

# Ontario Professional Surveyor



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*on the cover ...*  
**Gibson House Museum**

**also in this issue ...**

**Getting it Right**

**The Algonquin Radio Observatory**

**UAV Aerial Topographic Surveying**

**Can it Replace GPS Ground Topographic Surveys?**

**Mapping the Toronto 2015 Pan Am/Parapan Am Games**

**plus our regular features:**

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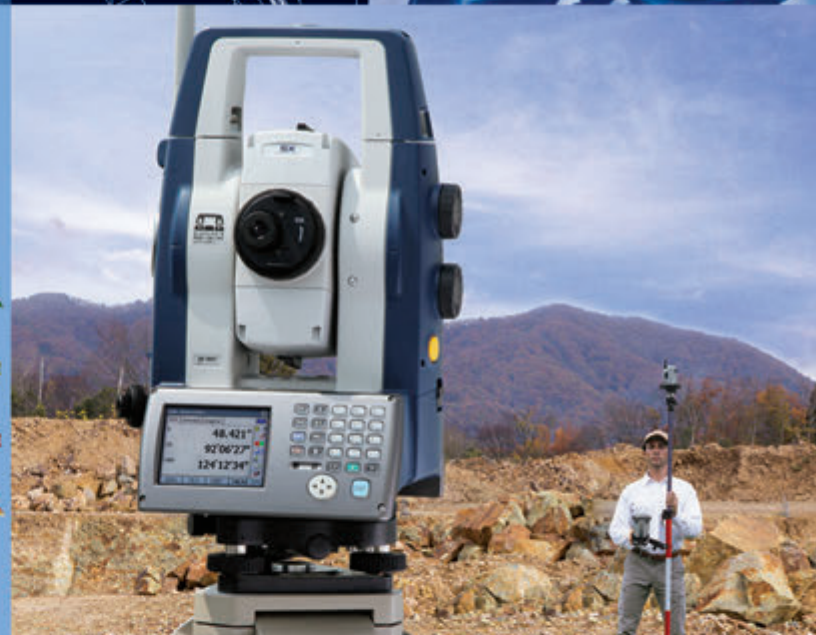
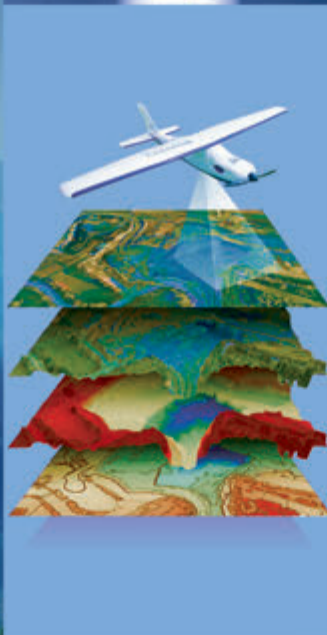
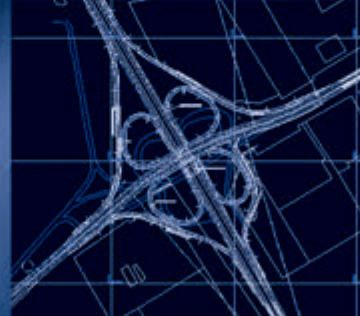
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## ON THE COVER ...

Cover photo: Gibson House Museum taken by Maggie Newell, Acting Museum Coordinator. ([www.toronto.ca/museums](http://www.toronto.ca/museums))

Tracy Hanes brought attention to the museum in her article “Park revives historical spirit of North York” which was published in the Toronto Star on Saturday, May 30, 2015. She wrote that the redesign of Gibson Park “bridges the gap between the modern condo towers that surround it and the area’s historic past”. The park sits on the farm lot once owned by David Gibson, one of our most well-known surveyors. See the article in The Last Word on page 36.

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# President's Page

By Travis Hartwick, O.L.S.



Since my initial President's address in the Spring edition of Ontario Professional Surveyor, I have had the privilege of representing the Association membership at 5 sister Association meetings, 2 Council meetings, 4 Executive Committee meetings, 1 regional group meeting and 7 other AOLS functions. It has been a busy few months but acting in a leadership role at these events has allowed me to grow professionally and for that I am grateful.

One item that has stood out since assuming the role of your President is the need for collaboration between professionals. This is applicable on both a micro level, such as good communication and professional courtesy between competing Ontario Land Surveyors, and on a macro level, such as sister Associations working together to strengthen professional surveying in Canada, North America and across the globe.

I believe that I have been fortunate in my career thus far since I have been employed by firms that rely on collaboration to excel. They understand the value of sharing work and using the proper resources to complete a task, which in turn recognize successes for both their clients and themselves. I now understand the importance of information sharing when looking at our profession. In the past we, as an Association, dealt with issues and tackled challenges that we felt were "Ontario's". We expended money and resources to find a solution only to find out later that someone else, somewhere else, had the same challenges and spent their money and resources to come up with a similar solution. Would it not make more sense to work together on items of common interest so that the best people are working on the solutions and there is an economy of scale?

When I look at what our Association has accomplished in the areas of Strategic Planning, Continuing Professional Development, Marketing and Recruitment, Communication, Digital Cadastre Implementation, Website development and maintenance, Monument Protection and Ground Disturbance involvement and liability insurance enhancements, I cannot help but wonder if some of these things could be implemented on a national level. I think we all recognize there are common items that we can be working on, but the question is, what is the right venue to accomplish this? Holding Presidents' Forums and Executive Directors' meetings, and working with Professional Surveyors Canada and GeoAlliance Canada are all ways that we can facilitate idea sharing but implementation must follow.

The Presidents from the sister Associations across the country discuss common interests during our "Presidents' Forum" at the various AGMs. The conversation is informative and it is good to know what others are doing and thinking. The problem is that there has been limited success in transferring the information from Presidents' policy discussions to implementation on a broad level. We have to somehow find a way to translate the discussion into actually working together to solve some of the common interests of the day.

Another meeting that is picking-up momentum and creating collaboration between the Associations across Canada is the Executive Directors' meeting. Twice a year via teleconference and once a year face to face (recently during the National Surveyors Conference) the Executive Directors meet to discuss operational items of common interest. These meetings have proven fruitful to understand and share ideas in the day to day running of the Associations. Good relationships and synergies have resulted and I hope that these meetings continue into the future.

Based on the success of these meetings we are hoping that we will see a joint Presidents/Executive Directors' meeting take place at least once a year where policy and strategic items as well as administrative items will be discussed. The seed has been planted and I hope your next president will continue this charge.

Professional Surveyors Canada is another body that has the potential of enhancing collaboration on a macro level. The potential is there for representatives from each province to have input on common items. A good example of a success with this group is PSC and the AOLS using the same liability insurance broker. Facilitating this has spawned the insurance broker's interest in all the provincial associations and initiated attendance at their AGMs: an insurance broker that knows about surveying talking to other surveyors about their needs, fabulous!

There is also the newly formed GeoAlliance Canada. This umbrella organization has the potential of bringing professionals together from many disciplines to help us understand the needs of groups that are closely associated with our industry. This group will be represented by government, associations and spatial data interest groups.

Of particular interest to the AOLS is the 2017 AOLS AGM being held in Ottawa. We are attempting to make this a truly historic and collaborative event to celebrate our 125<sup>th</sup> anniversary. The Executive Directors and Presidents of l'ordre des arpenteurs-géomètres du Québec, ACLS and AOLS are happy to announce that for the first time in history we will have a joint meeting between three of the eleven professional organizations that provide land surveyor licensing in Canada. I find that extremely exciting.

This is only a small sample of the collaboration opportunities available to us and which we need to be utilizing to strengthen the position of the AOLS and its members.

In today's world knowledge is power. There is a plethora of knowledge out there and we as an Association need to find ways of accessing this knowledge and building upon others' work to continue to make us viable into the future. Speaking of the future, I often wonder what the future of Ontario Land Surveyors will look like. Will we hold onto our traditions and be similar to what we are now or will we collaborate with other groups and grow and diversify? Maybe it is one professional licensing body for all of Canada with different chapters for each province? Maybe it is revised legislation to make surveying uniform across the Country? Who knows? The future is ours to create. Collaboration is the key to being in the driver's seat.



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# UAV-g 2015 International Conference on Unmanned Aerial Vehicles in Geomatics

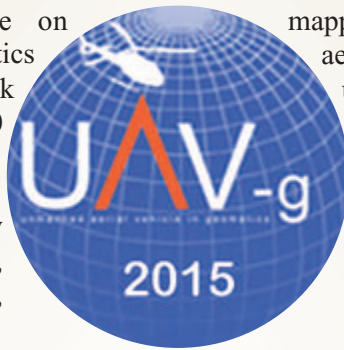
***Small Unmanned Aerial Systems (sUAS): a disruptive technology for geomatics***

By Costas Armenakis, PhD, PEng, ISPRS Fellow, Conference Chair

The 2015 International Conference on Unmanned Aerial Vehicles for Geomatics UAV-g 2015 will be held at York University, Toronto, Canada from August 30 to September 2, 2015. This is the third event of the series of UAV-g Conferences and the first in North America following the very successful meetings in 2011 in Zurich, Switzerland and in 2013 in Rostock, Germany.

Using small UAV as data acquisition platforms and measurement instruments has become attractive for many emerging applications. These small and lightweight Unmanned Aerial Vehicles (UAV) are also known as Remotely Piloted Aircraft Systems (RPAS) or Unmanned Aerial Systems (UAS). Small unmanned aerial systems (sUAS) are being used for a variety of civilian uses ranging from mapping remote Arctic areas, to search and rescue, and to home deliveries. sUAS mobile mapping systems are becoming the technological impetus for revolutionizing 3D geospatial data acquisition and mapping and are causing a paradigm shift in the field of geomatics. sUAS are transforming geomatics research and applications; creating new and innovative opportunities for measuring, mapping and modelling geospatial environments. However, there are no complete and easy solutions as the low cost, smaller and simpler pilotless aerial mapping systems, which mostly consist of small aerial platforms and off-the-shelf equipment and sensors, are still expected to deliver high quality results in efficient and economical ways.

The aim of UAV-g 2015 is to bring together experts in photogrammetry and remote sensing, surveying, robotic



UAV-g 2015 conference logo

mapping, computer vision, artificial intelligence, aerospace engineering, geosciences and various users' communities. Researchers, developers, service and systems providers as well as users are invited to contribute with presentations, posters, exhibitions, technology demonstrations and discussions to create synergies between research and applications using UAV in Geomatics. It is a great opportunity to learn about the most recent developments and to exchange views on the future directions of UAV in geomatics research, applications and services.

The conference will include plenary and thematic sessions, poster sessions, an exhibition and a technology demonstration day.

## Conference topics and papers

About 70 papers have been accepted for oral and poster presentations based on a peer review process. The conference papers have been accepted based on either extended abstract or full paper submissions and cover topics such as:

- Platforms, payloads and instruments for photogrammetry and remote sensing
- Navigation and position/orientation determination
- Simultaneous localization and mapping
- Dense image matching and 3D surface reconstruction
- Terrestrial laser scanners and UAV data fusion
- Monitoring, tracking and change detection
- Low altitude thematic remote sensing and environmental mapping
- Obstacle sense and avoidance
- On-line and real-time processing
- Technology challenges and applications
- Regulations

## Keynote speakers

Keynote presentations during the plenary sessions will be given by the following distinguished speakers:

- Dr. Kimon Valavanis, University of Denver

Challenges in Unmanned Aircraft Systems: autonomy, sense-detect-and-avoid, and formation control

- Dr. Michael Jenkin, York University

Flying underwater: some results with an amphibious robot

- Dr. David Bird, McGill University



DJI Phantom 3 small unmanned aerial mapping system.

Applications of unmanned vehicle systems to wildlife research and management in the 21st Century

### Special Presentation

- Mathieu Boulianne, General Manager of Spectral Aviation Inc. Regulatory requirement for Canadian airspace UAV air operations.

This is expected to be quite informative about our regulations.



York University students Sonal Ranjit, Earth Science (left) and Dennis Sherman, Geomatics Engineering (right) testing the ArduCopter 3DR DIY 2014 Quad small unmanned aerial mapping system.

