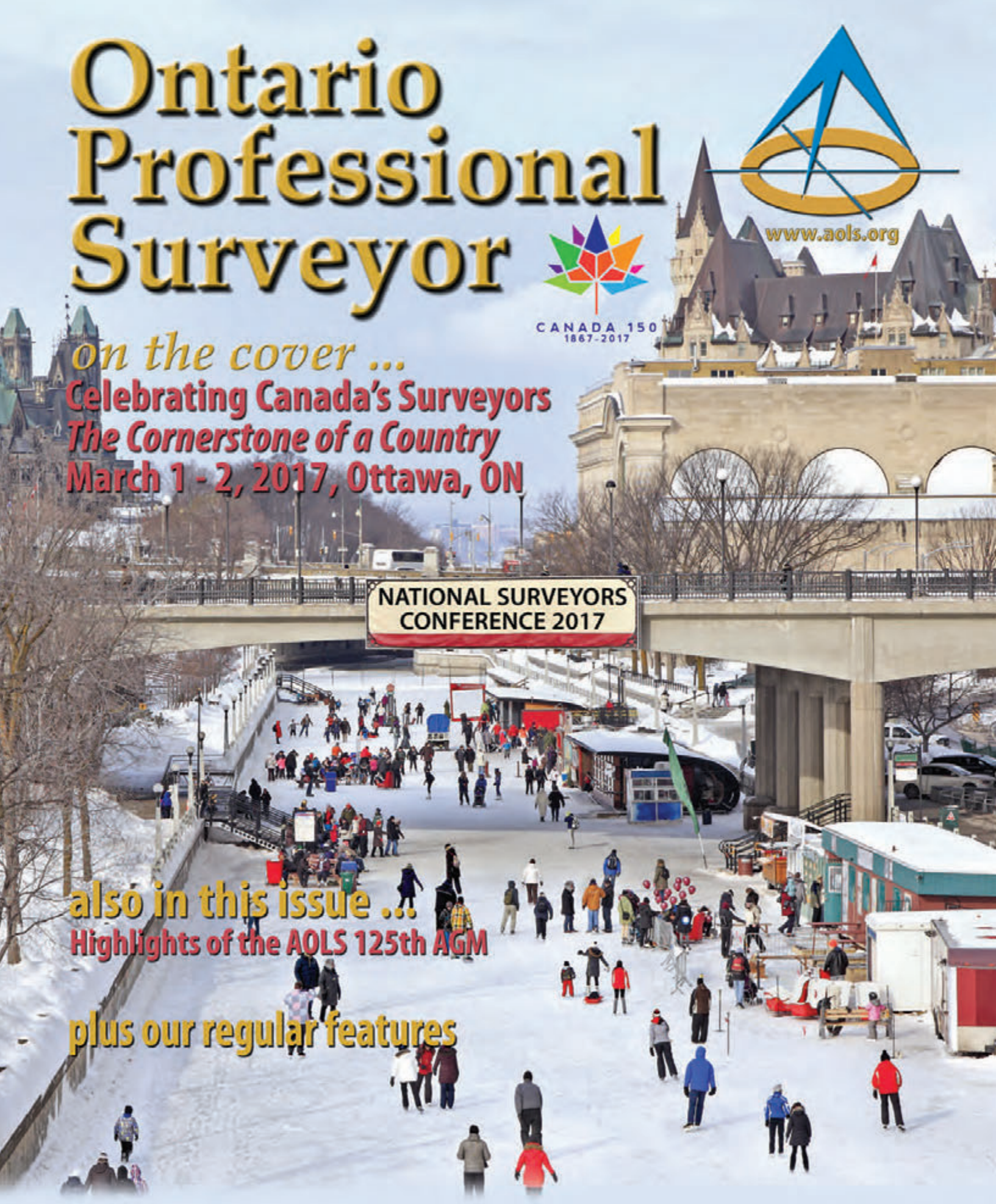
Ontario Professional Surveyor

www.aols.org

CANADA 150
1867-2017

on the cover ...

Celebrating Canada's Surveyors
The Cornerstone of a Country
March 1 - 2, 2017, Ottawa, ON



also in this issue ...

Highlights of the AOLS 125th AGM

plus our regular features

Canadian Publications Mail Product
Sales Agreement No. 40064685

Volume 60, No. 2
Spring 2017

TOPCON SOKKIA

ONE COMPANY TWO BRANDS

GCX2 GNSS ROVER

Compact
Rugged
Affordable

Perfect in combination with a Robot for Hybrid mode

CERTIFIED TOPCON / SOKKIA REPAIR CENTER

Servicing all Topcon & Sokkia equipment including GPS

Turn-key solutions for surveyors worldwide.

As surveying specialists, we back our products with the industry's most complete service and support capabilities, including regionally-located sales managers, technical support, online help, product training and a certified repair and service facility.

SOKKIA

For general inquiries, contact us at 905-238-5810 | sokkiacanada.com
1050 Stacey Court, Mississauga Ontario L4W 2X8

ONTARIO PROFESSIONAL SURVEYOR

VOLUME 60, No. 2 **Spring 2017**

CONTENTS

REGULAR FEATURES

ADVERTISERS

ON THE COVER ...

The **National Surveyors' Conference (NSC)** was held at the Shaw Centre in Ottawa on March 1-2, 2017. It was hosted jointly by the Association of Ontario Land Surveyors (AOLS), the Ordre des arpenteurs-géomètres du Québec (OAGQ) and the Association of Canada Lands Surveyors (ACLS). These associations came together for the first time in history to celebrate the 125th Anniversary of the AOLS, the 135th Anniversary of the OAGQ and to bring attention to the importance of Canada's Surveyors, the Cornerstone of our Country, in our nation's capital, in Canada's 150th Birthday Year.

Professional Surveying in Ontario

encompasses the Disciplines of

Cadastral, Geodetic, Hydrographic, Photogrammetric Surveying & Geographic Information Management

President's Page

By Russ Hogan, O.L.S.

It is truly an honour and a privilege to serve as the President of the Association of Ontario Land Surveyors. I would like to start by thanking my friend Past President Murray Purcell for his dedication and commitment to the AOLS and the leadership he has provided over the years especially this past year as our President. I will do my very best to live up to the high standard he has set and I will continue to look to him for guidance and support in the coming year as we continue his good work and embark on new initiatives to keep the profession strong.

Last week we held our 125th AGM in Ottawa and what an exciting and historic event it was! Held in collaboration with the Association of Canada Lands Surveyors (ACLS) and the Ordre des arpenteurs-géomètres du Québec (OAGQ), the National Surveyors Conference was a huge success attended by 411 Ontario Land Surveyors and a total of over 700 surveyors from across the country. It was wonderful to see such a large number of our colleagues coming together to celebrate our history and to contribute to a shared vision for our future.

The conference program was excellent. From the opening video presentation "Our Reason for Being", narrated by the Presidents of the 3 Associations, to the inspiring Keynote Address by Natalie Panek, highlighting her experiences pursuing a career in engineering and technology, to presentations about liability insurance or mapping the Arctic seabed, all of the sessions were both relevant and interesting to the members of all 3 organizations.

I'd like to commend the organizers from all 3 Associations and in particular the AOLS Organizing Committee and the staff of the AOLS for all of their hard work in making the event such a success. If you were not able to attend some of the sessions I encourage you to watch them once they are available on GeoEd at www.geoed.ca

Our book, Great Lengths – A Celebration of the Surveyors of Ontario, was unveiled at the AGM. Charlie Wilkins has done an excellent job of capturing and relaying the stories of surveyors and the history of the Association in such an engaging way that informs people about who we are and what surveyors do. It will be an excellent vehicle to help raise awareness of the profession to high school students who are planning for their future careers. The next step for the book is to get it distributed to all of the high schools in the province so that it is accessible to students, teachers and to guidance counselors.

