

...joining the geospatial jigsaw



GIS helps restore Florida's Everglades

- iPad + GPS + GIS speeds data collection
- AGI and RGS-IBG tie up
- Geospatial data capture by Smartphone
- 2016's Big Maps: winners and losers
- Geological data and Smart Cities
- OSi's maps from 1:1000 topo database
- Space and Earth Observation prospects
- GIS and location awareness for politicians

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COVER STORY

Water birds like snowy egrets and wood ibis flock to Florida's Everglades, a vast freshwater wetland. The South Florida Water Management District is using advanced GPS from Trimble and GIS software from Esri running on an iPad to track restoration efforts caused by overly aggressive flood-control measures.



P. 10 CREATING A NEW NORMAL IN THE EVERGLADES

GPS linked to an iPad and GIS software is bringing significant efficiency gains in data capture to a water management organisation, reports Mary Jo Wagner.



P. 16 BIG MAPS 2016 – A YEAR OF BRILLIANT MAPS

The Editor looks back on some cartographic high points during the portentous year of 2016, including those published in GIS Professional.



P. 18 FROM PUBLIC TO PRIVATE SECTOR

Conor Smyth reflects on how he's not looked back following a big career move after 25 years in the public sector.



P. 21 SPACE & EARTH OBSERVATION: FUTURE DIRECTIONS

Space is no longer the sole preserve of the military and telecoms. Today, the market is growing for a whole raft of applications, says Niall Conway.



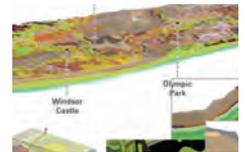
P. 23 ORDNANCE SURVEY IRELAND SHOWS NEW PERSPECTIVES

OSi is the world's first national mapping agency able to produce 1:1,000,000 maps in a fully automated workflow from its 1:1,000 database, reports Frédérique Coumans.



P. 25 THE ROLE OF GEOLOGICAL DATA IN THE SMART CITY AGENDA

Advances in GIS and 3D modelling drive greater opportunities to develop geo-environmental information systems, argues Dr Katherine Roysce of BGS.



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|-------|----------------------------|-------|-------------------------|
| P. 05 | Editorial | P. 15 | Elevator Pitch: Quorum |
| P. 06 | News | P. 28 | AGI's new Chair reports |
| P. 09 | People | P. 29 | Products & Services |
| P. 13 | Columnist Adena Schutzberg | P. 30 | Calendar |
| | | P. 31 | Classified |

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We have the skills and tools: it's up to others to draw the conclusions

Welcome to the first edition of a new year, with a refreshed layout and a renewed focus on how GIS can help people and organisations make informed decisions.

We offer the tools, skills and data sources, but it's up to others to draw the conclusions to make businesses successful, governments make the right decisions or deliver the right services and for people to gain the information they need to hold governments in check.

The use of GPS and GIS to help track restoration work in Florida's Everglades, one of the world's important wetlands and centre for wading and migrating birds (page 11). Our thanks to Trimble and author **Mary Jo Wagner** for providing this report together with some very photogenic material.

As we continue to capture data from the physical world around and below our feet, new possibilities arise. Dr **Katherine Royse** of the British Geological Survey explains how accurate geological information can help reduce construction overruns in urban environments as well as inform suitability before development takes place (page 25). GIS and BIM are the tools developers and builders use but they will need expert interpretation for fuzzier geological data.

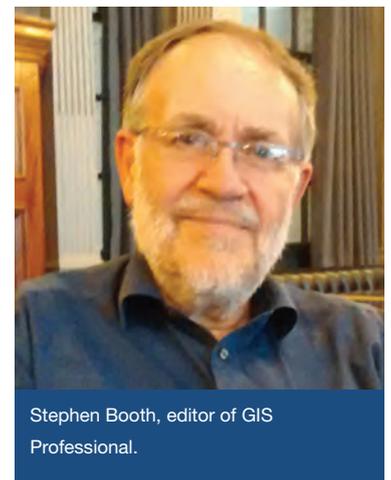
Our new Elevator Pitch column continues with a handy little app to help politicians before they open their mouths (page 15). Quorum locates the right information as well as like-minded potential allies for new legislation. It could be just what the US and UK's divided representatives need to build new coalitions.

The core of most geospatial information systems is topographical mapping. In the developed world, national mapping agencies have been undergoing a transformation, driven by rapid data collection tools like GNSS, photogrammetry and Lidar. But for many years the challenge has been creating large-scale topographical databases from which smaller scales can be easily, and ideally automatically, derived. Ordnance Survey Ireland has achieved this, as CEO **Colin Bray** reports on page 23 in the first of two articles.

Data sources continue to grow and one such is from Earth Observation. **Niall Conway** (page 21) provides a timely review of how space is a growing and significant source of data. There are great opportunities ahead from this sector, once the preserve of the military. Cheaper launch vehicles and mini satellites are key but as Conway observes it remains for, "all interested parties to design a framework for communication, coordination and collaboration".

Lastly I am delighted to provide a more human-centred account that may help inform others thinking of moving to greener grass. **Conor Smyth** was a well known activist in public sector GI circles in Northern Ireland and latterly Scotland. He's now made a life-changing move to the commercial sector. Does he regret it? Is he happy in his new role? Turn to page 18 to find out.

There is important diversity in all these articles. They remind us not only how important GIS is but the opportunities that remain in this exciting business. If you want a deeper and longer read on this theme then please go to the Guardian newspaper's website and the splendid article "Worlds apart" published on 7th February. It highlights how much of the planet remains to be properly mapped (think deep oceans) whether topographically or thematically through recording human habitats. Author **Lois Parshley** also reminds us that those same mapping skills can be applied to track disease, chart the neurons in the brain or track Internet connections (<https://www.theguardian.com/science/2017/feb/07/faultlines-black-holes-glaciers-mapping-uncharted-territories>).



Stephen Booth, editor of GIS Professional.

A handwritten signature in blue ink that reads "Stephen Booth".

Stephen Booth, Editor

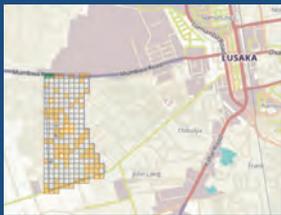
MapAction deploys to Chile

MapAction has sent a team of two volunteers to Chile to support the response to extensive wildfires. The mission has been mounted at the request of the Chilean Government and the UN Disaster Assessment and Coordination team.

Thousands of people have been evacuated from their homes due to extensive wildfires across Chile. Drone images show entire neighbourhoods destroyed and hundreds of thousands of hectares of land devastated. The fires have also claimed the lives of several people including firefighters.

The fires have escalated in recent days due to unusually dry, windy conditions. Chile's President Michelle Bachelet said, as she visited the hard-hit Maule region, "We have never seen something of this size, never in Chile's history. And the truth is the [firefighting] forces are doing everything that is humanly possible and will continue to do so until the fires are contained and controlled."

Help needed with mapping projects



Right now you could help map part of Lusaka, capital of Zambia.



Help Hawassa University in Ethiopia conduct land use analysis to identify populations at risk.

Humanitarian OpenStreetMap team update: a successful second annual crowdfunding campaign, becoming a monthly donor and current mapping needs.

Humanitarian OpenStreetMap Team (HOT) – which first featured in the April 2016 edition of *GIS Professional* – is a global online community of volunteer humanitarians creating and providing free, detailed and up-to-date maps for NGOs and local communities.

HOT and its partners need your help with several mapping projects which can found on the OSM Tasking Manager: tasks.hotosm.org. The Tasking Manager introduces mapping projects, explains what needs mapping and divides projects into small mappable squares. Right now, you could help map part of Lusaka to help OSM Zambia map some of the city's

overcrowded informal settlements (task 2473) and Gununew, Ethiopia to produce a base map and help Hawassa University conduct land use analysis to identify populations at risk from a variety of disasters (task 2404).

In other news, HOT's second annual crowdfunding campaign has just come to an end. Thanks to all donors your generosity has helped raise \$36,567 surpassing an initial target of \$30,000. The focus of this year's campaign was raising funds to support the direct needs of volunteer-led HOT/OpenStreetMap projects across the globe and the money raised has already provided 10 local communities with the equipment and funding required to map. If you would like to become a monthly donor, visit donate.hotosm.org or contact HOT via Twitter (@hotosm), Facebook or info@hotosm.org.

Enhanced advocacy for geography and GI

Britain's Royal Geographical Society (with IBG) and the Association for Geographic Information (AGI) have formed a strategic alliance which will see them working closely together to advance the understanding and use of geographic information as enablers to the world of big data. The focus will build on the widely recognised competence of the RGS-IBG in public affairs and the insight of AGI in the use of GI. Together they will provide a stronger voice for professional geography in areas and with audiences that can benefit from using location intelligence, geospatial data analytics and data integration.

Director of RGS-IBG, Dr Rita Gardner, believes this is an exciting time for geography, "understanding of the role it plays and insights it provides for some of the biggest challenges society faces has never been better and the opportunities for even greater contribution are immense." The move is expected to provide a basis for enhanced advocacy for geography and geographic information for RGS-IBG.

AGI Chair, Abigail Page, adds: "Whilst maintaining the identity of our respective organisations, we will together, champion the value of geography and our collective expertise in ensuring the newest component of our critical national infrastructure – data – serves the digital economy of our nation effectively by embracing location in all aspects of its collection and use."

Interactive mapping for Sefton's residents

Sefton Council, with the support of Arvato, has launched an interactive mapping tool to help residents independently access council information online. The intuitive technology from UK company Cadcorp overlays a range of data including property and electoral figures from across the region onto a map hosted on the authority's website. This enables local residents to check the progress of planning and building applications and find listed buildings, heritage sites and polling boundaries.

A version of the software will also be launched for council employees to provide a comprehensive archive of data in one place, reducing time spent manually searching and collating information from different departments. Jane Taylor, geographic information system manager at Arvato, comments: "By enabling residents to self-serve, the new system will reduce the need to contact Sefton Council over the phone, or in person, for simple information requests, creating efficiencies and giving staff more time to handle complex citizen enquiries." Martin McGarry, MD of Cadcorp adds: "A strength of the Cadcorp SIS product family is in its ability to read different spatial data formats directly and without translation."

