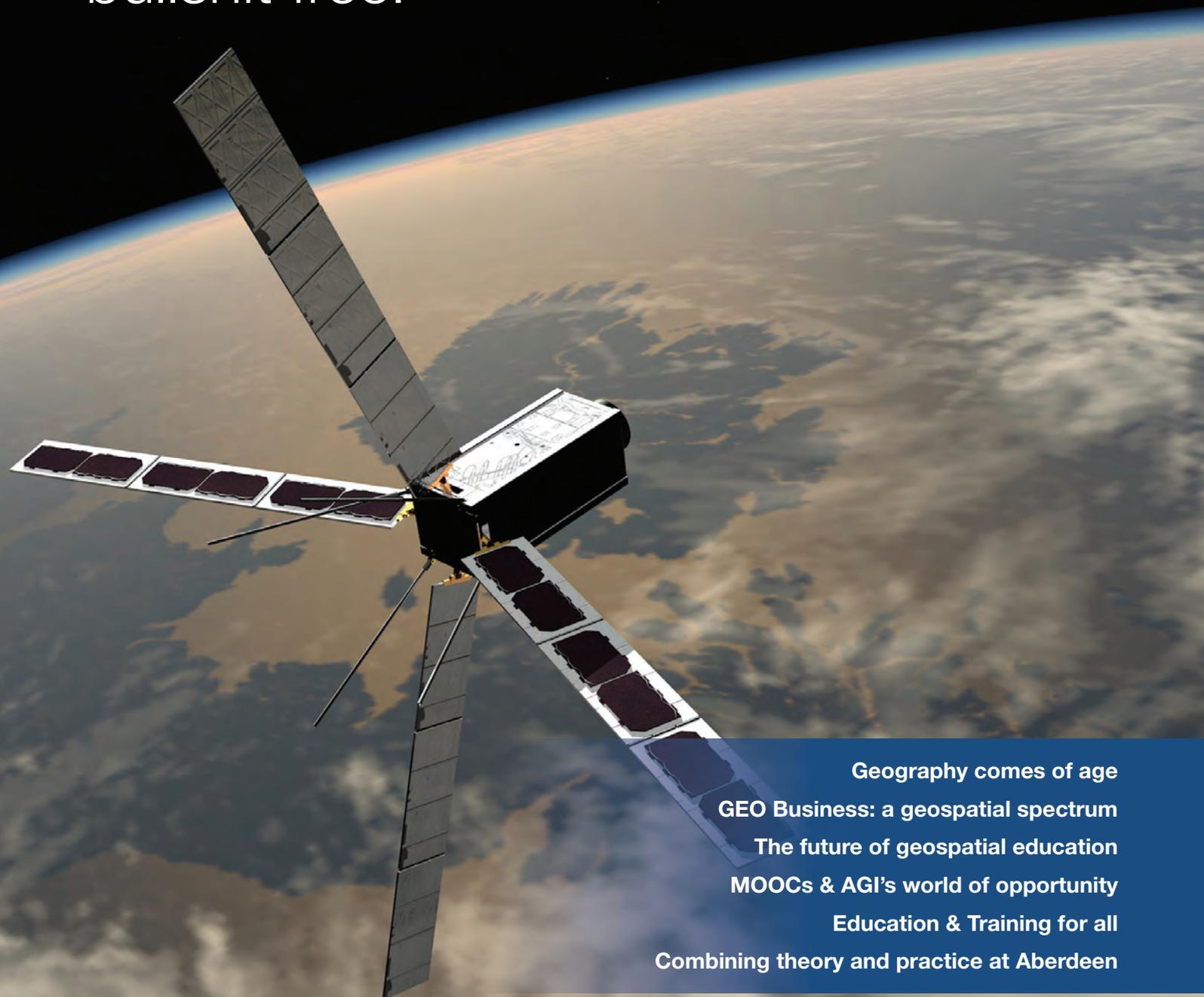
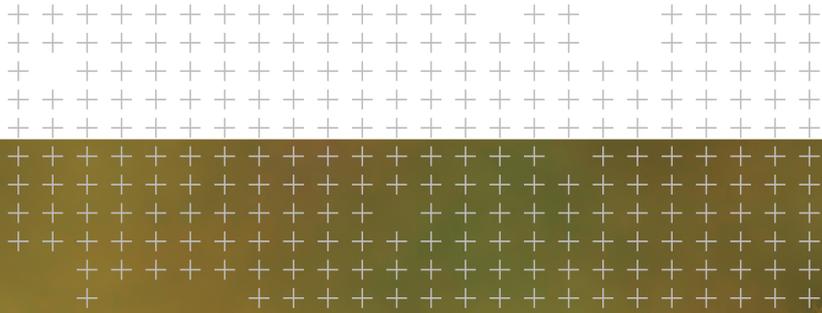


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COVER STORY

Our thanks to the University of Manchester for this artist's impression of a low orbit satellite. The University has a major research project to develop cheaper low-orbit satellites which will help dodge space debris and improve the quality of images captured.



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Open, engaging, informative and diverse was how Steven Ramage found the SatSummit in Washington D.C. And it was bullshit free!



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GIS comes of age

But we must keep up education and training

An important issue for all our readers as we focus on education and training for GIS professionals plus the growing market for remotely sensed data from space.

Just over two years ago Sir Mark Walport, the UK Government's chief scientific advisor, told delegates at the AGI GeoCom conference that "geospatial now underpins everything government does". That applies to local government and the emergency services too, through the PSMA and the work of GeoPlace. Our focus on education and training in this issue underlines how geospatial and geography have truly come of age. Our interview with the RGS's director Dr Rita Gardner reveals that geography is now a highly sought-after starting point for a career. Whither the PPE ruling elite?

The recent budget in the UK contained several aspects with a high geospatial content. £270 million for emerging technologies like driverless cars and other so-called disruptive technologies, together with £16m for 5g mobile phone infrastructure development, for which currently no standards exist, all add up to endorsement of geospatial as an essential part of the economy. The budget also included money to fund new 1,000 PhD's in those important STEM subjects – science, technology, engineering and mathematics, some of which should trickle into geospatial. Mathematics in geospatial is identified by the RGS and others as needing more support. In the age of big data and analytics, starting out in geospatial/geography with A level maths has become an essential.

A sector of the economy tipped to grow in the near future is space. We already derive much useful information from remotely-sensed data. With the emerging market for low-orbiting satellites (see our front cover and News page 6) the UK could be poised to become a global leader. Check out too Steve Ramage's report from the SatSummit event in Washington D.C. (page 9).

Elsewhere we take an in-depth look at education through a variety of contributions. Adena Schutzberg sounds a cautionary note about MOOCs – aka massive open online courses. While their original intention was to offer free training, most have now closed even their freemium options. Meanwhile, Patrick Rickles, a researcher at UCL, offers some sound advice. He says

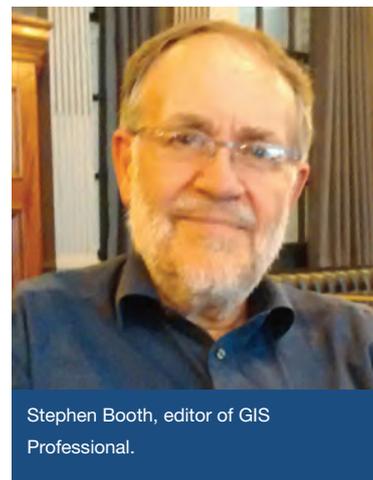
that GIS educators and learners will need to expand their understanding of approaches to learning and make greater use of a variety of teaching resources if they are to stay up with rapidly evolving technology such as spatial apps on smartphones. We are in the age of enthusiastic crowd sourcing and the citizen scientist.

We have identified several courses for GIS education and training and offer a more detailed insight into the MSc programme available at the University of Aberdeen (page 23), while Abigail Page explains the benefits for all GIS students and practitioners in joining the AGI with its early careers network and evolving link to the RGS and the chartered geographer route to becoming a GIS Professional.

This issue is also my last as editor. As you should be aware, last year GiSPro became part of the stable of magazines published by Geomares Publishing. It is their declared intention to continue publication and grow GiSPro's readership internationally. A new team of contributing editors under the editorial management of Joost Boers is already in place and I wish them well.

I launched GiSPro in 2004, which may seem like ancient history to younger readers but for me is little more than a flick of an eyelid! Back then we were beginning to get excited about 3D spatial information systems (pioneered by UCL's Virtual London model). In the first issue I declared that as publishers we put great store by ensuring that the words on the page invite reading. That applies just as much today if not more so as we compete against the incessant drip-drip of emails and the web's constant attention-seeking. I wish my successors well and urge them to keep in mind those ideals. I also thank all the authors, regular columnists and past editors of GiSPro who have contributed to making this magazine essential reading for GIS professionals.

Stephen Booth, Editor



Stephen Booth, editor of GIS Professional.

MAPACTION DEPLOYS TO PERU

Little over a week after deploying a team to Madagascar, following a damaging cyclone, MapAction has deployed a team to Lima, Peru to support the UN Disaster Assessment and Coordination team, following intense rains causing widespread floods and landslides, reportedly affecting more than half the country. To date (18 March) 72 people have been confirmed dead.

The floods have inundated Peru's key infrastructure, including hospitals and schools, and left some communities isolated. Concerns have been raised that stagnant water could present health risks, including the spread of Dengue fever. The unusually high amounts of rainfall are thought to be caused by a warming of the surface waters in the Pacific Ocean, the El Niño phenomenon. It is predicted that further rains will continue in the coming fortnight.

UNIVERSITY LEADS SATELLITE PROJECT



Under a €5.7m grant from the EU's Horizon 2020 fund the University of Manchester is leading a multi-million pound project to develop satellites which will orbit much closer to the Earth – making them smaller,

cheaper, helping to dodge space debris and improving the quality of images they can send back. The project's technological developments will be worked into new engineering and business models identifying the future for very low Earth orbit remote sensing satellites.

Remote sensing satellites currently operate at about 500-800km above the Earth, limiting resolution. The new satellites will be designed to operate at 200-450 km – lower than the international space station.

Dr Peter Roberts, scientific coordinator for the project, explains: "If we are able to get satellites closer to Earth then we can get the same data using smaller telescopes, or smaller and less powerful radar systems, all of which reduces the satellite mass and cost."

Because the atmosphere is denser nearer to Earth drag needs to be minimised and countered. The team will develop advanced materials and test them in a new wind tunnel which mimics the composition, density and speed of the atmosphere at these altitudes before testing on a real satellite launched into these lower orbits. The satellite will also demonstrate how the atmospheric flow can be used to control the orientation of the satellite, much like an aircraft does at lower altitudes. The development of an experimental electric propulsion system is planned to use the residual atmosphere as propellant with the potential to keep satellites in orbit indefinitely.