### Technology Demonstration Day

A technology demonstration of small unmanned aerial mapping systems has been scheduled for Tuesday September 1, 2015 at Markham Airport located approximately 30 km north-east of York University. The guidelines and parameters of the technology demonstration day event have been approved by Transport Canada. Participants are required to have a valid Special Flight Operations Certificate (SFOC) obtained from Transport Canada for this event. The SFOC should incorporate the approved by Transport Canada UAV-g 2015 demonstration event guidelines and parameters document.

### Sponsorships and Exhibition

Various sponsorship packages are available and provide excellent opportunities to promote companies and organizations and ensure a high degree of exposure to the conference delegates. The Exhibition will provide an opportunity for companies and organisations to highlight their products and services, and promote their interest to professional delegates. For details please see the Prospectus for Exhibitors and Sponsors on the conference website. AOLS is a Bronze sponsor of the UAV-g 2015.

### Post-conference publication

A special theme issue on sUAS in geomatics is planned

*cont'd on page 6*

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for the *Journal of Unmanned Vehicle Systems*, the official journal of Unmanned Systems Canada. Authors of the conference papers are invited to consider submitting an extended and revised version of their papers for this special publication.

UAV-g 2015 is organized by the ISPRS ICWG I/Vb on Unmanned Vehicle Systems (UVS): Sensors and Applications and is hosted by the Geomatics Engineering program, Lassonde School of Engineering, York University. The event is supported by the Canadian Institute of Geomatics (CIG).

We look forward to welcoming you in Toronto for the UAV-g 2015 International Conference. The Program overview and information on Tutorials/Workshops and Registration details can be found at [www.uav-g-2015.ca](http://www.uav-g-2015.ca)



ArduCopter 3DR DIY 2014 Quad small unmanned aerial mapping system

Please visit the conference web site for information and updates.



## NEWS FROM 1043

### Changes to the Register

#### MEMBERS DECEASED

Andrew Gibson	918	Mar. 22, 2015
Albinas Tarvydas	937	Mar. 27, 2015
Michael J. Terry	1514	Apr. 7, 2015
Robert T. Hanson	1241	Apr. 30, 2015
Herbert Todgham	682	May 18, 2015

#### RETIREMENTS/RESIGNATIONS

William A. Woitowich	CR151	Dec. 31, 2014
Alvin D. McCausland	CR181	Dec. 31, 2014
Bruce A. Donaldson	1125	Dec. 31, 2014
Lambro Misofi	CR153	Dec. 31, 2014
Richard C. Dixon	1478	Dec. 31, 2014

#### CANCELLED

M. Peter Allen	1407	June 1, 2015
Wayne R. Wollerman	1409	June 1, 2015

#### REINSTATED

Paul J. Benedict	1800	Apr. 23, 2015
Talson E. Rody	1096	May 27, 2015

#### COFA'S ISSUED

WSP Geomatics (Ontario) Inc.  
Markham, Ontario, May 4, 2015  
Paul Goodridge, Ontario Land Surveyor  
North Bay, Ontario, May 15, 2015

#### COFA'S RELINQUISHED

R.G. McKibbon Limited  
Markham, Ontario, May 25, 2015

#### COFA'S CANCELLED

Grange W. Elliott Ltd.  
Kingston, Ontario, June 1, 2015

### Surveyors in Transit

**Robert C. Hawkins** is now the Managing OLS at **L.U. Maughan Company Limited** located at 5 McMurray Street, Parry Sound, ON, P2A 1E6.

**Michael J. Simpson** is no longer with **exp Geomatics Inc.** in North Bay, ON.

**Adam M. Stephen** is now the managing OLS at **WSP Geomatics (Ontario) Inc.** located at 600 Cochrane Drive, Markham, ON, L3R 5K3. Phone: 905-475-7270.

**Surveyors On Site Inc.** is now located at 3244 Walker Road, Unit 3, Windsor, ON, N8W 3R8. Phone: 519-890-4219.

**Paul G. Goodridge** is no longer with **Stantec Geomatics Ltd.** and is now the managing OLS at **Paul Goodridge, Ontario Land Surveyor** located at Unit #1 - 490 Main Street East, North Bay, ON, P1B 1B5, Phone: 705-493-1770.

**Stantec Geomatics Ltd.** has closed its office in North Bay, ON.

**Bryan W. Tamblyn** is no longer with **Macdonald Tamblyn Lord Surveying (A Division of J.D. Barnes Ltd.)**.

**Shawn Hodgson** is now the managing OLS at the Mississauga office of **MMM Geomatics Ontario Limited** which has moved to 2655 North Sheridan Way, Suite 300, Mississauga, ON, L5K 2P8. Phone: 905-823-8500, Fax: 905-823-8503.

**Fernando de Luca** is now located at **MMM Geomatics Ontario Limited** in Thornhill, ON.

**Ganesh Sundar** is no longer with **Hopkins Chitty Land Surveyors Inc.**

**R.G. McKibbon Limited** has been acquired by **Lloyd & Purcell Ltd.** **Robert W. McKibbon** is now with **Lloyd & Purcell Ltd.** located at 1228 Gorham Street, Unit 28, Newmarket, ON, L3Y 8Z1. Phone: 905-895-6416, Fax: 905-853-5837.

**Jason Chun-Ho Mo**, who had moved with **R.G. McKibbon Limited** to **Lloyd & Purcell Ltd.** is no longer with the company.

**Talson Rody** is now with **Rugged Geomatics Inc.** located at 138 Main Street South, Kenora, ON, P9N 1S9. Phone: 807-468-8516.

**Paul R. Thomsen** is now the managing OLS at **Zubek, Emo, Patten & Thomsen Ltd.**



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# Can Drones Help Our Wildlife?

By David M. Bird, Ph.D. and Dominique Chabot, Ph.D.

*This article is based upon a more extensive review paper which has been accepted for publication in a Special Wildlife Issue of the Journal of Unmanned Vehicle Systems [www.nrcresearchpress.com/journal/juvs](http://www.nrcresearchpress.com/journal/juvs)*

**W**ildlife science generally refers to the study, monitoring and management of wild mammals, birds, reptiles, and amphibians (and occasionally fish), as well as their habitats. The monitoring and management components render it a distinctly practical and applied field of science, in particular because they routinely involve urgent objectives (e.g. saving threatened species before they go extinct or controlling nuisance species before they cause significant damage), with limited resources to tackle them. Moreover, wildlife is inherently challenging to study and manage—wild animals tend to be elusive, wide-ranging, sensitive to human disturbance and/or dangerous to approach. In addition, the habitats they occupy tend to be remote, expansive, and/or otherwise challenging to impossible to access or navigate at ground level.

Consequently, the science of wildlife biology has historically derived great benefits from various technologies that help to overcome these challenges. Notable examples include aircraft, remote sensing satellites, radar, thermal cameras, motion-triggered camera traps, projectile-based animal capturing devices and chemical immobilization agents, and a wide array of animal-borne electronic tracking and logging devices.

The twenty-first century has ushered in a steady rise in the development and application of a new technology that promises to offer further support to wildlife science: unmanned aircraft systems (UAS), also known as unmanned aerial vehicles (UAV), remotely piloted aircraft systems (RPAS) or, popularly, drones. Following decades of exclusive use by militaries, drones now continue to find new usages in an ever-growing variety of fields in the civil sector—including wildlife science—thanks to their ability to collect very high-resolution aerial data in a distinctly timely, repeatable and unobtrusive manner, notably over areas that are difficult to access or navigate at ground level.

## Drones for optical surveying and observation of animals

Much work to date has focused on surveying and observing wildlife species with various cameras, as drones are seen to offer a safe, convenient and low-disturbance means of acquiring high-resolution imagery of animals, particularly in locations that are difficult to access or survey from the ground.

### Mammals

Drone surveying and observation of aquatic mammals has overall received the most focus out of any category of wildlife, owing to their inherently hard-to-access aquatic habitats, which in many cases are so remote as to be hazardous to survey by manned aircraft. Indeed, lives have been lost in the process of carrying out long-range aerial surveys of marine mammals in remote regions. The earliest accounts of aquatic mammal observation using drones involved tethered airship systems. A system equipped with a video camera was used to measure the length of manatees

congregating in Homosassa River, Florida, while others have employed a similar system to monitor the responses of bottlenose dolphins to boat traffic in Sarasota Bay, Florida.

With the rise of more sophisticated autonomous drones, attention turned to larger-scale detection and monitoring of cetaceans, e.g. whales, dolphins, etc. However, to this day these endeavours have yet to move past the trial phase, mainly impeded by airspace regulations which tend to restrict drone flights to within visual line of sight

of ground-level operators. There has been interest in proposed design considerations for a drone-based monitoring system intended to alert ships of risks of collisions with large cetaceans. Several studies have focused on a lightweight multispectral imaging system intended to be carried by small UAS, designed to detect cetaceans at or near the water surface. Others have studied using drones as



McGill University wildlife biology student, Dominique Chabot, sets up an Aerial Insight AI-Multi drone.

a safer alternative to manned aircraft for large-scale monitoring of ocean-dwelling cetaceans, including trials with both decoy and live whales, an assessment of the potential suitability of various available drone models for performing such monitoring, and a comparison of marine mammal detections by live surveyors versus analysts of digital imagery. Proof-of-concept experiments definitely demonstrate that a drone can be capable of autonomously detecting and tracking moving whales at the water surface.

Hand-launched, fixed-wing drones have also been used in Florida to monitor manatees, which are relatively more amenable than cetaceans to drone surveys due to their tendency to congregate in warm, shallow waters that can be overflown within visual line of sight of operators on the shore. A larger catapult-launched system has been used to survey dugongs in Shark Bay, Australia, followed by the development of an algorithm for automatic detection of the animals in the digital imagery. Finally, pinnipeds, e.g. seals, walrus, etc., are similarly amenable to relatively small-scale drone surveys due to their tendency to congregate at rookeries and haul-out sites, though reports of such surveys have been somewhat limited. One study in 2009 deployed a high-endurance drone from a ship to survey for Alaskan ice seals, and most recently a small vertical-takeoff-and-landing (VTOL), multi-rotor drone was used to census

Antarctic fur seal rookeries and obtain morphometric data on leopard seals.

Large terrestrial herbivores have also been the subjects of drone-based surveying, though as with ocean-dwelling cetaceans it has been noted that airspace regulations as well as the limited endurance of small consumer-grade drones tend to preclude effective monitoring of these animals throughout their expansive ranges. Drones have been used to perform a head count at a bison range, while a small, low-flying multirotor system equipped with a thermal camera has been designed to detect concealed meadow-dwelling roe deer fawns which are susceptible to being killed by pasture mowing machines. Other efforts have focused on African and Southeast Asian megafauna, namely elephants, rhinoceros and giraffes, including in the context of anti-poaching efforts. Image analysis techniques, aimed at automatically detecting and counting these animals in drone imagery, have also been recently developed.

Finally, drones have detected orangutan nests as well as northern pocket gopher mounds in grasslands. One study demonstrated the automatic detection of rabbits in thermal imagery captured from a lift, intended to simulate a low-flying drone scanning for small concealed animals in the path of agricultural machinery.

*cont'd on page 10*

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Dominique launches the drone to collect high-resolution imagery of critical wetland habitat for the threatened Least Bittern, a tiny heron.

eagles and crows. Some researchers have also succeeded in capturing close-up imagery of white stork nests atop transmission towers by flying a fixed-wing drone overhead.

### Reptiles and Amphibians

Drones have not yet become popular for use in studying reptiles and amphibians, but some progress has been made in detecting live and decoy alligators and sea turtles.

### Conclusions

Since the turn of the century, rapidly evolving drone technology has progressively made inroads into the field of wildlife research and management, and we feel that there remains much untapped potential. Drones are particularly well suited for collecting data at an intermediate spatial scale between what is easily coverable on the ground and what is economically coverable with conventional aircraft. They have proven useful as a convenient, timely, and unobtrusive means of surveying wild animals and their habitats in areas that are hard to

### Birds

For similar reasons to aquatic mammals, waterbirds have received the most focus to date when it comes to surveying birds with drones. Waterbirds tend to live in hard-to-access habitats (e.g. wetlands, islands, offshore waters) that drones may conveniently overfly, as well as conspicuously aggregate in relatively small, open areas for various activities including breeding, foraging, roosting, moulting, and staging during migration. Moreover, waterbird aggregations tend to be sensitive to overt disturbance and even aggressive towards investigators (e.g. mobbing).