EastWest opts for Bluesky

EastWest Mapping of Bunclody, Ireland has purchased aerial photography and height data from Bluesky Geospatial to update its recreational maps. The data, of Counties Wicklow and Dublin, will also be used to update current 1:30,000 and 1:25,000 scale topographic maps, providing up-to-date ground cover information and more detailed height measurements.

Barry Dalby of EastWest Mapping adds: "As the Bluesky aerial images depict the landscape as it appears now, this also gives us an advanced starting point for new recreational map products. Likewise, the height data, being more accurate, will allow us to generate more detailed contour information, which is of particular interest to walkers and cyclists."



GeoPlace annual conference

The theme for this year's GeoPlace conference is 'Everything Happens Somewhere – Connecting Data For Better Outcomes'. The conference is free to attend for its core target audience of local authority address, street and geographic information experts in the UK.

GeoPlace's gazetteer information is increasingly being used by councils to facilitate data analytics and generate strategic insights with the view to targeting resources more efficiently and affecting service transformation. The conference programme will feature examples of this, together with a major announcement of a new 'Development Fund', so the event is expected to attract business intelligence and analytics officers, policy and research officers and chief information officers. Now in its 12th year, the conference and exhibition takes place at Elland Road, home to Leeds United Football Club on Thursday 11th May. More details at www.geoplace.co.uk

Revenues from 5G for councils?

5G phone networks could help improve revenue for local councils, says the UK's Local Government Association (LGA) draft report on procurement strategy. The National Technological and Digital Category Procurement Strategy finds that some councils already get income from mobile networks by siting masts on the roofs of their buildings. Opportunities should increase when 5G becomes available.

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BRIEFS

Esri UK's annual conference is set for 16th May at the QE2 conference centre London. Last year the event attracted some 2500 delegates. Registration is free. More at www.esriuk.com

Views on proposals to harness the positive benefits of drones for public and commercial services and the benefits to the UK economy are being sought by the K Government. The consultation closes 15th March 2017. More at: www.gov.uk/government/consultations/benefits-of-drones-to-the-uk-economy

Cadcorp's contract with West Yorkshire Police for a corporate GIS has been extended into 2020. Cadcorp SIS is used for crime analysis, hotspot mapping and routing analysis; web mapping products are used for the distribution of spatially related data over the intranet while Cadcorp developer components provide GIS capability for Steria STORM, the force's Command and Control system.

MapAction has released a video on its work behind the scenes of humanitarian response. Backed by Royal Patron Prince Harry, the video highlights how the charity's team are always on standby, ready to respond within hours of an alert - including last Christmas period, when it was the subject of BBC Radio 4's Charity Appeal on Christmas Day, presented by broadcaster and comedian Alexander Armstrong. The video can be viewed at MapAction's website, <https://mapaction.org/>

Geomares (publishers of GiSPro and Diversified Communications) have announced a cooperation whereby the media company's Geo-matching.com product database will become the official supplier directory for the following trade events and e-media sites organized by Diversified: SPAR3D Expo & Conference, SPAR3D.com, International LiDAR Mapping Forum, Commercial UAV News, Commercial UAV Expo Europe and Commercial UAV Expo Americas.

A series of free events hosted by 1Spatial in the UK, Australia and Singapore is aimed at helping users and newcomers to FME software understand how best to transfigure their data into useful information, and make it appear when and where it's needed. Dates and locations to note, in the UK: 14th March (Edinburgh), 16th March (Leeds), 21st March (Cardiff), 23rd March (London). In Australia: 21st March (Sydney), 23rd March (Melbourne). In Singapore: 16th March.

In Ireland for 2017, Bluesky plans to commit additional resources for its orthophoto base as well as derived and complementary data products such as 3D height models and colour infrared imagery. In addition to extra survey planes, the company is expanding its Cork based headquarters and launching an online Mapshop dedicated to serving the expanding Irish geographic data market.

Blue Marble Geographics has partnered with Pointerra to provide cloud-based LiDAR data delivery to its Global Mapper GIS. Pointerra's 3D technology allows users to view massive 3D point clouds at any time, on any device, anywhere in the world and this functionality will be enabled in Global Mapper as an extension for viewing, downloading and publishing LiDAR data.

AGI's new Council

The UK's Association for Geographic Information (AGI) has confirmed its newly elected members of Council for 2017. Formed from elected members, Council's main role is to set the strategic direction for the organisation.

The new AGI Council Chair is Abigail Page (Euro-Geographics). The remaining office bearers are: Vice Chair, Steven Eglinton (GeoEnable); Honorary Treasurer Duncan Hill (Europa Technologies) and Honorary Secretary Brad Fisher (Sopra Steria). Serving alongside are: Chris Chambers (Ordnance Survey), Jonathan Hardman (Ordnance Survey of Northern Ireland) and Peter ter Haar (Ter Haar Geoinnovation Ltd). These new members will complement the existing Council members: James Cutler (emapsite), David Henderson (Ordnance Survey), Lizzie Stutchbury (Informed Solutions), Dave Lovell, Matt Pennells (ConsultingWhere (Middle East)), and Andy Wells (Sterling Geo).

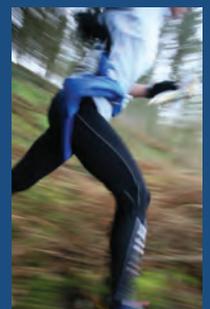
New Chair, Abigail Page, who plans to transform AGI into a modern day membership association, said: "During 2017 it's important that as an organisation we continue to engage and focus our collective efforts on the key elements that make AGI a valuable part of our community and wider industry."

The full list of Council members and their biographies are available on the AGI website: www.agi.org.uk/about/council/members

Imagery and height data to help orienteers

High resolution aerial images and laser-mapped height data are helping orienteering club members navigate their way around complex landscapes. Bluesky data is used for detailed and intricate maps depicting small depressions and pits, changes in vegetation and otherwise unmapped paths and trails. The maps for the Nottinghamshire Orienteering Club (NOC) will help competitive participants decipher the landscape and select the fastest route between a set of control points.

"Orienteering maps show far more detail than other tourist or leisure maps," adds David Olivant, a trained cartographer and member of the Club. A popular competitive sport, the aim is to navigate between control points marked on a map, in the quickest time, by selecting the optimal route.



From Peter Parslow, Ordnance Survey open standards lead, and chair of AGI standards committee

Dear Sir,
I read with interest Ed Corkery and Steven Ramage's article in December's *GIS Professional*, and I couldn't help thinking of INSPIRE, and the even earlier idea of a national SDI. They are not specifically about open data, in the sense of data that is openly licensed, but they are about data that is available in open standard ways, and the pain-points and steps which Ed and Steven identify, are very much central to the INSPIRE initiative too. Where Ed and Steven have "Find, Appraise, Access, Use", INSPIRE – at least in the UK – has "Discover, View (& Evaluate), Download (& Use)". Recommended solutions for each step are even built on the same OGC standards that Ed and Steven mentions.

With our likely departure from the EU, Defra and the government Data Leaders Forum, are considering our relationship to INSPIRE, and the longer held dream of a national SDI – the earlier UK Location Council and its work. I'm sure many people can point to bits of the INSPIRE technical solution that could be improved, and I believe both Defra and the Forum are open to such suggestions – as is INSPIRE across Europe, through their "maintenance and implementation" governance structure. For more information, as well as to "find" data, and in many cases "view" it for evaluation, visit <http://data.gov.uk/location>

PEOPLE

Dr Rob Walker has received a BSI International Standards Maker award, recognising his contribution to open standards for GI over the past 25 years and more. Walker has been active



in GI and standards for over 25 years and is well respected nationally and internationally for his integrity, knowledge and judgement; he always voices an opinion based on good judgement and common sense, states the citation.



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Creating a new normal in the Everglades



The southern half of the Kissimmee River restoration area. The KRRP aims to return a natural flow to 40 miles of the river and restore about 25,000 acres of wetlands by 2019. Photo credit: Brent Anderson – SFWMD.

Professional grade GPS linked to an iPad is bringing significant efficiency gains in data capture to a water management organisation, reports Mary Jo Wagner.

Based in West Palm Beach, the South Florida Water Management District (SFWMD) covers 16 counties stretching from Orlando to the Florida Keys, including the unique and intricate Everglades freshwater wetland. The oldest and largest of the state's five water management districts, the 67-year-old SFWMD strives to maintain a delicate balance between safeguarding the water needs of the natural environment and the competing water-supply demands of 8.1 million residents.

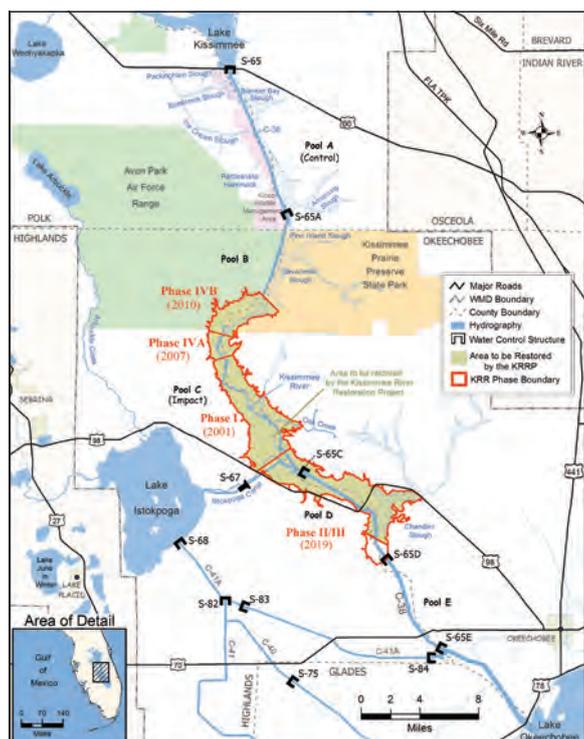
Project (KRRP), which aims to repair damage from past overly aggressive flood-control measures.

With the scope of the KRRP and the extent of its monitoring area – about 17,000 hectares (44,200 acres) – the SFWMD created the lakes and river ecosystems section (LRES) in 2006 to act as a dedicated team to evaluate environmental changes and ensure the ecology of the region is thriving throughout the restoration phases.