As I stated in my election platform, one of my ongoing concerns is the sustainability of the profession. The increasing number of Articling Students (now at 84) is very encouraging but with 382 (76%) of members over the age of 50, and 173 of those over 60 we need to do everything we can to attract students to surveying (at least for the foreseeable future). The two videos unveiled at the AGM will go a long way in helping to promote surveying as a career. One is an animated video prepared by the Geomatics Recruitment and Liaison Committee, which promotes the Specialist High Skills Major (SHSM) Surveying Certification Program developed for high schools. The other was created by Chris Fox, OLS, and it won the John Duncan Barnes Multimedia Award. Chris' video describes and promotes a career in surveying. Both videos are exceptionally well done and I want to congratulate and thank everyone involved in their creation.

I believe that part of the solution to attracting students to surveying is by ensuring that there is a clearly defined path for students to follow to obtain the education required to become a surveyor. At this time there are four universities in Canada that offer Geomatics Engineering programs but none of these programs provides all of the courses required to become an Ontario Land Surveyor. I am happy to learn that York University is introducing a Geomatics Science program that may provide all the required courses, in addition to their existing Geomatics Engineering program.

As in previous years, Council will be using a strategic planning process to help establish priorities for the coming year. In addition to the membership numbers mentioned above a few of the items from previous years that continue to be a work in progress are; providing a home for C of R members, clear and current standards (including awareness and education), review of the Surveyors Act and associated regulations to identify needed changes and, implementation of a Province-Wide Survey Records Index. This year's session is being held at the end of March so stay tuned for a Strategic Plan update in the Summer issue of OPS magazine.

I am excited to serve as President of the Association of Ontario Land Surveyors and I am looking forward to what lies ahead. We have a strong and engaged Council again this year and with the help of our very dedicated and enthusiastic AOLS staff, I foresee that it will be a very successful year.

MARK IT™

LOCATES INC.

MARK IT RIGHT
THE FIRST TIME

CAMERA INSPECTION
SEWER LOCATES & MEASUREMENTS
BOREHOLE CLEARANCES
CONFINED SPACE ENTRY
GPR SCANNING
SUBSURFACE UTILITY ENGINEERING - ASCE 38-02
PRIVATE LOCATES

Initiation and coordination of all Ontario One calls and other public utility requisites.

info@markitlocates.com | 1-855-337-9202 | markitlocates.com

Executive Director's Notes

By Blain Martin

My article for this issue was one of my first tasks after the Annual General Meeting (AGM). I admit to struggling with what the content should be. I certainly could provide the highlights of that meeting and review the inspirational speakers, the learning sessions and the social activities, however, when 80% of our membership attended the AGM, such a story would likely be redundant.

I could talk about "Great Lengths" and thank you all again for contributing, for sponsoring and for purchasing our fabulous book. I have already done that a number of times. Then I thought about writing about our demographics (see below) which seems to have been a theme throughout my tenure as Executive Director.

Demographics - February 9, 2017

Age	2010	2011	2012	2013	2014	2015	2016	2017	Cad	Cof R
Art Shu	38	45	49	50	51	68	71	84		
20 - 29	5	6	3	3	6	8	5	7	7	
30 - 39	40	32	26	31	31	36	37	38	37	1
40 - 49	189	162	143	130	112	99	86	78	75	3
50 - 59	237	244	247	242	238	229	212	209	189	20
60 - 69	117	128	137	139	135	129	138	126	116	10
70 - 79	46	46	48	41	38	39	34	36	35	1
80 +	5	8	6	9	8	9	10	11	11	
Total	**639**	**626**	**610**	**595**	**569**	**559**	**522**	**505**	**470**	**35**
Percentage Over 50	68%	68%	72%	72%	74%	74%	75%	76%		
Percentage over 60	26%	29%	31%	32%	32%	33%	35%	34%		
Percentage change in Art Shu numbers since 2010		18%	29%	32%	34%	79%	87%	121%		
Percentage change in 20s - numbers since 2010		-2%	-5%	-7%	-11%	-13%	-18%	-21%		

I could also talk about the fabulous future that I see for our profession and all the great things the Association members are doing to enhance that future. Those things include the substantial increase in the number of articling students and the engagement of the membership.

But instead of all those things, I thought I would write about my role as Executive Director (ED). Over my eight-year tenure I have gotten to know all of the ED's from the other associations across the country. What surprises me is the similarity between us. We all deal with virtually the same issues and in the same way. That really makes it easy for us to work together, as was proven by Luc and Jean-Claude who worked with me to manage our recent AGM.

Speaking of the AGM again, many of you have said that I looked "tired" or a bit "worn out" and I have to admit you are right. Managing that event and finalizing our book were two projects that took a tremendous effort and really did take a toll on me. The success of them both made the effort all worthwhile. I have received several emails thanking me for both projects and it is great to know that people appreciate the effort that a lot of people put into them.

Thinking about my role, I always consider those who held the position before me. I really like the picture below taken at the "Council Roast Dinner" of four of the five Executive Directors of the Association. Each ED made a mark in his/her own way. For instance, I have often heard it said that Lorraine brought us into a state of professionalism that was not present prior to her tenure. Murray and Jim also left their individual marks on the Association. I consider each of them to be very good friends and I have actually known them and appreciated all of them for most of my life.

I want to highlight the fifth ED who is not in the picture. Many of you know that Carl Rooth and I are great friends and I often get asked for news of him. Just prior to the AGM I spoke to Carl to encourage him to attend. I found out that he would have liked to have come to this historic conference but he could not as he had to spend time at home taking care of

Left to right: Murray LeGris, Blain Martin, Lorraine Petzold and Jim Statham.

his wife Jan as she faced a serious medical issue.

I was thrilled to see the picture (at left) of both of them on the day that I wrote this column. In the picture Jan is ringing a bell that indicates her success with her medical issue. I want to take this opportunity to congratulate them both and to let the wonderful friends that they have in the Association know that they are both doing great.

Over the last couple of days Carl and I have corresponded and I sent him the link for the "opening ceremony" video. He said, "The video of the AGM made me proud to be once a part of this great historic organization." Of all the previous Executive Directors, I consider Carl to be my mentor as I worked closely with him during his time here in the office and I do try to follow in his footsteps. That said, I would like to thank all the previous Executive Directors for their stewardship of our Association.

The book is finished, the 125th celebration is over and many of you are wondering what is next! We have our Strategic Planning Session booked for the end of March and that will help us determine the specific activities that will continue to move our association forward. I am looking forward to next year's Annual General Meeting on February 28th to March 2nd at the Sheraton on the Falls in Niagara Falls. I think that organizing this meeting will be like a "walk in the park" compared to the organization required for the meeting just a couple of weeks ago.

Maintaining Public Trust and Confidence in the Profession

By W.D. Buck, Registrar

A basic tenet of all self-governing professions is that members will abide by a code of ethics, and that failure to do so will be considered Professional Misconduct, having potentially serious consequences. The AOLS Code of Ethics requires that among other things *"every member shall conduct his or her private and professional affairs in such a manner as to maintain public trust and confidence in the profession."* As future professionals, articling students are also expected to abide by this code.

During a recent sitting of our on-line Statutes examination the invigilator observed an articling student copying answers from a document on his computer and pasting them directly into the answer spaces in the examination program. Our Learning Management System does not raise an alarm or record when students go out of the program and access other documents or websites, however the student was removed from the examination room immediately and during a subsequent interview he admitted that he had cheated.

