212 million points. The data file in Faro format was 1.48Gb, and when exported as an ASCII xyz file was 7.5Gb.

The following steps, summarized in *Figure 3*, were developed to generate the required model output:-

1. The first processing step was to sample the point data to a uniform spacing of 1cm. This removed unnecessary points where overlap was excessive but retained all the relevant detail. This process also removed noise from the data and created a uniform cloud which would be beneficial to the creation of mesh surfaces. The xyz ASCII file was now 330Mb, down from 7.5Gb and less than 5% of the original.
2. This ASCII file was imported into Geomagic Wrap, a powerful point to mesh modelling software. Here, a high-resolution mesh was generated and a number of functions applied to the mesh model including spikes and outliers removal, and the filling of holes within the data. This cleaned, high-resolution mesh model (17.6 million polygons, file size 1.34Gb) was exported as a .obj file, the industry standard for a mesh. The resulting high-resolution polygon mesh was simplified and re-sampled to form a uniform low-resolution TIN model.
3. The high- and low-resolution models were then imported into Autodesk Mudbox where they appeared in the same model coordinate space. The low-resolution mesh was then retopologised in order to create a mesh suitable for texturing. The result of this process was a low-resolution mesh containing only 200,000 polygons, with a file size of 10.4Mb.
4. The next step was to generate a series of UV maps of the low-resolution mesh. UV mapping is the process of projecting 2D textures onto a 3D model, with U and V denoting the coordinate axes of the 2D texture. Unwrella is a plug-in for Autodesk 3DS max that automatically unwraps a mesh. This UV map was the key component as will become clear as the process continues.
5. A UV normal map was then extracted from the high-resolution mesh model in Autodesk Mudbox. Normal maps store the direction of the normal of the high-resolution 3D model, and when applied back onto a low-resolution model the texture pixels dynamically control how the light interacts with the model surface, creating the illusion of a detailed 3D surface.
6. The second map applied to the low-polygon model was an ambient occlusion map, generated from a programme called xNormal. This process produced a global ambient shading map which enhanced the 3D geometry of the object, such as shading

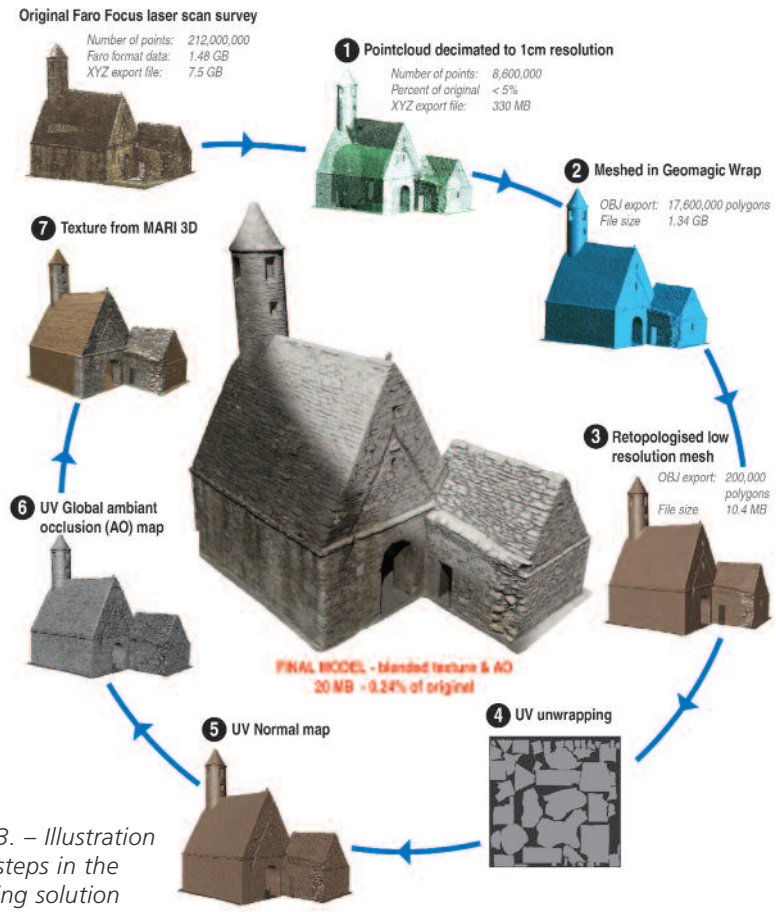

Figure 3. – Illustration of the steps in the modelling solution

> *"... to the general public such data can be very difficult to access and understand."*

recessed areas on carved stones or the area between stone blocks in built structures.

7. The Faro Focus scanner does not capture suitably high-resolution data for a final model so spherical HDR images were captured using a Canon EOS 5D mkII and a Gigapan Epic Pro camera. Utilising MARI 3D texture painting software, these spherical images were projected onto the model and the photo texture extracted without the evidence of parallax errors.

The results – textured or enhanced shaded models – achieved the objective of the project and could be repeated for models at the other scales, landscapes and detailed stones, using the same processing principles.

Web platform

The final phase of the project was to find a suitable web platform, which provided online access to the models. Sketchfab was chosen, a website that enables users to display and share 3D content online. It provides a 3D model viewer based on WebGL technology that can be embedded on any mobile or desktop webpage. A Discovery Programme sketchfab page was established to host the wider range of 3D content being created, with the resulting models being embedded in a project website (**www.3dicons.ie**) together with a full range of additional content and media including images, site descriptions, map and videos.

The EU funding of the 3D-ICONS project ended in January, and as such the project was complete. However, the response in Ireland to the project has been overwhelmingly positive and it is intended to continue adding 3D models of new monuments to the website. For the 3D assets already available it is hoped that these will be utilised by a wide range of sectors including: conservation, education and tourism. Over the next year, the Discovery Programme will be working in conjunction with the Irish Office of Public Works (OPW) to generate interactive and immersive visitor experiences for several archaeological monuments using the 3D models.

The 3D-ICONS project has been very much a collaborative team effort. Developing the processing pipeline drew heavily on the experiences of the European partners but it was the team at The Discovery Programme; Anthony Corns, Gary Devlin, Aaron Deevy, Patrick Griffin, Ian McCarthy and Louise Kennedy who developed this solution.

3D ICONS was co-funded by the European Commission's ICT Policy Support Programme. For more information, visit: **http://3dicons-project.eu/ , http://3dicons.ie/** and **https://sketchfab.com/discoveryprogramme.ie**

• *This article is based upon a presentation given by Robert Shaw at Survey Ireland 2015.*

About the author
Robert Shaw graduated from the University of Glasgow in 1988 with a BSc (hons) in Topographic Science. After working in geodetic surveying and digital cartography he settled into a career as an archaeological surveyor. He worked for ten years at the Royal Commission on the Ancient and Historical Monuments of Scotland before moving to The Discovery Programme in Ireland, where he is now the Senior Geo-surveyor in the Technology Section. Robert is a member of the Institution of Irish Surveyors.

Shorter and flexible trials available

"The one great principle of the English law is, to make business for itself. There is no other principle distinctly, certainly, and consistently maintained through all its narrow turnings. Viewed by this light it becomes a coherent scheme, and not the monstrous make the laity are apt to think it. Let them but once clearly perceive that its grand principle is to make business for itself at their expense, and surely they will cease to grumble." Bleak House by Charles Dickens, Ch XXXIX

A Pilot system of Shorter and Flexible Trials is a continuation of Lord Woolf's reforms which started in 1994, explains **Carl Calvert**.