The University of Manchester's partners are Elecnor Deimos Satellite Systems, GomSpace AS, University of Stuttgart, Universitat Politècnica de Catalunya, University College London, The TechToybox, EuroConsult and concentris research management. The project is scheduled to run for 51 months from January this year.

OGC's NEW STANDARDS

The Open Geospatial Consortium has approved GeoSciML as a standard to define model and encoding for features in geological maps, cross sections, geological reports, and databases. GeoSciML provides a mechanism for storage and exchange of a broad range of geological data enabling users to generate maps and other data in a consistent and repeatable fashion.

OGC has also published Moving Features Access, an official standard to define location data access so that big data from moving features, such as people and vehicles, can be processed and analyzed swiftly and across different sectors. The move standardizes specifications to access data by specifying places in addition to times, making it possible to access data on moving objects that passed through a certain area at a certain time after a disaster, therefore gathering information on density and flow of people and vehicles in a more timely manner.

OGC is also looking for information on mapping and geospatial Application Programming Interfaces (APIs) as part of a study to examine the interoperability of existing geospatial APIs. The explosive growth of APIs for geospatial and the variability in API practices creates new opportunities and challenges in supporting geospatial services.

MAPPING TO RELIEVE TRAFFIC CONGESTION

Traffic congestion could cost the UK economy more than £300bn over the next ten years, according to the Government. The town of Swindon is one of nineteen local authorities across England being asked to come up with ideas to improve journeys through digital innovation. The Government-funded scheme will use the latest technology to transmit real-time traffic information to road users, such as delivery drivers, including those making "just-in-time" deliveries to important local factories like BMW and Honda.

Roadside monitoring equipment on these routes will send real-time information to businesses, bus companies and road users. The pilot scheme will include trials to get information to drivers using sat-navs and other in-vehicle equipment, so they can plan and adjust journeys to suit traffic conditions. Collected data will be used to inform future road schemes and enable Council highways teams to respond more quickly to incidents as they occur.

NORTHUMBRIAN WATER'S £8.75M SAVING

Northumbrian Water (NWL) assumed responsibility for an estimated 13,500km of private drains and sewers when the law changed to transfer ownership from property owners to local water companies. However, only 5% of the inherited network was mapped – a big unknown according to 1Spatial's head of consultancy services, Bob Chell. The solution was an approach built on 1Spatial's 1Integrate solution. Working with experts at NWL, the team developed a series of rules to infer the missing information, based on limited records available and the expertise of staff. The move has saved £8.75m on surveying the networks and was completed in 1/8 of the time planned.

Northumbrian Water estimated that using a traditional surveying process would have cost £10m in the first five years alone. Choosing 1Spatial's rules-based approach dramatically reduced both the time and cost of the project to create a new model of the network. Head of Wastewater Networks and Developer Services, Mike Madine, explains: "The cost difference is quite significant. Our original plan was to physically map just one third of the transferred network. That would have cost £10 million. Working with 1Spatial, we're able to deliver a map of the whole transferred network in just two years, for £1.25 million."

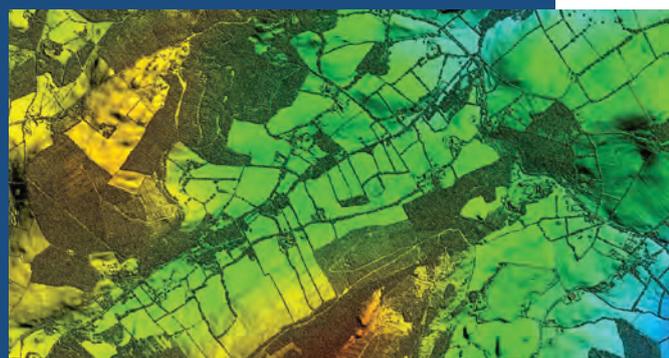
OUTSOURCING MODELLING

Cadcorp has announced an independent consultancy service to UK fire services using Cadcorp Map Modeller and Workload Modeller to assist in the production of their Integrated Risk Management Plans. The software maps resources and demand, and performs spatial analysis. Examples may include thematic maps, hotspot maps and travel time analysis. While fire services can perform this analysis themselves, they can now choose to outsource the modelling to the consultancy service.

CAPTURING 185,000 HA BY LIDAR

Working on behalf of the Geological Survey of Ireland (GSI) and state forestry company Coillte, Bluesky is capturing 185,000 hectares of LiDAR data in Ireland. The resulting 3D maps will be used to inform protection schemes for clean drinking water and Ireland's adoption of the EU Water Framework Directive. The LiDAR maps will also be used to improve knowledge of the composition of Ireland's state owned forests.

As part of their remit as Ireland's earth science agency, GSI collates and hosts geological databases, including 'karst features' – a term to describe distinctive landforms that develop in limestone, such as sink holes and caves. Mapping their location enhances understanding of groundwater flow, sources of drinking water, potential contaminant movement and susceptibility to collapse.






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BRIEFS

Address Management experts Aligned Assets has undergone a management buyout. New owners Andy Hird and Dinesh Thanigasalam are now majority shareholders. Founded in 1996 by outgoing owners Carl Nunn and Phil Gee, the company has been at the forefront of developing software solutions for local authorities, the emergency services and the commercial sector within the UK.

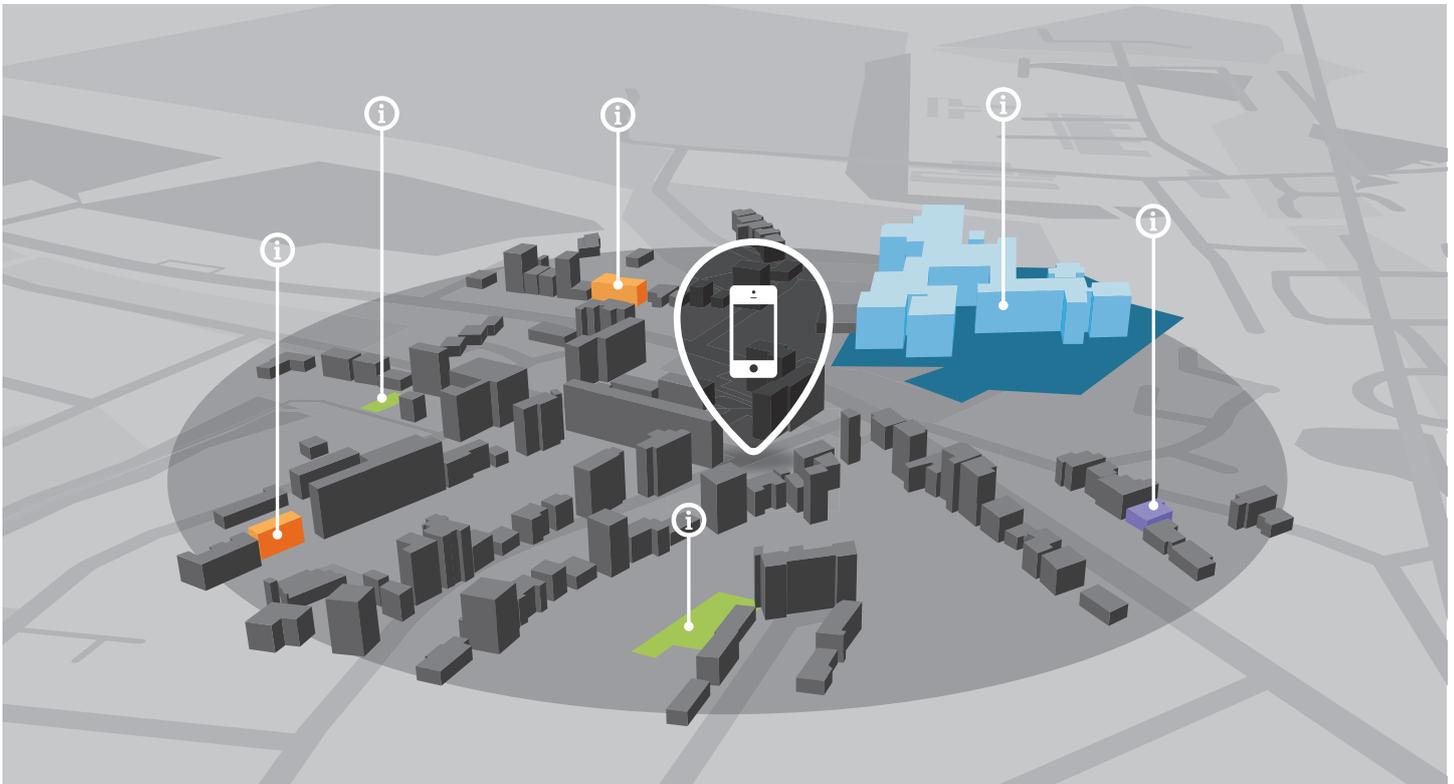
The Regulatory Accelerator is a new geospatial software application developed by Luminent that uses intelligent automation to acquire data from a company's existing databases in order to automate required regulatory compliance while using the data to provide predictive and actionable insights. The aim is to demonstrate how automated data and predictive analytics can reduce the cost of regulatory compliance.

Kinesis, a telematics and vehicle-tracking specialist, has selected web map services (WMS) from the HERE Location Platform for its fleet location and driver management. Working seamlessly alongside other mapping and data within the Kinesis system, the HERE Location Platform supplied by "allmapdata" from Mapmechanics makes it possible to deliver instant reports on excess speeding by trucks, vans and other vehicles.

Blue Marble Geographics has established a partnership with Pointerra to provide cloud-based LiDAR data delivery to Global Mapper, its GIS software. Pointerra's 3D technology allows users to view massive 3D point clouds at any time on any device, a function enabled in Global Mapper as an extension for viewing, downloading and publishing LiDAR data.

British aerial mapping company Bluesky International is expanding its business into North America by acquiring Col-East Inc (www.col-east.com), a Massachusetts based aerial survey company. Col-East has been mapping the northeast states for 65 years and will continue as Col-East International Ltd. The move follows Bluesky's increase in demand for specialist large scale mapping, 3D modelling and feature extraction in the European market, and the company intends to apply its skills to the expanding US market.

La Poste de Djibouti and Tonga Post are the latest postal services to adopt what3words addressing system, joining the postal services of Mongolia, Côte d'Ivoire and Sint Maarten, in adopting the addressing standard. Three word addresses will provide both countries with an easy reference for international mail and quickly enable home delivery – something that has been out of reach for the majority of citizens from these countries until now.



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My First SatSummit Experience

Open, engaging, informative and diverse was how Steven Ramage found his first SatSummit in Washington D.C. The event, to examine the satellite business in support of global development, was bullshit free!

My first SatSummit in Washington, D.C. was only the second ever such event. It was fabulous. Open. Engaging. Informative. Diverse. I had the privilege of sitting on a panel with ESA, NASA and the CEO of Radiant, an organisation being set up by Omidyar and the Gates Foundation to talk about open data and government, but more on that later.