As far as I am aware, we have never before experienced an incident of cheating on an Association exam, and for this reason we had never developed a policy to address such an occasion. It was unthinkable that such a thing would happen. A few days after the incident the offending student requested a meeting with the Registrar and he met with both the Registrar and the Executive Director. This meeting was recorded and the recording, as well as the student's subsequent letter of explanation and apology, were provided to the Academic and Experience Requirements Committee.

Without a policy in place, the committee had to make an ad hoc decision that would address the seriousness of the situation, but would not be so onerous that it would not withstand a court or Human Rights challenge. After much discussion and consideration of policies from other self-governing bodies the committee decided that the student's articles should be cancelled immediately, that he not be eligible to re-apply to article for a period of two years, and that he must complete an approved ethics course before re-applying. The two-year period corresponds to our own Act, which states that a member whose licence has been cancelled for cause may not apply for reinstatement sooner than two years after the cancellation.

The Academic and Experience Requirements Committee is currently working on a Policy Manual. It is important that this manual include a section on the consequences of being caught cheating on an AOLS examination so that students are aware of it, and the committee can make acceptable and consistent decisions based on a published policy.

Calendar of Events

April 27 to 28, 2017

GISTAM 2017
Porto, Portugal
www.gistam.org

May 3, 2017

URISA Ontario – BeSpatial 2017
Markham, Ontario
www.urisaontario.ca

May 29 to June 2, 2017

FIG Working Week 2017
Helsinki, Finland
www.fig.net/fig2017

July 2 to 7, 2017

International Cartographic Conference
Washington, D.C.
www.icc2017.org

September 4 to 7, 2017

UAV-g 2017
Bonn, Germany
http://uavg17.ipb.uni-bonn.de

September 26 to 28, 2017

INTERGEO
Berlin, Germany
www.intergeo.de

PURE SURVEYING

Sure, the GS16's intelligent technology has tree canopies, bridges, and urban canyons for breakfast. But it is really the Captivate interface that makes technology feel human again.

CS20 Controller

GS16 Smart Antenna

- High Accuracy & Precision
- Powerful Processing
- Artificial Intelligence
- Light Weight

For more information please contact:
Don Edgar
don.edgar@leicaus.com
416-520-4310

gnss.leica-geosystems.us

PART OF HEXAGON

Leica Geosystems

Advertiser's News

senseFly's New SmartGeo Drone – eBee Plus RTK/PPK
Shaping the future of UAV survey-grade work

By Jean-Francois Dionne and Francois Gervaix

Background

Last year's world InterGEO conference in Hamburg (where companies unveil their latest technologies) was a buzz amongst attendees when senseFly unveiled its newest fixed-wing UAV, the eBee Plus RTK/PPK for professional surveying and geospatial data acquisition. First launched 4 years ago, as the lightest and most versatile UAV systems with RTK survey grade accuracy, the newest offering from senseFly was not to disappoint with its many flight, geoinformation and workflow enhancements. AOLS first reported on the eBee RTK survey grade accuracy in their OPS Summer 2015 issue (Volume 58, No.3). What is especially appealing in land surveying is the ability to utilize a combination of technology tools, from UAV, photogrammetry, and post-processing software like Pix4D for producing dense point clouds that integrate into GIS software. Now with collection of thousands of data points, and being able to remove, or filter out unwanted objects/points, specialists can produce accurate surface model that gives a visual document easily shared with engineers, clients and others. As surveying projects get larger, more costly and more complex, users will appreciate the vast time-saving the eBee Plus offers with its long flight time (59 minutes), and large coverage area (500 ac @ 400 ft).

The eBee Plus comprehensive RTK/PPK functionality

Surveyors, construction managers, and GIS specialists will appreciate the unique upgradeable RTK/PPK functionality that boasts a horizontal/vertical absolute accuracy to 3cm/5cm without GCP's. Enhancing this functionality is a new 20 Mp. RGB sensor (S.O.D.A) with global shutter that has a spatial resolution of 2.9 cm/pixel (altitude 122 m AGL). Many traditional cameras used in UAV's have been modified to reduce weight and remove unnecessary parts (e.g. flash). The S.O.D.A. is very light weight, more accurate, and very stable since there are less moving parts. The stability is about 1-2 µm (1-2cm in Z). Those interested in detailed data set with the S.O.D.A camera may find it at https://www.sensefly.com/drones/example-datasets.html

Versatility in High Precision on Demand (HPoD) with PPK/RTK Correction

At the core of the eBee Plus is its geolocation versatility enhancements with the ability to mix and match various sources of RTK corrections during flight for accurate geotagging images with complete redundancy for the need for post flight geotagging.

What this means for users is that should RTK functionality not be available in the field, the PPK offers an easy post-fight geotagging correction solution. The end game result is improved efficiency in data collection, without necessarily needing GCP's; cutting time spent in the field by over 50 percent.

Survey Grade Data Collection options

1) Standalone GNSS with GCP – the de facto solution for most UAV surveys not equipped with accurate GNSS systems or differential capabilities. In lieu, a minimum of 4-6 marked ground control points are needed for mosaicking of images in post-processing software. Site access and terrain can pose issues for worker safety and positioning of GCP's is critical. They need to be highly visible in a minimum number of pictures to obtain a consistent bundle adjustment and aero triangulation.
2) Real Time Kinematic – Virtual Reference Service – Requires commercial fee-based services offered by CanNet, TopNEt or SmartNet networks. The drone's supplied eMotion3 flight management software connects to the services via cellular 3G Bluetooth/Wi-Fi connection. eMotion3 receives RTCM3.x correction streams from one of the IP addresses, in some cases a physical CORS and in some case from a virtually created correction position in the vicinity of the initial eBee RTK position.
3) Real Time Kinematic – GNSS Base – The eBee plus is compatible with most leading brands of base stations. The RTK base station is situated over a known point or unknown point that was averaged over a specified period of time. The GNSS base is connected to eMotion3 via a serial cable or a Bluetooth connection

and corrections over the position are streamed in RTCM 3.x format. eMotion3 simultaneously records the RTCM stream while also transmitting the corrections to the eBee plus, eliminating the need for a typical UHF radio link between the GNSS base and the eBee.

4) Post Processed Kinematic – Virtual Reference Service – Utilizing the RTCM 3.x stream recorded by eMotion3, images are geo-tagged post flight without the need for a direct RTK link.
5) Post Processed Kinematic – GNSS Base – Like installing a base station using RTK, collected data is in RINEX format and installed on a known or unknown point that can be corrected also in the post-processing steps after the flight in eMotion3. Usually baselines are short and within or close to the project area.
6) Post Processed Kinematic – CORS – Baseline distances up to 30 km away are possible, but positional accuracy is enhanced and ambiguities reduced by closer proximity. RINEX data can be downloaded and used in eMotion3 in the post processing steps.

eMotion3 Flight Data Management Software

Flight management software is at the centre of a pilot's professional flight and data management experience. eMotion 3 is senseFly's next generation flight software; feature packed, easy, simple interface allows for pre-programming mission blocks, multi-flight missions, multi-height zone flights, live weather updates, automatic terrain-adapted 3D flight planning and more. The large amount of data often collected during flight is stored in the eBee Plus internal memory and the S.O.D.A. camera SD card. Following a mission, data is imported through eMotion3 into a user-defined directory on your computer, automatically

cont'd on page 10

generating necessary folders. eMotion3 alerts you if the imported data requires additional differential processing from existing RTK geotagged data or differential corrections from RINEX data recovered from either a GNSS base, or a CORS. The software can adjust for any unknown static position of the GNSS base at the time of flight to be corrected to a known value and re-process the complete flight geotags. The options are robust and take only a short time to generate a detailed report on expected accuracies on the method used to post-process the PPK/RTK geotags.