• *Carl Calvert MA MSc PgDLaw FRICS CITP MBCS, is the sole principal of Calvert Consulting, specialising in Boundary litigation. He also lectures part-time in GIS law.*
www.calvertconsulting.co.uk
Email: *carlcalvert@aol.com or 023 8086 4643*.

There are two new pilot schemes introduced after a judge-led initiative by the judges in Charge of the Commercial Court and Construction and Technology Courts with the Chancery Division and Mercantile Court. This initiative should prove Dickens (above) wrong.

First is an opportunity to make the trial period shorter, and second there is a flexible trial procedure, both of which aim to make justice cheaper and swifter than previously. In a briefing statement issued by the Chancellor, **Sir Terence Etherton**, and the judges **Mr Justice Flaux** (Commercial Court) and **Mr Justice Edwards-Stuart** (Construction and Technology Court), the pilot schemes are set out.

Eversheds LLP have headlined it 'Litigation Lite' in a press release and the Chancery Bar Association has produced an outline of the scheme at **http://www.chba.org.uk/for-members/library/consultations/shorter-and-earlier-trial-procedures-initiative-consultation-document**. The Civil Procedure Rules (CPR) Part 51 allow for pilot schemes of which this is one and is at Part 51N. So, to the meat of it.

The scheme came into operation on 1 October 2015 and will run for two years. In essence it is a continuation of Lord Woolf's reforms of 1999 in making Justice swifter, reasonable and proportional in cost. This pilot is for business related litigation. Businesses often depend on swift resolution for their business to survive and often those of their sub-contractors. The pilot should not be seen as replacing Alternative Dispute Resolution (ADR) but as encouraging a change in culture in which a full, oral trial is often unnecessary to achieve justice. The Shorter Trail would provide for a maximum of four days total of any trial whilst the Flexible Trial procedure would involve more flexible case management, where the parties agree to it, producing a more simplified and swifter procedure than currently provided under CPR.

The Shorter Trial scheme will not be suitable for:

(a) cases including an allegation of fraud or dishonesty;

(b) cases which are likely to require extensive disclosure and/or reliance upon extensive witness or expert evidence;

(c) cases involving multiple issues and multiple parties, save for Part 20 counterclaims for revocation of an intellectual property right (IPR);

(d) cases in the Intellectual Property Enterprise

(e) public procurement cases.

Many mapping or GIS cases are IPR related and often carry with them the need for extensive disclosure and may include elements of fraud or dishonesty. So the Shorter Trial pilot is unlikely to be used for such matters because of a number of reasons.

The procedures are time constrained and the Statement of Case must be less than 20 pages and should attach core documents. This in itself is laudable as some Statements of Case are not exemplars of cogent thought and clarity and often core documents arrive in court in dribs and drabs. The Defence must be served within 28 days.

There is no obligation to 'opt in' to this Shorter Trial and once opted in there is provision to 'opt out' but promptly.

The Case Management Conference (CMC) should be within 12 weeks of the issue of the Claim Form and at the CMC the court will consider the issues including the use of ADR with a trial date not more than 8 months from the date of the CMC. Clearly this is itself a most useful change for any business involved in litigation, as often the uncertainty or delay in going to trial can disrupt a business to such an extent that it may cease trading during the period. Any extension of time is limited to a single 14-day period for the defence and a single 7-day extension set by the rules or directions.

The trial will be before the same judge as conducted the CMC (unless this is impractica) who will endeavour to hand down judgement within six weeks.

As with any litigation, costs are of great importance to business and costs will be summarily assessed by the trial judge. This is a major change as often the trial for costs can be almost as lengthy as the trial itself.

The Flexible Trial procedure encompasses pre-trial disclosure, witness evidence, including that of experts, and submissions at trial. The objective is to reduce costs, time for the trial and enable an earlier trial date. Below is from CPR Part 51N

3.1 The Flexible Trials Scheme applies to a claim started in any of the Rolls Building Courts[2].

It is expected, according to the Chancery Bar Association, that aspect of the scheme may require refinement over time and, consistent with the overriding objective, parties using the scheme will be expected to cooperate and communicate with each other to a high degree.

This high degree of cooperation and communication may prove difficult for if it was easy then the litigation, or threat of litigation, may never have been necessary.

I will finish with the quote from **Lord Thomas of Cwmgiedd**, the Lord Chief Justice who said that:

"Small and medium sized businesses are the lifeblood of the economy. To prosper, they need disputes to be resolved in a speedy, fair and economic way. The introduction of this judge-led reform will help to ensure that court users can have their disputes resolved quickly, improving access to justice for businesses."

"There is no obligation to 'opt in' to this Shorter Trial and once opted in there is provision to 'opt out' but promptly."

Footnote

2 This is the court building in Fetter Lane, EC4A 1NL.

Developments in Photogrammetry: impressions from two international meetings

Are we on the threshold of the 'uberisation' of geospatial services and will the surveyor's trusty tripod be replaced by the UAV? Professor **Ian Dowman** reports from two fascinating conferences that took place recently in Stuttgart, in addition to InterGEO.

In September there were two important meetings concentrating on photogrammetry: the Photogrammetric Week (PhoWo), which is held every two years at the University of Stuttgart, and the ISPRS Geospatial Week (GW2015), which was held for only the second time.

These meetings gave a nice snapshot of the key issues in photogrammetry at the present and a preview of what will be covered in more detail at the ISPRS Congress in Prague from 12th to 19th July next year. This article is not a comprehensive report on these two meeting but aims to bring out the main trends in photogrammetry and remote sensing and the research which is pointing to new developments in the future.

Research and applications

The three themes of PhoWo were data acquisition, modelling and 'excellence in geoinformatics', whilst GW2015 had 11 'events' covering data acquisition from laserscanning and UAVs, applications to city models, roads and traffic, image sequence analysis and disaster management, spatial data quality, image spectroscopy, big data, visualisation and remote sensing data infrastructure. PhoWo tends to concentrate on new research, new technology and developments which involve new applications, whereas GW2015 concentrated more on applications and in particular allied disciplines such as forestry.

Applications for UAVs. . .

UAVs are of course of significant interest but still face operational challenges, and in the academic community the emphasis is on processing data to derive useful products, this includes camera calibration, bundle adjustment, image matching and feature extraction. The session on data acquisition at PhoWo looked at new advances in several areas. **Bareth** gave a very interesting talk on the use of UAVs for 3D data acquisition for crop monitoring and showed the power of consumer standard platforms and cameras for this. **Mayer** focused on automatic processing of UAV images, which can be combined with terrestrial images for building modelling. **Hirschmueller**, showed videos of UAVs flying indoors and mapping the interior of buildings as they went; this technique is particularly important for search and rescue applications and is also used over opencast mines. These same themes were covered at GW2015 and data integration and navigation were also important topics.

Below: *Prof Ian Dowman chatting to Dieter Fritsch, the organiser of the Photogrammetric Week and who retires this year as Director of the Institute for Photogrammetry at Stuttgart.*

. . . and laser scanners

Pfeifer at PhoWo showed the versatility of laser scanning and how it can be used to determine land cover, topography and object detection. At GW2015 Tarolli showed how high-resolution laser scanning could give sufficient information of the topography to predict landslides, which could be particularly useful in planning to mitigate the consequences of anthropogenic changes. The creation of urban models was taken up by Haala who showed the power of dense matching techniques such as semi-global matching from images which gives comparable results to laser scanning, and by **Schindler** who looked at large-scale tie-point search in crowd sourced images. The extraction of features from point clouds is another topical research topic. At GW2015 Schindler described a method for generating 3D models which is being developed using voxels (a cubic element in a 3D grid) and through combining geometric data and semantic interpretation; Schindler claims better 3D geometry and better segmentation into semantic object classes.