Although accounts of detection of various wading bird species in drone imagery were reported as far back as 2005, we evaluated a basic fixed-wing drone for surveying staging flocks of Canada and snow geese. There has been particular interest in using small, unobtrusive drones to survey dense and sensitive breeding colonies of, for example, gulls, terns and penquins as an alternative to ground surveys or conventional aerial surveys. Reactions of non-breeding mallards, greater flamingos, and common greenshanks to small multirotor drones of varying colour, speed and approach angle have also been systematically assessed.

Another emerging application involves the use of small multirotor systems to perform nest checks, which is seen as a safer and more convenient alternative to either physical climbing or using conventional helicopters or light airplanes to survey hard-to-reach nests on trees, cliffs or artificial structures, and/or for highly defensive birds that attack intruders. Examples include surveying the nests of hawks,

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access or navigate from the ground, as well as for distinctly sensitive or aggressive species. They also allow unprecedented close-up remote observation of focal subjects in hard-to-reach places.

Beyond various technological limitations, a major challenge to drone operation still remains airspace regulations, which currently tend to range from highly restrictive to prohibitive in most developed countries. In particular, flying drones beyond visual line of sight of ground operators is commonly forbidden, which precludes many potential applications. We urge prospective users to familiarize themselves with local regulations governing the use of drones as one of the first steps in project planning. It is generally anticipated that regulatory restrictions will gradually ease up as the use of drones becomes increasingly ubiquitous and proven, and particularly when more sophisticated collision-avoidance systems are achieved.



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# The Algonquin Radio Observatory

By Catherine Tsouvaltsidis

**T**he Algonquin Radio Observatory (ARO) is a radio telescope research facility located in Algonquin Provincial Park in Ontario, Canada. The site's primary instruments are a 46 m fully-steerable parabolic-dish radio antenna and 11 m dish (presently in refurbishment). ARO has been under Thoth Technology's operation since 2007. The company houses three divisions; miniaturized space instrumentation, space qualification and testing, and space tracking and communications. The miniaturized space instrumentation division showcases the award winning Argus infrared spectrometer and Aurora linescan camera, while the space qualification and testing division utilizes a thermal vacuum chamber and vibration chamber. The space tracking and deep space communications division is housed at the Algonquin Radio Observatory, offering astrophysical services, deep-space communications, and space mission and geodetic reference services.

## ARO's Rich History

The National Research Council of Canada (NRC) inaugurated the construction of ARO in 1959. The construction of the site's buildings, dishes, horns, and feeds occurred in phases from 1964 onwards. The ARO antenna reflector is 46 m in diameter and the first 36.6 m is made up of 0.364 cm steel plates surrounded by 4.6 m of steel mesh. The surface accuracy was designed to be 0.32 cm for the solid portion and 0.64 cm for the mesh.

During the site's operation under NRC, ARO became the first telescope used to demonstrate the Very Long Baseline Interferometry (VLBI) technique in 1967 with a team that comprised the National Research Council of Canada and Dominion Radio Astronomical Observatory (Penticton, BC). Originally developed for studying deep space radio objects in the universe, it can also be used for very precise studies and measurements of the Earth. The VLBI process allows the relative time-of-arrival of signals from the source to each telescope to be determined to within a few picoseconds (3 picoseconds of light travel time equates to a 1 mm movement). By observing many radio sources that are spread widely over the sky over the course of a day, the ultra-precise measurements of the Earth and its orientation in space can be inferred.

In 1991, the responsibility of the ARO site was transferred to Natural Resources Canada (NRCAN). A team comprising NRCAN, Space Geodynamics Laboratory (SGL), and CRESTech primarily used the telescope in VLBI projects to

measure the movements of continental plates in geodetic surveys. Several upgrades to the 46 m telescope were made after taking over operations, allowing it to track at higher speeds in order to participate in satellite tracking.

The antenna is surrounded by a high stability network consisting of 13 concrete piers. The high stability network was continuously and precisely measured multiple times throughout the period from 1991 to 2006 in order to obtain the geodetic tie between VLBI, GPS and SLR (satellite laser ranging) system to a few millimeters precision. Through the use of ARO's main 46 m dish, Canada participated in International VLBI efforts. The worldwide association produced a 30000 km baseline telescope. The ARO system used the S2 system, developed at York University, for its data acquisition. ARO was the largest dish participating and therefore had the most sensitive IVS network station. During this time period, NRCAN maintained a permanent GPS monitoring station at ARO which was used by all International GPS service stations as a fiducial reference. ARO also participated in international astronomical observations as a part of the Polar Bear Network and performed radar observations of satellites and asteroids.

Radio astronomy and geodesy require the very careful measurement of timing signals in order to extract useful data from observations. Algonquin Radio Observatory has its own atomic clock (hydrogen maser) to precisely keep track of time. Accurate to 1 part in  $10^{15}$ , the clock loses less than one second in 30 million years. Its accuracy relies on the precise measurement of hydrogen atoms as they decay from one electronic state to another. The clock operates year-round and supplies its information to the Canadian government. Currently the information provided by the maser and a network of GPS antennas is used to compute the corrections to the orbits of GPS satellites in order to remove orbital precession. This information is vital – without it GPS receivers would slowly incur errors in position, resulting in decreased navigation performance.

ARO is a continuously tracking GNSS station and is a part of the Canadian Active Control System. The GNSS reference mark consists of a brass plate with a forced centered stainless steel bolt embedded on top of a 2.0 m high concrete pier. The concrete pier is anchored to exposed bedrock by steel reinforcing rods. The site also participates in the Canadian National Gravity Network. The station is embedded with a brass screw that is flush with the surface of the floor. It is used to measure the precise gravity value in order to infer the



Figure 1 – GNSS and Gravity

movements of the Precambrian bedrock underneath the site. The last measurement was found to be  $9.805977300 \text{ m/s}^2$ .

### Spectral Imaging with Drones

Currently Thoth Technology Inc. (Thoth) uses the ARO site for many different purposes, from spectral imaging campaigns to pulsar research and for participating in space situational awareness work. The spectral imaging campaigns focus on data collected by drones using spectra taken with either an Argus or Aurora instrument.

Researchers at York University are working in conjunction with Thoth at the ARO site as a part of a spectral imaging campaign. They are using an Argus 1000 Infrared Spectrometer to obtain a ground-based truth for spectral imagery taken from space. Currently an Argus 1000 instrument takes space-based imagery aboard the Canadian nanosatellite CanX-2. On the CanX-2 mission, the Argus spectrometer observes reflected infrared solar radiation emitted by Earth surface targets as small as  $1.5 \text{ km}^2$  using optical wavelengths within the  $0.9\text{-}1.7 \mu\text{m}$  range. Over the past five years that Argus has been in operation, more than 200 observations from a series of land and ocean targets have been imaged.



Figure 2 – UAV

The drone payload system used for the field campaign consists of an Argus spectrometer, optical camera, GPS, and attitude sensors integrated into a low-cost, unmanned aerial vehicle (UAV). The UAV is a battery powered vertical take-off and landing (VTOL) system with six motors placed in a Y configuration. The 880 Kv motors and 30 A electronic speed controllers (ESC) were chosen to be able to deliver a strong lift and ability for the UAV to carry the entire system during the imaging campaign. The system weighs 2.6 kg. The Argus 1000 is controlled and its output data is logged by a BeagleBone Black development platform. The BeagleBone Black was chosen for its

simplicity, light mass, and ease to program and control remotely using an XBee radio module. The data is saved to a micro-SD card. During flight, the GPS coordinate and drone telemetry values are logged at 1 second intervals. Special Flight Operations Certificates are obtained previous to any drone flight and are maintained according to Transport Canada regulations.

Infrared (IR) spectra obtained over exposed soil will be used to correlate soil health information, while coastline data will be used to assess geolocation accuracy using a coastline crossing detection algorithm developed at York University.

The Aurora instrument will be flown over the site's private power lines in order to locate potential problems and assist utilities with eliminating failures in transmission and distribution of power to the ARO site. The camera renders an

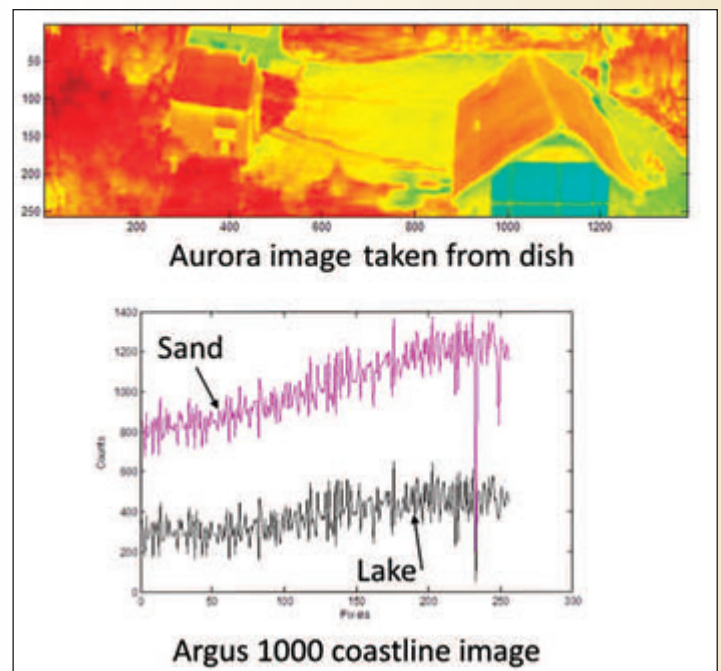


Figure 3 – Argus and Aurora

cont'd on page 14

image of an object's thermal emissions which is then analyzed post-collection. Used in conjunction with a time-stamped GPS collection, power line problems such as bad splices and failing insulators can be marked for maintenance and repair quickly and efficiently.

### Further Research at ARO

The ARO dish is now being used for a variety of projects including galactic imaging using radio antennas, pulsar research and space situational awareness work. Deep space objects will be imaged using a custom radio antenna array. Each antenna of the array will measure the power level, with each pixel showcasing different values based on how the object is emitting radiation. This will be used to create radio imagery. The system currently has 4x3 pixels, with each pixel space at 0.5 degree apart, but this will be increased to ½ HD quality over time. The same system will be used to increase telescope accuracy when pointing at objects in low Earth orbit, such as satellites. The power received at each antenna will be used in order to determine where the satellite lies to 1/5 of a pixel accuracy.

Since 2012, the main instrument has participated with the Canadian Institute for Theoretical Astrophysics in an inter-

national collaboration to observe pulsars at long wavelengths. The observatory hosts the Long Wavelength Laboratory of the University of Toronto, Dunlap Institute for Astronomy & Astrophysics. The telescope is operated in a global network with other large radio telescopes around the world in order to create an interferometric array. By careful correlation of this data, researchers hope to create a telescope aperture with a resolving power equivalent to the diameter of the Earth.

The Algonquin Radio Observatory's House offers a chance to see Canada's largest radio telescope while staying in a comfortable accommodation surrounded by the natural beauty of Algonquin Park. Take a tour of the radio observatory for a behind the scenes view of one of Canada's engineering marvels. Packages include a full meal plan, accommodation, use of the lodge's amenities, and a tour of the observatory. Please visit [www.aroncanada.com](http://www.aroncanada.com) to learn more and book a weekend stay.



**Catherine Tsouvaltsidis** is the Head of Research and Development at Thoth Technology Inc. She can be reached by email at [catherine@thothx.com](mailto:catherine@thothx.com) for further information.



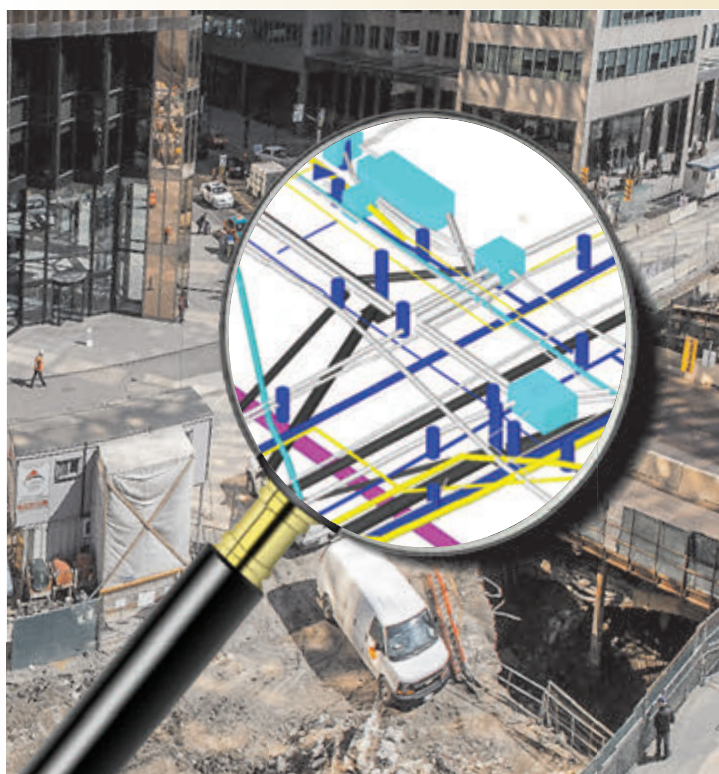
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# UAV Aerial Topographic Surveying Can it Replace GPS Ground Topographic Surveys?