Accuracy assessment of eBee Plus PPK & RTK

The engineering team at senseFly demonstrated the accuracy and workflow of the various differential correction options on a 10-hectare site during an endurance test. A total of 641 images were collected during a 57-minute flight on a north/south and east/west perpendicular overlap at 100 m above ground level (AGL) with a ground resolution of 2.3 centimeters. Eight geodetic monuments were identified and marked for photo identification and used as check points in the validation step.

Four geotagging methods were tested for this exercise. Direct RTK, PPK RTK, PPK VRS and full PPK at 7 km, 27 km and 38 km distance from the site. The same dataset was also post-processed within eMotion3 and total number of correctly tagged photos were produced. Table 1 displays the total and percentage of images with good geotagging. The accuracy erodes the further the distance to the correction source. Longer carrier-phase baselines affect the ambiguity resolution of a larger amount of geotags. In each case the number of images that could not be adequately geo-tagged (poor rating) was very low. If the number of missed geotags are under 5%, these images can still be integrated into the photogrammetric process by using surrounding higher accuracy geotags.

Table 1: Geotag Image Accuracy using 4 Correction methods

Computation in eMotion3: 641 geotagged images

Ratings[7]	Direct RTK[3]	PPK RTK[2]	PPK VRS[4]	PPK[6] 7km	PPK[6] 27km	PPK[6] 38km
good	639	638	618	614	546	283
average	0	0	0	3	66	328
poor	0	0	15	16	21	22
not tagged	2	3	8	8	8	8
total	641	641	641	641	641	641

Notes:
(1-6) Please refer to corresponding description of correction method outlined above
(7) Good means better than or equal to 5 cm in horizontal (H)/ 7.5 cm in vertical (V)
Average 5-10 cm H and 7.5-15 cm V
Poor >10 cm H and > 15 cm V
Not Tagged means no information was available to geotag a photo

The data reveals that while closer distance to VRS is better, at higher distances the percentage of poor geotags is limited (Table 2). During the photogrammetric process, some of the poor images can be integrated provided this does not rise above 5%. Table 3 shows the average error in meters of all the images captured using various correction methods. The data shows no bias in the horizontal X or vertical Y parameters, while there is some in Z because of presence of poor geotags. When these poor geotags are removed, the bias (sigma Z) is much better and significantly better than even X, Y. (Table 4). Figure 1 shows the same in graphical format.

Table 2: Validation in eMotion 3: % of good geotags

Ratings[7]	Direct RTK[3]	PPK RTK[2]	PPK VRS[4]	PPK[6] 7km	PPK[6] 27km	PPK[6] 38km
good	99.7%	99.5%	96.4%	95.8%	85.2%	44.1%
average	0.0%	0.0%	0.0%	0.5%	10.3%	51.2%
poor	0.0%	0.0%	2.3%	2.5%	3.3%	3.4%
not tagged	0.3%	0.5%	1.2%	1.2%	1.2%	1.2%
total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Notes:
FDM= correction in flight data manager eMotion3

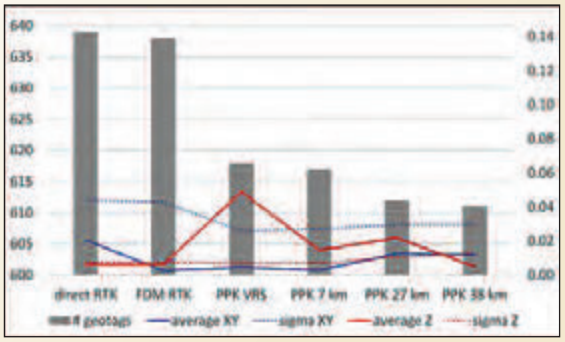
Table 3: Differences to the mean weighted value all geotags (meters)

	Direct RTK[3]	PPK RTK[2]	PPK VRS[4]	PPK[6] 7km	PPK[6] 27km	PPK[6] 38km
# geotags	639	638	633	633	633	633
average XY	0.018	0.003	0.002	0.001	0.008	0.018
sigma XY	0.044	0.043	0.054	0.056	0.176	0.174
average Z	0.006	0.006	0.047	0.017	0.014	0.012
sigma Z	0.007	0.007	0.045	0.043	0.307	0.397

Table 4: Differences to the mean weighted value ignoring poor geotags

	Direct RTK[3]	PPK RTK[2]	PPK VRS[4]	PPK[6] 7km	PPK[6] 27km	PPK[6] 38km
# geotags	639	638	618	617	612	611
average XY	0.021	0.003	0.005	0.003	0.013	0.012
sigma XY	0.044	0.043	0.026	0.027	0.030	0.030
average Z	0.006	0.006	0.049	0.015	0.022	0.005
sigma Z	0.007	0.007	0.007	0.007	0.011	0.013

Figure 1: Average and sigma without poor geotags[1]



Notes [1]: When poor geotags are excluded, the sigma remains excellent throughout to sub-pixel basis

Summary

While the data provided here is provided by senseFly, it does highlight the utility and accuracy of using survey-grade UAV's for survey work. The evolution of UAV's and photogrammetry software and workflow have matured to where they are an everyday solution for surveyors.

cont'd on page 12

Carlson for Surveyors

From field... to finish

NEW BRx6 GNSS Receiver

Combined with SurvCE5.0, get highest positional accuracy, plus:

- 372-channel receiver
- World-Class Athena™ RTK technology
- Integrated Atlas™ L-band receiver
- Multi-Constellation Support – GPS, Glonass, Beidou, Galileo
- Each receiver can be configured as Base, Rover or Network Rover

Power Your Field Data Collection With –

Carlson SurvCE

Produce Your Final Plans and Deliverables With –

Carlson Survey

And the world's most reliable data collector just got better…

Carlson Surveyor2

- Faster Processor
- Long-range Bluetooth
- Extended Battery Life
- Larger, Brighter Display Screen
- Easier To Use
- More Options
  - Integrated camera
  - 3G modem
  - GNSS receiver

Advanced Technology to Improve Efficiency

Carlson CR2+/ CR5+ Robotic Total Station

- Perform measurements automatically
- Track target continually
- Speed staking out
- Get maximum accuracy
- Center accurately & easily

For more information: Call or email your Carlson representative, Gary Rosen, grosen@carlsonsw.com 603-648-2525 or 877-207-4626 • www.carlsonsw.com

Since 1983

Carlson ...For the Total Project

RTK	PPK
Rigor: GNSS accuracy is assured in field, before flight	Flexibility: freedom of choice of base station location
Same software & modem for stand-alone or a RTK supported mission	Same software and same settings for a stand-alone or PPK project
No additional work or software	Few additional steps, no additional software
"job done" confidence when returning to office	Several alternatives when processing in office
For small projects, when technology is available & base station and ground station can be set next to each other	For larger projects, when the technology is not available or base and ground station cannot be set next to each other. Permits greater distance one can rove from base station
Time to get quality survey positions is reduced	No communication issues. Possibility to eliminate single baseline solutions by PP to multiple reference stations

The eBee Plus offers the aerial surveyor greater choice of methods to select from for accurate positions of images. Both connection systems mean business, and accuracy. They achieve this in slightly different ways. In aerial imagery mapping, RTK positioning can have limitations, with GNSS signal blocks or link outages. PPK offers processing of positioning after the flight, with robust traces back and forth through the data to ensure accurate results. The connection options of systems like eBee Plus ensure jobs can get done regardless of the application, connection options and availability, size of project area, terrain. UAV's offer surveyors a cost-effective and work efficiency solution for completing jobs on time and offering other advantages like job-site safety, and providing data rich point clouds, powerful DSM's and documentation that clients can easily visualize.