Data integration

Modelling, based on probabilistic models was further discussed by **Heipke**. **Vosselman**, showed how a 3D landscape model has been created in The Netherlands by fusing the Dutch elevation database with the topographic database, data integration being another important topic. A full programme on laser scanning at GW2015 covered topics such as registration of lidar datasets, calibration, modelling and classification. A major interest at GW2015 was the Silvilaser conference dealing with the application of laser scanning to forestry. A keynote paper by **Wulder** stated that laser scanning was of real practical value to forestry, and particularly as a management tool, and that lidar was complementary to other data, especially long-term image data such as Landsat. However, a key issue running through discussion on use of data was the necessity for standard products produced with internationally agreed standards, and the ability of users to have easy access to the data and products. Other papers at Silvilaser concentrated on forest structure and on forest inventory.

Big Data

Big Data was the topic of one event at GW2015 and was also discussed by **Wagner** at PhoWo with the topic of big data infrastructures in the context of processing SAR data from Sentinel 1. The step change in data management introduced by sensors like Sentinel is illustrated

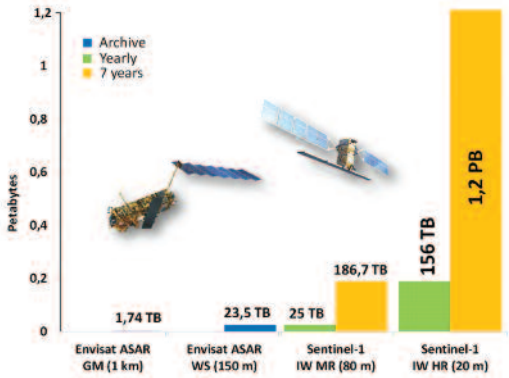

Figure 1: *Growth of data volume from ENVISAT ASAR to Sentinel-1 [from Wagner, Procedings of Photogrammetric Week '15]*

in figure 1. Wagner emphasised the need for cooperation and networking between organisations to maximise the benefits from massive data sources such as Sentinel.

Wagner talked about the Austrian Earth Observation Data Centre which was set up to process big data and this too was presented at GW2015. Big data was a well supported topic at GW2015 which covered many of the areas of application from other events such as processing lidar data, 3D building reconstruction, forestry as well as the hardware and infrastructure required.

Improved trajectories

Colomina noted the importance of trajectory determination in modern photogrammetric data acquisition and showed how new systems, such as Galileo, and new inexpensive components, can reduce the cost and increase the accuracy of sensor orientation and hence the end products. **Sester** also discussed trajectories in the context of the interpretation of moving points. Image sequence analysis was an event at GW2015 with papers on robotics, traffic flow and in-car navigation.

Data quality

One of the events at GW2015 was the International Symposium on Spatial Data Quality (ISSDQ) which covered data quality across the board of spatial data with an emphasis on land cover. **Foody** showed how statistics on the assessment of land cover could be very misleading unless fully understood and that uncertainty is a major issue. Another significant topic in ISSDQ was the quality of data from crowd sourcing and issues such as the reliability of classification and integration of crowd-sourced data were discussed in a number of papers.

Crisis response from Google

Parsons from Google showed how Google's acquisition of Skybox, a company operating a constellation of small satellites which obtains full frame video, and the use of Google Earth Engine, would be able to support crisis response with short revisit times and through machine learning. He also emphasised the use of the cloud and processing big data are essential to this application.

Hyperspectral imaging

The GepHyper event at GW2015 dealt with hyperspectral imagery. This demonstrated the increasing importance of this technology as new sensors become available. The main applications are agriculture and land cover; papers discussed data fusion and processing.

Other topics covered at PhoWo and GW2015 were, CityGML, visualisation, advances in close-range photogrammetry and the acquisition and use of oblique aerial imagery.

Photogrammetric future

The presentations at PhoWo and GW2015 indicate that photogrammetry has a dominant position within the geoinformation production chain, particularly in data acquisition with aerial imagery, images from UAVs, laser scanning, crowd sourcing and close-range data collection. Techniques for automatic feature extraction are getting better and photogrammetric experts are working with computer scientists to contribute to computer vision.

There is major interest in data quality arising from ubiquitous techniques such as crowd sourcing and UAVs. More data, more applications and reduced cost of acquiring data make the integration of data from different sources and knowing the quality, essential. One of the striking features of these two meetings, particularly GW2015, was the interest from a wide range of disciplines which are not usually strongly represented at ISPRS meetings; Silvilaser, looking at the use of laser scanning in forestry was a major topic but cartographers looking at visualisation, land cover experts looking at hyperspectral data and date quality, computer vision scientists involved in robotics for a range of applications, including disaster response, were all well represented. We can conclude that photogrammetry is in a healthy state and is working with other disciplines to acquire and process image data which is being used in many different applications.

In conclusion we can note two sound bites in a talk by **Jürgen Dold** from Hexagon Geosystems to mark the retirement of **Dieter Fritsch** from Stuttgart: 'uberization' as a term to show how we are becoming dependent on services rather than independent activities, and 'the surveyors tripod in the future will be a UAV'. Plus ça change?

The proceedings of PhoWo are available at **www.ifp.unistuttgart.de/publications/phowo15/index.en.html** and the proceedings of GW2015 are available in the ISPRS Annals (peer reviewed papers): **www.isprs-ann-photogramm-remote-sens-spatial-inf-sci.net/II-3-W5/index.html** and Archives **www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-3-W3/index.html**

About the author
Ian Dowman is Emeritus Professor, University College London.

"One of the striking features . . . was the interest from a wide range of disciplines. . ."

Open Geospatial Consortium follows BGS's Geological Walk

The importance of standards in the geospatial field is growing as an ever growing range of applications are developed. **Richard Groom** attended a recent Technical Committee event in Nottingham.

The past few years have witnessed increasing influence of the OGC over the geospatial industry. Rarely does a week pass without a press release from the organisation. In September, the Technical Committee met for a week at the British Geological Survey's offices, near Nottingham. The RICS recently became a member and Richard Groom spent a day finding out more on behalf of the institution.

The OGC is a not-for-profit international organisation which was founded in 1994 with the objective of advancing the development and use of geospatial standards to promote interoperability. It currently has over 500 member organisations from the commercial and government worlds, academia and NGOs. This number is growing, particularly with new members from the Far East.

Levels of membership

Britain's Ordnance Survey has recently elevated its membership to the highest level – Strategic, joining a select group of five.

The next layer down is principal membership. There are eighteen organisations at this level, roughly half software companies and the rest government bodies. All are North American apart from two universities in the Asia-Pacific region and Airbus Defence and Space, in Europe. The price for joining the Principal club is an annual fee of £35,000.

Then come the Technical members. There are 73 of them, with a much higher proportion of Europeans and several British organisations. The annual subscription for Technical members is £7,000.

There are a number of classifications at Associate grade, which comprises the bulk of the OGC membership. This grade has a relatively modest annual subscription of £2,800.

Members at Associate level can get involved with working groups and enjoy voting rights within those groups. Technical members have a vote on the technical committee, which approves all standards, and technology providers who are Technical members benefit from discounts against the costs of OGC compliance testing. In addition, Principal members have a greater say in the running of OGC, have final authority over approval of standards and a number of other benefits including support from OGC staff in developing standards. Strategic members enjoy the same, but enhanced benefits as principal members whilst also maintaining and approving policies and procedures for OGC's Interoperability Program

Developing Standards

OGC exists to encourage its members to define, document and implement open standards that solve geospatial interoperability problems. The organisation's staff are facilitators and the work programme is driven by the members.