The event was made possible by a number of sponsors and as the

CEO of one of them, Mapbox, **Eric Gundersen** gave a heart-warming intro with one caveat, "no bullshit". I like this since he is running a software company and not once did he pitch his wares. Our MC and event organiser was **Ian Schuler**, CEO of Development Seed.

First up was **Carissa Christensen** from the Space and Technology Practice at Tauri Group, who provided insight and numerous

stats regarding the state of the satellite industry. I would recommend visiting Tauri's website if you want to learn more about the satellite aspects of global Earth observations.

BEST IMAGE OF THE DAY

Kevin Bullock from DigitalGlobe was the first of the major commercial satellite constellation owners to speak and he entertained us with several references to physics and explaining the increase in high-resolution imagery available from the DigitalGlobe constellation following the launch of WorldView-4. He also announced

>

On November 11 2016, DigitalGlobe's WorldView-2 satellite captured this image of WorldView-4 launching from Vandenberg Air Force Base, California. When the image was captured, WorldView-2 was passing over the Grand Canyon, 637 km northeast of launch site, and pointed 38 degrees off-nadir



DigitalGlobe

opendata.digitalglobe.com, which I hope will be brokered via geoportal.org. The best image of the day also goes to Kevin for his slide showing #WV4 launching from Vandenberg AFB captured by #WV2.

The next presenter, **Andrew Zolli**, leads global impact initiatives at Planet and spoke about their work around the world, which is indeed making an impact. I don't remember him mentioning it, but shortly after his session there was a public announcement about Planet acquiring Terra Bella from Google.

Both DigitalGlobe and Planet, as well as several other commercial providers, are working to support the UN Agenda 2030 and the Sustainable Development Goals (SDGs). As an aside, this is something close to my heart since I have been working with the UN team leading Global Geospatial Information Management (UN-GGIM) for over five years and this team now chairs the Inter-Agency and Expert Group on the Sustainable Development Goal Indicators (IAEG-SDGs) Working Group on Geospatial Information (WGGI) – just rolls off the tongue! My organisation, the Group on Earth Observations (GEO) is also part of the WGGI working on Earth observations and the SDGs.

WOMEN TO THE FORE

Back to SatSummit. **Melanie Preisser** from Vulcan Aerospace, the first of numerous female speakers, provided an overview of how many satellites make it into space; and the coalition that makes launches happen. Her photos were a close second to Kevin Bullock's slides, and showed the sheer enormity of some of the space vehicles.

Melanie was followed by **Matt O'Connell**, who for many people in the industry, requires no

introduction. Matt was formerly president and CEO of GeoEye. He regaled us with tales of 'making it work' and what inspired him. Matt and his team built an organisation of 60 employees producing \$9 million of revenue a year to 760 employees and \$360 million per annum. He talked about building a billion dollar satellite company, now sold to DigitalGlobe.

Mark Gildersleeve from The Weather Company, part of IBM, spoke extensively about the recently launched GOES-R (Geostationary Operational Environmental Satellite-R Series) and lauded the efforts of the National Oceanic and Atmospheric Administration (NOAA). GOES-R series data will be used in real time for critical weather forecasting and warning applications – invaluable for Weather Company customers and others.

Bronwyn Agrios from Astro Digital talked about building a platform for satellite data and about how satellites create an overwhelming amount of raw data. She explained how the platform has been focusing on the importance of good UI design and APIs, notably the concept of #fatdata – every pixel contains lots of information – big data and metadata.

CROSS SECTION INVOLVED

One of the great things about SatSummit was the cross section of industry organisations involved in the space sector. **Tahara Dawkins** who is responsible for commercial remote sensing in the Regulatory Affairs Office of NOAA spoke about government challenges in this area and how they are working to keep pace with technology and to make it possible for industry to work effectively with them.

Also representing government was Ambassador **Mark Brzezinski**, formerly with the Arctic Executive

Steering Committee at The White House under the Obama Administration. He shared how in January 2015, in recognition of the unique challenges and opportunities presented by the Arctic, President Obama issued an Executive Order to enhance coordination of national efforts in the Arctic. Mark recounted how, when tasked with executing a tactical implementation of a presidential vision on climate resilience and adaptation, he used digital elevation maps in the Arctic to understand a rapidly changing region with global implications. I like it when you get someone who is honest about not being a technologist but seeing the impact it can have. One of the GEO Participating Organisations, the World Meteorological Organisation (WMO), has written regularly about the extent of sea ice in the Arctic and Antarctic. Mark brought it home that we are seeing Arctic warming two to four times faster than anywhere else on earth. His talk also reminded me of some of the important work GEO is undertaking with GEOCRI.

PANEL'S "NICE JOB"

I sat on a panel with ESA, NASA and Radiant. NASA, ESA, JAXA and other space agencies that produce a great deal of open data. It is possible that many people in the international development community are unaware of all the great data that is actually available. I mentioned that geoportal.org also brokers all the satellite imagery, as well as other Earth observations since GEO provides EO data in, on and around the Earth.

One goal of this panel was to highlight what open data and services are available that are relevant to social and environmental work. A second goal was to understand how NASA and ESA can better serve the needs of the global development community,

i.e. make their data discoverable, accessible and usable. Finally, there was a goal to understand the new initiative being led by **Anne Miglarese** to provide open imagery to the development community.

As the moderator, **Charlie Lloyd** from Mapbox did a nice job of allowing the panelists to speak. **Kevin Murphy** from the Earth Science Data Systems Program at NASA talked about their long commitment to open source and open data and how he is directing a number of efforts to modernize NASA's data processing and distribution. This includes making better use of cloud processing and distribution. **Chris Aubrecht**, the ESA representative to the World Bank, spoke about his

role as an example of how global development is supported by ESA at large multilateral institutions through the Sentinel missions for the operational needs of the Copernicus programme. Anne Miglarese talked about going beyond providing imagery and playing "infrastructure" roles like maintaining data standards, funding maintenance of important open source libraries and conducting training and education. I contributed with my own experience on open data (going back to 2007) and open standards, as well as the massive community activities around the Group on Earth Observations (GEO). I also gave a shout out to people giving their personal time to help others and move the community forward,

namely #GISTribe and the Spatial Community on Slack.

I really enjoyed my 36 hours in Washington, D.C. and I would encourage anyone who has the possibility to get there (ideally for longer) to attend the next one: SatSummit 2018, 22 April 2018.

• This article first appeared in <https://satsummit.io/insights/2017/02/23/insights-steven-ramage/>

ABOUT THE AUTHOR

Steven Ramage is senior external relations manager for the Group on Earth Observations (GEO).



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Software Licences: Getting Agitated

Unlicensed software, not to be confused with open source, has been costing the big players millions. Now, with the switch to the cloud, the pirates will be the ones getting agitated.

I got pretty agitated some months ago when several writers (who should know better) and their editors at technical publications (who also should know better) published articles that stated that open source GIS software has no licence. This, the authors argued, made the software superior to software that has a licence.

Open source software does carry a licence. Per the Open Software Initiative, open source software carries an open source licence that meets specific criteria. One of those criteria, and the one I think the writers I noted above wanted to highlight, is that the licence does not require payment of a royalty or other fee. That means a user can have 1 or 10 or 100 licences for the same price: free. That's indeed a big deal, but it does not mean the software does not have a licence.

PIRATED LICENCES

I'm not the only one getting agitated about licences. As I write in March there's word that Autodesk is making plans to address users of its software that do not have legal licences. Why? The company did not meet revenue estimates and lost a good deal of money (\$171 million) this past quarter. Why? The company, like many others, is moving its user base from perpetual (forever) to subscription (per period of time) licensing. To help fill the coffers during the transition, the company plans to track down and request payment from some of its six million unlicensed software users. Per Co-CEO Andrew Anagnost, 1.2 million of those licences are in accounts "that we know and have worked with in the past."

Will the unlicensed respond positively to Autodesk's overtures to "get legal?" Decades ago Autodesk joined the Business Software Alliance (BSA), now known as the Software Alliance, to encourage companies to pay for their software. The charge, led by Microsoft, included some heavy-handed efforts and had limited success. Today, the growth of low-cost work-alike and free tools that read and write Autodesk's DWG format give users more options to "get legal." Open-source CAD solutions haven't matured as quickly as GIS ones, but they, with their open licences and \$0 price tags, are an option, too.

CHANGING LICENCES

When I started in this industry users bought a box of software and in that box were the installation media, the manuals, and a paper licence. As internal software networks evolved, vendors offered licences that could be shared. One popular option was called concurrent licensing. An organization paid for a pool of licences, say five, to run the software. The first five users got the available licences and went to work. When the maximum number of licences was in use, the next requestor, number six, would need to wait until a colleague finished with the software and "freed up" a licence. As more software ties itself to the cloud and provides privileges based on identity, software vendors (SAP, Microsoft, Oracle, Esri among others) are implementing named user licences. That means, one named individual can use the licence, sometimes on multiple machines, with specific privileges. Software users are agitated as they learn about and work to navigate these new licensing waters.

CHANGE IS HARD

The one thing these three situations share is that they involve learning about licences and accepting, like everything else in life, that they change. The authors of the articles I noted grabbed on to one aspect of licensing that was exciting to them (free!) but didn't do enough homework to understand that a licence was still in force. Autodesk is returning to a concern it had back in the days of selling boxes of software: pirated licences. Now, however, pirates can be tracked more easily via the Internet and serial numbers. Pirates, once they pay Autodesk for past offences, have more CAD licensing options than ever to continue on the straight and narrow. Software users accustomed to concurrent licensing are scratching their heads as they think through named user licensing and how it maps to their needs. Being agitated, while sometimes uncomfortable, encourages exploration and decision making.



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

Remember, open source software does carry a licence.



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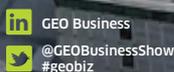
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GEO Business 2017

bringing Geomatics and Geospatial Professionals closer

Event chair, Steven Eglinton, director of GeoEnable and vice-chair of AGI, urges geospatial professionals to come together for two days of conferences, workshops and exhibitions to learn, network, share and collaborate.

While GEO Business' roots are in survey and geomatics, the event has broadened into 'geospatial'. It covers not only data capture, but data processing, management, use, re-use, maintenance and how to add value to business. It looks at the whole spectrum of what 'geospatial' can mean.

Organisations represented include:

- Association for Geographic Information (AGI)
- Chartered Institution of Civil Engineering Surveyors (ICES)
- Institution of Civil Engineers (ICE)
- Royal Institution of Chartered Surveyors (RICS)
- The Survey Association (TSA)

I love the mix of exhibitors which for me makes GEO Business different. We bridge the gap across different disciplines (and organisations), all in the 'Geospatial Spectrum'.

The free-to-attend exhibition is complimented by free-to-attend 'associated meetings' and 'commercial workshops' for industry bodies and commercial organisations, typically introducing technical solutions or focused 'hot topics'.