NEW TECHNOLOGY HELPS MEASURE SUCCESS

Measuring the environmental successes, however, was a significant challenge for LRES personnel because they were trying to monitor and map a very fluid environment with static, labour-

As part of its extensive responsibilities for south Florida's water-rich environment, the District has been at the helm of significant natural resource. One of the most ambitious initiatives is the Kissimmee River Restoration



Map of KRRP area and its restoration-phase schedule.



LRES staff collect vegetation ground control points for EAV mapping.



Staff collected wading bird data from the helicopter with the Trimble R1 and an iPad.

intensive tools – paper notebooks and maps, hard-copy geospatial imagery and consumer-grade GPS technology.

That all changed, however, in 2015. After a ten-year digital transformation designed to bring data-collection efficiency, versatility and accuracy to the LRES, the department implemented a new technological solution: a Trimble R1 GNSS receiver connected via Bluetooth® to an iPad running the Esri® Collector for ArcGIS® app. The new combination of iPads paired with R1 GNSS receivers has not only shredded the paper trail for the LRES, it's giving staff the smart tools they need to more efficiently and accurately monitor and map diverse vegetation species in the KRRP and produce deliverables with higher confidence.

BOATLOADS OF DATA

Given the size of the KRRP monitoring area, the LRES uses both airboats and helicopters to survey and map the vegetation – field work that is coordinated with aerial surveys flown every three years for large area coverage. The focus is on studying and mapping the predominant emergent vegetation – plants above the soil or water surface – which is a key indicator of the ecosystems' overall health.

Historically, staff needed to print out reams of paper before embarking on their field assessments. However, for the 2015 field surveys, LRES environmental scientist **Lawrence Spencer** fielded the new Trimble R1/iPad combination.

Rather than printing paper, Spencer loaded the iPad with all the relevant apps and maps he needed. Travelling by airboat, he used the R1 in combination with the iPad to navigate to predetermined sample

areas. Once at a location, he stopped, located the centre of the vegetation cluster and captured a precise GNSS ground-control point (GCP) of that population, which was stored into the Collector app to provide an accurate position for mapping that vegetation class. Using templates, he recorded an array of attributes such as the plant type, its areal extent and its health, and attached photos of the area. Data collection complete, he navigated to the next location and recorded the vegetation there, a process he repeated every week for about six hours a day from April to June.

Using the R1 receiver, Spencer collected around 475 submetre-accuracy GCPs – about three times the number of GCPs he could acquire previously. The GCPs are used both to generate signatures for air-photo-based vegetation classifications and to assess the accuracy of the final vegetation maps produced.

"The GNSS technology allows me to take more points, and higher-quality points, in the time we have," says Spencer. "These points allow me to create spectral signatures so I can better distinguish individual plant classes on the air photos and map them across the whole restoration site."

MORE GCPS FROM THE AIR

In between airboat trips, Spencer also carried out vegetation surveys with a helicopter. Once he reached a predetermined location, the pilot hovered over the wetland and Spencer collected several GCPs with the R1 receiver, recorded plant attributes and took pictures of the vegetation below, all within less than 90 seconds. Then he flew on to the next sample area. In all, Spencer collected another 450 GCPs from the helicopter, giving him about 900 data points



for the final maps. With only four hours per flight in which to collect data over the whole KRRP study area, efficiency is critical. The new system enables him to collect more information in less time and with less crew.

"In the past, I'd have another colleague, a laptop running Esri's ArcPad, an old backpack GPS unit and paper maps in the helicopter," says Spencer. "I often couldn't take data points fast enough so I hand-wrote notes while my colleague took pictures of the vegetation. And we usually needed the full four hours to complete the work. With the R1 and iPad, we have reduced flight times by nearly 50% and I can acquire all the data, including photos, myself."

Fire Ants take a ride down the Kissimmee River.
Photo credit: Brent Anderson – SFWMD.

A White Ibis flaps its wings amongst other Snowy Egrets foraging in the Kissimmee River basin.
Photo credit: Brent Anderson – SFWMD.





A mother Moorhen holds a snail snack for her chick.
Photo credit: Brent Anderson – SFWMD.

ABOUT THE AUTHOR

Mary Jo Wagner is a Vancouver-based freelance writer with more than 23 years of experience in covering the geospatial technology.

AUTOMATED MAP PRODUCTION

In addition to the new field system, Spencer is also developing a more automated and accurate map production system using Trimble's eCognition® image analysis and land classification software. Historically, he manually drew polygons around vegetation populations on the digital infrared air photos, named each one by its signature and then used them to map the wetland vegetation. This time, he will transfer all of the data points he collected in the field, along with the 2015 aerial imagery, into eCognition to automatically classify and map the vegetation.

"With significantly more sub-metre accuracy data points, I'll be able

to classify the vegetation much more accurately and quickly," says Spencer. "And I'll be able to repeat and customize this process to produce any type of map needed. This flexibility and detail will help to better measure how well the vegetation and wildlife is responding to the KRRP."

The Trimble R1 and iPad combination has not only improved the data-collection efficiency and the ability to readily share information within the LRES, it has also attracted other colleagues at SFWMD who see the benefits of this versatile system for their own work. The combined system may indeed become the new normal for acquiring data in the field.

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Thinking about credentials

Although usage of the word is subtly different in the US from the UK, where we tend to apply it to qualifications, it has the same ultimate meaning. Adena Schutzberg thinks we'll be hearing a lot more of the word this year for single sign-on services.

At the end of 2016, **Geoff Nunberg**, who covers language for one of my favourite radio shows, chose "normal" as his word of the year. He noted that the term's widespread use last year was "a sign that we're living in extraordinary times." My word for 2016 is "credential." When I joined Esri last July I was given credentials to access company data and services. Later in the year, when I started swimming at the city pool, I found myself using a credential, my driver's licence, to gain access at a discounted rate. These days I spend a great deal of my working hours creating, managing, and pondering other people's credentials. In particular, I work to make sense of, create, explain and send out new credentials to Esri's Massive Open Online Course (MOOC) students.

WHAT IS A CREDENTIAL?

One thing I've learned is that the term credential, as used in IT, is new to many students. I like this concise definition: credentials refer to information used to control access to resources. If you are reading this column, you are likely to have credentials to access GIS data and services on local, distant, and cloud-hosted platforms. And, you probably have credentials for websites and online services you use outside of work. I have credentials to access my grocery store's online loyalty programme and credentials to access my gym's reservation system to claim a bike for spin class.

IDENTITY

These credentials are becoming more important as software systems demand identity based access. Salesforce, SharePoint, and SAP use the idea of an identity (a set of named user credentials) to provide access to the appropriate content to the appropriate individual. Esri is doing that, too.

SINGLE SIGN ON

Esri, like many companies, uses an identity management tool that provides single sign on (SSO). That means that one set of credentials provides access to a laundry list of services. While SSO is a great idea, it can be hard to

get every resource and service under one umbrella. A friend who works at a major Internet-focused company jokes that he has seven SSOs! The good news is that standards are maturing in the SSO space, so there is hope that SSO may really mean SSO in time.

STUDENTS AND CREDENTIALS

It's not uncommon for an online course, either one offered for college credit or one that's less formal like a MOOC, to require credentials for two or more services. I took an EdX course that required both access to the EdX platform, a learning management system (LMS) and a second platform where students could publish their assignment on the Web. For Esri's MOOC offerings we do something similar: students need credentials for both the LMS and the Web GIS platform. Having been a MOOC student myself, and having watched many thousands of students in MOOCs in the recent months, I've tuned in to how difficult it can be to keep track of these two sets of credentials. It does not matter that students need to track "just" two more sets than usual, or that the credentials are needed for only a few weeks.

SECURING CREDENTIALS

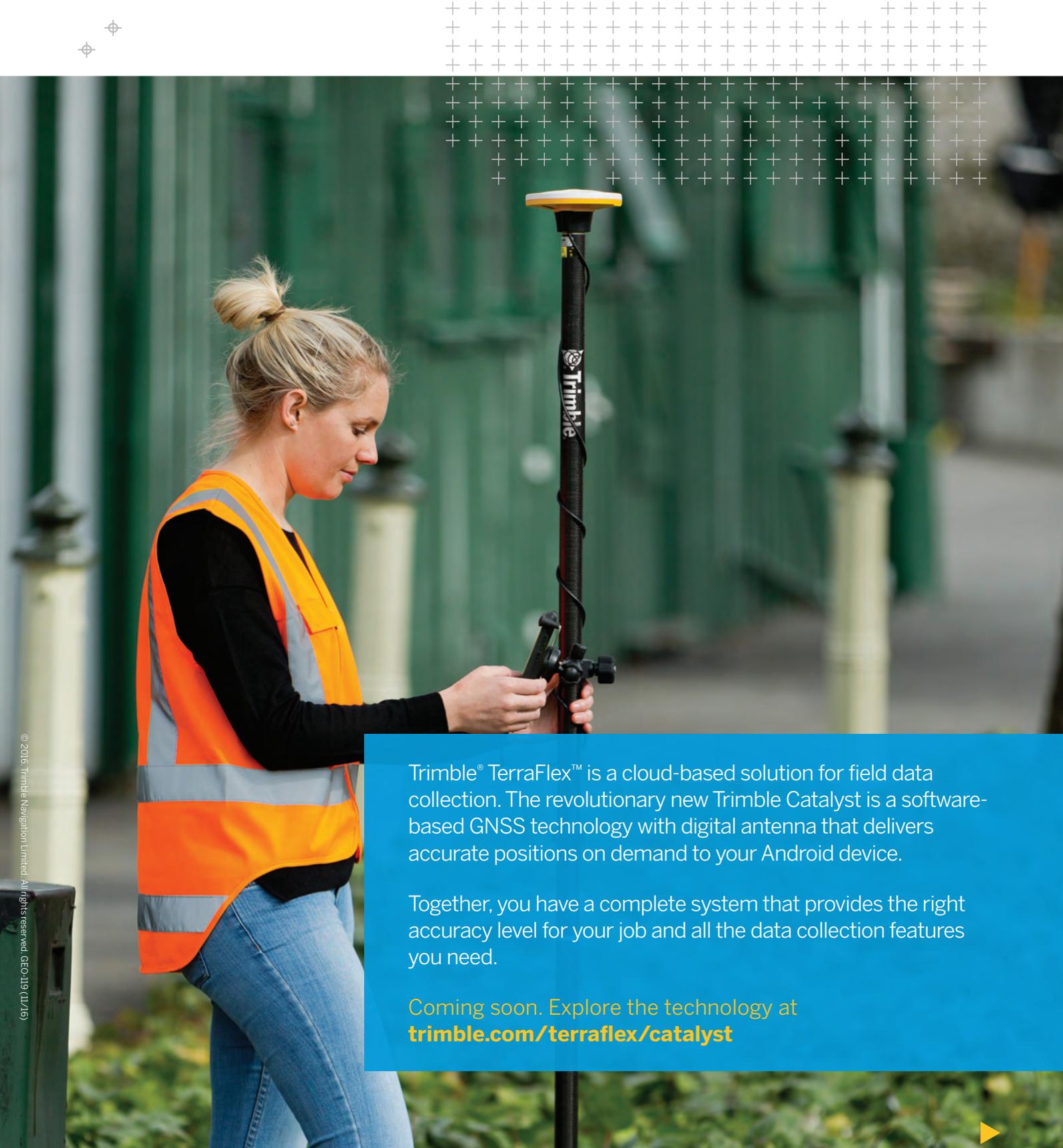
While exploring credential management for MOOC students I found a list of "Do's and Don'ts" for passwords. **Brian Krebs**, of Krebs on Security wrote, "My views on the advisability of keeping a written list of your passwords have evolved over time. I tend to agree with noted security expert **Bruce Schneier**, when he advises users not to worry about writing down passwords. Just make sure you don't store the information in plain sight. . . ." The more I thought about that statement, the more confident I was that "writing credentials down" was at least part of the solution to preventing my students' credential trouble.