Face to face meetings are held every three months in different parts of the world, so the opportunity afforded by a meeting in Nottingham was not to be passed up. Participants from afar or otherwise engaged were able to join the meeting via Webex.

During the day I was able to experience meetings of the Europe Forum, a Domain working group and a Standards Working Group. The Europe Forum is an umbrella group for forums covering the UK and Ireland, Iberia and Latin America and the Nordic countries. The meeting included an update on INSPIRE along with an explanation of OGC's interoperability programme and including a discussion about the possibilities of gaining European funding for standards work. The point was made that by involving OGC, standards work will be retained after the research project has completed, whereas otherwise it may get lost.

During the lunch break there was a guided tour of BGS's Geological Walk]

DWGs and SWGs

Domain Working Groups (DWG) develop ideas and decide on the scope of the work. They are essentially high level and consider, for example, whether there are already standards that can be adopted or adapted. The DWG then sets up Standards Working Groups (SWG) to go into the detail of standards.

I joined the DWG and SWG for the Landinfra conceptual model. Landinfra was set up to respond to a lack of support, for LandXML, even though it continues to be used – particularly for machine control, where

it is being implemented with format variations. The DWG had decided that the Landinfra standard should start from scratch.

Illogically, in Nottingham the DWG meeting took place after the SWG meeting, and both seemed to have a SWG flavour. I attended the SWG for Landinfra as a guest of the chairman, because I had not worked out how to join the group. The OGC members' website takes some getting used to. The conceptual model sets out in flow-chart form the characteristics and interrelationships between data objects. The idea is that the conceptual model stands on its own and can then be used to develop coding in any language – e g GML.

Much of this session was devoted to discussion of the conceptual model for road design, so that a particular design could be transferred from one design package to another. This is extremely complex because the conceptual model has to include all the rules that go into a road design package, such as how the design cross-section interacts with the existing ground surface under different circumstances. Quite why one would want to do this defeated me, and several other meeting participants, but apparently numerous road schemes are halted mid-way through the design process only to be restarted years later when the original design cannot be re-used because it is not interoperable.

The later DWG meeting went into detail on the definition of land parcels in a cadastral system. Here, the conceptual model was being devised to cover the minutest detail of a cadastral system, including details of the survey monuments used to define the parcel and each parcel's history.

Acting for the common good

It was an interesting day with a friendly group. OGC has its bureaucratic ways, which one should expect of an organisation that deals with standards. Whilst there is clearly a need for a body to promote interoperability, I do worry that with OGC's hierarchical membership levels there is a possibility that with higher membership grade it might be possible to exert influence to steer OGC activities in a self-interested way rather than for the common-interest.

Pull quote:

OGC exists to encourage its members to define, document and implement open standards that solve geospatial interoperability problems.

"OGC exists to encourage its members to define, document and implement open standards that solve geospatial interoperability problems."

OS & OGC: a 17-year relationship

Odnance Survey (OS) has a long relationship with OGC since becoming a Technical Member in March 1998 through to Strategic Membership which started in May this year.

Today, OS is the only organisation outside of the US to hold Strategic Membership status, joining the US Department of Homeland Security, US Geological Survey, US National Geospatial Intelligence Agency and NASA.

This latest step from Britain's map-maker reinforces the organisation's vision to be at the forefront of open standards development. The new membership level is allowing OS to represent Europe, at a strategic level, to improve the quality of standards globally and to enable the industry to continue to innovate and grow. The membership is also allowing OS to play an even greater role in the development and implementation of OGC standards and in the international coordination of geospatial technology initiatives.

It is vital that OS is involved in these discussions. Open Standards are key to OS and seen as a critical part of achieving their business goals. OS also understands that they are vital to the industry as a whole and pivotal to many ongoing projects and future developments which will impact on the geospatial sector.

A particular focus for OS is the development of standards in the emerging fields of Smart Cities, BIM (Building Information Modelling) and the Internet of Things. OS recognises that geospatial data has an important role to play in these developing areas and the need for interoperability and common standards is critical to their long-term success. Through the OGC membership OS aims to introduce and recommend new standards, which will ultimately benefit the whole geospatial industry. OS has recently been awarded a grant to harmonise Smart Cities standards as part of an OGC-led bid for a European Horizon 2020 project. OS aims to play a major role in the project which is expected to start later this year and will allow OS to get a stronger foothold in Smart Cities standards.

As well as working on new standards OS, through the OGC, will also continue to support development of global standards around the more traditional geospatial themes including web map services and 3D mapping, with a specific focus on day-to-day usability.

OGC, and its members, are vital to the geospatial industry and play an essential role in developing and introducing quality open standards for the world.

TIMELINE:

1998 OS becomes a Technical Member

2001 OS MasterMap in OGC's GML format the largest commercial use of GML at the time.

2006 OS sponsors OGC web services testbed phase 4

2007 significant OS input into the Digital Rights Management Reference Model

2008 CityGML Specification Working Group publishes CityGML 1.0

2010 OS implements open standards data management registry / feature catalogue for Geospatial Data Management System

2012 European Spatial Data Research publishes "GI+100: Long term preservation of digital Geographic Information — 16 fundamental principles" led by OS in conjunction with OGC

2012 CityGML Specification Working Group publishes CityGML 2.0

2013 OS International delivers OGC and ISO/TC211-compliant 2D and 3D data model for Kingdom of Bahrain

2013/14 OS hosts OGC UK Interoperability Assessment Plugfest in Southampton, to advance the usability of four important OGC standards/

2014 OS becomes principle OGC member on 1 June 2014

2015 OS accepted as strategic member of OGC, OS sponsor smart cities pilot

Surveyors Rendezvous 2015 – it was the place to be

Around 120 visitors from all over the US and Canada came to Bellingham in the north-western state of Washington to join the Surveyors Historical Society (SHS) SR2015 hosted at the Silver Reef Casino. It was brilliant days of lectures and tours within a most surprising environment of great weather, rural surroundings and spectacular events on the islands in the western waters, reports **John Brock**.

En route to the 2015 Surveyors Rendezvous, I stayed in Seattle for three nights at the Hotel Seattle right in the centre of the CBD near the famous Pike Place Markets and metro station. Sunday saw me on the Amtrack riding the rails around the edge of the spectacular seas adjacent to the western coast to get to the state capital Olympia, where I paid visits to Bigelow House being the oldest in town (1860) and had a fantastic free tour of the Legislative building within which there are purported to be more images of the great first president surveyor **George Washington** than anywhere. His image not only emblazons the Washington State flag but hundreds of likenesses in murals, paintings, busts, mosaics and even a mysterious image appearing in the contrasts of one of the marble columns.

With a self-imposed busy itinerary I embarked the *Victoria Clipper* on Monday morning for an enjoyable trip to Victoria at the southern tip of Vancouver Island in Canada for a full day of activities in the capital of British Columbia (BC). Upon arrival it was a brisk walk to Fishermen's Wharf where I enjoyed fish and chips while watching the children hand-feed the wild seals, which are white with black spots. Sea otters darted around the dock trying to snatch the fresh fish on offer.

Famous surveyors on show

At the next stop I was thrilled to view historic surveying exhibits and tributes to my favourite surveyor/explorers **James Cook**, **George Vancouver**, **Lewis & Clark** at the Royal BC Museum. Joining a bus tour, I saw the earliest buildings of the old town plus a self-guided tour of the five storey Craigdarroch Castle built by coal baron **Robert Dunsmuir** in the 1890s during the reign of Queen Victoria. Back at the waterfront I paid a visit to Miniature World where I pushed every button to mobilise the small-scale models of many places, as I am really still just a big kid.