Jean-Francois Dionne is the UAV/UAS Technical Survey Specialist with UKKO Canada (A Division of AG Business & Crop Inc.), specializing in the operation and sales of the senseFly eBee RTK Mapping UAV and senseFly eXom Intelligent Mapping and Inspection Drone. He can be reached at **jfdionne@ukkocanada.ca**

Francois Gervaix Product Manager – Surveying, senseFly is a qualified Geomatics Engineer. He has worked for Leica Geosystems in the past and as a professor at the Technical University for Applied Sciences Western Switzerland (HES-SO). Francois joined senseFly in February 2016 and has since been managing the market vertical "Surveying". He is also President of the Swiss Society of Photogrammetry and Remote Sensing **(www.sgpf.ch).**

It's business and it's personal.

AFTER ALL, getting to know you better is what allows us to truly understand your investment needs. And that means a world of difference for you. We take the time to customize an investment plan that fits your life, so you can focus on what really matters—living it.

To learn more about Investment Management, please contact Julie Brough who will match you with a Portfolio Manager that is right for you: **647-352-5100.**

LWM

LOGAN WEALTH MANAGEMENT

Origin of Hierarchy of Evidence

By R.J. Stewart, B.Sc., O.L.S., C.L.S.

Surveyors across Canada are familiar with the principle recognized as the "Hierarchy of Evidence". The purpose of the hierarchy is to determine the intention of interested parties by resolution of ambiguities, either patent (for example, where a parcel clause description contains conflicting calls) or latent (where incompatible criteria are not immediately obvious, and only come to light, for example, with research). Whenever a description is clear, and free from ambiguity, the description speaks for itself as a pure demonstration of intention; it is unnecessary—and improper—to resort to the hierarchy in such cases.[1]

Currently, the hierarchy is usually set out as in *Nicholson v. Halliday*, 2005 CanLII 259 (ON CA):

> The leading authority on boundary resolution is *Thelland v. Golden Haulage Ltd.*, [1989] O.J. No. 2303 (Dist. Ct.). In that decision, Stortini D.C.J. cited an article by Lorraine Petzold, O.L.S., the Executive Director of the Association of Ontario Land Surveyors, "The Survey and The Real Estate Transaction," which was presented to the Law Society of Upper Canada in its Continuing Legal Education Seminar of October, 1983. That article notes the surveyors' "hierarchy of evidence," which ranks the evidence to re-establish a boundary from most compelling to least compelling as follows (at 2):
>
> 1. natural boundaries;
> 2. original monuments;
> 3. fences or possession that can reasonably be related back to the time of the original survey;
> 4. measurements (as shown on the plan or as stated in the metes and bounds description).

A paraphrase of the original, the list in *Thelland* (and *Nicholson*) is essentially correct; but it is incomplete. The paragraph numbered "3" above should be numbered "2a" since such evidence points to retracement of original monuments.[2] The correct "*Thirdly*" is entirely absent from the list set out in *Thelland* (and *Nicholson*).

A reader of the cases since *Thelland* could conclude, mistakenly, that the list was a 1989 clarification or statement of the law.[3] However, the hierarchy has specifically been law in Canada since at least 1868 (*McPherson v. Cameron* (1868), 7 N.S.R. 208 (NS CA)), in part as early as 1854 (*Fraser v. Cameron* (1854), 2 N.S.R. 189 (NS CA)), and possibly earlier. Certainly, the principles date from time immemorial based on cases of ancient precedent.

Both *Fraser* (at page 193) and *McPherson* (at page 212) refer to *Greenleaf on Evidence*.[4] Simon Greenleaf was an American lawyer and jurist, with prominence in the first half of the 19th century, some of whose writings form the seminal legal text *A Treatise on the Law of Evidence*.[5]

David W. Lambden, O.L.S. and C.L.S., discussed Greenleaf in his commentary on *Richmond Hill Furriers* published in *The Ontario Land Surveyor* Vol. 40, No. 1, Winter 1997. As part of his analysis, Professor Lambden noted that the Court of Appeal "recited section 54 of the *Surveys Act*, R.S.O. 1990, c. S.30, that deals with the unalterable status of 'Every line, boundary and corner, established by survey and shown on a plan of subdivision … deemed to be defined by the original posts or blazed trees in the first survey …' This is, of course, unnecessary legislation, since it is a common law principle of ancient precedent". In *Richmond Hill Furriers*, the court rejected section 54 as having relevance since the wood stake in question was not an original monument. Section 55 of the *Surveys Act*, before setting out the prescribed method of re-establishing a line, directs that a surveyor "shall obtain the best evidence available respecting the line, boundary or corner"—another principle of ancient precedent codified by the statute. In sifting the evidence, if ambiguity arises, the hierarchy of evidence is the guideline for resolution.

The hierarchy, as developed in common law, was compiled by Greenleaf in the 1840s as a tool to assist in dealing with ambiguities in descriptions, in order to identify which portion of a description "will be taken to be the true one", and which should be "rejected as *falsa demonstratio*".[6] To quote from Greenleaf:

> The object in cases of this kind is, to interpret the instrument, that is, to ascertain the intent of the parties. The rule to find the intent is, to give most effect to those things about which men are least liable to mistake. *Davis v. Rainsford*, 17 Mass. 210; *Mclver v. Walker*, 9 Cranch, 178. On this principle, the things usually called for in a grant, that is, the things by which the land granted is described, have been thus marshalled:
>
> *First*. The highest regard is had to natural boundaries.
>
> *Secondly*. To lines actually run, and corners actually marked, at the time of the grant.
>
> *Thirdly*. If the lines and courses of an adjoining tract are called for, the lines will be extended to them, if they are sufficiently established, and no other departure from the deed is thereby required; marked lines prevailing over those which are not marked.
>
> *Fourthly*. To courses and distances; giving preference to the one or the other, according to circumstances.[7]

Greenleaf stated at the outset that the purpose of the tool

cont'd on page 16


=

=

???

Does your employee benefits agent/broker/consultant think surveyors are the same as plumbers or the same as roofers?

MOST DO!

You don't wear "one-size-fits-all" shoes!

You don't wear "one-size-fits-all" pants!

Why put up with a "one-size-fits-all" benefit plan?

Why not enjoy a plan that is "custom-tailored" for surveyors with special features you won't get anywhere else?

Your fellow surveyors have helped us custom-design the Land Surveyors Group plan over the past 24 years!

They told us what they wanted or needed, and we made changes.

Why not call Bob @ 1-888-747-7707 and have a look at a plan that is "custom-tailored for surveyors"?

Looks are free!

ROBERT J. MORROW CLU RHU CEBS

THE CONNECTORS INSURANCE GROUP LTD.
SUITE 101, 299 GLENVIEW AVENUE
OSHAWA, ONTARIO L1J 3H5

(905) 721-7569 (905) 721-9154 fax
1 (888) 747-7707 toll free
bob.morrow@theconnectors.com

was to "ascertain the intent of the parties". Intent is a key issue in interpreting descriptions, whether in metes and bounds or plan form.[8] To repeat, wherever intention is clear and unambiguous, the description is taken to specifically demonstrate intention; where ambiguity arises, whether patent or latent, intention is drawn from the evidence, with the guidance of the hierarchy.