WHAT'S AHEAD

I suspect that before GIS practitioners have fewer credentials, we'll have more of them. And, like the MOOC students, we'll need to think through credential management, both for our work and personal lives. Perhaps "credentials" or even "identity" will be your word of the year for 2017.



Adena Schutzberg has worked in geospatial technologies for more than 25 years. She is a member of the Esri Education Team.



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Politics is all about location

- and finding a quorum

In the US, GIS is at the forefront of digital transformation of government by empowering legislators to work collaboratively. Kurt Daradics, Esri Startup Program Manager, explains how Quorum Analytics applies location data to inform policy making.

The political views of a single constituency can vary widely across a region. This presents a huge challenge for politicians who are trying to identify voter trends or form a governing coalition. But legislators can now leverage the geospatial data that governments typically use for initiatives such as national parks services and defence intelligence, to visualize census data, and see polling results on maps. A start-up called Quorum Analytics is enabling legislators to see the relationship between location data and political behaviour.

COLLABORATION

Passing laws is an inherently collaborative process; it requires cooperation with other legislators. For instance, a senator who wants to propose a bill to provide low-income families with access to better childcare must garner support from other members of Congress to get the measure through both the Senate and the House, to the president, and signed into law. It therefore makes sense to target lawmakers who support similar causes or who have constituents in their jurisdictions with similar needs, such as concentrations of low-income families. But finding this information is difficult, and keeping track of it for hundreds of politicians is arduous. Quorum Analytics uses Esri technology to access to geographic datasets, such as demographics, to enable lawmakers to find senators and representatives who will support their issues, co-sponsor legislation, and help get bills passed.

COALITION BUILDING

Quorum's ability to share useful insight about constituents helps lawmakers find ideal political partners for passing legislation. Politicians can use Quorum's web and mobile apps to target those colleagues that are a good match based on what bills they have sponsored, who they have worked with in the past, their voting history, and their stances on political issues. They can track legislation, leverage quantitative analytics on all 50 states, and identify a potential ally. The data is constantly being updated in near real time, so users can see which members of

Congress are being the most active and influential regarding a particular issue.

VISUALISATION

Once users have identified which lawmakers they want to target for partnership on legislation, they can use Quorum apps to generate profiles demonstrating the value of their issues. Geographic data from Esri's platform can be imported into and visualized from which users can then leverage to view legislative data and analytics in map form. The software employs the ArcGIS REST API for the GeoEnrichment service, which makes it easy for Quorum users to layer in extensive demographic statistics – such as age, race, industry, and consumer preferences – about each lawmaker's constituents. With this, users can visualize a proposed policy's effects on various districts and identify legislative targets. Quorum isn't just a political tool though. It is equally useful for retailers who want to identify their economic impact on specific regions.

For instance, companies can use it to run analytics on how many people they employ in each state and then visualize the amount of money they contribute by means of employment revenue to the community by region. To enable effective public policy, proposers of projects need to be able to communicate directly with lawmakers clearly. Quorum enables users to send datasets and maps from the software via email to project stakeholders. Using the mobile app, lawmakers can visualize the effects of proposed legislation on their smartphones. Along with Esri's data mapping capabilities, Quorum is at the forefront of a digital transformation in government policy making.



Quorum Analytics enables legislators to see relationships between location data and political behaviour.

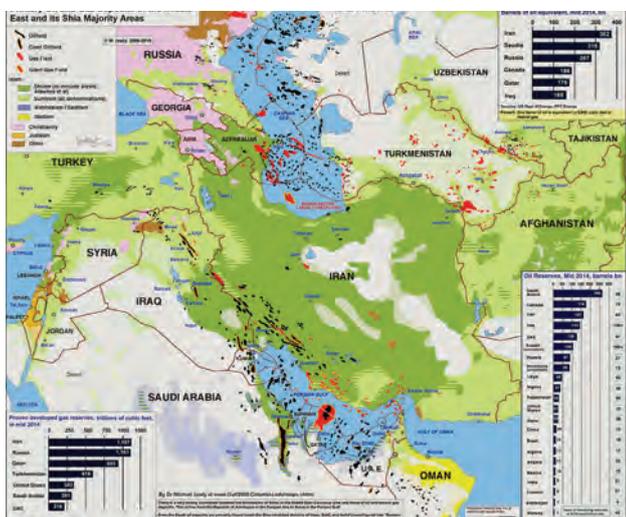
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Kurt_Daradics@esri.com

Have you or your company developed a novel product or app that you'd like to tell readers about? Remember, it must be something truly new and not just an extension of an existing product line or service. Drop a line to editor@geomares.co.uk

2016 – a year of brilliant maps

The Editor looks back on some cartographic high points during the portentous year of 2016.

Last year *GIS Professional* ran a series under the title Big Map Feature. We began in February with Dr **Michael Izady**'s map of how oil in the Middle East is distributed according to Islam's ancient schism between Sunni and Shia.



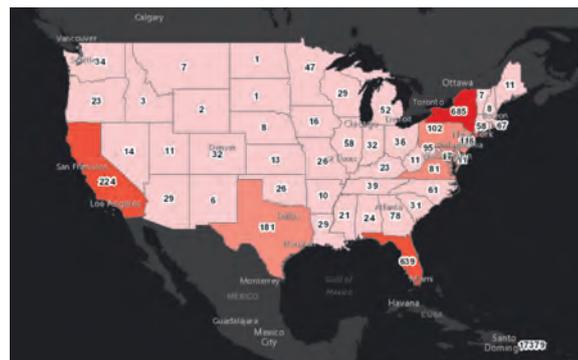
In June, to mark the Bard's 400th anniversary, we published **Jane Tomlinson**'s colourful schematic map of where Shakespeare's plays took place, which covered from Scotland (Macbeth) and Denmark (Hamlet) in the North, to Egypt (Anthony & Cleopatra) in the East. In between the map touched on plays set in Italy, Greece, France and the stormy Mediterranean (The Tempest).



In the August issue **Metayo Moshi**'s topical map of the Islands of Remain in the Brexit Sea revealed how the UK voted in an intriguing way by showing those for Remain as islands. Unsurprisingly Scotland suddenly dominated Britain's topography.



Amongst the many tribulations which assailed the world last year was the Zika virus. It disrupted the Olympics in Brazil and caused widespread worry for women in pregnancy. Drawing on US Census data, Esri's map tracked the spread of the virus across the states and counties of mainland US to help health agencies target response.



TOP 16 FOR 2016

GiSPro would like to acknowledge the source for several of these maps. The website Brilliant Maps (www.brilliantmaps.com) has published many interesting maps and far more than we can cover. Their 16 best maps for 2016 are worth mentioning however (<http://brilliantmaps.com/best-maps-of-2016/>). They are:

In top slot was the none-too snappily titled **If “Did Not Vote” Had Been A Candidate In The 2016 US Presidential Election, It Would Have Won By a Landslide**. A surprising choice perhaps, given that most informed people on both sides of the Atlantic are aware that voting turnouts have been falling in the US and the UK for several decades; the recent referendum in the UK may have begun to stop the slide with a 72% turnout against 66% for the previous year’s general election.

In second place was **England vs Great Britain vs United Kingdom Explained**. Anna Debenham’s deceptively simple map explained to a confused world beyond these isles the difference between Britain, the UK and the British Isles (also known as the British-Irish Isles).

In third place **The Genetic Map Of Europe** showed through a scatter of colourful mini pie charts how our origins are spread. The range is quite remarkable with the outer edges of the continent - UK and Ireland - showing (unsurprisingly) the least genetic diversity. Amongst the 16 maps there were several tongue-in-cheek and downright cynical cartographic teasers.

European Food According to Italians tracked through radii from “Real Food” which barely went beyond Italy’s borders to “Toxic” at the outer fringes of the British Isles and Iceland. The map was divided by two meridians: muddy coffee in the east and overcooked pasta in the west. Lines of longitude defined the Supersized Coffee parallel, the Culinary Despair Line and the San Umberto Nobile Line (a reference to a pioneering Italian aviator and polar explorer). The map comes from the unashamedly named Atlas of Prejudice by Yanko Tsvetkov.

Game of Thrones’ Westeros Is Really Just Britain & An Inverted Ireland paid homage to the popular TV series, while Which European Country Has The Lowest Drinking Age? revealed that in Germany, Belgium, Luxembourg, Austria, Switzerland and Portugal you can get plastered at 16 but only on beer and wine;

you’ll have to wait another couple of years before hitting the hard stuff. For most of the rest 18 was the legal age though for the abstemious (?) Icelandics its 20.