After enjoying an amazing high tea at the heritage Empress Hotel with a view of Captain Cook's statue through the stylish windows I was back on the large cat for the return cruise back to Seattle.

Following the short flight northward and transfer from Bellingham airport to my hotel, I met up with old friends **Denny** and **Delores Demeyer** and **Jim Schomper** from Philadelphia, one of the team responsible for the fantastic SR2013 in his own city back east in Pennsylvania and which featured the Mason/Dixon Line survey that began 250 years ago. A "Sin and Gin" tour of Bellingham's old town area and its many houses of colourful pleasure got me wound up to join the "Welcome Weary Travellers" introduction to the area with more refreshments.

Cook's early survey skills awakened

My first invited talk was the history of epic explorer **James Cook** who first trained in land surveying in North America with **Samuel Holland**, **John Simcoe** and **J.F.W. Des Barres**. Cook's curiosity in the profession was sparked in about 1758 when he witnessed 'Sammy' employing his plane table to measure up the terrain. With great natural ability and superb mentorship Newfoundland Governor Sir **Thomas Graves** encouraged the young Cook's development by giving him his first theodolite in 1762 for his charting work, which provided the English with the intelligence to thwart the French aggression in the area.

Other presentations were on the early mapping of the NW as well as the international border line between the two North American countries being over 5,000 miles long when the Alaska/Canada interface was included. With the "Pig War" invited speaker a no-show, I was happy to fill in at the evening dinner with my "*Silent Screen Superstar Surveyors: 1908 to 1930*" with a couple of introductory clips of The Smurfs, A Country Practice, The Color Purple and Get Smart to entertain the crowd.

Friday took us on a breathtaking cruise to

***Left**: Washington State is reputed to hold more images of the eponymous first president than anywhere. This statue is atop the state legislature.*

the San Juan Islands to visit **John** and **Vicky Thalacker**'s waterfront property at Friday Harbor where John let us look at his extensive collection of antique instruments and paraphernalia, while **Tim Kent** showed us the procedure taken to obtain positions using a Burt Solar Compass.

Porcine war divided nations

Next we were bussed to the English and American Camps at which the opposing armies remained for the duration of The Pig War, which erupted when a US citizen shot dead one of England's finest porkers. After many years of this Kentucky stand-off both sides thought it better to "bury the carcass" than to maintain their "pig-headed" attitudes of pork-rib diplomacy!

Dinner that evening of Dungeness crab and barbequed salmon at the Senior Citizens Building was delicious with everyone most contented for their return to the hotel.

Saturday started with three early talks on the International Boundary Survey 1857-62 followed by a bus trip to the real borderline at Peace Arch Park in Blaine WA where it is possible to freely put one foot in both nations at the same time. Along part of this dividing line the physical barrier is actually a cut trench, something similar to the one referred to by **Homer** in one of his works. Denny led the dedication ceremony, which included NPLS President **Jon Warren**, Canadian Surveyor-General **Peter Sullivan**, US Boundary Commissioner **Kyle Hipsley** and SHS President **Richard Leu** for the newly erected signage placed into a wooden kiosk in the nearby park with photos and history explaining the significance of the International Border.

Another incredible cooked lunch with dessert was keenly devoured in the nearby hall after the Canadian S-G had given an illustrated presentation on how Washington and British Columbia got their shapes. The Annual SHS Banquet and Auction that evening saw much needed funds raised for future projects with the Aussie items donated by me receiving plenty of bids along with a wide array of other objects up for purchase.

Sunday took us out on another boat journey to the wonderful Sucia Island, which included another dedication of kiosk signage giving a history of the surveying of the island as well as some restoration actions taken to preserve a few of the local reference marks relocated by Denny and Delores; some of which were found in precarious predicaments.

With another mouth-watering lunch in the island pavilion, we were entertained by some aquarobics by two river otters in the small bay. Ancient fossils can be seen around the area bearing this name which can be dated back many millions of years. The chicken dinner on the return sail was another top effort of catering.

***Right**: the Royal British Columbia Museum had some fine surveying artifacts, which honoured Cook and Lewis & Clark.*

***Right**: Peace Arch Park in Blaine WA where it is possible to freely put one foot in both the US and Canada at the same time.*

Later in the afternoon on Monday saw me depart this very relaxing part of the USA and Canada with my passing over the International Date Line I did not get home until early morning on the Wednesday.

Based upon the two Surveyors Rendezvous that I have been lucky to attend I can only highly recommend that you all consider coming to upstate New York next year where SR2016 is to be held in the awesome Adirondacks. There is even strong talk about the SR2018 going to England which will be the first time it will have been held outside the USA. **James Kavanagh**'s name was mentioned most favourably by those who went with the small excursion party in 2013 to visit the ancestral home of George Washington's family among other sites. Keep your eyes out for this exciting event.

• 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.

KOREC at the Armoury

UK Trimble dealer KOREC had plenty of shiny new technology on display at a posh city location surrounded by ancient weaponry. But did all make the most of the technology? **Richard Groom** reports.

September and it was KOREC's turn to display its wares, in the first of a series of technology days. The venue was the Honourable Artillery Company, a distinguished building fronting an immaculate cricket pitch. An oasis amongst the City of London's office blocks.

It was not a good day for cricket and the inclement weather put a number of delegates off making the journey to London. For those who did make it, there was technology for all seasons in a series of talks with case studies from customers.

Be as effective as you can be

KOREC CEO **Alan Browne** set the scene by stating that it is the company's aim to "help people, businesses and organisations to be as effective as they can be", with a focus on results. **Oliver Brooks**, KOREC's MD added that the company is Trimble's largest reseller worldwide and has been in business for 45 years. But it is also able to sell other products to fill gaps in Trimble's portfolio. The objective is to use technology to reduce costs, become more productive and to add value. Brooks also said that the company "bridges the skills gap" by streamlining workflows with technology that is easy to use. This seemed to be an interesting reflection on the shortage of qualified surveyors and the coincident rise of the non-specialist surveyor.

Don't be a typist

Lee Braybrooke was one of two Trimble representatives at the technology day. He has become an eloquent speaker. Having just returned from InterGEO, he reported that there was "trepidation" in some quarters about the uptake of technology. Are enough people buying the technology on show? He urged the audience to recognise opportunities and take them. Technology continues to develop apace. He took as an example the typewriter. Its disappearance was rapid, however not only did the typewriter cease to exist as a specialist tool for typists, but the typing pool went too.

In truth of course it is not as simple as this. Some technological change is inevitable and predictable long in advance and some indeed falls by the wayside. The secret of success is to recognise the new technology that will stick and to make the change at the right time, when the technology is sufficiently mature and prices will make a return on investment a likelihood. Braybrooke urged the audience to move up the value chain and create "actionable data". Surveying now has to be more than 'collecting data'.

He aligned Trimble's products with the UN-GGIM uture trends report. Trimble's TX8 laser scanner takes care of data collection and Realworks turns that data into actionable data, as 3D models. The V10 Imaging Rover takes care of the trend towards more imagery as a unique product in the market. Another trend from the report is towards the ubiquitous use of GNSS. Trimble's R1 receiver can be controlled from a SmartPhone and brings with it decimetre accuracy. But what was most striking was a photo of a GNSS receiver at a building corner on Trimble's self-correcting tilted pole: it's not just an aid for surveyors who cannot hold the pole vertical!