## A Case Study

By Brian Kerr, O.L.S., C.L.S., O.L.I.P. and  
Jean-Francois Dionne, GISP, C.Tech

### BACKGROUND

In May 2015, McIntosh Perry Surveying Inc. collaborated with UKKO to conduct a test of an eBee RTK flying wing with the capability of acquiring low altitude aerial photography. The purpose of the test was to compare the accuracies of horizontal positions and vertical elevations against a topographic and site detail survey completed by McIntosh Perry



Orthomosaic of Site

on the same property in 2014 using Trimble R8 base and rover RTK GPS units.

The site is primarily farmland; set on 40 hectares of land surrounded by a combination of rural residential, commercial and industrial properties and lies within 3 km of an uncontrolled airport. Most of the site is relatively level, and consists of open fields with occasional intervening tree lines.

The land is currently being considered for development, and will require a detailed base plan which includes boundary and title information, accurate locations of all existing buildings, drainage features, service locations, access points, tree lines and bush areas, and a comprehensive contoured terrain model. The modern development process in Ontario



Jean-Francois Dionne of UKKO preparing the SenseFly eBee UAV for its mission.

considers cultural and environmental constraints in the form of wetland areas, endangered species, archaeological features and woodland preservation. It must also address serviceability issues, such as stormwater management, utility installations, water supply and sanitary sewer locations, as well as the road and parcel design of the development. The base plan, which is in reality a three-dimensional digital model, begins by accurately representing the existing site conditions, but grows as a living digital document, as the cultural, environmental, servicing and design information is compiled and layered into the base plan.

### THE GROUND RTK GPS SURVEY

McIntosh Perry's previous survey of the site was completed in late 2014 by visually identifying and taking RTK GPS observations at break lines and physical features such as ditches and culverts, laneways, buildings, visible pole lines and adjacent road surfaces. The site was covered with a light layer of snow during the field survey, but the ground surface was easily identifiable. The field topographic survey resulted in the acquisition of approximately 1800 data points, each with x, y & z coordinates. A digital terrain model was prepared from the acquired data and contours were developed using CAD software for inclusion into the base plan. Field accuracies were observed to provide results between 3 and 8 cm in each of the 3 axes over 95%+ of the observations, with combined accuracies averaging 5 to 6 cm. These results were achieved by using a fixed base station. This level of accuracy was required by the design engineers, so they could prepare a preliminary servicing plan with confidence that the stormwater management concept would be workable once the development had been approved by the municipal authority.

## THE eBee UNMANNED AERIAL VEHICLE

In May 2015, McIntosh Perry and UKKO agreed to perform a comprehensive test to compare the accuracies, timing and cost of an aerial survey performed by UKKO's eBee RTK fixed wing UAV with the more conventional ground RTK GPS topographic survey completed in 2014.

The eBee RTK flying wing carries an on-board Sony 18 Megapixel camera and operates much like conventional aerial photography platforms, with two notable differences: the eBee is an unmanned aircraft weighing only 850 grams, and the on-board camera is an inexpensive point-and-shoot camera. The eBee achieves its high photo resolution by flying at altitudes of less than 120 metres, where 1 pixel on the photograph is equivalent to 3 cm on the ground. The light weight and strong safety profile of this aircraft can exempt it under specific conditions from Transport Canada regulations which would otherwise require acquisition of a Special Flight Operating Certificate (SFOC) for each flight.

The UAV is controlled by software called eMotion2, which allows the operator to use a laptop in the field to prepare the flight plan, monitor the aircraft's exact position at all times, and control the unit while in the air. The software also acts as an interface between the UAV and the GPS base station.

## THE eBee AERIAL SURVEY

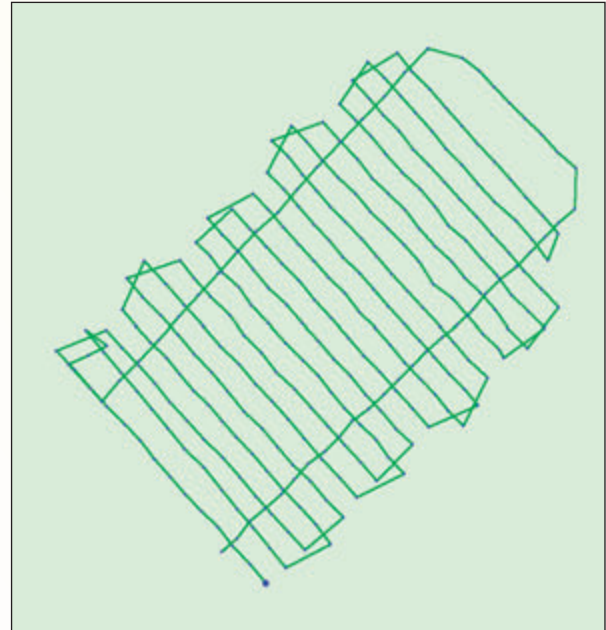
A Trimble R10 RTK GPS unit set on a point with known coordinates was used as the base station for this survey. The GPS unit was provided by Cansel to use specifically for this test. The known latitude, longitude and ellipsoid height for the base were entered through the eMotion software on the laptop controller, and the base was connected to the UAV through the laptop, where real time RTK corrections could be pushed to the UAV during the flight. The onboard RTK GPS receiver in the aircraft constantly updated the laptop with the calculated deviation of its 'fix' from the base station, a value which averaged <2 cm throughout the flight.

For accuracy comparisons, McIntosh Perry had previously set 6 targeted ground control points (GCP). These GCPs were not used in processing the final data, but only as a check on the accuracy of the positioning determined by processing the data acquired by the UAV.

The mission plan was entered into the laptop; the photographs would be taken with a lateral overlap of 70% and a longitudinal overlap of 85%. The maximum altitude for the mission was 100 metres, providing a ground resolution of 3cm/pixel. Setup required about 10 minutes.

The eBee was hand-launched and flew a predetermined pattern of flight lines as preprogrammed in the mission planning software, acquiring 314 photographs in just over 28 minutes. During the mission, winds peaked at 18 km/hour, and the UAV was able to adjust its track using the onboard RTK GPS unit and its attitude (correcting for yaw, pitch and roll) using the on-board accelerometer.

The proximity to the airport required the operator to be aware of air traffic at all times, both visually and with the use of a radio tuned to the advisory frequency of the airport. The

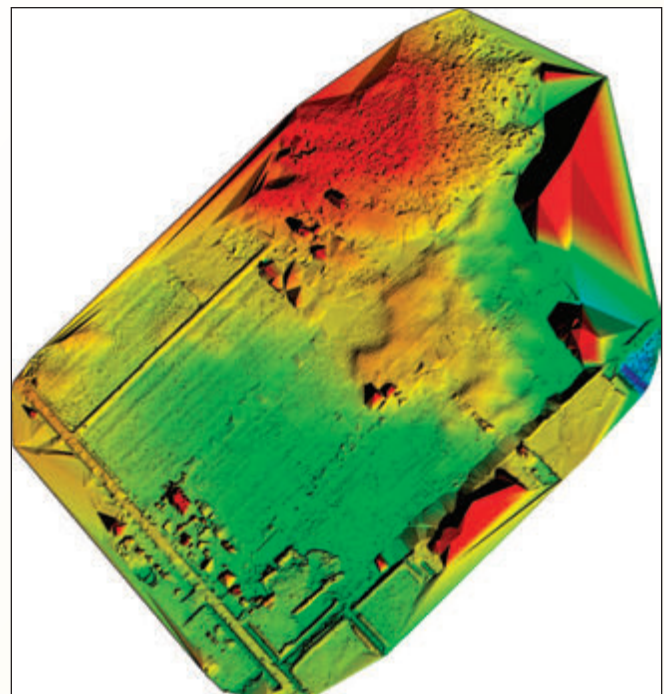


Flight Lines and Photo-Centres

UAV was diverted on one occasion to ensure good separation from an aircraft climbing out on the aerodrome circuit. The diversion instruction to the UAV was performed quickly, the UAV moved to a 'hold and orbit' location, and the survey resumed as soon as the airspace was clear.

## RESULTS

The post-processing software supplied with this unit, known as PostFlight Terra 3D, provides the aerotriangulation function for the photographs, configures the coordinate system to the one used in the original topographic ground survey (in this case NAD83CSRS MTM Zone 9), and the adjustment of the geoid separation of the base to orthometric elevations.



Surface Model

*cont'd on page 18*

The software generates a point cloud, in this case at a density of 115 points per cubic metre, or a total of over 31 million individual observations across this property.

A comparison of the digital terrain models created from the ground survey and from the aerial survey indicates an average standard deviation of 5 cm in vertical values across the site, well within the requirements for creation of the preliminary servicing plan by the design engineers.

The table in Figure 1 indicates comparative values

be <5 cm on photo-identifiable hard points, and vertical deviations between 5 and 10 cm on ground shots. The vastly greater number of observations achieved using the UAV, as represented in Figure 2, indicates the limited effectiveness of having field crews select and observe on sufficient ground points to provide an accurate surface model. The 20 centimetre difference between ground elevations along the slope shown in Figure 2 is probably attributable to there being only 3 ground observations along the slope on this profile,

compared with approximately 360 aerial observations along the same length.

Accuracy Comparison Between eBee Observations and McIntosh Perry Ground Control			
GCP Name	Accuracy (m)		
	X (m)	Y (m)	Z (m)
210000	0.045	-0.008	-0.067
210001	0.032	0.030	0.034
210003	0.088	0.017	0.042
210004	-0.022	0.039	-0.077
210006	-0.043	0.070	0.036
210007	0.020	0.021	0.063
Mean	0.016	0.028	0.003
Sigma	0.043831	0.023433	0.054605
RMS Error	0.046891	0.036551	0.054718

Figure 1

achieved against the 6 targeted ground control points, based on the aerotriangulation. The Sigma and RMS Error values give the clearest picture of actual deviations between the two sets of values.

Figure 2 illustrates the relative data point distribution along a sample profile approximately 180 metres in length. Where field personnel acquired positional information of 7 ground topographic points along this profile, the eBee acquired approximately 1700 data points. The illustrated profile is a representative sample of many others which were examined across the 2 models. Deviations between ground-surveyed locations and aerial-surveyed locations across the site tended to be accurately reflected in the RMS values shown in Figure 1. At most points sampled, the horizontal deviations tended to

### SUMMARY

This test has shown that a terrain model created from data acquired by aerial means using the eBee platform can successfully compete in accuracy with a conventional ground topographic survey completed using RTK GNSS receivers, comprising a base and rover. These results are consistently suitable for pre-

engineering design and well above the requirements for draft plans of subdivision.

The real benefits of this technology are not simply in duplicating conventional results, however.