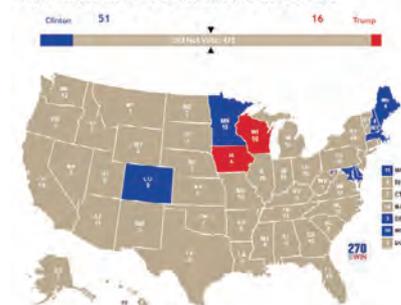
How North Londoners View The Rest Of The UK Or Why The Rest of The UK Hates London

from reddit.com’s Mapporn site charted a range of tropes and stereotypes from a line below the River Thames demarcated as “Here be Dragons” and the south east generally being defined as Waitrose shoppers (a more upmarket supermarket chain) to most of the rest of the country being defined in generally unprintable descriptions apart from the Lake District, which this writer concurs with as “Miserable walking holidays”. (I have never understood why our TV weather forecasters have a homing instinct for this remote and sparsely populated area in their forecasts – the weather is easily discerned from the region’s title).

Holland Is Not A Dense Country, But An Empty City compares Europe’s most densely populated country to the world’s big cities and urban conurbations. Maybe the Dutch have got it right: don’t get too hung up about green belts. Other entries cover the world’s fastest growing religions, the Pan American Highway and the 2016 US presidential election by county and An Incredibly Detailed Map of the Roman Empire At Its Height in 211AD. Check it out.

• To enjoy all these and more “Brilliant Maps” go to www.brilliantmaps.com

If “Did Not Vote” Had Been A Candidate In The 2016 US Presidential Election



So what will 2017 bring? Do you have an interesting map you’d like to share with us? Drop a line to us at editor@geomares.co.uk and title it “Big Map Feature”.

From public to private sector

'I've really not looked back!'

After 25 years working in the public sector Conor Smyth felt he needed a new and bigger challenge. He reflects on his career to date and the new environment he finds himself in.

It is not often I'm approached to write for *GiSPro*. The brief was very different from my last one, entitled, '*GI helps drive change in Northern Ireland*' (issue 20: February 2008).

The brief this time was to provide a personal account of my experiences in moving from a long-standing career, spanning nearly 25 years in public sector organisations, into a role within a recently established, small commercial enterprise.

Looking back over the last two decades or so, it goes without saying that a lot has happened! The industry and sectors which I have worked in have changed immensely; as has, of course, the inexorable pace of technology and societal change. From a personal perspective, what is immediately evident is that my journey, choices, various employment roles and achievements have followed a pathway wholly within public sector organisations.

IDYLIC LOCATION

So why would I even consider moving into a private, commercial organisation? Nevertheless, that is what I did in late August last year.

I have been asked by many on LinkedIn and in person about what actually motivated me to make this change. I guess the 'catalyst' that got me thinking about even

making a 'change' occurred in the Spring (2016) whilst on the idyllic Panwa Peninsula in Thailand. Having worked in the public sector in several roles based in Northern Ireland and latterly Scotland, I pondered at length on an inner desire for a new (and bigger) challenge in my professional life – one where I could make an even more significant difference in the world. Perhaps a rather 'heady' aspiration, but I was resigned to make the change!

Whilst I was very fortunate to be Head of Research and Geodata Services at EDINA, University of Edinburgh, my decision to make a change and therefore to procure a more compelling role started in vain. Needless to say, the main motivating factor in my search for a new role was predicated on finding an organisation that would benefit from my skill-set and experience. In addition, and importantly for me, I sought a role that would not only allow me to make a difference, but would also afford me the opportunity to make a significant contribution to global societal change. I really wanted a job with the potential for 'impact'!

IMMEDIATE ATTRACTION

Through a specialist recruitment agency, I was introduced to **Alexis Smith**, CEO, of recently established Intelligent Modelling Ltd (trading as IMGeospatial.com). The company works in the Earth Observation (EO), machine learning and artificial intelligence domains to develop 'insight and intelligence' solutions for businesses at an international level. My attraction to

IMG was immediate. Two reasons stand out, firstly, the CEO relayed a passionate account of the business, its culture, activities and ethos. That in itself was compelling. I just 'connected' with what the business was about. Secondly, the potential opportunity to make a key contribution to the success of a new innovative and growing small business in EO solutions globally was extremely attractive.

After a number of interactions with the CEO over the course of several months, I sensed that my journey into a new world was becoming a reality. Indeed, the entire recruitment process was unlike any other that I had encountered and the people along the way were awesome. Despite the considerable security of employment in the public sector, I was excited by the prospect of joining the company (and team!) in a role that would allow me to experience the challenges of leading-edge work in the space and EO domain; and at the same time, offering the potential to make a really positive (societal) change too. That was very important to me.

FULL CIRCLE

Whilst the recruitment process seemed protracted (with final selection by GH Smart), I was formally offered the position of Head of Data Intelligence. In many ways, my appointment took me back full circle to where I started my real passion for geospatial (applications) during my doctoral research days in Brazil, working on EO and GIS modelling for reducing

societal risk impacts associated with urban landslides in Rio de Janeiro State.

So, looking back on my short time in the commercial world, what can I say? My first comment would have to be that: 'I've really not looked back'. I would recommend that others in the public sector considering career changes to think about opportunities beyond the public sector.

The role demands multi-tasking but also regularly taking on and supporting many additional business functions. The reality of a small commercial business is quite simple; it can be pressurized, at times chaotic, but always fulfilling. Nevertheless, teamwork and

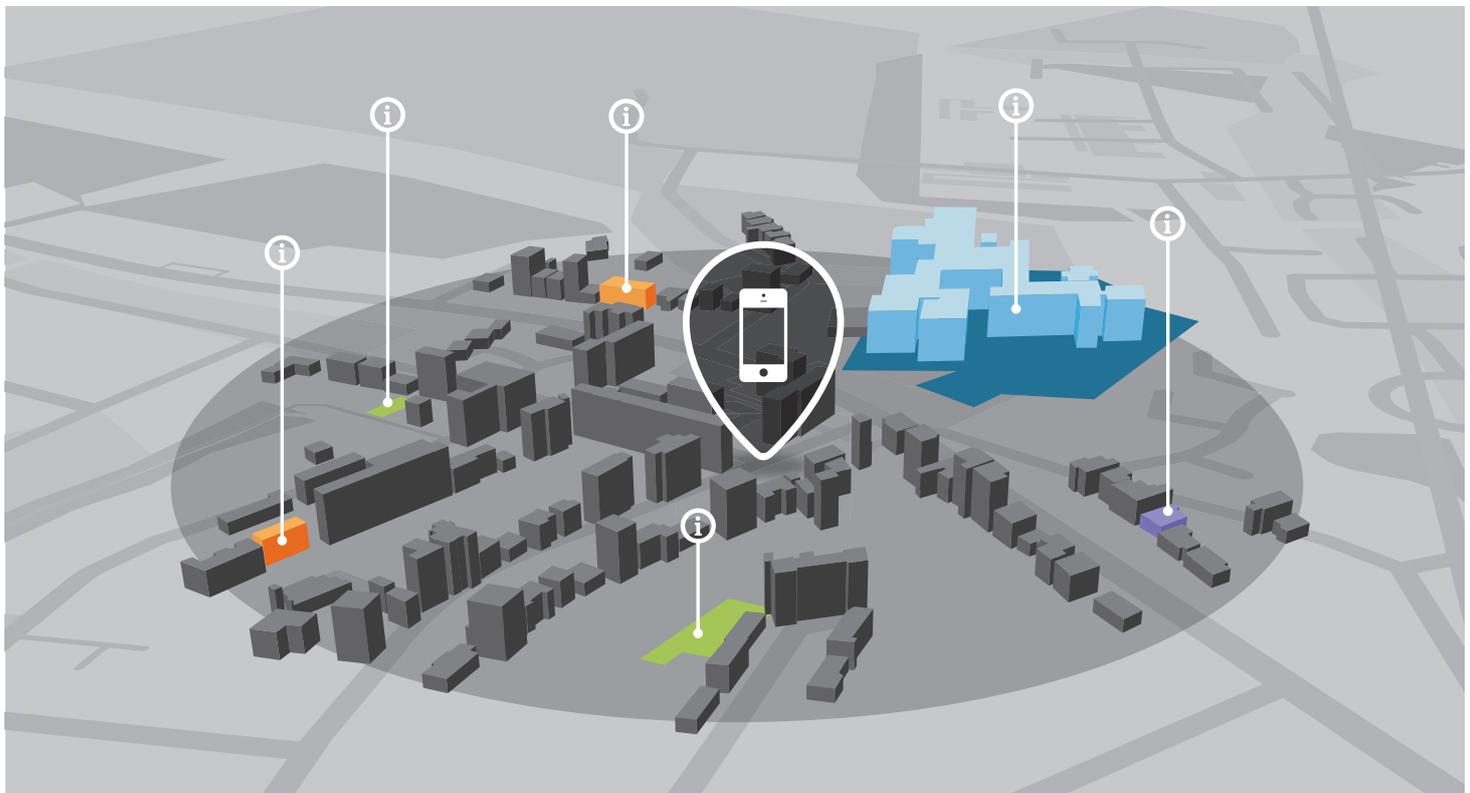
mutual support abound and are absolutely critical. With small staff numbers, it just takes one person to be off to disproportionately impact on operations.

Despite the challenges and demands, the role and working with an awesome team with immense passion and common shared goals does make for a very fulfilling job. I would go even further and say that it does not feel like work at all! It is something that 'I' – 'we', the team - all do for a common end goal namely business and client success by hopefully contributing to making the world and society a better place. As a professional geographer, it's certainly a sector where I want to be – making a difference!



Conor Smyth who recently made the move to IMG.

• If working in a place like IMG interests you too, do consider contacting us via our website www.IMGeospatial.com as we are growing as a business and we seek new team members.



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Future Directions for the Space Industry

Space is no longer the sole province of the military and telecoms. Today, the market is growing for earth observation, cyber security, navigation and positioning products, while tourism and mining loom, explains Niall Conway.

During a recent IoT event, I heard an observation which seems to reflect the changing status of the space industry in today's world. In the 1960s, the speaker said, some of the greatest minds on the planet worked towards putting a man into space. Today, he added, some of the world's greatest minds are now focused on increasing the number of views on a Youtube video.