Mobile mapping is becoming more viable as costs reduce and data collection speeds increase. There were several on display outside. As an example of new markets opened up by technology, the MX2 is being used to survey road corridors to identify places where vegetation needs cutting back to clear lines of sight. UAVs are also becoming cheaper, faster and can support larger payloads. In addition to the fixed wing TX5, Trimble has brought out a multi-rotor UAV, the ZX5, although I have to be admit that it was rather overshadowed by Sensefly's eXom.

Trevor Pearson from Historic England gave a potted history of the organisation's historic links with Trimble equipment, including a fascinating insight into the painstaking survey of the earthworks surrounding Stonehenge.

Adding value

Paul Brodin described the work of K-MATIC. This branch of KOREC develops software to extract the added value from spatial data. He described half a dozen examples ranging from tracking of badgers in Ireland to gully cleaning in England. KOREC are also involved with visualisation for televised golf. UAVs are used to survey the golf course, golf balls are positioned using a laser ranger finder and then there is some smart software to visualise what actually happened as well how the

"These devices are a tad more complicated than a cannon. . ." Jack Daniel of Surefire and the sensefly eXom.

golfer could have achieved the perfect shot.

In fact KOREC seem to be carrying out more surveys themselves as if the thought is 'if you surveyors won't take the risk with new technology, we'll provide the service as well as the equipment!'. It's an obvious move with many benefits for the company, but it could cause some resentment if KOREC were to end up competing with its customers – a situation which no doubt is avoided at all costs.

Point cloud processing

KOREC's **Ryan Bowles** talked about point clouds. They are no longer synonymous with laser scanning as data from scanning and photogrammetric sources can now be combined in Realworks, which can be used for automatic classification of points into layers. Data can be published in an offline viewer in which measurements can be made and it is even possible to define windows in the data and export it in LAS format. Trimble has recently forged a partnership with EdgeWise which is used for object recognition.

Work for drones

Jack Daniel runs a company called Surefire. He described his transformation from musician to mapping and inspection using drones. Having started by using mass-market UAVs he has now decided to buy an eXom aircraft and reckons his bread and butter will come from inspection surveys of wind farms and progress surveys of a large potash mine in Yorkshire. Does his story reflect the future? Should that future be embraced by surveyors? An interesting statistic from the talk was an assertion that the accuracy of a survey using ground control is 5 – 10 cm whereas by using the eXom's RTK capability this is halved to 3 – 5 cm.

eXom wows

Over lunch there was a demonstration of the eXom on the cricket pitch. This really is an impressive UAV. It is rotary, so there is greatly reduced risk from take-off and landing. It's very light and incorporates numerous sensors. The rotors are protected. It can work in high wind speeds. And perhaps most valuable of all, it can be used in both UA markets: for inspection and mapping. Discussion on UAS revealed a willingness on the part of the CAA to engage with aerial surveyors who request flight plans outside the strict limitations of the CAA rules. The CAA's major concern is with the unlicensed amateur UA operators.

The weather did put off a number of delegates and although the eXom received a thorough airing, other pieces of equipment did not receive the attention that one would have expected of a sales event. If you have a wonderful scanner, tell us why it's wonderful!

"... move up the value chain and create "actionable data" "

Maths, Egyptology and measuring a lost mountain

A proud grandfather celebrates maths before finding and heighting a lost mountain and a literary legend.

Cruising Sydney Harbour in a tall ship and a Topp Tour to the famous recently restored Hydro Majestic Hotel in the Blue Mountains by steam train took us back into a glorious vision of older times steeped with splendour and elegance. Opened in 1904 by department store magnate **Mark Foy** the lunch we savoured was within the historic rooms renewed to their former opulence. A few weeks later another tour took us to an Old Convent and cemetery housing favourite son former PM **Ben Chifley** as well as other colourful characters of Bathurst's past in Australia's first inland town, celebrating its bicentenary this year. I was the proudest Granddad in the room when my six-year old grandson Dylan won a highly commended certificate in the annual Public Speaking finals of the Oran Park Town Grammar School against all years from the primary school.

Maths Day and Egypt Conference

The second of three Maths Spectaculars at Homebush Bay Centennial Park showcased Surveying as a career for Year 10 students from six schools in Sydney suburbs and beyond. The usual action packed day is planned to have the high achiever pupils gain a working experience with different exercises measuring Treillage Towers, gardens, town planning layouts, UAV's and historic surveying. All of the volunteers can be congratulated for taking the time in the campaign to increase the numbers choosing to pick surveying as their academic choice with the organisers led by the creator Ian Iredale to be especially praised.

At the annual Centre for Egyptology (Macquarie University) conference legend of the ancient civilization research **Kent Weeks** regaled the crowd with more fascinating stories from the desert land including the most startling discovery of the possible burial chamber of Tutankhamun's stepmother, Nefertiti actually concealed behind her stepson's burial place in the Valley of the Kings.

Finding a Lost Mountain

Being given the quest to verify the location of a long lost mountain (in international terms more like a hill) by my good friend and fellow UNSW Bachelor of Surveying graduate **Paul Harcombe**, who is also deputy surveyor-general of NSW, is very humbling and most exhilarating. The Geographical Names Board desires to finally allocate the name of Tench's Prospect Mount to the feature actually selected by the exploring party which first identified the site in dispute. After discussions with another surveyor, **Vic Jurskis**, who made a recent visit to the area, I have been satisfied with the correlation of the recent maps and that of **Watkin Tench** himself (1792) from his publication *Sydney's First Four Years*. Compelling corroboration over more than 200 years of charts hopefully will be accepted as the final identification of this doubted high point in western Sydney's early colonial landscape.

Lunch With Literary Legend

Before I joined Kerima-Gae for lunch with her four passengers on a tour of Parramatta she was totally unaware that her main passenger was Booker Prize winning author **Thomas Keneally** with his daughter Meg and grandchildren Rory and Alexandra. His most renowned publication *Schindler's Ark* was made into Spielberg's blockbuster Schindler's List but is only amongst a corpus of works extending much further back than his recently attained 80 years with two more books in the pipeline, one about the neighbour of the Little Emperor in his last years on St Helena titled *Napoleon's Last Island*.

***Left**: a chance meeting with Booker-Prize winning author Thomas Keneally.*

• 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.

Optech launches new Lynx

Teledyne Optech has announced the addition of the Optech Lynx SG-S system to its line of Lynx mobile survey systems. The system comprises a lidar sensor with Optech's LMS Pro software, an inertial navigation system, and a deeply integrated Ladybug 5 camera. All the components are mounted on a single light-weight platform.

Landsat images made accessible

Data - Eternix Ltd., is now able provide access to Landsat data through Blaze Terra, allowing users to instantly review and analyse the entire data directly in a GIS setting. The service gives access to all of Landsat's close to two hundred thousand images with real-time updates ensuring that the latest imagery is immediately available. Images are represented on a global layer map, making it easy for users to work intuitively and spot areas of interest. To open images in their full resolution, users can download them through the Blaze Terra user interface, including all additional multi-spectral bands.

Add-ons for Nautiz

Handheld Group has announced new expansion pack features for its NAUTIZ X8 rugged PDA. The new functionalities will make the NAUTIZ X8 more versatile for field workers in a number of market segments, including forestry, surveying, construction, field services, warehouse projects and logistics. Nautiz X8 Long Range Bluetooth (LRBT) Expansion Pack features a LRBT u-blox module, which allows long-range communication up to 300 metres. Nautiz X8 Basic Expansion Pack is an empty add-on cap for an extension of your choice. It increases the Nautiz X8's customisability and flexibility for specific customer requirements. It also allows users to install custom accessories under the cap using the proprietary interface.