On the web pages, we describe the event as an "...international exhibition at which visitors will be surrounded by the most exciting new products and services as around 200 companies gather with ideas from across the globe."

We have a strong theme for the conference, built on two sub-

themes for each day. The focus is change in our industries to identify the opportunities now and in the near-future and how we take advantage of them:

- Day 1 is about Digital Innovation for Geomatics and Geospatial.
- Day 2 is Geospatial, Underpinning Infrastructure Projects and Asset Management – the application of geospatial in infrastructure; opportunities around projects like Crossrail 1, HS2, Crossrail 2, Hinckley Point, Thames Tideway Tunnel, Northern Line extension.

NETWORKING

For me, networking is key. I am from a GIS / remote-sensing background but I know people in all the major survey companies and catch-up with them at GEO Business. It's always interesting to see new geomatics / survey solutions and what's happening internationally too. As the technologies and techniques blend, the geospatial industry needs to work closer together.

To catch-up with people you know (and get to know some you don't!) there are networking opportunities throughout the event, as well as drinks the night before, a Gala Dinner on the first evening and the 'Ale Trail' – so popular last year.

UNDERPINNING THE UK

This year we wanted to reflect that we, as geospatial professionals, are moving closer together to add clarity on how we add value from working together. The theme of



© Nick Day

GEO Business 2017 is 'Delivering a Spatially-Enabled Economy'.

Geospatial professionals and solutions are intrinsic; they relate to how geospatial professionals add value to the UK by underpinning infrastructure projects, provide trusted, co-ordinated and actionable information for (physical) asset management, or provide control networks in the built and natural environments. So, think underpinning the UK – literally and physically.

It means how we make decisions to achieve better 'operational' outcomes; such as using GNSS in autopilots, SatNavs, route optimisation, insurance analytics, flood modelling, security – 'view sheds' for CCTV locating, optimisation the provision of healthcare – where to locate a new doctors' surgery – etc, etc. These enhance efficient and effective decision-making.

A GEOSPATIAL SPECTRUM

I see a 'Geospatial Spectrum' as a scale without hard boundaries. I see Geospatial as spectrum of technologies, solutions and skilled professionals. Collectively, we as geospatial professionals, have a lot to offer. GEO Business will be a great opportunity to learn, share and collaborate with others in the 'Geospatial Spectrum'.

- More at <http://geobusinessshow.com/>

Geography comes of age

The editor talks to Dr Rita Gardner CBE, Director of the Royal Geographical Society (with IBG) and the Society's head of education and outdoor learning, Steve Brace.

Forget those Oxford PPEs if you want to rise to the top: focus on geography. This is the message from the Royal Geographical Society (with IBG). And if you're looking for evidence in these times of fake news, what better example is there than the UK's current Prime Minister, Theresa May, a graduate in geography from St Hugh's College, Oxford.

For those with less lofty ambitions and aiming to become a GIS professional, there's no better beginning than a geography degree; it's the starting point to understanding geographical information science. It's also a popular undergraduate choice, with interest doubling in recent years and over 7,000 graduates last year alone. Why is this? Well Dr Rita Gardner argues there are two reasons.

Firstly, she says it's their wide range of skills. 'They have IT skills and spatial awareness, they have knowledge of social and environmental issues and they are employable'. She also adds that they have social skills, are team players and are trained in research, all underpinned by the specialist knowledge of the RGS-IBG. 'They have the capacity to see the big picture', she concludes.

The second reason is the 'inter-disciplinary nature of geography', says Gardner, 'they have the capacity to speak with specialists and to pull together ideas because of their grounding in the language of

natural and social sciences.' Steve Brace thoughtfully adds that 'events, processes and changes happen in places, which is how geographers organise and understand the world'. Supporting the development of all these skills is the RGS-IBG, which has, at the request of higher education, introduced a programme to accredit university courses against the Geography benchmark.

QUANTITATIVE LITERACY

So how true all is this? In 2013 the RGS-IBG and two research councils produced the report, International Benchmarking Review of UK Human Geography. The review found a very healthy and lively discipline, well regarded internationally and way ahead of most other countries. But there was one worrying aspect: geographical information science was under-represented compared to the US and perhaps due to what it cited as a weakness in "quantitative literacy" – those analytical and maths skills, so essential to high level GIS application. Yet surely by now GIS is an essential tool of geographers? Gardner agrees and emphasises that those skills are taught in courses equally with the ability to understand and interpret what the technology delivers, whereas in the US geography is more tightly focused around GIS technology.

We turned to mapping skills, always an implied essential to a geography course. It was good to learn that Professor Danny Dorling's cartograms, an imaginative and engaging way of looking at maps and data, are now a regular feature in classrooms across Britain (check out www.worldmapper.org/). Gardner

confirms that students must have good geospatial skills if they are going to understand and interpret data. She believes that geography can be a vehicle for improving those quantitative literacy skills at secondary education level.

Since 2011 RGS-IBG has been closely involved with the Department for Education in developing a new national curriculum for 11-18 year olds as part of the English Baccalaureate initiative; the new curriculum was introduced from September last year. In recent years the number of secondary school students studying GCSE geography has risen by 35%, with over 37,000 studying geography to A-level.

For 11-14 year olds, the curriculum calls for the ability to interpret a range of sources of geographical information, including maps, diagrams, globes, aerial photographs as well as GIS. For A-level students (16-18 year olds) the scope is more advanced focusing on fieldwork skills, quantitative and qualitative analysis, collecting and using geospatial data and understanding the meaning of concepts like place and the application of GIS. And there's additional help for teachers too. A recent two-year initiative, Data Skills in Geography, backed by the Nuffield Foundation has enabled RGS to upskill secondary school teachers with online resources as well as face-to-face development. Universities too are demanding better GCSE grades in maths, with some looking for A-levels in maths (currently around 20% of students studying geography degree programmes have maths A Level – doubled in the last ten years).

For those seeking more information for young people about the opportunities studying geography can bring, the RGS's Going places with Geography is a good starting point (<http://www.rgs.org/OurWork/Study+Geography/Going+places+with+geography.ht>).

For post-grad students, the prospects are looking better than they have for some time. Several universities offer MSc's in GIS (see our article on the University of Aberdeen). The UK Government's budget recently announced additional funds for 1000 new PhD's and fellowship positions in STEM subjects (science, technology, engineering and mathematics). The money will be allocated through institutions and

the various research councils and some will hopefully trickle down to "part STEM" geography. Gardner argues that because geographers are employable (amongst the top three or four subjects that quickly find jobs for grads) some of this should trickle down to geography.

CHARTERED GEOGRAPHERS ON THE RISE

One of the flagship programmes of the RGS-IBG has been the introduction of the chartered geographer qualification, which has attracted many from the GI community. Launched in 2004, there is now a cohort of around 700 who have achieved the standard – usually a post-grad six-year period of practice to reach this status and ongoing CPD requirements of 30 hours a year.

Growing acceptance of the accreditation across the public sector and industry recognises the value that CGs bring through working in sectors like education, government (local and central), retail and the City where geospatial analytical skills are in demand, for instance, in risk modelling and analysis for the insurance sector. 'The image of the geographer is rising' explains Gardner, and it's not just chartered geographers. 'We have a new strategy around the professional geographer community working in a myriad of workplaces'. She also says that CG's can get paid more with many mentioning an "esteem factor" as well as putting them on par with colleagues from other professional disciplines. The qualification is

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- recognition by the UK Association for Geographical Information (AGI) for continuing professional development
 - annual intake in September
 - competitive fees with instalment options
 - key textbook and industry standard software included



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also beginning to be mentioned in recruitment adverts.

Prospects for geography in the UK have never looked better, 'it is now in its rightful place,' says Gardner, 'it is a professional discipline bringing

serious training and professional skills to bear'. For university courses it's no longer seen as a "soft option" and the chartered geographer qualification has added genuine value to CVs for those seeking new opportunities as well as promotion.

to work with both organisations' professionals and early careers networks.

AGI members and readers may recall the 2014 GeoCom conference when the government's chief scientific advisor Sir Mark Walport gave a presentation that spectacularly underlined how geospatial data now underpins everything government does. Sir Mark has now backed the appointment of a Head of Geography within the government science and engineering profession. The interest in place is again moving up the national agenda.

- For more about the RGS-IBG go to: <http://www.rgs.org/> or follow @RGS_IBG



From left to right, Dr Catherine Souch and Dr Rita Gardner of the RGS and Abigail Page and David Henderson of AGI sign the new alliance.

STRATEGIC ALLIANCE BEGINS WORK

Earlier this year the RGS-IBG announced a strategic alliance with the Association for Geographical Information (AGI). Although it's early days Gardner is enthusiastic about the possibilities this may bring. With joint funding from both organisations, a new senior public affairs manager will be in place shortly with a work programme agreed by both bodies. The aim is to help promote better understanding of GIS and

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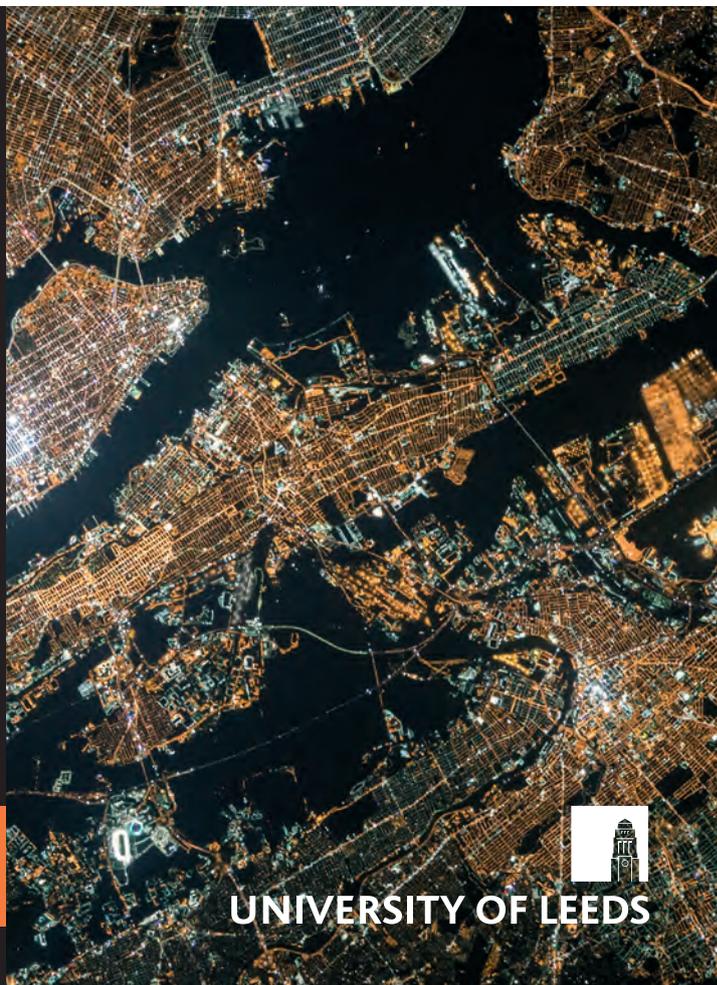
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UNIVERSITY OF LEEDS



Opening the door to a world of opportunities

For those seeking professional support for their career in GIS joining the AGI is essential. Chair of AGI Council Abigail Page explains the early careers network, support for the chartered geographer accreditation and CPD.