Although this comment was a light-hearted attempt to emphasise the big effort behind selling ideas in the real world, it suggests that space activity is now perceived as being a less complex and more accessible pursuit than it once was. The comment also implies that other industries are so innovative that they can compete against the space industry for the world's top talent. In order to better understand if and how such a comment could be true, one needs to examine some of the forces which have made space more mainstream in 2017. History books are full of the pioneering achievements of the space sector at a time when the industry comprised of government-led projects, national security agendas and lucrative contracts. Although the industry is often associated with secrecy, bureaucracy, and legacy, it has also sparked the imagination of a generation and has helped to drive home the STEM education agenda which now underpins our globalised economy.

It is quite likely that the same individuals who were influenced and inspired by early space achievements are today helping to reinvent certain aspects of the industry. Innovators and investors such as Elon Musk and Richard Branson, who are perhaps frustrated with the established space industry models or the progress that has been achieved to date, are beginning to pursue their own ambitions in space thanks to economic and technological factors.

NO LONGER CUTTING EDGE

The space industry has matured considerably since its early days, and much of what was once considered to be 'cutting edge' technology is now widely available in the developed world - in cars, materials, devices and appliances. Furthermore, cost-effective manufacturing, streamlined supply chains and improved business models are allowing more parties to build a presence in space. In relation to satellites for example, the hardware, software and data required for situational awareness, imagery capture and systems operations are far more accessible than they were in the past. Furthermore, today many processes can be outsourced, automated or accessed through online services. With the costs of entry now significantly lower, many new and often unlikely players with space-related ambitions have

emerged. Pioneering bodies from the US and Russia collaborate with agencies, research institutions, NGOs and high profile companies from a range of developed and developing nations. The arena which was traditionally concerned with defence and national security, space exploration, and telecommunications now includes a wider range of interests such as earth observation, cyber-security, and IoT navigation support. Combined with the increasing likelihood of extraterrestrial tourism and mining activity, space is expected to become a lot more crowded in the future. As an example, according to one statistic from Euroconsult, an expected 1,450 new satellites, representing a market of \$250 billion for the space industry, will be launched between the years 2016 and 2025.

REALISING THE POTENTIAL

Despite these major advances, the industry now faces some big challenges. Although being much better equipped and having more clearly defined objectives than ever before, there is an element of uncertainty for both pioneers of and newcomers to the 'Final Frontier'. The term 'frontier' implies an area which is as yet ungoverned, and since space, just like the Earth below, does not come pre-packaged with policies, agreements, rules and jurisdictions much work needs to be done. If the true potential of mankind's activity in space is to be realised then it will be necessary for all interested parties to design a framework for communication, coordination and collaboration. Such a system will need to combine

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decades old knowledge and experience with a modern, flexible, and results-driven mindset. Before any such system or governing structure can be established it will be important to raise awareness of the role which geospatial technology and data can play in terms of helping to solve global issues. Participants should pay close attention to the recommendations of the UN's initiative for Global Geospatial

Information Management (UN-GGIM), which emphasises the importance of education and skills development as well as to the recommendations of the Group on Earth Observation (GEO). The industry should also focus on implementing interoperability standards of the Open Geospatial Consortium (OGC). These standards, among other things, form the foundation of the important Earth Observation Sensor Web. The strengthening of the global spatial data infrastructure (SDI) network and the continued support for space industry incubation centres, such as those launched by the ESA, should also be encouraged.

are likely to concern certain groups more than others. Pioneers of the industry may view current advances cautiously and seek more regulatory control. Meanwhile, younger generations will probably view the space industry as just another one to disrupt.

Regardless of which perspective is adopted, space is more accessible than it ever was before and the industry now competes with other hi-tech sectors for top talent. If the pioneers of space activity are to build on their groundbreaking achievements to date then they need to design frameworks and systems which will allow them to harness the imagination and skill set of a younger, more agile generation.

The major changes which the space industry is currently experiencing

ABOUT THE AUTHOR

Niall Conway is an Irish/Australian GIS professional, urban planner, graphic designer and casual academic who writes a regular blog at www.geobreadbox.com



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Ordnance Survey Ireland shows new perspectives

The Republic of Ireland is leading the way in the international mapping arena, reports Frédérique Coumans. Last September, Ordnance Survey Ireland (OSi) became the first national mapping agency in the world with the capability to produce 1:1,000,000 cartographic products and services from its 1:1,000 topographic database in a fully automated flowline. OSi has populated a standards-based, object-oriented data model and implemented orchestrated, rule-based production workflows to achieve this result.

One of the primary roles of a national mapping agency is to provide the authoritative view of the real world through the publication of mapping products and services. In OSi's case, this means providing products and services at mapping scales ranging from 1:1,000 to 1:1,000,000. Traditionally, OSi's production methodologies have been geared towards the publication of cartographic products that were aesthetically beautiful. They focused solely on geographic reference and involved managing a national mapping coverage of over 5,000 individual maps. Today, OSi represents real-world features in a more intelligent way and maintains a single, high-resolution digital landscape model comprised of over 50 million uniquely referenced objects.

DATA INTEGRITY

In 2007, as part of OSi's National Mapping-as-a-Service strategy, it decided to create a scale-independent, object-oriented, spatial data storage model called PRIME2. Advances in this area were reviewed in Europe and further afield. "We identified best in breed and took the opportunity to learn. We also focused on implementing non-

proprietary industry standards where appropriate," says Colin Bray, CEO of OSi. In 2011, OSi began re-engineering its existing data into PRIME2. Databases were transformed into the new data platform, including full rules-based orchestrated maintenance workflows. In 2014, OSi went live with these data-maintenance flowlines. "Maintaining the investment in PRIME2 meant not infecting the new re-engineered data with old work practices," explains Bray. OSi implemented the orchestrated workflow based on 1Spatial and Oracle technologies. The data collection systems that were introduced ensured that new input from surveyors and other parties was compliant with the PRIME2 data model.

Another part of the project involved documenting OSi's core operating procedures. This gave OSi the opportunity to reduce the risk associated with any significant loss of corporate intelligence (particularly because of upcoming retirements).

CHANGES TO DATA CAPTURE

OSi uses a combination of photogrammetric and field-based data capture methods to



maintain its national geospatial platform. "For OSi's surveyors, the new PRIME2 data model and management systems were a quantum change," recognises Colin Bray, being a surveyor himself. "When we, as surveyors, looked out of the window, our concept of modelling the world was completely different to what is asked of us today. Geographic location used to be everything in our profession. Now we work in a digital society and it's all about the data. 'Location' is now considered an attribute of an object – it enables us to relate the object to the real world."

The workflow has changed dramatically too. Now, when a surveyor is notified about an available job, they must extract multiple objects covering the area of interest and load the extracted job to their tablet. On every

Data integrity is key, even if it's all over a van!

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interaction a surveyor has with the data, over 200 rules are run simultaneously to ensure that the data captured is compliant with the PRIME2 data model. When uploaded, only those objects that have actually changed will be posted back to the core database. Bray explains: "An additional 400 server-based rules are then run against the newly captured data before they are adopted into the national map. That's how we look after the investment made in authoritative data – we absolutely have to maintain the integrity of the data."

MULTI-RESOLUTION DATA STORE

The next phase in OSi's flowline is an automatic update of the model across multiple resolutions. When the photogrammetrist or the field surveyor make a change to the PRIME2 national map, the change in that object is automatically updated across all the various resolutions of the digital landscape model. Correspondingly, OSi's digital cartographic models are updated and translated into vector, raster and web services. This automated approach is based on processes and workflows designed and built by OSi cartographers.

This September, OSi has completed a multi-resolution data

store (MRDS) project with Esri, which delivers the capability for OSi to optimise the automated workflows. Bray states: "Our staff have now gained the capability to create automatically generated products using the new process before the end of the year. I am very proud of this, because it means that we are the first mapping agency in the world to generate products from 1:1,000 to 1:1,000,000 in a 100%-automated flowline."

These new workflows provide the capability to create additional resolutions of the core digital landscape model at local, regional and national level for OSi. In addition, cartographic models have been created that automate map-making and generalisation regarding topographic consistency, cartographic displacement, geometric simplification, etc. Bray adds: "And with that we have the different products available in raster, vector, web services and the paper products. MRDS is putting us in the position to spin up automated flowlines for any future new product or service."

CARTOGRAPHER'S CHANGING ROLE

Cartography remains a crucial requirement to visualise the national map at different resolutions. The

role of the OSi cartographer is now very much a systems expert, operating rule-based, orchestrated cartographic production flowlines and systems to create various products and services. The CEO stipulates: "You will struggle to see a difference between a manually produced map with traditional techniques and the one produced from our Esri-based, automatically generated flowline. But our cartographers do much more than follow rules of traditional cartography. The data changes its look and feel depending on the resolution – there's no longer just one single view of an object."

WHAT'S NEXT FOR OSi?

"We believe our core data holding is now suitable for use in modern GIS environments and is therefore future-proof based on our current understanding of market requirements," says Bray. In addition to consulting with the user base, and as part of its data-collection strategy, OSi is now creating semi-automatic production workflows for collecting 3D objects from remote sensing: "OSi has collected in 3D for 25 years with digital photogrammetry, and in 2017 we are developing a new flowline for 3D object maintenance, starting with cities. OSi also intends to focus on image processing to enable imagery to be stored at pixel level in rows and columns within a database. Bray is convinced, "that is going to be the next generation. We will get the intelligence of our remote sensing data as attribution into the national map."

WHO AND WHERE?

Colin Bray is chief executive and chief survey officer of OSi. He took up the position of CEO in 2013 after a career as CIO and professional surveyor with OSi since 1998. He is a chartered geomatics surveyor, vice president of the Society of Chartered Surveyors Ireland, and a member of the Public Service Chief Information Officer Council.



Ordnance Survey Ireland is the Republic of Ireland's national mapping agency. It is a state body and its funding model is made up of commercial revenue (81%) from both the public and private sectors. 19% comes from a Service Level Agreement with the Department of Justice & Equality for national interest mapping. In total, 60% of its commercial income comes from the public sector. In addition to the head office based in Dublin, OSi has six regional offices and a total staff of 223.