I-Site boosts underground survey

Updated I-Site 8200 laser scanners feature new tools and compatibility with Maptek Sentry surface tracking and Drive continuous survey systems. The I-Site 8200SR is a fast and accurate solution for cavity surveys. A carbon fibre boom extends up to 10 metres into a tunnel or over a void. The 500-metre range scanner can also be used for surface applications such as stockpile, shed and silo scanning. 8200ER version has a range at 750 metres. A new backsight workflow allows survey resection to find the current real world position of the scanner.

National groundwater flood map

ESI and Ambiental have today formally announced that they have incorporated the ESI National Groundwater Flood Risk Map into Ambiental's UKFloodMap4. Covering 100% of the UK, with a full range of return periods, and integrating the most up-to-date river flow and rainfall data, Ambiental claims that UKFloodMap4 provides the most detailed flood maps currently available for the UK, greatly improving the way insurers assess flood risk at the individual address/building level.

Remote sensing suite

Trimble's remote sensing suite combines the capabilities of the new Inpho SATMaster module with its eCognition software to generate high quality data, models and analytics from satellite based imagery. SATMaster provides streamlined workflows to generate DTM's and DSM's from overlapping satellite imagery. eCognition Essentials, included with SATMaster, provides a guided workflow to easily generate land cover maps for applications such as environmental mapping, vegetation monitoring and other landscape changes.

DynaRoad update

Topcon has announced a significant update to DynaRoad mass haul management software. DynaRoad v5.4.1 is designed to enhance the user experience and streamline workflows through additional features for planning, scheduling and project control. In addition to an updated interface and new map views, DynaRoad now offers seamless interoperability with the MAGNET Office software suite.

Bluesky maps solar potential

Working with resource efficiency company Sustain, Bluesky has mapped around 100,000 Housing Association properties across the UK, measuring their potential for energy generation from solar panels. Bluesky can accurately predict the potential for solar energy generation for individual houses based on a number of factors, including roof size and aspect as well as possible interference from neighbouring properties or trees. Sustain uses this information to prepare detailed reports for its Housing Association clients containing cost benefit analysis and, more recently, highlighting potential impact on fuel poverty avoidance.

Global Mapper V17

Blue Marble Geographics has released Global Mapper version 17. This major release offers numerous new and improved geospatial tools, functional upgrades, and performance improvements throughout all areas of the application. A new multi-view map display allows several docked map windows to be displayed within the interface. These views, which support both top-down 2D rendering as well as oblique 3D viewing, can be independently zoomed and panned and can be resized to make the most efficient use of the available screen space.

The all-new Map Layout tools provide the necessary functionality for designing state-of-the-art printed maps. Cartographic elements such as a scale bar, compass rose, and map legend can be precisely placed within the layout frame and supplementary text and corporate branding graphics can be easily added to the design and saved as a template for future use. Version 17 sees raster display, redraw, and export speeds that are up to ten times faster than previous versions; LiDAR processing is also significantly faster.

Earth-i to deliver TripleSat data

Earth-i expects to begin offering full operational imaging and data services later this year from the DMC3/TripleSat constellation and will place specific focus on fast, easy and convenient access for data users. Three identical <1m resolution optical satellites make up the DMC3/ TripleSat constellation. Twenty First Century Aerospace Technology Co. Ltd (21AT) acquired the total capacity from SSTL in 2011 during a signing ceremony attended by the Chinese premier and British prime minister. Subsequently, prior to the 10th July 2015 launch on an Indian PSLV-XL rocket, Earth-i signed an agreement with 21AT to become a strategic partner and master distributor.

MAGNET Construct app for Apple

Topcon has announced cross–platform support for the MAGNET Construct app. The no-cost app is purpose built to drive the LN-100 Layout Navigator system and was initially released for the Android market. This "out of the box productivity" is now available for Apple devices.

Topcon has also announced that their Sitelink3D real-time 3D

Three new scanners from Topcon

Topcon has announced the GLS-2000S, GLS-2000M and the GLS-2000L. The scanners are designed to capture data based on the measurement range needs of specific applications. Using Topcon Precise Scan Technology II, the GLS-2000 models are designed to emit pulse signals three times faster than earlier GLS systems, which results in reduced noise and higher-accuracy data. The scanners have dual 5MPx cameras, one with a 170-degree wide-angle lens for high-speed imaging, and the other a 8.9-degree telephoto camera which is coaxial with the measuring axis.

management service is now cross-platform compatible for mobile devices. Regardless of platform, when field operators or managers are away from their desks, the app is designed to provide instant access to project data and ongoing activities for any job site. The Android App is currently available from Google Play.

Spectra Precision wins in Myanmar

The Agricultural Land Management and Statistic Department (ALMS) in Myanmar recently concluded comparative field tests of four leading models of GNSS receivers. The Spectra Precision SP80 swept to first in all tests. Based on the test results and bids, ALMS chose the SP80 and ordered 340 units. The comparative field tests included; positioning accuracy, initialisation speed, internal radio performance, pole drop test, water immersion test to one metre, and on-board battery performance.

Spectra Precision enhancements

The FOCUS 35 RX is a new range of motorized robotic total stations providing high-speed, accuracy and precision in measurement. It is available in 2", 3" or 5" accuracies, features a dual-battery system for longer working and is controlled externally by Trimble's Ranger, Nomad, or T41 data collectors running Survey Pro or Layout Pro field software on the Ranger or Nomad.

The Nomad 1050 data collector is an update of the Nomad 900. The base processor is now 1 GHz compared to 806MHz on Nomad 900 and the Nomad 1050 has 512Mb RAM and 8Gb flash storage. The other major enhancement is a new 3.75G dual-mode GSM and CDMA WWAN modem.

Version 5.7 of the company's Survey Pro Field Software has been introduced. Included in this update are new map displays that enable viewing and managing most of the map features on the main map display. The GNSS and robotic staking screens can also display a map view to include background maps along with the standard dynamic guidance control option. For customers who wish to use GNSS and robotic simultaneously, there are now enhanced options for configuration and switching between modes.

Spectra Precision Survey Office v3.60 Software now includes enhanced functionality; support for the Spectra Precision Focus DL-15 digital level and the import of levelling data from any DiNi level; least squares and 5 and 7 parameter Helmert transformations with reports; Geoid 12B support and grouping by country in the coordinate system manager and point cloud support.

A new version of MobileMapper Field GIS application runs on Android devices. The application will be the key component of Spectra Precision's Bring Your Own Device (BYOD) solution. This makes it possible to pair Android tablets and/or smart phones with the MobileMapper 300 GNSS receiver to collect GIS data with survey-grade accuracy.

OS revolution continues

September saw the latest phase in Ordnance Survey's rejuvenation of its paper maps with the release of its Explorer range, each map coming with an exclusive mobile download and graced with a cover image taken by the public. The Explorers follow the successful launch of OS's 62 Outdoor Leisure (OL) map titles. Landranger maps will be released in February next year.

FARO updates PointSense and VirtuSurv

FARO has introduced the 16.5 version of its laser scanning software PointSense and VirtuSurv as well as additional plug-ins for AutoCAD. The programs provide numerous tools for efficiently processing 3D laser-scan data in AutoCAD and Revit.