The time required to do these surveys is substantially different. The ground survey required 4 days of field time, while the aerial survey required 1 hour, including setup and teardown. Setting and targeting the ground control points added another 3 hours to the ground survey in this case, but that function was for testing purposes only, and would not normally be done for an RTK GPS-controlled aerial survey. Post-processing time is similar in both cases, although there are more options available using the PostFlight Terra 3D software than there are using CAD software. Such a substan-

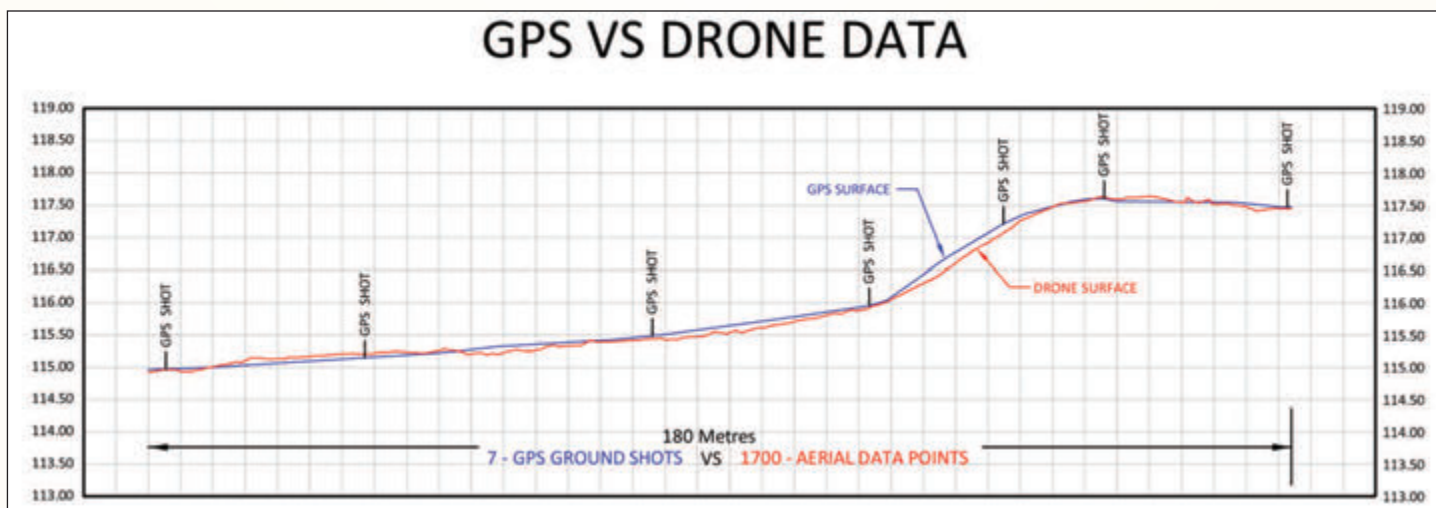


Figure 2

tial decrease in field personnel time translates to an equally substantial cost saving.

The larger benefit of the aerial survey, however, is in the amount of data acquired. In this case, the ground survey acquired 1800 data points, selectively chosen by the trained eye of the field personnel. There are limitations to how well the survey crew can consistently pick terrain break lines, as seen in the slope example above. By comparison, the aerial survey acquired over 31 million data points at a density of 115 points per cubic metre. With such a high density of data acquisition, there is no need for the aerial platform to differentiate between ground features to provide an accurate depiction of the surface. It simply records everything it “sees” in great detail. Based on this test, the surfaces generated by the aerial survey can be relied on to provide accurate topography and site detail at all points on the surface, without the large amount of interpolation required to construct a terrain model based on much more limited numbers of ground observations.

The implications of such a massive volume of data are two-fold. First, it will be necessary to edit data files down to manageable sizes, so the data can be accommodated by most office computer systems. Second, the availability of



The SenseFly eBee UAV with On-Board RTK Survey Accuracy GPS Location Capability.

those 31 million points signals a paradigm shift in how surveyors will view surveying. With this aerial platform, the high density, saturated point cloud becomes a permanent resource which can be referred to without the need to send field personnel back to the site. Even though, for ease of use, the data file may be edited down to a fraction of its size

*cont'd on page 20*

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after the terrain model has been constructed, it remains available in raw form should a requirement arise to focus down on a particularly complex portion of the site, such as converging slopes in a ditch, landscaped or hard surfaced features, fences, utility installations or even buildings, which can be viewed not only from the zenith but also in oblique views.

In other words, the paradigm which surveyors and other professionals live with today, namely that surveying is done in the field and processing is done in the office, will shift to one where data acquisition is done in the field and surveying is done in the office. It is having the property, in virtual form, right in your office, and being able to return to it, measure it, visualize it and design within it, without ever leaving your chair.



**Brian Kerr** is a Senior Project Manager with McIntosh Perry Surveying Inc., specializing in applications of aerial technology in surveying and mapping. He can be reached at [b.kerr@mcintoshperry.com](mailto:b.kerr@mcintoshperry.com) Credit for all photos: Brian Kerr.

**Jean-Francois Dionne** is the UAV/UAS Technical Survey Specialist with UKKO (A Division of AG Business & Crop Inc.), specializing in the operation and sales of the senseFly eBee RTK Mapping UAV and senseFly eXom



Kyle Mannion of McIntosh Perry Surveying Inc. launching the eBee UAV.

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# Discovering history in Canada's Arctic waters HMS *Erebus* found

By Theresa Nichols<sup>i</sup>, Scott Youngblut<sup>ii</sup>, Jonathan Moore<sup>iii</sup> and Ryan Harris<sup>iii</sup>

<sup>i</sup>Communications, Fisheries and Oceans Canada <sup>ii</sup>Canadian Hydrographic Service, Fisheries and Oceans Canada <sup>iii</sup>Underwater Archaeology Team, Parks Canada

The 2014 discovery of HMS *Erebus*, one of Sir John Franklin's two lost ships, solved a key part of a mystery stemming back over a century-and-a-half, which saw the doomed ships beset in ice in 1846 while searching for Canada's Northwest Passage. None of the crew survived the expedition. Its companion vessel, HMS *Terror*, remains to be discovered.

Since 2008, Parks Canada has led a collaborative effort searching for the lost ships. Throughout these searches, Parks Canada garnered the support of numerous organizations that contributed to research and surveying efforts. Partners for the 2014 search included Fisheries and Oceans Canada (the Canadian Hydrographic Service and the Canadian Coast Guard), the Government of Nunavut, Environment Canada's Canadian Ice Service, the Canadian Space Agency, the Department of National Defence (Royal Canadian Navy and Defence Research and Development Canada), and the privately funded Arctic Research Foundation. New to the project in 2014 were the Royal Canadian Geographical Society, the W. Garfield Weston Foundation, Shell Canada, Lion TV and One Ocean Expeditions.

On September 1, 2014, a breakthrough clue that ultimately led to the location of the wreck of HMS *Erebus* was found on an island in eastern Queen Maud Gulf. A heel of a davit from a British naval ship was found by the helicopter pilot from the Canadian Coast Guard icebreaker *Sir Wilfrid Laurier*, Andrew Stirling, while conducting ground surveys with the Government of Nunavut's archeological team, Doug Stenton and Robert Park. A Nunavut-federal joint News Release outlining the find and related images of the artefacts was issued on September 8, 2014.

Following the land-based find, Parks Canada marine archeologists amended their target search area using their own survey and diving boat R/V *Investigator*, deployed from CCGS *Sir Wilfrid Laurier*. It would be the side-scan sonar of R/V *Investigator* that would capture the first images of the nearly intact ship sitting upright on the seafloor.

A subsequent inspection by Parks Canada using its remotely-operated vehicle (ROV) confirmed the wreck as one of Franklin's, seen for the first time after more than 166 years of searching. Later, two days of diving operations by Parks Canada's marine archeologists would provide invaluable first-hand views of one of Franklin's ships, all of which was captured by underwater camera and video systems. This find would also confirm Inuit oral history of a ship having been seen in this general area. Canada's Prime Minister announced the discovery on September 9, 2014.



Side-scan sonar image of the historic shipwreck HMS *Erebus* as it rests on the seafloor.  
© Parks Canada, 2014

Working around the diving operations, it fell to the Canadian Hydrographic Service to collect high resolution bathymetric data using multibeam sonar equipment, a cutting-edge technology that transmits hundreds of beams of sound through the water to help paint highly detailed images of the seabed. This technology was installed directly onto two hydrographic survey launches, CSL *Kinglett* and CSL *Gannet*, with teams of hydrographers and Coast Guard coxswains, who were tasked to survey the shape and depth of the arctic seabed and to detect all hazards to navigation.

However, in this instance, the high-precision data collected from the Canadian Hydrographic Service multibeam sonars were used to produce three-dimensional images and a digital fly-thru of the shipwreck. This detailed information was used by the marine archaeologists, along with other side-scan sonar data and visual observations made during preliminary dive operations, to confirm the identification of the wreck as the lead vessel in the original 1845 expedition. The official announcement of the ship's identity as HMS *Erebus* was made in the House of Commons on October 1, 2014.



CSL *Kinglett* conducting surveys in the Arctic. Photo credit: Christine Delbridge, Canadian Hydrographic Service, 2014

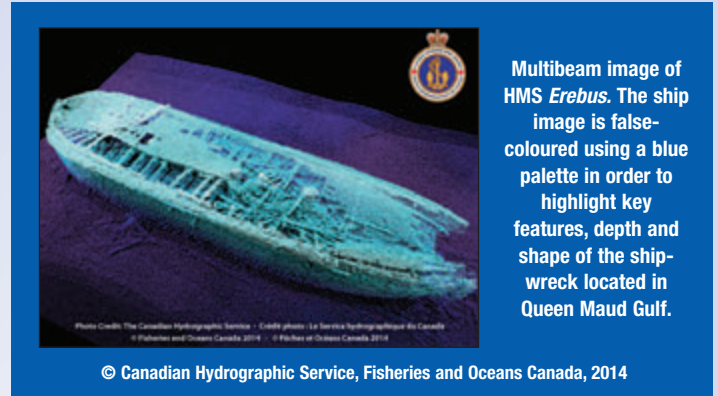
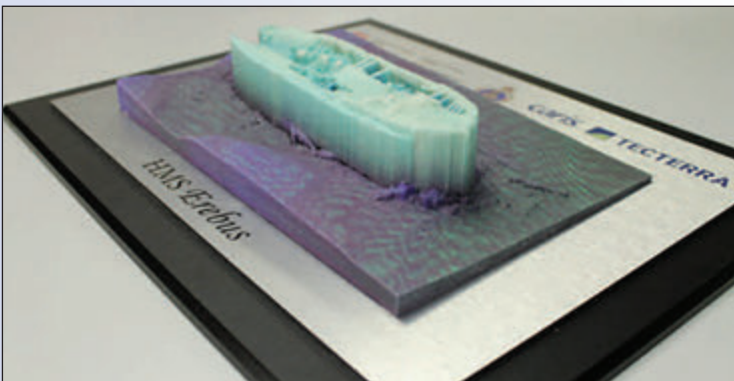




Hydrographers Marcus Beach and Arthur Weickens inside CSL *Gannet*. Photo credit: Christine Delbridge, Canadian Hydrographic Service, 2014

On April 1, 2015, officials from Fisheries and Oceans Canada joined with New Brunswick-based geospatial software company CARIS and Calgary-based geomatics technology innovation support centre TECTERRA to unveil high precision 3D printed models of HMS *Erebus*. The high precision models were printed from the multibeam sonar data collected by the Canadian Hydrographic Service. The bathymetric measurements were processed in seafloor mapping software created by CARIS and exported for use in a 3D printer provided by TECTERRA.

The level of detail in the models provides a clear view of the vessel's current structure, and even shows details of the wooden beams and materials surrounding the wreck, as well




Multibeam image of HMS *Erebus*. The ship image is false-coloured using a blue palette in order to highlight key features, depth and shape of the shipwreck located in Queen Maud Gulf.

© Canadian Hydrographic Service, Fisheries and Oceans Canada, 2014

as one of its anchors that rests off the port side. Being able to generate the models added extra value for Parks Canada archeologists and divers from the Royal Canadian Navy's Fleet Diving Unit Atlantic for their spring dive operations conducted in April into the wreck as part of Operation NUNALIVUT 2015.

And while the archeological achievements are extraordinary, the project continues to successfully demonstrate the value of such collaborative multi-disciplinary ventures, yielding advancements in areas of sovereignty, marine safety, environmental protection, science, history and culture.

Project summer planning is currently underway for 2015, with the team anticipating further investigation of HMS *Erebus* and a continued search for HMS *Terror*. 



cont'd on page 24

## Sites to See

### Samuel Holland 250 Prince Edward Island

<http://samuelholland250pei.ca>

In 1764-65, surveyor Samuel Holland, on orders from the British Crown, created the first truly modern, accurate map of Prince Edward Island, dividing it into townships and counties, and designating its county capitals, including the Provincial capital Charlottetown.

The focus of the *Samuel Holland 250* celebrations will be to educate Islanders and visitors about Samuel Holland, the historical significance of the map, its profound influence on our Island identity, and how it continues to define us today. It will also provide an ideal opportunity to celebrate and explore the Island that his map helped to create.