The portion of Greenleaf's hierarchy missing from the list set out in *Thelland* (and *Nicholson*) is "*Thirdly*", where "lines of an adjoining tract are called for" in the description. For example, if the course in a description calls for "200 feet to the parcel conveyed to John Doe", the line will be extended to reach (or be truncated at) the boundary of the named parcel, and the distance call becomes a "more or less" entity. This is not the same as "fences or possession that can reasonably be related back to the time of the original survey". The principle has nothing to do with fences or physical possession, except by coincidence. Fences or physical possession are only accepted as evidence of boundaries if they demonstrate the location of original monuments, which is a principle covered by "*Secondly*" in the list.[9] Greenleaf's "*Thirdly*" means that the boundary of the adjoining parcel (called for in the description) must be respected whether or not there is fencing or any other form of possession marking the line. This "*Thirdly*" principle is missing from the list in *Thelland* (and *Nicholson*).

The decisions noted above that contain the incomplete list were not dependent on Greenleaf's "*Thirdly*" principle; and, to repeat, the paraphrase is essentially correct—it's just missing an important element of Greenleaf's complete list. In the event that cases arise that involve the correct "*Thirdly*" principle, surveyors should be aware of the *complete* hierarchy of evidence first compiled by Greenleaf.

[1] *Miller v. Tipling* (1918), 43 O.L.R. 88 (Ont. C.A.); *Landry v. Landry* (1920), 48 N.B.R. 47, 53 D.L.R. 284 (N.B. C.A.).

[2] *Home Bank v. Might Directories Ltd.* (1914), 31 O.L.R. 340, 20 D.L.R. 977 (C.A.) for example, and many others.

[3] The only exception since 1989 (that the writer has found) is *Richmond Hill Furriers v. Clarissa Developments Inc*., 1996 CanLII 11805 (ON SC), in which the full list appears, cited mostly as the "priority of evidence rule" (the word "hierarchy" is used once).

[4] *Fraser* (1854) cites section 302 of a then-existing version of Greenleaf's text; *McPherson* (1868) cites "*Greenleaf on Evidence*, p. 441, *n*. 2". The 6th edition was published in 1852; the 7th in 1854; and the 9th in 1858.

[5] The version before the writer is Vol. 1, 11th edition, (Boston: Little, Brown and Company, 1863), with substantially the same wording as *McPherson* appearing in section 301, at page 436, footnote 2.

[6] *Ibid*. Quotes are from the last sentence of s.301.

[7] This is the wording found in the *Canadian Encyclopedic Digest* as well, although the reference is to *McPherson*, not Greenleaf.

[8] Latent ambiguities in Registered Plans of subdivision were resolved by analysis of evidence of intent in relatively recent cases: *Tiny (Township) v. Battaglia*, 2013 ONCA 274 (CanLII); *Lackner v. Hall*, 2013 ONCA 631 (CanLII); and *Michnick v. Bass Road Beach Association*, 2015 ONSC 1936 (CanLII).

[9] Any fences or other forms of physical possession that do not lead to the location of original monuments can only, at most, amount to evidence of adverse possession or some form of prescription—an issue quite apart from retracement of parcel boundaries.

GeoShack
Productivity & Positioning Solutions

TOPCON LOCKHEED MARTIN We never forget who we're working for™ sentera


Indago Mapper


Sentera OMNI


Hiper HR


FC-5000


HiPer SR


HiPer V


GT Series
Total Station


LN-100 Layout
Navigator

We Have Everything You Need!

If you're looking for great deals on equipment then call our experts or stop by one of our many locations and see for yourself what products and services GeoShack has to offer. We have everything you need to get the job done accurately and right the first time.

Don't forget to ask us about our ***GeoShack Advantage*** programs – where you can get support, training, and other services along with your equipment purchase.

London
1930 Mallard Road
London ON CA N6H 5M1
Phone: (519) 235-0240

Toronto
35 McCleary Court, #21
Concord ON CA L4K 3Y9
Phone: (905) 669-9759

Ottawa
15 Grenfell Crescent
Ottawa ON CA K2G 0G3
Phone: (613) 225-1110

FIND US ON

For More Information Visit Us At: www.GeoShack.com

2.3_Ontario.Survey.CAN

Survey Review Department Forum
The Comprehensive Review Process

By Doug Reitsma, Survey Review Department Consultant

In the first article in this forum Tim Hartley provided responses to some frequently asked questions and in the second article, Al Worobec provided a synopsis on the field examination process. In this next article, we will introduce some important details regarding how a Comprehensive Review is processed.

A Comprehensive Review is initiated with a letter from the Survey Review Department (SRD) Administrative Officer requesting a copy of the firm's tracking system/log Schedule "B"/A.O.L.S. PLAN LOG - http://www.aols.org/survey-review/survey-review-helpful-documents for S.R.D. sticker usage during the twelve-month period prior to the date of the letter. A link to a 'fresh' copy of the A.O.L.S. Plan Log is provided with this correspondence to remind everyone of the type of information that is required and the preferred format for its documentation. The essential information to be recorded includes your 'Project No.' (for obvious reference purposes), the 'Date of Release' (confirming that the survey is from the one-year time period prior to the date of the letter), the 'Plan Type (Code)' (to identify the different types of surveys prepared by the firm), the 'Sticker No.' (which cross references with the plan and project number) and the 'Supervising O.L.S.' (identifying the signing surveyor). The proper completion of this form permits the SRD to efficiently choose the appropriate number and type of surveys for the Comprehensive Review.

The plan selection process begins upon our receipt of the firm's Plan Log, but the first step is to determine the number of plans to be chosen. This involves a review of the A.O.L.S. records, to confirm the number of surveyors registered with the firm, and then cross referencing this information with the number of signing surveyors identified on the Plan Log. As mentioned in a previous article, SRD chooses a minimum of four plans from each firm, having up to a maximum of two surveyors, and then two extra plans are chosen for every surveyor in the firm thereafter up to a maximum of ten surveys. A minimum of four surveys from a firm is necessary to ensure there is a variety in the types of surveys reviewed, and further ensures that a minimum of two surveys can be chosen for each surveyor.

Once the number of plans to be chosen is determined, we review the plan codes listed on the Log and attempt to identify the range or types of surveys prepared by the firm. Our goal is to choose at least one survey from each category and ensure that the total selection will provide a wide range of examples of regulatory applications. We endeavour to provide each firm with the opportunity to represent their processes as they relate to: the acquisition of documentary evidence, the collection and management of field data, the representation (on the plan) of the required information (in the required format), and the documentation of the communications with the client.

The next correspondence sent to the firm from the SRD is our 'Request for Support Material'. This package identifies the plans chosen for the review and further provides important instructions regarding the submission requirements for each file. Some of these instructions are obvious reminders, such as signing the Surveyor's Certificate on any plans not registered or deposited on title, not sending original documents, completing the Log Sheets to record the documents submitted, completing the Office Questionnaire, etc.
http://www.aols.org/survey-review/survey-review-helpful-documents

One of the more important attachments linked to this correspondence is the Schedule "A"/'INFORMATION REQUIRED FOR COMPREHENSIVE REVIEW' - http://www.aols.org/survey-review/survey-review-helpful-documents This attachment is intended to provide some general direction regarding the content of the submission and is based on some assumptions or expectations of what actions are

Sites to See

Family Ties: Ontario Turns 150 at the Archives of Ontario

www.archives.gov.on.ca/en/explore/gallery/gallery.aspx

Family Ties: Ontario Turns 150 explores the Era of Confederation through the stories of four family groups in Ontario, and how their lives intersected with larger historical forces of the period. The exhibit uses reproductions of images, and textual records, and artefacts from the Archives of Ontario and other institutions across the province to show multiple perspectives on life in Ontario during the late 19th century. *Family Ties* also includes a look at how Ontario celebrated the Centennial anniversary of Confederation in 1967.

required from a professional (i.e. documentation). This would include the expectation that the firm's processes fulfill the regulatory requirements in such a way so as to not only ensure compliance, but to also provide acceptable documentary evidence to prove compliance. The specific types of processes and/or documentation that illustrate the best representation of compliance will be covered in more detail in future articles under the headings of Research, Field Work, Plans and Correspondence.