PointSense Plant, the AutoCAD solution for industrial plant documentation, now offers a direct export for detected structural members to Autodesk Advance Steel. Results can be easily ported to Revit Structure as well. New "mass extraction" techniques allow for multiple fit and alignment of gridded steel sections to the point cloud with substantially less time and effort. A fully revised tie-in point routine now intuitively guides users through precise flange extraction, avoiding time consuming modelling of the point cloud. Inline-fittings such as valves can be easily swapped and exchanged within existing pipe runs. Pattern recognition speeds for pipe run extraction have improved from previous releases. New surface analysis tools allow users to visualise deformations from any surface in Revit. The results of this analysis can also be used for modelling deformed elements or complex terrains. New tools such as fitting polygons and automatically finding plane edges or rims dramatically speed the fast creation of construction aids for a project. For the first time these construction aids can be saved directly as Revit 2D and 3D families; a function that helps to fast-track scan-to-BIM workflows.

An enhanced image management user interface within PointSense Heritage simplifies multi-image evaluation. Agisoft PhotoScan users can now import their calibrated photos into PointSense Heritage and use them as an additional source for processing their point cloud data.

All PointSense solutions for AutoCAD 16.5 support the creation of horizontal slices at a defined level. PointSense Pro users benefit from a new command for simultaneously fitting multiple polygons on to point-cloud sections. The creation of cross sections such as tunnels or irregular contours is drastically accelerated. Improved construction aids plane detection, now possible with just a single click. Planes automatically extend to locate their edge/rim automatically.

VirtuSurv, the intuitive solution for processing point-cloud data based on photo-like scan views, offers a new interface to the timber construction application SEMA.

Riegl releases

Riegl has released the VZ-400i 3D laser scanner. With its advanced processing technology, data acquisition and simultaneous geo-referencing, filtering and analysis become real-time. The scanner has cloud connectivity via Wi-Fi and 4G LTE, MEMS IMU for tilt estimation, as well as a high-end camera option and advanced flexibility through support for external peripherals. The VZ-400i offers ultra-high speed data

acquisition at up to 1.2 MHz Pulse Repetition Rate and survey-grade accuracy of 5mm.

The Riegl BathyCopter is the world's first small-UAV-based surveying system capable of measuring through the water surface, ideally suited for generating profiles of rivers or water reservoirs. The robust and reliable platform design integrates the topo-bathymetric green laser depth-meter, an IMU/GNSS unit with antenna, a control unit and a digital camera.

The new VQ-880-G Topo-Bathymetric airborne laser scanning system is now equipped with an optional infrared channel to supplement the data acquired by the green laser and to further increase data reliability and quality.

The new Riegl Database (RDB) Format 2.0 offers additional point attributes, metadata information, and an SDK for 3rd party support. Riegl's software package RiSCAN PRO 2.2 already supports the new RDB 2.0 format while RiWORLD 5.0 processes files 60% faster and, when combined with the new RiPROCESS, improves performance by up to 300%.

Trimble Inpho v7.0

Enhancements to Inpho suite v7.0 and UASMaster v7.0 are intended to help users improve data quality and reduce production time. These include more robust processing of UAS data generated to cope with challenging flight conditions, support for highly accurate GNSS data in UASMaster as well as streamlined support for the new ZX5 rotary UAS platform and performance improvements through optimized default processing parameters (suitable for overnight processing). PDF quality reporting is now supported and ortho images are generated directly from colourised pointclouds within seconds. UASMaster Lite now supports up to 800 images.

StreetMapperIV

3D Laser Mapping's StreetMapperIV mobile mapping system was launched at Intergeo. StreetMapperIV is a portable and automated solution which is easy to use, yet retains survey grade accuracy. With only one cable connection attaching the system to the vehicle, it is the simplest StreetMapper design yet. Each system comes with a high-accuracy laser scanner and navigation system, with optional additions of panoramic cameras and navigation upgrades.

Hydro accessory for GNSS rover

Satlab Geosolutions AB has introduced the SLD-100 hydrographic echo sounder accessory for GNSS rovers, to measure water depth with survey grade accuracy in up to 100m of water. It is powered by a ten-hour Lithium battery and transmits data via Bluetooth in standard NMEA formats for compatibility with any hydrographic surveying software package. The suggested retail price is $2995.

BRIEFS

Smart Max Geosystems Co of Hong Kong has released its M8 GNSS RTK receiver running FieldGenius8. The receiver has UHF/GSM communications and receives signals from the GPS, GLONASS and Beidou constellations.

Data services provider emapsite has launched a geocoded perils model enabling insurers and underwriters to assess the subsidence risk for every property in the UK. Subsitree, available as a discrete dataset and through an on-tap location content platform, gives a detailed perspective into the distribution of risk, based on the latest soil type and tree data as shown in National Tree Map data.

Topcon has announced that its DS-200i direct-aiming motorised imaging station is now compatible with the Autodesk BIM 360 Layout app for the Apple iPad, offering a reflectorless solution along with imaging and greater vertical range.

Digimap for Schools has added the OS 1 inch Seventh Series to its portfolio or products. They are now able to supply data from the 1890s, the 1950s-60s and the present day. The historic OS maps have been scanned and geo-referenced by the National Library of Scotland (NLS). The annual cost is £69 for primary and £144 for secondary schools.

Collaboration between the R&D departments of HEXAGON AB and its subsidiary, Aibotix GmbH, sees Version 2 of the AibotX6 with RTK positioning, which can also be installed in existing AibotX6 hexacopters taking corrections from Leica's SmartNet service. Post-processing is also possible.

GNSS antenna manufacturer, Tallysman, has released its VeraPhase 6000 antenna Series. Performance rivals that of choke ring antennas. The antenna family is ideal for use in survey, precision RTK, and reference antenna applications, claim the manufacturers. There are three members of the family for survey, base station and reference station applications.

Pegasus: a flying stallion gallops into view

The latest mobile mapping technology was on show at a recent event hosted by Leica Geosystems. Richard Groom reports.

In October, Leica Geosystems hosted a group of forty or so customers for a day of mobile mapping at the firm's HQ in Milton Keynes. Centrepiece of the day was the Pegasus:Two, Leica's vehicle-mounted system. It is available in four variants. One is fitted with a Z+F profile scanner, the second with a Leica P40, which can be used for static scanning when not on the vehicle, the third has a Velodyne scanner and the fourth carries only cameras.

So far, not perhaps very remarkable – especially as the system only has one scanner, while competing systems have at least two. The reason for this is that the company reckons the road has to be scanned twice in any case, to mitigate for the inevitable lorry in the next lane, blocking the view from scanner. By measuring the road twice under different GNSS conditions, the difference between the two scans can be examined and they can be meaned.

But the system is remarkable in that it boasts an accuracy of 15mm which, Leica assured the attendees was far better than anything else on offer. The system also carries many cameras and can be fitted with other sensors and can also tow ground-penetrating radar equipment.

Pegasus:Two's little brother is Pegasus:Backpack which can be carried into those places that cannot be reached by a vehicle. The system includes a GNSS receiver with IMU, two laser profilers and five cameras. It can use GNSS, inertial measurements or SLAM (Simultaneous Localisation and Mapping) for positioning, and is therefore self-sufficient indoors or outdoors. Inevitably it will be compared with the ZEB1 handheld scanner. The accuracy is similar at around 3cm but Pegasus:Backpack has three positioning technologies instead of one. Its data can be adjusted to fit control points en route, observed by other means. The Pegasus can take panoramic views which could be useful for identifying features not picked up in the point cloud and its scanners also have a longer range, at 50 metres.

The day also included an update on mapping using sister company Aibotix's UAV, the AibotX6. This now supports RTK positioning using SmartNet, thus (theoretically) removing the need for ground control. The presentation was given by Julian Deeks, who hinted that Leica has some interesting plans for further development of UA technology over the next few years. We wait with anticipation.

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