This isn't 'new' news to anyone: in the last 15 years, we've seen tectonic changes in the geospatial industry. Hardware, software, disruptive technologies . . . our sector is changing at a pace that is both alarming and exciting, making it hard to keep up. What hasn't changed, is the enthusiasm we're seeing among early career professionals. Geography has always been the discipline that opens the door to a world of opportunities – but we believe geographers of all kinds can benefit from having a structured approach to their careers.

PROGRESS AND TALENT

To maintain commercial momentum, and better still to actually shape new developments, every organization needs access to the best available talent. People with the enthusiasm, skillsets and ideas to change the world. This is part of what we do: the Association for Geographic Information (AGI) wants to support all UK geospatial companies and professionals, and help them make sure they're at the forefront of 'what's hot' in geospatial.

In January 2015, we launched a scheme that provides additional support, training and advice to geospatial professionals at the start

of their careers. We called it the Early Careers Network (ECN). One of our first forays for the ECN was a survey to our members:

- Approximately 51% of our ECN had less than four years' experience, and 37% of our public sector respondents said lack of opportunities impacted their careers.
- However, 75% were interested in voluntary collaborative projects to gain further experience.

Geographers want to learn: it's in our nature. The next generation of GI professionals will help us all to stay abreast of new developments; and companies always benefit from the introduction of fresh perspectives. We need to capture that enthusiasm, and support it in myriad ways.

STUDENTS FREE AT AGI

Our ECN is aimed at those with less than 10 years commercial GI experience. It's for professionals and students alike, and AGI membership for students is free. Our goal is to create a vibrant community of early career GI professionals – making friends, identifying career contacts. We also provide a framework that supports those individuals' Continuing Professional Development (CPD) in different ways: we offer a CPD track that sits alongside the CGeog.

Becoming a Chartered Geographer (CGeog) is a mark of significant achievement: the RGS (IBS) qualification is the only internationally recognised professional accreditation for those with competence, experience and professionalism in the use of geographical knowledge,

understanding and skills in the workplace. We work closely with the Royal Geographical Society, and we've been aligning our activities to provide better support on the route to that recognition of achievement.

TRACKING CPD PROGRESS

However, we're also seeing data scientists, analysts and business development specialists reaching out to us all the time. And with that in mind, it's worth remembering that a separate track of CPD attained through the AGI can bridge the "I have a record of working with . . ." gap, which people may not want to fill with CGeog. Chartered status isn't for everyone. Some aren't quite ready for it; others have different career paths in mind; people learn in different ways. Advances in every sector depend on a variety of skillsets and approaches.

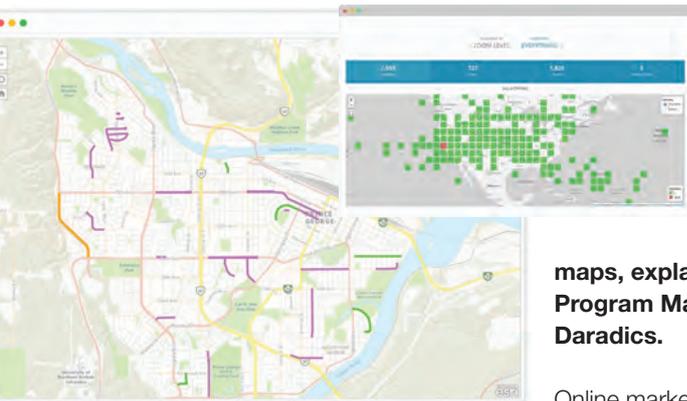
CPD recording through the AGI can help track personal development as well as maintaining the log needed for CGeog. In addition to receiving a well-respected certificate showing each year's personal progress, our CPD scheme is free to join – another good incentive to take part.

ONE AMBITION

Whichever path people choose to further their careers, however our industry changes, a structured approach says much about an individual's commitment to career progression. Working in tandem with the RGS (IBS), we'll be here to help anyone who wants geography to become their world.

- *For more information about the AGI turn to page 34.*

The **Where** in Customer Engagement



A web map showing current and future road construction in Prince George, British Columbia, Canada.

participant in creating content. Interactive marketing content enables people who visit websites to take a dynamic part in messaging. However, there is more that marketers can learn from consumers. The virtual relationship between consumer and retailer can go much farther when it's reciprocal. And now, organizations that produce online content can use web analytic tools to determine how effective their web pages are in grabbing and holding readers' attention.

VISUALIZING CUSTOMER ENGAGEMENT

Startup "sparkgeo" has created an app called Maptiks which uses Esri's spatial analytics technology to provide businesses with insight about activity on their web maps. The app shows how people are navigating a web map, such as the number of clicks and activities like panning and zooming. The app calculates the user's navigation velocity rate, indicating where people are slowing down to read or speeding through the content. Using this business intelligence, companies can increase their return on investments in online spatial analytics by building more effective maps.

*For more information visit: maptiks.com/esri.
Or contact Kurt Daradics, Esri Startup Program Manager
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

An App that tracks website visitors navigation moves and clicks is ideal for businesses that rely on

maps, explains Esri Startup Program Manager Kurt Daradics.

Online marketing allows the consumer to be an active

ONLINE LOCATION STRATEGY

There are numerous useful applications for this service wherever people interact with online maps. A great example of Maptiks at work would be a business for which location is key. Most realty (estate agents) websites have maps for locating properties that people might be interested in. These maps are loaded with integrated data such as imagery, listing prices, property specs, and neighbourhood demographics. Maptiks analytics reveals how potential buyers are using the apps to find neighbourhoods that interest them. By tracking readers' navigational habits, real-estate professionals can see which areas of the map people are slowing down to look at and what is catching their attention. Using these indicators, the agent can make better inferences about which neighbourhoods interest prospective buyers and then build marketing strategies accordingly.

SEEING THE PAYOFF FROM OPEN DATA

The applications for this technology aren't just commercial in nature. Maptiks is also useful for open-data efforts where government organizations want to determine citizens' level of engagement in a particular area. That way, governments can gear their open-data efforts toward community concerns. For example, if constituents show a lot of interest in a road renovation map – panning and zooming considerably and slowing down when certain content appears – then this topic is likely important to community members and may demand more attention. Governments can use online citizen engagement to determine whether they are getting a return on their investments.

A location strategy is all about translating data into a common visual language so that we can better understand it. The context of a map allows us to comprehend information spatially, in a real-world way, so that we can use it to make better-informed decisions. This same understanding can be applied to anything with a location component, not just physical geography. Virtual space has become important to enhancing our understanding so that we can make better-informed decisions in business and government. An online map is like a digital twin of the physical world. The better we understand how individuals interact with web maps, the better we will be at engaging with them as customers and citizens.

The Future of Geospatial Education

GIS Professionals need to diversify their skills and quickly learn emerging technologies, argues Patrick Rickles.

The use and understanding of GIS was historically limited to specialists. Today, GIS is commonplace, as spatially-enabled apps become standard on smartphones. With over a third of the world's total population – an estimated 2.6 billion people – owning smartphonesⁱ, and a reported 5 billion requests per week to Apple Maps aloneⁱⁱ, there are a large number of non-expert users of GIS, which is only sure to grow. GIS professionals need to diversify their skillsets and quickly learn emerging technologies in order to support these new users, many of whom are coming from a variety of backgrounds, in achieving what they want with GIS.

This poses a challenge to GIS educators in preparing for an unknown yet exciting future with geospatial tools. For these educators, evolving frameworks exist in formal education, such as the Geographic Information Science and Technology Body of Knowledge^v, which may provide them with guidance on GIS concepts that students should learn; and what about those wanting to use GIS who are not pursuing formal education? What resources and learning approaches are they using?

VARIETY OF GIS LEARNERS

As a GIS educational specialist, I teach and work with a variety of GIS learners, from students on formal

education programmes hoping to become industry professionals, to members of the public taking part in science projects (Citizen Scientists), such as those shown in Figure 1. These non-GIS professionals increasingly need to make accurate, visually appealing maps. However, they are less likely to require a thorough understanding of all traditional GIS concepts and skillsets.

To better understand the informal learning approaches used, I conducted a survey of researchers from a variety of disciplines^v who needed to use GIS for work but did not learn GIS through formal education. When asked about methods used to learn GIS, as well as the perceived effectiveness of the learning method, the results, shown in Figure 2, suggest that searching the internet, watching a video, following a tutorial or asking a more experienced person for help were the methods utilised and considered effective.

SIMPLE AND SELF-EXPLANATORY

When working with Citizen Scientists, I find that they employ similar informal learning efforts when learning GIS, so I tailor tutorials and educational materials accordingly. An example, which I recently co-authored, utilises Survey123, Esri's mobile data collection platform, to create emergency preparedness lists^{vi}, based on the Challenging RISK Citizen Science project. Teaching and applying these tools in a non-academic or multi-disciplinary setting necessitated that educational materials were both simple and self-explanatory, and that the teaching support provided



was delivered with patience and sensitivity to individual learning processes, cultural differences and digital proficiency. Therefore, on top of technical skills, I believe it is also necessary for GIS professionals to acquire a wider skillset – particularly the ability to communicate complex information in an understandable and inclusive way. Educators may have difficulties translating these skills and incorporating them into formal or informal learning structures, but innovative educational practices may make this possible (e.g. real-world case

Figure 1: Sharing Mapped Resources with Local Communities in Seattle as part of Challenging RISKⁱ

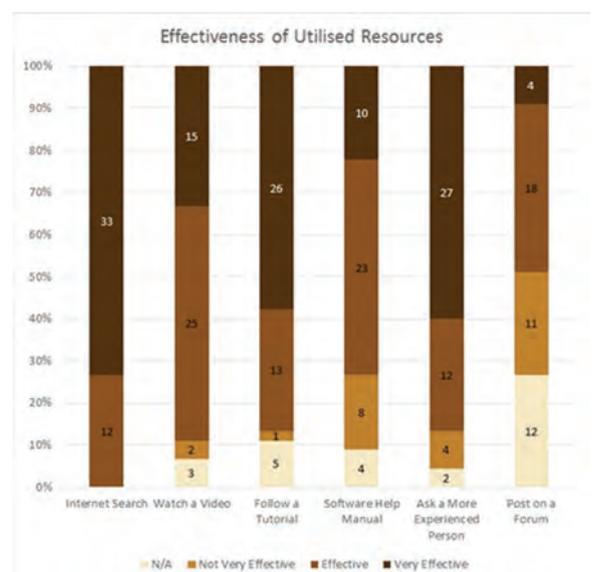


Figure 2: Survey Results – Methods for Obtaining Information (45 responses)

studies, service-learning, etc.) and would benefit GIS learners.