# The Technologies of the Discovery

## Side-scan Sonar

Klein 3000 and 3000H dual-frequency towed side-scan sonar systems have been the workhorses of the search since 2008, and most recently have been deployed from the Canadian Hydrographic Service launches *Gannet* and *Kinglett*, Parks Canada's *Investigator* and the Arctic Research Foundation's *Martin Bergmann*. Typically data has been collected at 445 KHz, 100 m range and 150 m line spacing to ensure efficient and reliable area coverage. Since the Parks Canada-led search began in 2008, approximately 1,600 square kilometres of seafloor in two distinct zones have been covered by both towed side-scan sonar and AUV-based side-scan.



Parks Canada side-scan sonar towfish, cable and winch on the CHS survey launch *Kinglett* in 2010. Photo credit: Jonathan Moore, Parks Canada

## Remotely Operated Vehicle

Parks Canada's Saab Seaeye Falcon made the first dive to HMS *Erebus*. This inspection-class unit is depth rated for 300 m and is equipped with vectored thrusters, high intensity LED lights and an on-board video camera that can feed high-definition images directly to the surface through a fibre-optic umbilical. A Kongsberg-Simrad MS1000 digital sector-scanning sonar system provides underwater navigation and target imaging.

Parks Canada's ROV on the deck of the diving and survey boat *Investigator* just prior to its first dive to the wreck of HMS

*Erebus* in 2014.

Photo credit: Marc-André Bernier, Parks Canada



## Multibeam Sonar

The primary tool for the acquisition of water depths (bathymetry) is the Multibeam Bathymetric Echosounding System (MBES), also known as a multi-beam echosounder. These high-precision systems allow for mapping large areas of the seabed rapidly with full acoustic bottom coverage required for modern charting purposes. In 2011 R2Sonic 2022 multibeam sonars were installed on the Canadian Hydrographic Service's launches *Kinglett* and *Gannet*. In 2014, the Canadian Hydrographic Service also temporarily installed R2Sonic units directly onto CCGS *Sir Wilfrid Laurier* and on the Royal Canadian Navy's HMCS *Kingston*. The combined Coast Guard and hydrographic teams aboard *Sir Wilfrid Laurier*, *Gannet* and *Kinglett* collected a total of 4,605 line kilometres, representing 459 square kilometres of fully mapped seabed in the Central Arctic. Although HMCS *Kingston* could not reach the intended shipwreck search area in the Central Arctic due to adverse ice conditions, hydrographers worked with naval crew members to survey 2,436 line kilometres, representing 645 square kilometres of fully mapped seabed in the Eastern Arctic,

## Autonomous underwater vehicles

In 2012 Parks Canada made a first trial of autonomous underwater vehicle (AUV) operations in the search for Franklin's ships, partnering with the University of Victoria's Ocean Technology Laboratory to deploy its Bluefin 12 AUV. In 2014, in addition to the towed side-scan systems, Parks Canada deployed its newly-acquired Iver3 AUV equipped with a Klein UUV 3500 dual-frequency side-scan sonar system. It is capable of sustained survey (approaching 8 hours) at a speed of 3 knots. Defence Research and Development Canada deployed its much larger *Arctic Explorer* AUV, equipped with a newly developed Kraken Aquapix Synthetic Aperture Sonar system. This state-of-the-art side-scan system offers three times the range and dramatically increased image resolution compared with traditional towed sonar. Unfortunately, the ability to regularly deploy these AUVs was curtailed by ice conditions and time limitations. For 2014, the AUVs were not involved in the discovery element.



## Sites to See

## International Map Year

<http://mapyear.org>

The International Map Year (IMY) is a worldwide celebration of maps and their unique role in our world. Supported by the United Nations, IMY provides opportunities to demonstrate, follow, and get involved in the art, science and technology of making and using maps and geographic information. International Map Year will be officially opened at the International Cartographic Conference in Rio de Janeiro in August 2015 and then continue until December 2016.

# When Did You Decide to Go into Surveying/Geomatics, and Why?

*An informal poll* By Julia Meldrum Smith

**A** few years ago Blain Martin invited me to participate in a 2-day Strategic Planning session. At one of the meals I was looking around and appreciating the variety of folks there – different ages and personalities, all engaged in the same industry. I was moved to write out a question on over 20 scraps of paper and pass them around to everyone there during the dinner: “When did you decide to go into surveying or become a GIM, and why?”

## Here are the responses:

1985...Was enrolled in a B.Sc. Geography program, which involved survey field work.

1965...I liked the indoor/outdoor as well as doing difficult retracements.

After high school...My marks weren't high enough to get into Phys. Ed at McMaster or Queens. I was good at math so I picked surveying.

Teenage Rebellion? Dad didn't want me to go into surveying so...and I liked a profession that worked inside and outside.

When I visited the university after high school...My love for math and History led me to this profession. I knew I wanted to do Engineering, and Surveying was the only one that interested me.

I decided to go into surveying in high school, not knowing much about it, then moved to New Brunswick to take Geomatics Engineering (took a chance). All because my parents had a survey done and I thought it was neat.

Recommended by my high school guidance councilor but had no idea what it was; good in math and science so options were engineering and surveying- engineering was office-focused, so guess what?

I loved maps and making maps when I was a child. Surveying included this and working outside.

It is the only program that would take me!

2000...AOLS GIM designation was the most suitable certification for GIS professionals at the time.

My dad took me out in the field when I was 10 and taught me trigonometry. I was hooked after that. Left many times, but always came back.

1972...Because I liked taking my shirt off outside in the summer.

When I was 3 my dad left me in the woods with a plumb bob. I was scared and vowed I didn't want to do that! At age 19 I needed a job and called my dad. 18 years later I had enough

experience to be a GIM under section F of the grandfathering provision (all experience) and so now I am one!

1972...I had no idea what I wanted to do after Grade 13 and a buddy was going to Ryerson to take surveying and so I tagged along. He only made it through first semester but here I am 30+ years as an OLS.

When I was 15 years old Surveying was an exciting job because of working outside and every day would be different.

When I was 19 years old and drinking in the “Peter Pond” tavern in Fort McMurray and had just quit my job as a plasterer, a land surveyor hired me on the spot and the rest, as they say, is history!

2 years of partying too much at Western was costing too much so I went into “surveying engineering” at Ryerson instead – no idea what I got into until my 3<sup>rd</sup> year!

Grade 11 at the suggestion of a career councilor...AOLS was requiring a B.Sc. so \$ would be good!

At end of 2<sup>nd</sup> year of Civil Engineering...Because I didn't want to design bridges, roads or sewers.

Grade 12...Failing French, I took French lessons from [former member] Jim Dearden's wife; and then in first year of a sociology degree I got a summer job with his firm and I loved the work.

I decided in my first year of university. I started off in Civil Engineering, which in first year requires students to take the introduction to Geodesy and Geomatics Engineering which had Land Surveying, Hydrography, Remote Sensing, GIS, etc. components – I liked the labs outside and some of the guys in my class were from COGS in Nova Scotia and generally had experience in the surveying industry. They told me what the jobs were like – on your own in the woods for example. Companies also came to the university to recruit by taking students for beer and wings and talked surveying the whole time. I graduated with no student debt from summer work.

I was laying out a 10,000 sq. foot dwelling with my father and he said I should have pursued my OLS, then I could be in one of these! So I got my OLS and realized my father was full of \$!@!.

When I was about 15 or 16...I had been working for my dad in his surveying company since Grade 9, as a gopher, then secretary and draftsman. Watching Dad engage with clients and staff made me want to follow in his footsteps.



# Getting it Right

By Brent Taylor

I recently had the pleasure of presenting the “Getting it Right” seminar to audiences in Toronto and Ottawa. For those of you that were not able to attend, the Getting it Right seminar is a concept first started in Alberta over 20 years ago and continues to be offered there annually. In 2008 the survey community in BC decided that they wanted to customize this concept and offer it in BC. To-date 15 two day workshops have been facilitated throughout BC. In 2011, I modified the concepts of the seminar to meet the needs of Canada Lands Surveyors and presented it in 3 parts between 2011 and 2013.

The obvious question is – that is nice but what is a Getting it Right seminar?

The concept of the seminar is to immerse participants in the value of land surveying to society, to remind participants about the importance of the profession and then to work through the lifecycle of a typical survey project and discuss approaches that will result in a high quality survey product.

Getting it Right seminars cover chapters on the Role of the Professional, the Cost of Getting it Wrong, Designing Your Company For Success, Operating Ethically, Project Management, Research, Field Work and Plan Preparation.

In Ontario, the Surveyors Act creates a self-governing status for the survey profession and along with that privilege comes certain responsibilities and obligations. A practicing land surveyor takes an oath when he/she is licensed to faithfully discharge the duties of a commissioned member of the Association of Ontario Land Surveyors, according to law, without favour, affection or partiality. From that moment on he/she agrees to conduct his/her professional and personal affairs in accordance with a Code of Ethics and ensure that all professional work meets or exceeds a minimum Standard of Practice.

If these standards are not continually met or exceeded there can be real impacts on a wide number of parties. This can include the surveyors themselves, their business associates, their family, other land surveyors, the client, other land owners, various government agencies, insurance companies and the public as a whole. Depending on the specific case, the impacts can be costly and can last for many years, maybe even decades and centuries.

An effective approach to maintaining high standards in a survey business is to adopt a culture of quality and a culture of team work. There is no question that ultimately the land surveyor is the one responsible for the final quality of the survey but it is also just as true that most surveys are completed by a team. A successful team will have access to and understand how to use the necessary resources such as applicable statutes, regulations and Bulletins. Continuing education for the whole team will be encouraged. Land

surveyors will set appropriate examples for the team with a good professional attitude and working as a team to achieve quality will be the priority.

In many cases operating ethically in a survey operation is natural and inherent in day to day operations. That said it is important for the whole team to be aware of and to commit to operating within the Code of Ethics. There will always be situations that arise from time to time when a project will require a decision that needs some ethical consideration. These situations usually arise as a result of pressure from a client looking for an outcome that the surveyor is not inherently comfortable with or from time and budget constraints. The Getting it Right seminar reviews the Code of Ethics and offers some techniques that are intended to help the surveyor be able to make the right choice in difficult situations.

Every project starts with a request from a client for a ‘survey’. The Project Management chapter explores how to draw out from clients all the necessary information, how to document it and why it is important to share that information with the whole team in a reliable and structured manner. Part of that documentation process often includes entering into a contract with your client so we explore the structure and value of a contract.

Virtually all surveys are a blend of old and new information. As a surveyor you have a responsibility to conduct thorough and adequate research regarding the old information. To complete this task properly you not only need to understand what information you should be looking for but you also need to understand where to find it and how to manage it once you have obtained it.

Now that you have your project set up, budgeted, scheduled and researched, it is time to get some field work done. There is no doubt that a large part of the field work is a matter of taking measurements, however, before you ever get to the site it is important to get prepared for that phase of the project. Quality field work begins with good preparation. This can include selecting team members that are best suited for the particular project. The most suitable team may also include the Ontario Land Surveyor. The presence of a land surveyor on site for any task may be the best solution but there are some field tasks that are particularly subjective and benefit from the experience, knowledge and first hand observation of the OLS. A few examples include locating water boundaries and assessing historic or unusual boundary evidence.

Providing a complete field package for the field crew is another critical component of success. Including copies of old plans and field notes is the most obvious element of such a package followed closely by briefing and debriefing field crews. Less obvious elements of the field package could include written instructions, schedules, budgets, the


overall nature of the project, client contact information, directions to the site, copies of relevant Regulations and Bulletins as well as checklists for the tasks to be completed and the equipment required.

Once in the field the critical task is finding, gathering and assessing the survey evidence. To achieve this successfully the field staff need the training to understand what they are looking for and how hard they need to look for it. In cases where boundaries are being resolved on site the team member who is completing that work needs to have a solid understanding of the principles in the Surveys Act, case law and the hierarchy of evidence.

The last critical element of field work that is discussed in the seminar is field records. Field staff need to be able to understand historic field notes and effectively record new information. The nature of field notes changes over time as technology and standards change. It is helpful if the field team has the knowledge and experience to be able to distinguish the nuances of old notes. For example, some notes read from the bottom of the page to the top and others from top down. Some notes show bearings or azimuths whereas others show angles. The use of offset lines was a popular technique prior to the availability of onboard survey calculating power. The AOLS provides a clear list of requirements for new field records so the seminar concentrates on the importance of adopting those standards as a minimum for field work and discusses the use of electronic forms of data collection.