Once the firm has completed its submission, the files are then forwarded for field examination; a process that was outlined by SRD Examiner Al Worobec in his article in the Winter 2017 edition of this magazine. The reports that are generated from Al's field examination of each site are specific and detailed and provide the Plan Examiner with insight into the processes employed by the firm in their preparation of a survey. These matters are incorporated into the comments made by the Plan Examiner in the Draft Report.

Once the field examinations are completed, the files are then forwarded to a Plan Examiner for review. This stage of the process is somewhat similar to the method that any OLS might use to check a plan; however, we are viewing the survey from a different perspective. Our comments at this stage are based solely on the information that was provided and give consideration as to whether the participant has provided sufficient information to show evidence of compliance with regulatory requirements. As we attempt to explain to each member during the office visit part of the process, our examination of the contents of the File at this stage is done with the intent of generating a discussion, and we purposely don't give the firm the benefit of the doubt, until we get to the office meeting. Our goal is not necessarily to identify instances of non-compliance to assign a penalty, but to raise topics to discuss solutions for the completion of the required tasks in a compliant manner, which better ensures that we are satisfying our obligation to protect the public interest. The office visit portion of the process provides us with the opportunity to have a thorough discussion of the issues identified in the Draft Report, with the intent of coming to an agreement on what actions the firm might take to not only ensure compliance, but to also provide adequate representation of compliance. Our mandate is to apply this Comprehensive Review system as an educational tool to ensure consistency in the correctness and accuracy of our opinions as surveyors, and to safeguard public trust in our profession.

We at SRD trust that this outline reflects something that is familiar to you as part of your SRD experience. We ask that you not hesitate to contact the department should you have any questions or comments. Future articles will be providing further particulars on some of the SRD operations and we will also outline details on specific topics related to 'surveying' processes.

125th AOLS AGM / NSC 2017

Dr. Brian Ballantyne, shared his thoughts on Land surveying: An institution that has shaped Canada. A truncated version of his Keynote Presentation can be found on page 30.

Jean-Claude Tétreault, Executive Director/Registrar of the Association of Canada Lands Surveyors (ACLS) delivered the Charge to the New Surveyors at the Convocation Lunch. A copy of his speech can be found on page 24.

The 125th AOLS AGM/NSC 2017 was called to order as the Sergeant-at-Arms, David Thompson (Francis Kenny) and Charlotte Small (Emélie Perron-Clow) laid down the Standard Measure, which historically was used to control the accuracy of surveys in Upper Canada.

Incoming President Russ Hogan (right) presented the Past President's gavel to Murray Purcell.

Members Commissioned in the Last Year

Front left: Roger Grose, Shane Rajakulendran, Michael Haines, Maryna Hanna, Luke Wilcox, Gavin Seaman, Farrokh Assaie-Ardakany

Murray Purcell (left) presented a Fellowship Award to Michael Marlatt in recognition of his substantial contribution to the status of the surveying profession in Ontario.

Murray Purcell (right) presented Charles Wilkins, the author of Great Lengths, A Celebration of the Surveyors of Ontario, with the President's Award in appreciation of his passion and dedication to "shine a light" on the story of surveying in Ontario.

"Celebrating Canada's Surveyors"

Natalie Panek, an Aerospace Engineer in MDA's Robotic and Automation Division, delivered the Keynote Address: Revolutionizing Women in Technology. She shared some of the extraordinary experiences that have lead her on a mission to inspire the next generation of females to pursue careers in engineering and technology.

Back left: James Dorland, Kevin Wahba, Waldemar Golinski, Alec Mantha, John Gauthier, Rob Leiper, Gregory MacDonald

Roselle Purcell (right) presented the AOLS medallion to Vicky Hogan.

Brian Lennox (centre), who is a descendant of Canada's explorer David Thompson, was invited to present the ACLS awards at the Convocation Lunch. He is pictured with actors Francis Kenny (portraying David Thompson) and Emélie Perron-Clow (portraying Charlotte Small).

Murray Purcell (left) and Jim Hill (2nd from left) together with Mrs. Odette Barnes (centre) and her son John D. Barnes (far right) presented the John Duncan Barnes Multimedia Award, sponsored by The AOLS Educational Foundation, to Chris Fox, O.L.S. for his winning video "I am an Ontario Land Surveyor".

Celebrating the National Surveyors Conference 2017

The Conference Organizers, from left: Jean-Claude Tétreault (ACLS), Blain Martin (AOLS) and Luc St-Pierre (OAGQ).

The Conference Chair, Ed Herweyer (AOLS)

The Conference Presidents, from left: Tania Bigstone (ACLS), Murray Purcell, (AOLS) and Sophie Morin, (OAGQ)

From left: Lay Councillor Patricia Meehan joined guests at the Welcoming Party from the New York State Association of Professional Land Surveyors; Patty Brooks, Rick Brooks, Janice Shaw and her daughter, Dianne Hess.

Guests from other surveying associations and their accompanying persons pose with AOLS President Murray Purcell and his wife Roselle at the President's Dinner and Dance.

Thank you to all of the Sponsors and Exhibitors for making the Conference such a success!

From left: Charles Wilkins, author of Great Lengths, A Celebration of the Surveyors of Ontario, shares a copy of the book with Doug Culbert and Jim Hill at the Meet and Greet.

Thanks to (from left) Martha Reeve, Julia Savitch, Penny Anderson, Lena Kassabian and Johanne Lemay for their hard work at the conference and for selling the Exhibitor Draw tickets at the Welcoming Party.

Hockey Night in the Capital Sponsored by Pat Hills and Cansel

The 13th annual hockey game at the AGM was a blast! Originally it appeared that the white team was putting a beating on the red but alternative facts are emerging that suggest otherwise. Okay, I can't even sell that. Players were thrilled to be able to keep the commemorative jerseys that we had made for Canada's 150th birthday and the 125th anniversary of the AOLS. And thanks to our Quebec friends who joined us this year! Have a great year, everyone! *Pat Hills*

Parliamentarian Jack Young was the Master of Ceremonies at the Veterans' Dinner.

Susan MacGregor and Michael O'Sullivan presented the 25 and 50-year Veterans' pins.

Gilles P. Doucet, Space Security Consultant, was the speaker at the Veterans' Dinner.

Veterans' Dinner

Front left: Bob Jordan, Tim Hartley, Ron Jason, Harland Moffat, Bill Bennett
Back left: Al Roccaforte, Hugh O'Donnell, Frank Mauro, Helmut Grander, Peter Sauvé

Front left: Paul Quesnel, Paul Torrens, Rick Miller, Andrea Tieman, Martha Burchat
Back left: John Galejs, Don Brown, Paul Riddell, Bill Buck, Bob Salna, Bill Merry

Front left: Tony Bourne, Ed Herweyer, Maureen Mountjoy, Andy Shelp, John Kennedy
Back left: Grant Bennett, John D'Amico, Steve Gossling, Bob Fligg, Dave Urso

Front left: Charlie Rogers, Adam Kasprzak, Bruce McMurchy, Kevin Perkins, Richard Murray
Back left: Bill Webster, Phillip Hofmann, Rob Harris, Jack Monteith, Dan Vollebekk

Front left: Bruce Baker, Ken Wiseman, Lorraine Petzold, Bob Hawkins, Wally Kowalenko
Back left: James Ferguson, Brent Collett, Anne Cole, Dave Dorland, Norm Sutherland

Front left: John R. Hiley, John W. Hiley, Doug Jemmett, Ardon Blackburn, Ted Williams
Back left: Bruce Johnson, Marvin McNabb, Murray LeGris, Eric Ansell, Blain Martin

Front left: Omari Mwinyi, Jim Purcell, Erich Rueb, Gord Good, Dan Dolliver
Back left: Brent England, Jim Hill, Cindy Kliaman, Kathy Sam-Guindon, Doug Culbert

Front left: Dino Astri, Vladimir Krcmar, Jack Keat, Ron Dore, Rodney Reynolds
Back left: Ivan Wallace, John Goltz, Chester Stanton, Leslie Higginson, Paul Miller

Convocation Address
Charge to the New Surveyors

By Jean-Claude Tétreault, CLS, a.-g., MBA
Executive Director/Registrar, Association of Canada Lands Surveyors

When I volunteered to present the Charge speech, I didn't know what I was getting into. This is a long tradition with the AOLS. We never did this at the ACLS. Here it goes.