The future of GIS education should provide a flexible structure to teach

the increasing number of learners who are new to the important concepts of GIS, yet allow them to challenge convention and innovate. GIS educators and learners will both need to expand their understanding of approaches to learning and make use of a variety of resources that may be available to them. The combination

of technical and non-technical skills can be powerful in driving forward initiatives with GIS, so incorporating them in to educational resources, if possible, would be beneficial to learners. Overall, I believe GIS educators are rising to the challenge and that there is a bright future for GIS and GIS education.

ABOUT THE AUTHOR

Patrick Rickles studied Environmental Management Science and Computer Science at Rochester Institute of Technology in New York (B.S. 2004) and Geographic Information Science at University College London in London (MSc 2005). He has over 10 years of experience in public and private sector industries (Oil & Gas, Software Engineering, Urban Planning) and is currently a Research Associate for the Extreme Citizen Science (ExCiteS) research group at University College London, managing researchers and developing GIS solutions. He is also working on his PhD (part-time) researching expedited education techniques of GIS in Interdisciplinary Research.

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- ⁱⁱ <https://www.statista.com/topics/840/smartphones/> (last accessed 08 March 2017)
- ⁱⁱⁱ <http://fortune.com/2015/06/16/apple-google-maps-ios/> (last accessed 08 March 2017)
- ^{iv} <http://gistbok.ucgis.org/> (last accessed 08 March 2017)
- ^v 45 academics (various universities) from 17 uniquely identified disciplines that included GIScience [6], geography (physical and human) [4], remote sensing [3], computer science and software engineering [2], forestry [2], cartography [1], ecology [1], education [1], general humanities [1], history [1], librarianship [1], marine biology [1], music [1], oceanography [1], petroleum engineering [1], psychology [1], and urban and rural planning [1] (16 respondents did not identify their discipline)
- ^{vi} <http://learn.arcgis.com/en/projects/get-started-with-survey123/> (last accessed 08 March 2017)



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The University of Aberdeen has an enviable reputation for geoscience, GIS teaching and research. Dr David Green introduces the challenging MSc in GIS programme.

All of the modules we teach as part of the MSc in GIS degree programme at the University of Aberdeen combine theory and practice into 11-week modules. The modules form the basis for the second half-session (SHS) of the academic year and are intended to provide students with an emphasis on practical work as preparation for their dissertation to be carried out in the summer months.

Whilst all of the modules continue to provide theoretical background through lectures, guest speakers, and reading in magazines, books, and journals, the main focus of the module work and assessments is directed towards putting knowledge and understanding gained in the first half of the academic year into a practical context, using projects and practical exercises for the assessment.

In three of the four modules comprising the coursework for the second half-session, students have to undertake extended practical exercises to bring together their knowledge and understanding of geospatial technologies (GIS, remote sensing, digital mapping, cartography, databases, mobile GIS and Apps, and Internet mapping) from the first half-session into a practical and problem-solving environment. The practical work usually takes the form of both short 6-week individual mini-projects (with limited staff input) and 12-week

group-work projects with external input from research, commerce, and government sectors.

RESEARCH PROJECTS

In these modules students are expected to carry out a small piece of research involving the sourcing, inputting, processing, and analysis of various geospatial datasets, utilising various different software packages (including industry standard and Opensource software as well as utilities), writing up a report with a literature review, preparing short presentations and designing a scientific poster. Group work projects include an assessment of individual roles in the project as well as contact with a 'client' and an advisor, and some data collection activities utilising smartphone Apps, and UAVs for aerial imagery, e.g. colour, NDVI.

AN EXAMPLE

For the project work, a GIS and image-based farm mapping exercise is undertaken. Students are divided into groups representing GIS consultancies and given the task of responding to an invitation by a farm client to tender for a farm-mapping project. They must provide a name and design a logo for their consultancy, a time management plan for the work, a budget breakdown and a list of deliverables. As part of the exercise, the consultancies must complete an outline presentation of their proposed work to the client – a farmer – and a business consultant. Following feedback, the consultancies proceed to undertake the work outlined in their proposal. Each consultancy is provided with comprehensive data and information about the farm including farm records, maps, aerial photographs, and various documents (mostly in analogue format), and are hosted by the farmer for a number of site visits that cover some of the general



background and context about the farm.

Following a question and answer session with the farmer and the business consultant, the consultancies set about the task that includes examining the information provided, and undertaking research. They are introduced to digital image processing (DIP) theory and practice to allow them to process satellite imagery from Landsat TM and ESA's Sentinel as the basis for producing a land-use/land-cover map for the farm. In addition, students are introduced to the role of UAVs in remote sensing and mapping for precision agriculture applications, CAA regulations, safe operation of UAVs, and a range of low-cost sensors used to collect photographic and video imagery,

as well as to build 3D terrain and feature models.

Once complete, students present their work to the farmer and the business consultant using Powerpoint. They also submit their work as a final report, together with deliverables, and an A0 poster as a summary of the work undertaken.

A CHALLENGE

This is challenging work for students, but it offers an opportunity to: work as a team; undertake research; explore the scientific literature; collect their own data; process, analyse and integrate data from often disparate sources; work to a budget; manage their time effectively; write a report; interact with clients; and communicate their work in different ways and formats. Students enjoy

this activity, especially as it prepares them for the work and discipline to complete their dissertation. It also has a positive benefit as they prepare for the workplace.

ACKNOWLEDGEMENTS

Thanks to: Roger Polson – Knock Farm, Huntly; Jason J Hagon and Ryan Peck for the project output illustrations.

ABOUT THE AUTHOR

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The programme draws upon a wide range of international, national, and local expertise in the coastal and marine sciences, landscape ecology and landscape change, archaeology, integrated coastal management, offshore, hydrographic and underwater survey, renewable energy, geology and hydrocarbon exploration, environmental risks and hazards, marine and terrestrial spatial planning, precision agriculture, climate change, and mobile data collection.

Full details regarding entry requirements, available funding, application process:

www.abdn.ac.uk/gis | cpsgrad@abdn.ac.uk



GIS Education: the Global View

GiSPro contacted several leading professionals around the world to get their views on the current state of GIS education. They come from both the commercial world and academia. Below are their edited comments.

JAMES BOXALL

The view from Canada



Canadian professionals in geospatial need support for professional development, certification, and recognition such as fellowships akin to chartered geographer. In Canada the sector is aligned with geomatics and thereby sees some pursuing the Professional Engineering (P.Eng.) designation through programmes and employment related to

similar to the GISP programme through the GIS Certification Institute, but not nearly as utilized.

There are many educational institutions which deliver core programmes needed for graduation, employment, potential certification and professional development. Interestingly, options for professional development

easily recognized or formal way to CPD. There is also the issue that education and qualifications is a provincial jurisdiction.

There are many Canadians in the geospatial sector who seek fellowship of the Royal Canadian Geographical Society (FRCSG) and the RGS-IBG (FRGS). Such recognition is seen as more than

“... size, time zones, travel costs and population distribution means... no easily recognized or formal way to continue professional development.”

geomatics engineering, surveying and geodesy. There are also organizations that require, for legal reasons, a certification in surveying to be maintained through CPD. The Canadian Institute of Geomatics offers a Certification Program for various sub-disciplines (www.cig-acsg.ca/Certification) to become a Geomatics Specialist. This is very

have increased greatly over the past decade as the number of programmes offered has increased (including more GIS Masters programmes in areas such as health and marine spatial planning).

Canada’s geography of size, time zones, travel costs and population distribution means there is no

certification because it is peer based and focuses on the total contributions over a career, rather than employment status, title and outcomes of technical processes. This makes the chartered geographer designation more valuable across jurisdictions, even if it is under-subscribed and not as recognized in Canada, as yet.

DR. ADAM DENNETT

Deputy Director, Bartlett Centre for Advanced Spatial Analysis, UCL



GIS, computer programming and modelling are merging and overlapping. Programming languages such as R and Python are becoming the de facto languages of data science. Their increasing popularity is helping spearhead the democratisation of data and the methods for

extracting meaning from it, in spatial contexts. This is contingent on the transfer of knowledge and skills, away from computer scientists to geographers, spatial analysts and GIS professionals. This is starting to happen, but for many years in the UK, those who were trained in ‘GIS’ were not

>

necessarily trained in programming and modelling.

At undergraduate level, a number of Q-Step (www.nuffieldfoundation.org/q-step) centres and degree

“... helping spearhead the democratisation of data...”

programmes are now running to boost student numbers coming through social science programmes, however only two (UCL and Bristol) have a focus on Geography. At postgraduate

level, courses such as the MSc in Smart Cities and Urban Analytics (<http://mscsmartcities.org/>) at UCL’s Centre for Advanced Spatial Analysis are starting to teach applied programming and spatial data analytics to cohorts of students who come either without the technical background, or with the technical background but without the experience of applying these skills to real-world problems.

For research postgraduates and early career researchers (and industry professionals), the ESRCs National Centre for Research Methods has been running a

variety of programmes since 2004 and a glance at the latest training programme (<https://www.ncrm.ac.uk/training/>) will reveal a number of opportunities for ‘skilling up’ in these areas.

In recent times, the changing emphasis from Geographic Information Science to Spatial Data Science is almost certainly a reflection of a shift in the role and skills of the analyst. Data requires the application of work (in its physical sense) before information can emerge and this, ultimately, will make those trained in the methods to achieve it, a more valued commodity.

MICHAEL GOULD
Esri Global Education Manager

In the past decade I have visited perhaps 200 universities around the world and can state with certain confidence that all major ones now teach GIS in some form or another. But a numerical grade on a transcript can be difficult to objectively interpret. The professional labour market is so diverse and evolving, that recognition of true excellence is critical to human capital benchmarking. Esri staff work hard to identify such cases of excellence and to provide numerous awards throughout the year, among them the Special Achievement in GIS (SAG) Awards, and the 20-plus Esri Young Scholars selected from around the world. See <http://denverro.maps.arcgis.com/apps/MapTour>

Esri supports awards given by professional societies such as FIG, AAG, EGU, and ISPRS. In a world where university degrees are

and for acknowledgement of capabilities renewal. Gone are the days of ‘pass the exam and forget it’. GIS expertise is becoming an

“... a trending desire both for lifelong learning and for acknowledgement of capabilities renewal.”

commonplace, GIS professionals are increasingly amassing mini-credentials such as these awards, completed MOOCs (Esri’s MOOCs alone have attracted more than 90,000 learners) and peer-reviewed memberships such as GISP and Chartered Geographer. This points to a desire both for lifelong learning

add-on to many cognate specialists, for example business and social science graduates, who are looking to increase their value as data scientists and analysts. Education increasingly is happening outside the classroom, anywhere, anytime, and in any manner or form that society recognizes and validates.