The last major component in the life cycle of the survey project is the processing of the data and the preparation of

the survey plan. This phase is where the opportunity comes to bring all the other components of the project together and produce the final deliverables. It is important to ensure that sufficient checks and balances are in place throughout this phase to confirm that the final plans are in fact the product that the client needed and that any plan prepared accurately reflects the work done in the field. The use of checklists, sample plans and drawing templates are critical in ensuring the quality and suitability of the final plans.

In summary there are many components of any survey project. Ending up with a quality product that serves to enhance and protect the cadastre is the ultimate mandate of the land surveyor. This is best achieved through intention, organization and team work. Set your team up for success every step of the way through good communication and clear documentation. When a team understands and appreciates what is required throughout a project they can and will support the land surveyor in enhancing the cadastre and protecting the public. The Getting it Right seminar is designed to benefit all members of the survey team. 

**Brent Taylor** has been a British Columbia land surveyor since 1984 and a Canada Lands Surveyor since 1995. He is president of Polaris Land Surveying Inc which is a private practice survey company that services southern Vancouver Island and the Gulf Islands in B.C. In addition to traditional survey projects Polaris supports the survey community by providing training and seminars, both in person and on line through GeoEd. Brent can be reached by email at [btaylor@plsi.ca](mailto:btaylor@plsi.ca)



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# Mapping the TORONTO 2015 Pan Am/Parapan Am Games

By Taylor Blake

In my time working with Geographic Information Systems (GIS), expensive desktop computers with gigantic two-foot-thick screens have given way to tablets with ten times the power. Expensive data is now often free and can be collected with a phone. Software can be accessed via the web. In addition to all of that, everyone has a familiarity with mapping. All of these things proved essential when it came to mapping the TORONTO 2015 Pan Am/Parapan Am Games (TORONTO 2015).

It gives me pause to think that I took my first university course in GIS fifteen years ago. There were few examples of GIS in everyday use, which made looking forward to a career in GIS difficult - it was still an esoteric industry. Add in the technical jargon of the material - which made heads spin - and many students quickly dropped the course. I'm very glad that I held fast, because GIS has come so very far since then that it's unrecognizable.

In 2000, GIS software was prohibitively expensive and resource-heavy, only running on a fully-loaded computer. Even then, crashes were frequent (and frequently frustrating). A GIS operator needed a post-secondary education to complete simple tasks, as basic analyses were often difficult and time consuming. Data creation was certainly an inexact science, and data was hoarded by creators or sold at exorbitant prices.

Nonetheless, I was amazed by what GIS allowed me to do and only now realize just how difficult each step of the workflow was.

Today, GIS is not only normalized, but fully embedded into our daily lives. Everyone with a computer (i.e. everyone) has access to a respectable suite of free GIS programs and data online. Everyone with a smartphone (i.e. everyone) carries an interactive map of the entire world in their pocket. The mapping app that we all take for granted has revolutionized GIS; the majority of people are now GIS users, even if they don't realize it. This paradigm shift cannot be overstated: the majority of people now participate in a technology that was largely unheard of less than a decade ago.

Seeking directions on an online map is the most common introduction to GIS, but there are many other ways GIS technology touches the average user: wayfinding or learning the layout of an unfamiliar place; navigating with real-time traffic conditions; searching for the closest takeout restaurant, pizza delivery, or *\*cough\** open beer store. These are all common tasks, and each is an example of GIS made mainstream.

Whoever uses GIS isn't just enjoying a simpler way of doing things - they're also contributing data from which we all benefit. GIS users are also GIS creators - they contribute data that we call Volunteered Geographic Information (VGI).



Every time you use your smart device, you're contributing anonymous data used to build the database and improve the accuracy of future searches.

This normalization of GIS was integral to the TORONTO 2015 mapping department. The goal was to create Olympic-quality mapping, but the budget that was struck wasn't big enough. Despite the fact that TORONTO 2015 will be the biggest multi-sport games to ever be held in Canada (yes, bigger than any of the Vancouver 2010, Calgary 1988, or Montreal 1976 Olympics!), it has nothing close to the resources of an Olympics. So, in order to build a mapping department befitting of such an historic event, we got creative.

We rented software and used it out-of-the-box. We searched for any and all Open Data (free to use) that was applicable to the footprint of TORONTO 2015. We signed partnerships where possible. We built a collaborative network of GIS professionals from partner organizations. But still, there just wasn't enough manpower in the department to deliver all that was required: maps for planning; maps for wayfinding; maps for spectators; maps for athletes; maps for delegates; maps for media; maps of the entire

games footprint; maps of the venue locations and maps of the insides of the venues. So many maps, all of which were needed in the three TORONTO 2015 official languages: English, French, and Spanish.

So, with more work than workers, the TORONTO 2015 mapping department trained staff from the larger organization in GIS, allowing other departments to integrate GIS into their workflow without taking time from the mapping department. It worked amazingly - our training paired with a baseline knowledge of mapping (gained, really, by having a smartphone) allowed many departments to lighten their workload with GIS.

A few examples:

A map-based product is training all volunteers on venue nuances and games-time procedures. A cloud-based mapping application will deliver venue-specific training to all of TORONTO 2015's 23,000 volunteers. Instead of a standard PowerPoint, volunteers are clicking through interactive presentations (based on live maps) to learn their way in and around their venues. Very cool, if I do say so myself.

The TORONTO 2015 Pan Am Torch Relay will be tracked and displayed on a custom map (created by an intern!) so that the public can follow the exact location of the Pan Am Flame

in real time. Full details on each Celebration Site (down to the minute), and the exact route between sites enable users to plan how they will join the celebration.

Each of the thousand-or-so volunteer fleet car drivers will be equipped with a custom map book and turn-by-turn directions from every venue to every other venue. This meant reduced in-car training and costs saved by omitting a GPS unit in every car.

Venue teams mapped locations of the equipment, signage, and staff needed for each TORONTO 2015 venue come games time.

The enthusiasm with which TORONTO 2015 staff welcomed and applied mapping and GIS was encouraging. A mixture of

surprise ("You mean I can do that *myself*?") and amazement ("You mean I can do that myself, *without having to leave the office*?") characterized the reception given to what was recently an esoteric technology.

In a way, the mapping department functioned as a support team for the organization, facilitating GIS understanding and usage beyond their smartphones. Training an employee inexperienced in GIS on a specific GIS service was quick and easy, and it worked: over a dozen departments have been actively using GIS after brief training sessions and a little support.

*cont'd on page 30*



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In a nutshell, part of creating and sustaining high mapping standards for TORONTO 2015 was a matter of outsourcing GIS work to the larger organization. TORONTO 2015 staff exceeded the mapping department's expectations. We think we produced Olympic-quality products - at a small fraction of the cost - by enlisting the help of other departments.

GIS has come a long way, and not just in terms of usage, software, and data. User-friendliness continues to skyrocket. Even some 'heavy lifting' can be done via the cloud, from anywhere, on a laptop. Or, data can be collected in the field using a free mapping application. I'd argue that GIS will continue to head in this direction at the expense of the clunky desktop and office version.

How then do GIS professionals stay ahead? We think critically and creatively about how to amplify the accessibility and impact of GIS. We adapt to and participate in the new wave of technology in order to deliver better products and services at lower costs. We foster the success of GIS via non-professionals. We lead the charge.

At TORONTO 2015, an intern with zero GIS experience created a web-based mapping application that I couldn't have, and several departments discovered and shared features and shortcuts on new products that the paid mappers hadn't thought of. As GIS professionals, this should excite us, not scare us - GIS is catching on!

The normalization of GIS is great for the industry. It's used and counted on more often as smartphones and mapping become ubiquitous. Every day, a huge amount of data is being created. Open Data - the large movement toward freely available data - is becoming the norm. As these trends continue,

GIS will only become more accessible.

It's a great time to be a mapper and the experience at the TORONTO 2015 Pan Am/Parapan Am Games has been incredible. The Games are coming in July & August. We're ready to show the world all that the Greater Toronto Area has to offer. It will be an exciting time for the residents of Toronto, with world-class athletes competing for gold on our turf.

Mapping the TORONTO 2015 Pan Am/Parapan Am Games is now complete. Each of the 10,000 athletes, officials, and delegates, the almost 25,000 volunteers, and hundreds of thousands of spectators will come across a map product made by the TORONTO 2015 mapping department. But perhaps one of the most telling things for the future of our industry is that each of these people will touch and feel a creation of the many TORONTO 2015 staff who worked in GIS without being a paid mapper. It's amazing how far GIS has come in my time, and I don't think it's the map nerd in me talking. Now we're all mappers, because of that magic device in our pocket.



**Taylor Blake** is Mapping Coordinator for the TORONTO 2015 Pan Am/Parapan Am Games Organizing Committee. He received a degree from the Department of Geography and Planning at the University of Toronto and a diploma in GIS & Urban Planning from Fanshawe College. He spent time in municipal and provincial government, built his own GIS consulting business, and is out of a job as soon as the Games are over! Until then, he can be reached at 416.709.6372 or [taylor.blake@toronto2015.org](mailto:taylor.blake@toronto2015.org). After August, please feel free to contact him (especially with job offers!) via LinkedIn or at [taylorrobertblake@gmail.com](mailto:taylorrobertblake@gmail.com)



# Calendar of Events

**August 23 to 28, 2015**

**27th International Cartographic Conference**  
Rio de Janeiro, Brazil  
[www.icc2015.org](http://www.icc2015.org)

**August 30 to September 2, 2015**

**UAV-g 2015 Conference**  
Toronto, Ontario  
[www.uav-g-2015.ca](http://www.uav-g-2015.ca)

**October 5 to 9, 2015**

**International Symposium on Digital Earth**  
*Towards a One-World Vision for the Blue Planet*  
Halifax, Nova Scotia  
<http://digitalearth2015.ca>

**October 18 to 22, 2015**

**GIS-Pro 2015 and NWGIS 2015**  
*Geography at the Nexus of Collaboration*  
Spokane, Washington  
[www.urisa.org/education-events/gis-pro-annual-conference/](http://www.urisa.org/education-events/gis-pro-annual-conference/)

**November 18, 2015**

**GIS Day**  
*Discovering the World Through GIS*  
[www.gisday.com](http://www.gisday.com)

**December 9 to 11, 2015**

**19th International Symposium on Mobile Mapping Technology**  
Sydney, Australia  
[www.mmt2015.org](http://www.mmt2015.org)





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# A Thank You Note — Survey Law 1 & 2

By Umaru Kargbo

## Preamble

It's been<sup>1</sup> quite a journey indeed! Well, not in terms of the usual meaning of the word “journey” this implies to physically traverse certain trails around the globe, but rather in terms of transforming one's ability to think “outside the box”. More so in regards to the suspension of one's judgement in a particular matter while exploring every possible alternative that would, in some way, shed light or better yet bring to light what would potentially become the best response.

The readings are plentiful in quantity and beautiful in quality – to say the least. I usually say after going through some of the readings – at some point during the courses: I feel like I am in Law School. Furthermore, the Online Questions posted on the forum played an integral role in this transformation process. In fact, in my opinion, they serve collectively as the single most important factor driving the students to think, reflect, and ponder before one attempts to present one's opinion. As the name goes “Survey Law” implies that there is a Law aspect which is based on: what evidence do you have to substantiate your claim<sup>2</sup>?

The intent of this note is not to relay a story of mine but rather it is to express my gratitude and appreciation to all who contributed in one way or another to making not only taking both courses a reality but also ensuring that the experience was an amazing one – for the lack of a better term. So without further ado, I will proceed in expressing my thanks and appreciation as follows:

## Appreciation & Thank You

The hierarchy chart below represents the cascading order of offering our thanks.

**The Association:** First and foremost, I express my gratitude to the Association of Ontario Land Surveyors (the Association) for it is the Association that oversees the entire practice of Cadastral Surveying in Ontario, and part of which included the academic requirement to successfully take Survey Law 1 & 2.

**York University – Lassonde School of Engineering:** Even though the Association might be able to conduct the aforementioned two courses (and others) outside of the York

University campus, the university nonetheless deserves a thank you – at the very least. I give my regards to the University and specifically to the Lassonde School of Engineering for doing an outstanding job executed by those incredible individuals whose names will be mentioned later in this thank you note.

**Izaak de Rijcke** – Instructor: Thank you very much indeed Izaak for your brilliant lectures and also for those extremely useful resources. From the annotated readings to the online forum questions, the thinking, reflecting, and pondering involved was quite a challenge given my Engineering background. Nonetheless, I managed to pass both courses.