This article first appeared in *GIM International*. A second article, to be featured in a future edition will focus on how OSi transforms these new work processes into 'Mapping as a Service'.

The role of geological data in the SMART City agenda

Advances in the use of GIS and 3D modelling software have meant that there is now a greater opportunity to develop geo-environmental information systems for urban development, argues Dr Katherine Royse of BGS.

By 2050 70% of the world's population will be living in cities. Cities have a major impact on the social and economic development of nations. They consume 75% of the world's resources. This evolution raises a very important change with regard to the deployment and management of all types of infrastructures within cities. The sustainable development of our cities is of paramount importance if cities are to cope with the impacts of climate change, population growth, congestion and resource demands.

One solution to these issues is to make cities SMART, which means being connected and integrated with confidence and precision – that means knowing where you, your people, assets, sensors and systems are. Smart isn't always about technology. It's about having efficient and effective systems that improve the quality of life for everyone. A city can be defined as

'smart' when investments in human and social capital, traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic development and a high quality of life, with wise management of natural resources, through participatory action and engagement.

resources such as space, heat, water, and building materials all of which need to be developed efficiently and sustainably. Difficult ground conditions are much better managed if anticipated. With 33% of all project overruns caused by unexpected ground conditions, not understanding the subsurface is often very costly.

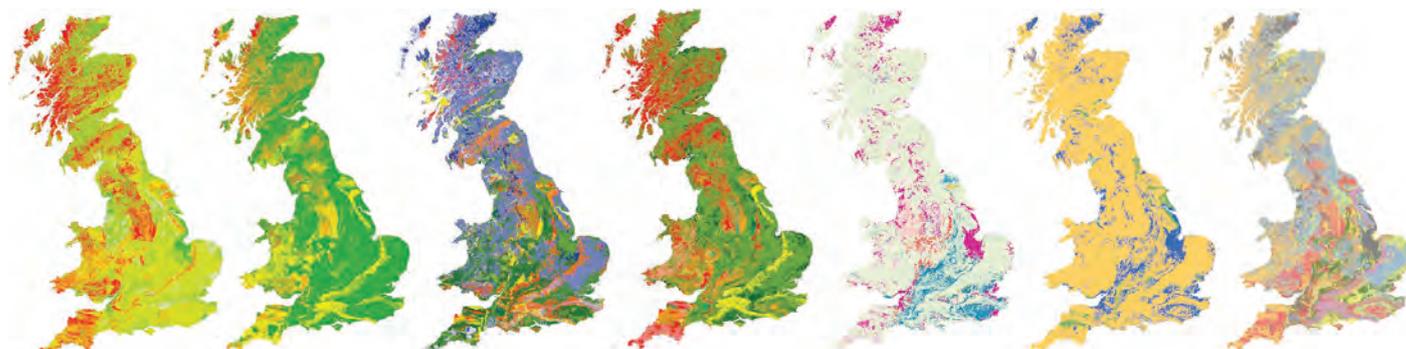
The development of the urban underground as a response to the increasing need for space in the urban environment has resulted in

“For the non-geoscientist, the geological map presents itself as a confusing array of colours and lines, which have little relevance to users' everyday working lives.”

WHAT HAS GEOLOGY GOT TO DO WITH THIS AGENDA?

The ideal urban form is for compact cities with efficient integrated infrastructure which maximises the potential of the subsurface. The subsurface is a valuable yet very complex expanse which is becoming increasingly congested. For example, the subsurface provides many

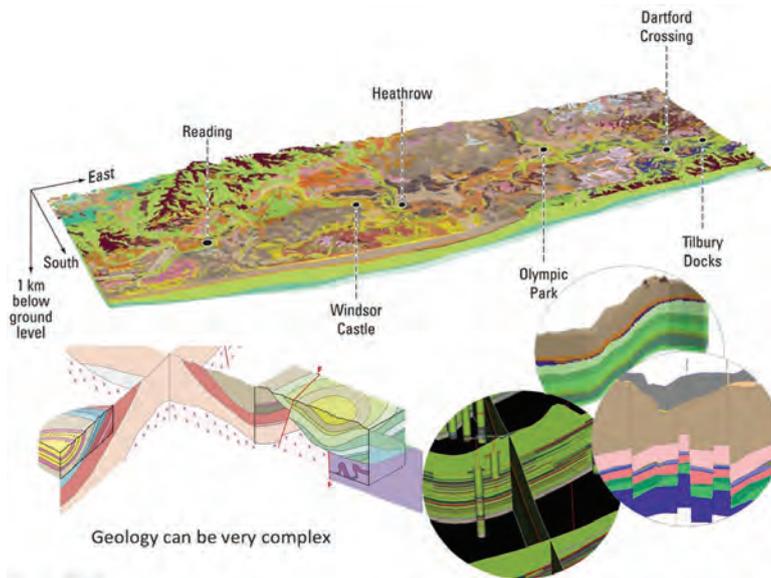
new demands for high quality geo-environmental data. New guidance and legislative changes have also driven demand; for example in the UK, the Planning Policy Statements and the water framework directive and part IIA of the Environment Protection Act 1990 have forced developers, planning authorities and regulators to consider the implications and impact of large-



BGS Civils is a step onwards from the geology map of GB. A collection of geospatial models designed specifically for the UK infrastructure sector 000251659264251658240

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BGS Civils is a step onwards from the geology map of GB. A collection of geospatial models designed specifically for the UK infrastructure sector 00025165-9264251658240



scale development initiatives on the environment. To comply with the principles of sustainable development, developers increasingly are required to demonstrate that proposals are based on the best possible scientific information and analysis of risk. Nowhere are these issues more relevant than in the context of

“... only 18% of data from recent major infrastructure projects can be used with a high degree of confidence.”

the urban environment. The case for using geo-environmental information to underpin preliminary site appraisal and for developing regional strategies has been made elsewhere and has been discussed in depth by Culshaw & Ellison (2002). In the UK, studies commissioned by the Department of the Environment in the 1980s and 1990s (Smith & Ellison 1999) promoted the use of applied geological maps to identify the principal geological factors that should be taken into account for development planning. Since this

work was completed, advances in the use of GIS and 3D modelling software have meant that there is now a greater opportunity to develop geo-environmental information systems for urban development, which can take greater account of the third dimension. As a result, new and innovative ways of communicating and visualizing geoscientific information have been developed.

Presenting geoscientific information is one of the key issues around the lack of geodata being utilised in decision making. Urban geologists have two problems to overcome: firstly, the traditional method of visualizing geoscientific information is via a geological map and secondly, changes in planning policy means that different types of data are required. The geological map is an excellent way of recording several sets of 2D information on a flat surface but it requires a significant amount of expert knowledge to interpret its meaning. For the non-geoscientist, the geological map presents itself as a confusing array of colours and lines, which have little relevance to users' everyday working lives.

The second issue of changing needs of planning policy, such as new innovative uses of the urban subsurface for geo-energy storage for example, will require data that describes the conductive heat properties of the subsurface geology, putting more functions underground will increase the competition for space and the potential for complex interactions between different uses to impact each other will be increased (Hack 2009). Detailed information on how subsurface rock properties will change over time is very limited and even where this does exist often the quality of the data and interpretations isn't verified.

There has been a significant change in the type of data-users requiring geoscience information. Data-users can be divided into two camps, 'thick' and 'thin' (Turner 2003). Traditionally, geoscientific information has been provided to 'thick' clients – those who are happy to interpret and manipulate raw data; typically, they are keen to have large quantities of un-interpreted data (e.g. academics). Thin clients, in contrast, desire simple, concise data that answer precise questions (Turner 2003). Thin clients make up the majority of planners and developers. This view was supported by Culshaw (2003), who suggested that academic users were no longer the most important users of geoscientific information. Therefore, if geoscience data is going to be used widely within the urban environment, geoscientists need to radically rethink the way geoscientific data is presented and visualized. Before urban geologists can produce new outputs three questions need to be considered (Royse et al 2008): what geo-environmental questions do users need answering, what geodata do I need to answer these questions and if the data is available, why is it not being fully used?

The British Geological Survey has developed a suite of spatial data aimed at UK infrastructure sector (BGSCivils) to address these issues for the engineering community. Essentially a geology map for people who have to put things in the ground, its aims are twofold: to provide information for engineers in their terminology to get wider use of BGS Geodata in civil engineering projects/BIM and to encourage a dialogue with engineers to enable further data/knowledge sharing. The Civils project itself started ten years ago from different beginnings with wholly different purposes; initially it was a one-off project to look at ways of installing electrical earthing cables in a way that prevented their (almost immediate) theft, and aspects of that work went on to be used for geo-forensic purposes, such as looking for covert burials.

Whilst very different projects, they demonstrated a basic set of principles (that the construction industry has worked with for over half a century) rocks and soils (of the engineering kind) occur in certain places (which is geology) and behave in certain ways (which is rock/soil mechanics). BGS Civils is essentially a suite of nine national engineering property maps providing the key engineering characteristics of the geology of Great Britain including: Excavatability, Strength, Bulking volume, Foundation conditions, Engineered fill, Discontinuities, Corrosivity, Sulphate-sulphide, Resistivity.

The urban environment usually contains a wealth of legacy of geological information from past site investigations, water extraction or mining activities (Culshaw and Price 2011). The problem is in finding and accessing this information. It isn't sufficient to just record details of the location and source of borehole logs to enable their use in 3D modelling

– the data contained in the log must not only be digitised but also quality assured (Royse et al 2009). Although the collection and conversion of data into interoperable formats is still a challenge, it is the long-term data storage that may be a bigger issue (Culshaw and Price 2011).

Consequently only 18% of data from recent major infrastructure projects can be used with a high degree of confidence. Work on removing the disconnects between available data, and stakeholders has been undertaken by British Geological Survey and Glasgow City Council where data is now procured in standardised accessible format and cross-sectoral awareness of what data exists and when best used. The project was funded by a local authority and research council's initiative (LARCI) and resulted in the development of the GSPEC (Glasgow specification for data capture) as a mechanism for improved data delivery and onward transfer. Data is deposited as raw digital data in standardised AGS forms. Key metadata (e.g. grid reference, borehole ID, borehole

construction) reported with all associated data.