MARK ILIFFE
Tanzania’s Ramani Huria Project

Dar es Salaam is one of Africa’s fastest growing cities and

and projected to be a megacity by 2030. The pace of urbanization

provision combined with exposure to hazards, such as floods and earthquakes in a rapidly expanding unplanned urban environment.

“... to leverage citizen participation for hyperlocal data collection.”

Tanzania’s primary city with a population of around 5.5 million

challenges traditional methods of planning and public service

The World Bank, the Tanzanian Commission of Science and Technology and the academic institutions of the University of Dar

es Salaam and Ardhi University have worked together on the Ramani Huria project (ramanihuria.org) to help empower communities to digitize their spaces through community mapping. It supports the development of community awareness and demonstrates how to leverage citizen participation for hyperlocal data collection. This citizen participation is focused on vulnerable and flood prone areas, presenting an opportunity to empower government officials and community leaders to identify and prioritize community resilience and action plans against flooding. In collaboration with the Red Cross, community resilience teams are now embedded in ten of the most flood-prone communities in Dar es Salaam, supporting resilience efforts.

Ramani Huria has demonstrated how low-cost, openly available

tools such as OpenStreetMap, drones and in-situ sensors can be scaled to provide a platform for innovation, including using drones to collect highly accurate aerial imagery and digital elevation models for Dar es Salaam to 3D printed weather stations. This in turn is powered by the collection of over 750,000 building footprints; 120km of imagery and surface models; 2091km of Roads and tens of thousands of points of interest such as toilets, water points, schools and other critical infrastructure. This has been achieved by engaging over 100 community members and 165 GIS and Urban Planning students of local universities: creating data and facilitating knowledge transfer on community based flood and disaster issues.

The community members involved can now support and update

changes. The next generation of Tanzania's urban and town planners have embedded themselves across the country, armed with knowledge on how to collect, disseminate and conduct data-driven urban planning and decisions across the country.



Taking the show on the road.

PROF DR. JOSEF STROBL

University of Salzburg, Department of Geoinformatics - Z_GIS, Chair, UNIGIS International Association

Learning anytime, anywhere by anyone – what are the strengths, weaknesses, opportunities and ‘threats’ brought by this proposition?

UNIGIS distance learning programmes were launched in the early 1990s by a network of universities (www.unigis.net), addressing the need for in-service continuing education in the then emerging field of GIS. In the meantime, residential undergrad and graduate programmes like the Applied Geoinformatics MSc (m-sc-agi.zgis.net) have emerged – but the need for online programmes is more urgent than ever.

Geoinformatics is a ‘transversal’ discipline, contributing added value across numerous application domains like ecology, utilities, emergency management, resource management, environmental studies and energy systems. Everyone active

in any of these and other ‘spatial disciplines’ today will benefit from competences in Geoinformatics.

Capacity building is needed on various levels, from hands-on software training to professional diplomas, CPD and certification all the way to graduate academic credentials and management qualifications. UNIGIS programmes are serving the postgraduate academic segment of these demands, offering online diplomas and MSc degrees in multiple languages and regions.

Over the past 25 years thousands have graduated from UNIGIS programmes, making them the undisputed leader in geospatial qualifications globally. Accredited in the respective host countries of UNIGIS partner universities, the curricula and syllabi are aligned with international standards like the

GIScience ‘Body of Knowledge’ and the EU ‘GI-N2K’ framework.

As a key qualification and competences contributor to the

UNIGIS: LifeLong Learning for Geospatial Experts

geospatial industries, UNIGIS has received Esri’s Special Achievement in GIS’ award (2014) and was recognized as the Geospatial Institution of the Year’ (2015, Geospatial World Forum). And of course we are proud to follow the career paths of our graduates who today are leading initiatives, companies, projects and institutions across the entire geospatial spectrum!



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The Evolution of GIS MOOCs*

*Massive Open Online Courses

Free online courses have been around for awhile in the geospatial sector. Adena Schutzberg reviews their short history and offers some cautionary words for would-be students.

The New York Times identified the Year of the MOOC in November of 2012. Back then, the three MOOC platform providers were Coursera, Udacity and edX. In June 2013 Google offered “Mapping with Google,” on its own platform, to teach students about its mapping service. In July of that year, Penn State offered “Maps and the Geospatial Revolution” on Coursera. These and other early offerings were free to take and included certificates for students who completed the required tasks. The platform providers were still defining their business models. Those writing the courses pondered the value. One GIS conference discussion I attended concluded they were strictly marketing efforts.

THE PRESENT

Spin forward to 2017 and the MOOC world looks different. The platform providers have all restructured their offerings toward profit. They offer fewer free courses and certificates. They’ve grouped courses into specializations or “nanodegrees” and require payment per course or per month. They made deals with industry players to use the platforms for employee training and professional development. They continue to pursue fee-based college credit solutions and offer full graduate degrees.

What happened to the early GIS MOOCs? Google never offered its MOOC again, but now offers “Google Maps APIs” as a free,

on-demand course on Udacity. Penn State announced it will offer its well-regarded maps course (and others) on the UK’s largest MOOC platform, FutureLearn. Other GIS MOOCs, including more than one featuring desktop GIS, appeared but few continue to be offered with cohorts in the hundreds. Esri offered its first MOOC in 2014 and now offers four, soon to be five, different courses.

THE QUESTION

Course providers as well as potential students and hiring managers, look at MOOCs from a different perspective than the platform providers. They ask: how effective are these large, open(ish), free(ish) courses at delivering knowledge and skills? Where do they fit alongside formal coursework, informal learning and self-learning? The answer is familiar: it depends. MOOCs are just like other educational opportunities: the value and effectiveness of the teaching and learning depends on the teacher(s), the student(s), the course content, and the environment.

To date, GIS MOOCs lean towards the introductory. While some focus on topics and ways of thinking (spatial analysis, geodesign) others focus on software use (ArcGIS, QGIS). Less motivated students will do the minimum. More motivated ones will, like their counterparts in college degree programmes, go further. I’ll re-phrase the old Tom Lehrer joke about life being like a sewer. MOOCs are like sewers:

What you get out of them depends on what you put in to them.

How can MOOC course providers, students and hiring managers “use” MOOCs in 2017? Course providers (individuals, colleges and universities, non-profits, private companies) can offer MOOCs to educate their target audience, enhance personal and organizational branding, and market products or services.

Students of all ages and experience levels can take MOOCs to follow their interests or fill gaps in their learning. Further, anyone who completes a MOOC should note it on their resumé, CV or LinkedIn to show their interests, motivation and commitment to continued learning.

Hiring managers can drop in to MOOCs to look for energetic, helpful and successful students. During interviews, they can ask applicants about what they learned in a MOOC and why they took them. Managers and HR departments can view MOOCs as free(ish) personal development opportunities for their employees.

MOOCs ARE NO PANACEA

MOOCs are not a silver bullet to solve educational disparities or magically increase the GIS workforce. But they are a key free(ish) resource for those wanting to grow their knowledge about GIS. In fact, used wisely, course providers, students and hiring managers all can get quite a lot of out of MOOCs.



Education & Training for all

As a service to readers we are delighted to list some of the leading GIS courses. They range from MSc's and undergrad degrees to short one or two day events for people to familiarise themselves with a particular aspect of GIS or a vendor's system. Please tell us what you think and help us to improve the feature when we next run it by suggesting other institutions and organisations.



The MSc in GIS degree programme at Aberdeen draws upon a wide range of international, national, and local expertise with 25+ years of excellence in postgraduate teaching of remote sensing, GIS, visualisation, digital mapping and cartography. This is a flexible programme designed to suit the needs of all learners, with both full and part-time on-campus study options, plus a part-time, and full-time distance learning option. The degree has both September and January start dates.

The GIS programme covers the fundamentals of tools and techniques for acquiring, storing, processing, classifying, analysing, and visualising spatially referenced data, and their application to the study of the environment. Assessment is by a combination of written and practical assignments, presentations, laboratory reports, and a dissertation, together with an oral examination and poster presentation. You will study with like-minded people in a very positive environment establishing a close network of support both during your studies and beyond. Visit: www.abdn.ac.uk/gis or email: d.r.green@abdn.ac.uk



Cadcorp complements the provision of GIS and web mapping products with a range of business and technology services. Cadcorp training covers a broad range of GIS and web mapping topics, and provides in-depth coverage of Cadcorp products and development environments. Standard courses cover the basic concepts of working with Cadcorp SIS, and provide a helpful framework for users to select the modules that are most appropriate for their needs. Cadcorp also develops and delivers courses customised to meet specific customer requirements. Choose from standard and/or bespoke training courses. Training courses can

be delivered on or off-site. All courses are run using the currently released version of the product.

All standard courses are accredited by the Association for Geographic Information (AGI) and can contribute towards the Chartered Geographer status. Continuing Professional Development (CPD) points are awarded. Visit: <http://cdcp.io/training> for more information.



Cadline is a specialist in providing Open Source Geospatial Software and Services and our expert trainers also provide structured and tailored GIS training courses depending on your requirements. Our Open Source GIS courses are delivered using instructor-led real world examples where you learn new techniques at your own pace.

Our training courses include:

- Introduction to QGIS: This course covers topics including getting started with QGIS, map navigation, general mapping tips and more...
- Introduction to GeoServer: This course covers topics including installation and configuration, familiarisation of the GeoServer user interface and more...
- Open Source GIS Integration: This course covers topics including installation and configuration of all software (QGIS, PostGIS and GeoServer), loading vector data and performing queries within PostGIS and more. . .

Benefits of attending a Cadline Open Source GIS course include AGI CPD points, lunch and refreshments, comprehensive training manuals, certificate on course completion and 30 days post-training support from our Open Source GIS experts. More at: www.cadline.co.uk and www.cadlinetraining.co.uk



ESRI: TAKE YOUR NEXT STEP TO ENHANCE YOUR GIS SKILLS

The latest release of ArcGIS brings new visualisation capabilities, improved geographic readiness, and new apps. It transforms how geographic information will be accessed and managed by GIS professionals, like yourself, and by organisations.

Esri UK instructor-led training provides the foundation you need to learn how to build a strong platform, extend it across your organisation, and fully leverage your GIS investment. Our courses are available to help you speed up your adoption of new technology; be more productive; and more easily share and collaborate with colleagues, decision makers and the general public.

With a curriculum of over 30 courses covering most aspects of the platform and delivered by the only Esri Certified trainers in the UK, why not take a moment to find the right course for you. Visit: www.esriuk.com/training or email: training@esriuk.com



GeoPlace

Quality spatial information – knowing where people and assets are and where services are provided – makes a substantial difference to the efficiency with which local services are delivered. The quality of the information is crucial for accurate service delivery. Creating and maintaining large spatial address datasets to an exceptional standard of currency and accuracy requires specialist skills and expertise. It's what GeoPlace does.