**Technical Team:** I have to say, the performance of both the in-class and remote support teams, put in place to ensure the lectures were delivered smoothly without any technical problems, was remarkable. I remembered that Diane Villemure and others would always be there behind the scenes while Bruce Millar would sometimes be in class and at other times in his office but was very quick to come down into the class whenever the need arose.

**Academic Team:** From the quizzes to the assignments it was really quite a bit of material to read through and assign grades, and not to mention the contributions to the online forum questions. As one might imagine, some of those contributions were interesting and others were not so brilliant, but that is what it takes to be a Teaching Assistant. Janice Woodcock and others, your efforts were appreciated.

**Guest Speakers:** They added more spice to an already delicious soup. In other words, Izaak's mode of transmitting the lectures was already brilliant in itself, so the invitation of these guests who presented from different perspectives just added to that brilliance more brilliance. Below are the following who were invited:

Ms. Roxana Niculae: Ms. Niculae is an Ontario Land Surveyor who is employed with the Ministry of Government Services. She gave a presentation in my Land Survey 1 lecture at York University on Nov 03, 2014. In her presentation she compared and contrasted between the Land Registry System and the Land Titles System. Her presenta-



<sup>1</sup> It might be thought-provoking to read here “it's been...” while in fact the courses had ended in April of 2015. The reason for using “it's been...” instead of “it was...” is that the development and enhancement of this “transformation” in terms of how one approaches a particular Cadastral Survey problem continue to carry on. In other words, the end of the courses does not necessitate – in any way – the requirement to stop learning. As a matter of fact, very similar concept is adopted by Association: Continuous Professional Development (CPD).

<sup>2</sup> As I was once asked: What is this course you're taking at York University? It's called Survey Law. The interesting aspect of this course is that you can claim an answer to an assignment question, for example, to be whatever; however, your evidence present to substantiate make the difference. You can claim that  $1+1=4$ , if you so desire, but what are your proofs/evidence?

<sup>3</sup> The usual term is “good chain of title”. I coined this term given the fact that the primary function of a Cadastral Surveyor is to create surveys not boundaries, and what is it that constitute such surveys are the boundaries. So even though the surveyor is performing a title search, in essence it is a boundary search.

tion topic was The Ontario Land Registry System and the Role of the Professional Surveyor.

Mr. Kevin Wahba: Mr. Wahba is a Lawyer and Land Surveyor in the making. He gave a presentation in my Survey Law 1 lecture at York University. His presentation topic was Adverse Possession.

Mr. Eric Ansell: Mr. Ansell is an O.L.S. who is, if I am not mistaken, an assistant to the Surveyor General of Ontario (Ms. Susan MacGregor) under the Ministry of Natural Resources and Forestry (MNRF). His presentation was a comprehensive one in terms of the topics discussed. For example he began his presentation with an historical account of “A Bit of History – Canada” and ended with an introduction to the “Beds of Navigable Waters Act”.

Ms. Anne Cole: Ms. Cole is an O.L.S and a C.L.S. who in her presentation discussed, from varying perspectives, the surveyor’s role in contributing to maintaining a robust land registration system; in terms of how (1) he/she (the land surveyor) searches the LRO for a “chain of boundary” and (2) he/she deposits a registered plan in the LRO. The presentation document was voluminous, but it was stuffed with very relevant information in each of the 13 sections contained therein, nonetheless.

Mr. Joe Wahba: Mr. Wahba, the father of Kevin who is mentioned above, is an O.L.S. who, on behalf of Rady-

Pentek & Edwards Surveying Ltd., gave a very illustrious presentation with regards to the fact that for every concept (or major step involved in creating a condo plan) there was a plan that he showed to the attendees. This, in a way, lessens the abstractness of the concepts being discussed especially when the majority of the attendees have little to no condo creation experience. At the inception, the most relevant statutes usually employed in the creation process where briefly mentioned, followed by the types of condos, and then the two conditions (or requirements) needed for the creation to become a reality, namely, Description and Declaration; all of which were discussed in light of: what is the surveyor’s role in the overall process?

**My Colleagues:** It was really a rare opportunity to have a class of this sort – It is an “all-star team”, and an honour to be able to engage in mature and meaningful discussions with any member of this team about the questions posted on the online forum. I met smart individuals. I thank them all for the due diligence exercised and remarkable understanding of concepts displayed.

**Conclusion:**

Finally I would like to end this note on a thank you note: Thank you.



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## EDUCATIONAL FOUNDATION NEWS

### Congratulations to our Spring 2015 Award Winners

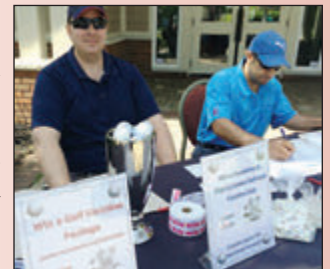
**Loyalist College – Cameron Brown** was the recipient of the *Eastern Regional Group Award*, which is co-sponsored by the Eastern Regional Group. This award is presented to a graduating student for scholastic achievement and leadership in the Survey Technician Program.

**Fleming College – Benjamin Taunton** received the *GIS Award*, which is presented to the student in the GIS Applications Specialist Program who exemplifies leadership in project management. **Geoffrey Andrews** received the *Kawartha-Haliburton Surveyors Scholastic Award* which is co-sponsored by the Kawartha-Haliburton Regional Group and is presented to a student in the GIS-Applications Specialist Certificate program who attended Survey Camp and exemplifies leadership in the

participation of assignments, and prepared exemplary field notes. Both awards were presented by Herman Wimmelbacher on behalf of the regional group.

### SCRG Fundraising Event

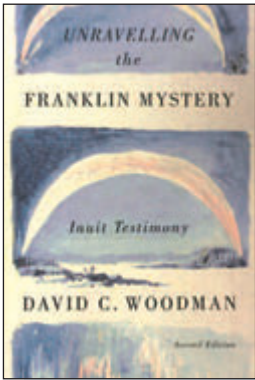
Thanks to **Graham Bowden**, **Shawn Hodgson** and **Al Jeraj**, the organizers of the Annual South Central Regional Group (SCRG) Golf Tournament, who raised \$690 for the Educational Foundation by selling tickets to *Win a Foursome at Cherry Downs Golf and Country Club*, the site of the tournament. The winner was Al Kaminskas, a guest of Tony Stauskas.



Shawn Hodgson (left) and Al Jeraj at the registration table.

The AOLS Educational Foundation would like to recognize with thanks a donation made in the memory of Andrew Gibson.

# BOOK REVIEWS



Published by McGill-Queen's University Press  
ISBN 978-0-7735-4541-0

## Unravelling the Franklin Mystery Inuit Testimony, Second Edition

By David D. Woodman

David Woodman's classic reconstruction of the mysterious events surrounding the tragic Franklin expedition has taken on new importance in light of the recent discovery of the HMS Erebus wreck, the ship Sir John Franklin sailed on during his doomed 1845 quest to find the Northwest Passage to Asia.

First published in 1991, *Unravelling the Franklin Mystery* boldly challenged standard interpretations and offered a new and compelling alternative. Among the many who have tried to discover the truth behind the Franklin disaster, Woodman was the first to

recognize the profound importance of Inuit oral testimony and to analyze it in depth. From his investigations, Woodman concluded that the Inuit likely visited Franklin's ships while the crew was still on board and that there were some Inuit who actually saw the sinking of one of the ships. Much of the Inuit testimony presented here had never before been published, and it provided Woodman with the pivotal clue in his reconstruction of the puzzle of the Franklin disaster.

*Information taken from the back cover.*

## The Toronto Carrying Place Rediscovering Toronto's Most Ancient Trail

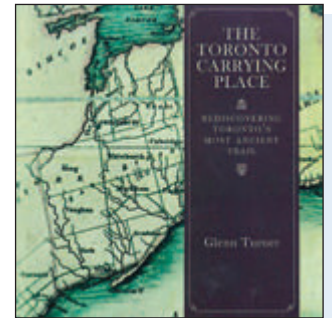
By Glenn Turner

Buried beneath Toronto's streets is a centuries-old trail that was once the road to wealth, adventure, or violent death for thousands of travellers. Now its route lies hidden and forgotten under sidewalks and farmland, though its influence can still be seen.

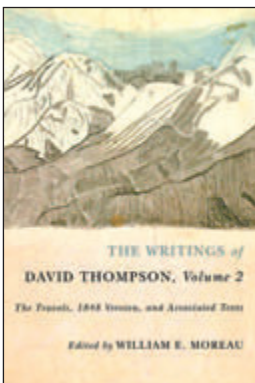
*The Toronto Carrying Place* brings Southern Ontario's most important First Nations trail back to life. Retracing the ancient portage from Lake Ontario to Lake Simcoe, Glenn Turner reveals the dramatic events and extraordinary characters that marked Toronto's earliest days, and shows how

the path played a crucial role in the history of Wendat (Huron), Haudenosaunee (Iroquois), and Mississauga First Nations. Toronto's French and English heritage is also explored, and reminders of the Carrying Place are discovered in unlikely places along its forty-five-kilometre route. Many photographs, maps, and reproductions offer both hikers and armchair voyageurs a look at what remains today of this fascinating portage trail, and an insight into how it has affected the growth of the Greater Toronto area.

*Information taken from the back cover.*



Published by Dundurn  
ISBN 978-1-4597-3046-5



Published by McGill-Queen's University Press and the Champlain Society  
ISBN 978-0-7735-4551-9

## The Writings of David Thompson, Volume 2 The Travels, 1848 Version, and Associated Texts

Edited by William E. Moreau

The second in a planned three volumes of Thompson's writings, this edition completes the great surveyor and fur trader's spirited autobiographical narrative. In the 1848 *Travels*, Thompson describes his most enduring historical legacy – the extension of the fur trade across the Continental Divide between 1807 and 1812. During these years he established several Nor'wester trading posts, made contact with the tribal peoples of the Columbia Plateau, and tirelessly mapped the lands he traversed, all the time striving westward toward the Pacific. The tale culminates with Thompson's historic arrival at the mouth of the Columbia in July 1811.

Like its companion Volume 1, this work presents an entirely new transcription by William Moreau of Thompson's manuscript, and is accompanied by an introductory essay placing the author in his historical and intellectual context. Extensive critical annotations, a biographical index, and modern maps, make this the definitive collection of Thompson's works, and bring one of North America's most important travelers and surveyors to a new generation of readers.

*Information taken from the back cover.*

# The Last Word

## Gibson House Museum - Preserving a Surveying Family's Heritage Home

In 1829 Deputy Land Surveyor David Gibson and his wife Eliza bought a farm lot on Yonge Street in Willowdale. In 1834 when Toronto was incorporated as a City, Gibson was appointed as the City Surveyor. He became an ardent supporter of the Reform Party lead by William Lyon MacKenzie and was one of his chief lieutenants in the unsuccessful Upper Canada Rebellion. In 1837 he was involved in the skirmish at Montgomery's Tavern, McKenzie's headquarters. Gibson fled to the United States and his house was ordered to be burned. Fully pardoned he returned in 1848; back to his farm on Yonge Street. In 1851 he built his red-brick Georgian house/surveying office and resumed his profession as a surveyor, a vocation that was continued by many of his children, grandchildren and great-grandchildren.

In 1951 the long-time home of the Gibson family was in danger of being demolished to make way for high rise apartments. The North York Historical Society was opposed and largely with the help of Bill Yates, OLS and the Council of the AOLS, the house was saved. It has been operated by the City of Toronto as a museum since 1957. A replica of Gibson's surveying office with some of his original surveying tools, his desk and his surveying certificates can be found on the main floor of the house/museum.

Gibson Park, which is adjacent to the museum, was created in 1979. Menkes Development bought the property in 2008 with the intention to build a condominium. As part of the approval for the project, Menkes agreed to redevelop the park. The redesigned park,

which provides better exposure and focus on the museum, was unveiled on May 30. A black granite wall that disguises the underground parking entrance to Gibson Square, the Menkes mixed-condo development, showcases vignettes of the daily life of the Gibson family.



David's son, Peter Silas Gibson, OLS#39 and his wife Eliza, who occupied the Gibson homestead until 1916, and some of their grandchildren. Photo credit Maggie Newell.



One Hundred Links – One Chain, an artwork by Stephen Cruise to commemorate Gibson and his profession, can be found in Gibson Park. Photo credit Maggie Newell.

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