In conclusion, there are many ways in which geoscience information can be and should be used to support planning and sustainable development of our urban centres. Its use in the SMART city agenda has been limited because of issues around the reuse of data and its interpretation by non-specialists. However, current developments focused on engaging the user community and making use of current geospatial modelling methods and virtual reality technology is starting to increase the use of geoscience data and information in SMART cities not just in the UK but all over the world.

ABOUT THE AUTHOR

Dr Katherine Royse is Science Director GeoAnalytics and Modelling for the British Geological Survey. She



holds a PhD in Anorthosite petrogenesis and emplacement. She specialises in 3D Geological modelling and was previously Project Manager London and the Thames Gateway project.

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Valuable platform for our outreach and advocacy



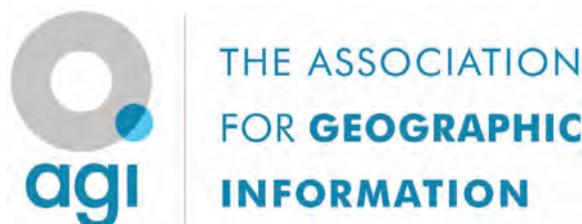
After a period of re-shaping, AGI has a new focus, new priorities and a new partner to champion GI, explains new chair Abigail Page.

What should a modern membership association look like? During my time as a member of AGI, I've seen significant changes in both the outlook of the organisation and steps we've taken to deal with significant challenges – most particularly in my last four years on the Council. Of course, the need to adapt is not limited to AGI. Around us we see the impact of significant change on organisations and

individuals' day-to-day work – disruption, restructuring and increasing “busy-ness”.

In January I was honoured to be elected as the first “millennial” chair of AGI by an incredibly strong AGI Council for 2017. It's an exciting time to serve AGI in this way - after a period of reshaping the organisation's “back office” we are now in a position to look ahead, streamlined and ready to take the steps to become a more modern membership association.

Our core values remain intact – our mission is still real, but our delivery must be different. There is much that we have to offer as experts in GI and an even wider playing field for us, if we can adapt to a different game. This was evident in our activities during 2016 – our successes were too varied to summarise succinctly here but notably we built on the success of the Foresight report and AGI held some of its most successful events in recent years, with record numbers of delegates attending events in Scotland and Northern Ireland, to a renewed and focused GeoCom creating a valuable platform for our outreach.



Moving ahead to the outlook for 2017, there are three key areas where Council will focus our attention:

- **Outreach and Advocacy**
- **Supporting skills and career development**
- **Opportunities for knowledge exchange and networking**

I'm delighted that the first step towards this was announced in early February, through a strategic alliance with the Royal Geographical Society (with IBG). The collaboration will provide the opportunity to champion the value of geographic information, ensuring advocacy and engagement with those who increasingly embrace location within the digital economy.

Skills development remains a key priority for AGI. Our Early Career Network (ECN) has been a notable success: we were delighted to welcome a representative to our January Council meeting and will continue to extend this invitation to ensure that input from this important demographic of our membership influences our strategy and activities.

We know that one of the ways that many members come across AGI is through our successful events – from #GeoDrinks and Special Interest Groups (SIGs) events to our annual conference - #GeoCom. AGI continues to commit to providing a valuable opportunity to bring members together, share issues and challenges but also to understand and keep pace with the changes around us (and of course, share a drink or two in the process). During 2017 we will work with our SIGs to reshape the way in which we can offer opportunities for knowledge sharing. We will also ensure that we have an opportunity to invite the whole membership to join us at #GeoCom – an important highlight in our year as members come together, but increasingly also a valuable platform for our outreach and advocacy. Keep the 26th October clear, more details coming soon!

I often reflect on how lucky we are to work in such an exciting industry, adapting to change and full of innovation and inspiring, committed individuals. I'm grateful that we have such a positive opportunity and support from our members to take AGI forward as a modern membership association and with renewed focus to continue our mission. Take the opportunity to engage with and support AGI during 2017 – we have an exciting year ahead.

DEVICE TURNS PHONE INTO GPS DATA COLLECTOR

Launched last year Trimble Catalyst is basically an app which turns a smartphone into a data collector and position device. By combining an Android smart phone, a software GNSS receiver downloaded 'Free of Charge' from the internet, a digital antenna and a subscription correction service users will have a sub-metre GNSS (even sub-centimetre, depending on the subscription package purchased).



An external antenna is needed because current smart phones are single frequency and are designed for cost not accuracy, the digital antenna converts raw GNSS signal from analogue to digital USB. A pole mount and external batteries are also available. At less than 130mm diameter and less than 300grams it's very portable, says Andrew Beckerson, director of business development at KOREC. Catalyst works with both Trimble Terraflex and Esri's Collector App.

AVOIDING OBSTACLES

The DJI Inspire 2 UAV available from Optical Survey Equipment features a new image processing system that records at up to 5.2k in Cinema DNG RAW, Apple ProRes and more. It goes from 0 to 50mph (80kph) in just 5 seconds and hits a maximum speed of 58mph (94kph) and a max descent speed of 9m/s.

Other features include Sense and Avoid with forward and downward vision detection of obstacles up to 30 metres ahead; a powerful tracking mode which allows single pilots to capture complex images; a 2-axis on-board camera separates the flight view from the main camera, giving the

Inspire 2 a dedicated TapFly camera; if video transmission is lost, and Smart Return to Home is enabled, it will fly back along the original route. Prices start at £2,549 excluding VAT.

THE NEW RUGGED

A new rugged tablet PC comes with IP68 protection and drop-tested to 3 feet (1 metre) on concrete. Its manufacturers, Juniper Systems, say that it was designed for intensive data collection in harsh environment. CT7G is in production and runs on the Android 6.0 operating system. The CT7G includes numerous sensors that are highly relevant to the geomatics industry and geospatial technology. Its superior functionality is provided by front and rear cameras, an e-compass, G-sensor, three-axis gyroscope and distance/light sensors – instruments which are critical to accurate and comprehensive data collection.

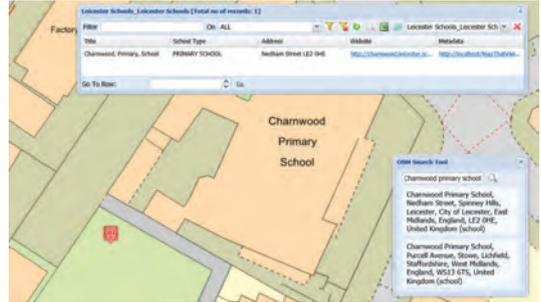
INDOOR MAPPING SOFTWARE

Orbit GT has announced the release of Indoor Mapping v17 to help surveyors meet the challenge of indoor mapping work without requiring other applications. Version 17 bucks the trend, says CEO Peter Bonne by including functions for point cloud and imagery management, as well as a set of tools for "quick and easy creation of floor plans out of indoor mapping data." On top of that, the software boasts a range of functions for semi-automatic feature-extraction, enabling users to "extract in 3D any point, line distance, area, and more, and save that as a new feature, e.g. in a GIS layer."

Bonne explained that the software should feel familiar to Orbit GT users, as it is based on the technology the company has already been using in its mobile and UAV mapping software. "This is the heritage of our years-long work in the mobile mapping space," says Bonne. "We bring all those technologies to indoor mapping." He added that "customers that are

MAPTHAT UPDATE

Cadline's has released MapThat version 2.1.0. New features and enhancements include the Data Table, Scale Print Tool, Drawing Tools, Measure Tool and the Spatial Importer Tool, as well as increased PostGIS interoperability. A new Data Table Export to GIS option, OpenStreetMap Search Tool and Data Layer Search Tool are also included. More at TryMapThat, dynamicmaps.co.uk.



using one of those tools will easily recognize the user interaction."

IP68 PROTECTION FOR SMARTPHONE

Juniper Systems has released a rugged Android smartphone. The CT5 offers IP68 rating, certifying complete protection against damage from dust and water ingress. With a 4.7" display, the device has front and rear cameras, can accommodate a micro USB, and has dual micro SIM card slots. Connectivity is provided via Wi-Fi, Bluetooth, GPS + GLONASS, FM Radio and NFC.



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1-2nd March 2017, Jakarta, Indonesia
www.bigittechnology.com/indonesia2016/

GEODATA 2017 IRELAND SHOWCASE

30th March 2017, Dublin, Ireland
www.geoaware.info/ireland

LOCATE 17

3-6th April 2017, Sydney, Australia
www.digitalearthsymposium.com/

OCEAN BUSINESS 17

4-6th April 2017, Southampton, UK
www.oceanbusiness.com/

AAG ANNUAL MEETING 2017

5-9th April 2017, Boston, USA
www.aag.org/annualmeeting

GISTAM 2017

27-28th April 2017, Porto Gaia, Portugal
www.gistam.org/

EVERYTHING HAPPENS SOMEWHERE 2017

11th May 2017, Leeds, UK
www.geoplace.co.uk/news-events/annual-conference

ESRI UK ANNUAL CONFERENCE 2017

16th May 2017, London, UK
www.esriuk.com/events/ac17

UCL GIS CAREERS EVENT 2017

22nd May 2017, UCL, London, UK
www.agi.org.uk/events/calendar

GEO BUSINESS 2017

23-24th May 2017, London, UK
<http://geobusinessshow.com/>

AGI Foresight Report 2020



THE ASSOCIATION
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The AGI Foresight Report 2020 gives insight into the issues we believe will have a significant impact on our economy, environment and society over the next five years. The purpose of the Report is to both observe and challenge the current role of Geographic Information (GI) in relation to these issues.

The Report highlights five key themes that are of relevance, not only to the GI industry, but to anyone with a vested interest in how technology and information will change our world and businesses in the next five years. These five themes - Open, Big Data, BIM and Future Cities, Innovative Technologies and Policy - form the backbone of our Report, bringing together papers from experts across industries and disciplines.

They show that the GI community can, and must, play a big part in helping us to understand and maximise benefits from these areas, and meet head on the challenges and opportunities the next five years will bring.

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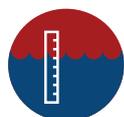
AGI	p. 30
Bluesky	p. 07
Cadcorp	p. 19
Cadline	p. 09
Caledonian	p. 29
Esri	p. 22
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