We offer a training programme with a range of packages available. The programme works with local data custodians to develop their skills associated with a core set of topics relevant to the role of creating and maintaining authority address and street data. The courses are delivered directly by our experts who collectively have over 60 years' experience in creating and maintaining address and street data. The courses also attract Chartered Geographer CPD points. More information: <https://www.geoplace.co.uk/helpdesk/training> or communications@geoplace.co.uk



KOREC: FREE INTRODUCTION TO GIS DATA CAPTURE

Join KOREC for a free ½ day introductory course. The course is designed for those new to GNSS (GPS), those who have a need to record the position of assets or other objects to update or populate a database.

The course starts with an overview of the GNSS system before discussing the type of outputs and data synchronisation options that are possible. Next is a field data collection exercise, including cloud based data synchronisation, before finishing with an inspection of the collected data back in the classroom.

Attendees will leave the course with the knowledge to:

- Know when GNSS data collection is viable
- Appreciate the positional precision possible
- Perform GNSS field data collection
- Ability to synchronize the data to an office PC from the field
- Inspect collected data and export to a GIS database file

Register at <https://www.korecgroup.com/support-training/training/taster-courses-an-introduction-to-gis-data-capture-using-gnss-technology/> or call: 0345 603 1214 or email: support@korecgroup.com



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If you'd like to improve or renew your existing skills but can't commit to a Masters, you can choose to study GIS at Postgraduate Diploma and Certificate level, or study a module as Continuing Professional Development (CPD).

Visit geog.leeds.ac.uk/gis for more information.

*The Times/Sunday Times' Good University Guide 2017



UNIGIS

UNIGIS UK has over 25 years' experience in providing distance learning based postgraduate education. Our network, jointly delivered by Manchester Metropolitan and Salford Universities, offers three Masters programmes including: MSc in Geographical

Information Systems, MSc in Applied Geographical Information Systems, and the MSc in Geographical Information Technologies.

Our Masters programmes have been designed to support the personal development, career advancement, and career change ambitions of students typically already in employment. UNIGIS UK also offers Continuing Professional Development (CPD) where students can access modules in stand-alone mode with or without assessment.

Key features of our MSc programmes include access to bespoke online study materials, free software, a free textbook, and pathway dependent optional modules. All modules include active tutor support and 100% coursework assessment (no examinations). This September we will welcome our 27th intake of students – find out more and apply via www.unigis.org.



ULSTER UNIVERSITY

With over 20 years' experience in teaching GIS, and

15 years teaching via online distance learning, Ulster University's School of Geography and Environmental Sciences has a significant track record in GIS education. We offer a broad-based postgraduate course in the principles and practice of GIS, available via online distance learning and that may be taken full-time or part-time.

The course covers core principles and concepts and provides extensive hands-on experience of a variety of commercial and open source software. Free copies of ArcGIS, Erdas Imagine and SPSS are provided. Our experience in online course delivery means high student satisfaction levels and very positive feedback from graduates.

You can choose to study for a Master's degree, a PG Diploma or a PG Certificate, or enrol for individual modules that interest you. Relevant work experience may be accepted in place of standard academic entry requirements and fees can be paid by instalments.

More from: Niamh McInerney, +44 28 7012 4401, n.mcinerney@ulster.ac.uk www.ulster.ac.uk/ges

AGI Foresight Report 2020



THE ASSOCIATION
FOR **GEOGRAPHIC**
INFORMATION

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.

Many thanks to our sponsors of the Report:

Download the report now:

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www.agi.org.uk



How did you get into geography, in the first place. . . ?

Chair of AGI Council Abigail Page charts her path to membership and achievement at AGI. . . and the route to outstanding cocktails!

I'm always interested in who's who at the AGI, where they've come from, and how they 'got into' geography in the first place. We have such a diverse membership – and with the emphasis on education and personal development in this issue, I wanted to share something about my own career path, the role for personal development, and indeed the changing nature of the AGI.

Before entering a world of geo I spent time managing a photo lab. Yes, traditional, printed photos – I have a lifetime of anecdotes from that job! When I applied for my first job in a cartography office, I had no idea it was possible to actually make a career out of creating maps, but suddenly I was hooked. That same blend of following a process with the utmost accuracy and care, to create something which had the opportunity to be beautiful, inspiring or informative – suddenly the bigger picture was much, much easier to see.

TICKET WINNER

I began my MSc GIS through distance learning. My first experiences with AGI were while studying – winning a ticket to the annual GeoCom conference in the first instance! A few years on, and I was very much an active volunteer: most sincerely, I can say I wouldn't have my day job today were it not for the support and opportunities I found through my involvement in AGI.

My approach as AGI Chair is very much shaped by my early experiences of the Association – I want an organisation that can support interests and a desire to learn, but also provide a vehicle to engage with others and demonstrate the benefits of applying geographic information.

THE GROWING POWER OF GEOSPATIAL

Like many of you, as my career progressed, the realisation of the power of geospatial only grew. We all see opportunities and applications of the role of geospatial through different filters; we're all influenced by our backgrounds and experiences. This provides a unique opportunity to contribute in a diverse community of practitioners – but also gives us a way to engage people who may not have considered the true

value of geographic information.

As a diverse community, we have many different stories to tell. And as AGI Chair I have the privilege of seeing and hearing many of these from around the membership. For our Early Career Network members – your story provides inspiration. For more established members – sharing your experiences, whether that's over a geodrink or a geo-landline, can shape a business, create a new partnership, or kick-start a young person's career. As an Association, our enthusiasm goes beyond this – we're always looking for new ways to capture everyone's knowledge and experience, ways that will move us all forward.

AN EXEMPLAR EVENT WITH COCKTAILS!

In February, I was delighted to attend the British Library Lates event in London. Alongside the curated exhibition demonstrating the power of cartography, the Library had organised interactive and compelling demonstrations of modern applications of geographic information. Staff from the GeoVation Hub were on hand, revelling in everything from laser scanning and 3D modelling to geodata being used for virtual reality. Add to that the market place of geo-wares, a comedy compère, a bouyant atmosphere and outstanding cocktails. . . and you have an exemplar in an event that engaged with everyday map-lovers, but at the same time appealed to geo-professionals on every level, of every age, and from every sphere.

We must show this level of ambition to engage and inspire. All I can say is, watch our space. . .



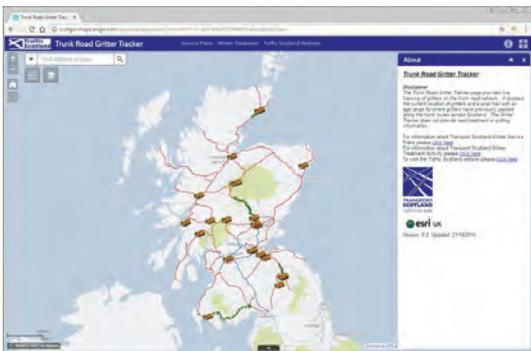
Abigail Page is Chair of the AGI's Council which is formed from elected members of the AGI. Its main role is to set the strategic direction for the organisation. www.agi.org.uk

The power of cartography at the British Library.



TRACKER APP HELPS KEEP ROADS OPEN

Transport Scotland has set up a 'Gritter Tracker' app to help keep its roads open. Using technology from Esri UK, the live app monitors all of the major trunk roads to show the public in near real-time when and where gritter vehicles have been active, via a 'snail trail' on the map. The aim is to enhance road user confidence in winter by showing the live location of gritters out on the road network. Esri UK's cloud-based ArcGIS Online underpins the app providing insight into the timing and routes used by the gritters.



TOOLKIT FOR ADDRESSBASE

AddressBase Premium is the comprehensive dataset used by local authorities and the emergency services in the UK. Aligned Assets

has now released AddressBase Toolkit to visualise the dataset for MapInfo users. The toolkit imports AddressBase Premium into MapInfo format and provides a fast search engine to find addresses. The heavy lifting to import and convert the complex address data into a meaningful format without the user having to know the data structure is done by the Toolkit.

Aligned Assets MD Andy Hird explains "We realised that there were a large number of users who required access to the AddressBase dataset via their GIS, along with visualisation and quick searching, but without having to create or maintain a full database management system. Although this first version of AddressBase Toolkit is only compatible with MapInfo Professional, we are looking forward to providing similar toolkits for other GIS providers."

CADCORP SIS 8.0 WITH NETWORK MANAGER

Cadcorp has launched a Network Manager application in the latest release of Cadcorp SIS 8.0. The application loads OS MasterMap Highways Network data into a structured topological network that includes roads, paths, and asset management information. This complements the existing support for OS ITN data.

Full support for the update to OS MasterMap Topography Layer Schema 9 is also included, via Cadcorp SIS MasterMap Manager, supplied free with SIS. The user has complete control over whether to apply Schema 9 styling rules, with the option to delay updating. When using the Topography Layer, the user can now choose from the very latest OS-supplied styles. Martin Daly, technical director of Cadcorp adds, "For over 20 years we've worked very hard to ensure that Ordnance Survey data is as easy to access and use as possible, and has good-looking default styling."

PARTNERSHIP'S LIDAR MODULE

Blue Marble Geographics has announced that it has established a partnership with Pointerra to provide cloud-based LiDAR data delivery to Global Mapper, its GIS software. 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.

SETTING ENTRY LEVEL

Faro has announced that their FocusM70 laser scanner, coupled with FARO SCENE software, is the first professional grade scanner to be offered for under £21,000 that does not compromise on industrial grade performance. Key features include 70m range, an IP 54 rating for use in high particulate and wet weather conditions, HDR imaging, an acquisition speed of almost 500,000 points per second and extended temperature range.

MODULAR GNSS RECEIVER

Topcon Positioning Group has announced a modular GNSS receiver system, the MR-2, which combines all current and planned constellation tracking with a comprehensive set of communication interfaces to service any precision application requiring high performance RTK positioning and heading determination. The MR-2 can perform as a mobile RTK base station, marine navigation receiver, mobile mapping device and as a GNSS receiver for agricultural, industrial, military, or construction applications.

Using Topcon HD2 heading determination technology, the MR-2's dual antennas compute high-performance heading and inclination determination alongside the RTK positioning engine for precise navigation and guidance applications.



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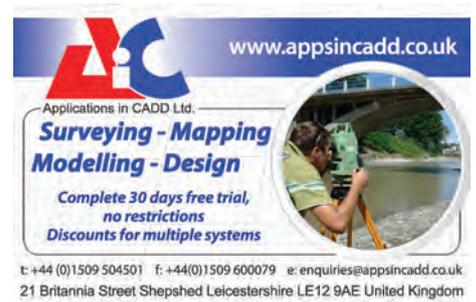
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