I want to thank the NSC 2017 Planning Committee for allowing me to address the new surveyors. It is quite an honour.

Congratulations to all new surveyors! You worked hard and made many sacrifices. Some of you got a university degree; some went the CBEPS route and wrote many hard exams. A lot of work and believe me, it's worth it. You think you got it made and maybe you know everything. Well that's not true, you are just beginning. But what a rewarding journey is ahead of you!

Albert Einstein said: "The more I learn, the more I realize how much I don't know."

If not already done, I recommend you find a mentor or mentors and learn. I was lucky; both my dad and one of his brothers were Land Surveyors and partners in a survey firm. I learned a lot from them and from their staff. This will be critical for the success of your career.

Remember your professional responsibility. Society has awarded you the exclusive right to practice cadastral surveying; in return you have a responsibility of high standards of behaviour and competence. You will be working for a client, a public utility or a government department but in fact you have a responsibility towards society as a whole. You have to act in an unbiased manner even though you are paid by your client or employer. I heard once that a professional is someone that does the right thing even though no one is watching.

Jean-Guy Leclerc, my Physical Geodesy course professor at Laval University once said during one of his challenging courses, "Don't only focus on cadastral surveying, challenge yourself. Explore how your surveying knowledge can solve difficult problems". But you must also know your limits and remember your ethical responsibility to refrain from accepting assignments beyond your competence or beyond the resources available to you. Don't go at it blindly. Ask for help from experts.

Surveying has evolved enormously in the last 25 years and will continue to do so in the future. Embrace technology and explore new ways of doing things and new markets. You

have the responsibility to always use the most efficient technology and processes to serve your clients and society.

You are not done with learning. Being a professional, you are embarking on a lifelong learning process. Your association has a mandatory CPD program in place because it is important. Society requires that its professionals be at the top of their game. It's not a game of accumulating points but

one of self-improvement. Find high quality learning opportunities that meet your professional needs and keep at it.

Get involved in your association activities. Easy for me to say, it's my job to manage the ACLS but there is a lot to gain from being part of a committee or even joining Council and running for President. Just ask Sophie, Murray, Tania and everybody you know that has participated. Networking, learning, accomplishing things, tweaking leadership skills, teamwork. Don't wait, your association needs you.

I always was fascinated by leadership. Read many books on the subject. My hero in the 60s was Star Trek's Captain Kirk. I wanted to be just like him. Lead by example, never give up, and take care of your people. We don't have enough leaders today. Get involved in your community. Be a role model. Encourage young people around you to consider a career in this great profession. Consider being a mentor. The future of the profession depends on you.

Most of you will own your business, be a partner or lead a government or para-government department so learn about the business of surveying. A healthy profession depends on a healthy industry and it needs competent managers.

Surveying is the greatest profession in the world. I started off as a Civil Engineer and realized that I loved surveying. After getting my QLS Commission I worked in private practice for 17 years but then realized that I had a knack for management and even went for my MBA. I left the practice of surveying to focus on management but always staying close to the profession that I love.

This to stay that you must remain open to any opportunities; you never know which door will open for you. I ended up with the best job I can ever imagine. Perfect fit for me and I consider myself very fortunate.

When Jim Gunn received the Professional Surveyors Canada Champlain Award two years ago, he said that in the surveying profession "you meet the nicest people". He is right and my wife Johanne would confirm that. Because of my job, my wife and I travelled all over the country and made many friends. We were always welcomed like we were family. The surveying community is a family; you probably already found that out.

I don't know if there will be another opportunity for this but I want to say that I was very happy to be part of this historic conference. It was not easy having three surveying associations who have different ways of organizing AGMs working together, but we did it. I want to thank Blain Martin, Luc St-Pierre, Sophie Morin, Tania Bigstone, Murray Purcell and Ed Herweyer. It was a real pleasure working with you all over the last two years. We should all do more projects together. The surveying community is too small for us to work in isolation.

Like Red Green would say, "Keep your stick on the ice! We are all in this together".

Locate, Archive, Process & Protect
Protection of Ontario's Land Survey Monuments

Submitted by the Monument Protection Task Force

The Monument Protection Task Force (MPTF) was established by the Council of the Association of Ontario Land Surveyors (AOLS) and the Ministry of Natural Resources "to look for recourse for the public when they encounter monuments that were intentionally or unintentionally removed".

The task force reviewed a number of options to solve the monumentation removal issue:

Option 1: Amend the Surveys Act to strengthen Ontario's monument protection strategy to emulate the best practices developed in other provinces. Enforcement is not practical under the current legislative scope.

Option 2: Engage road authorities, municipal organizations (AMO, OGRA, Municipal Engineers Association) with a best practice to develop a pre and post inventory system prior to utility installation or road construction. The replacement of missing or lost monuments would be the responsibility of the constructor.

Option 3: Consistent application of Section 7(1) of the Building Code Act which gives municipalities the right to pass by-laws to request plans for any purpose. This section could be used to require that all property corners be monumented at the time of occupation or after final grading.

Option 4: Continue the public awareness campaign to educate utility companies, contractors, municipalities and the public to see the value of protecting monuments.

Option 5: Mandating best practices using a legislative approach may be desirable at a future date if municipalities do not adopt best practices.

The problem is that no one agency is willing to offer any funds to help the public with the cost of replacing missing monuments. In most cases, private owners have no idea where their property corners are or even that the bars have gone missing after a construction activity has occurred within the road allowance.

The task force completed a survey of the AOLS members to determine what degree of monuments are missing throughout the province. Approximately 25 to 50 percent of primary monuments and 50 to 75 percent of the secondary points have been removed and the estimated cost to replace them is $600 million. It is felt that the primary cause of the removal of survey monuments is through construction activity within the road allowance or by people who are completing home improvement projects. In an age where people are paying record amounts for land purchases one would think that it is even more of a priority for them to know where their boundary limits are.

Land Surveyors depend on survey monuments in order to retrace property boundaries. As the monumentation gets destroyed it becomes increasingly costly to re-locate existing boundaries on the ground.

The reality is that surveys are not being completed at the point of land transactions and owners are not interested in paying any extra money to know where the limit of their ownership is on the ground. Buyers are relying on advice from non-land surveying professionals and only purchasing title insurance to stick handle any issues that deal with the boundary. Any land professional can see that this is a formula for disaster. Prior to title insurance, survey monumentation was constantly being refreshed due to the fact that new surveys were required for most real estate transactions.

The MPTF looked at a number of different solutions to try and reduce the number of monuments that are being removed for a variety of reasons. Like all problems in life we tend to turn to the government to help and guide us to solve and pay for all of our problems. The idea of more legislation to make sure that the survey infrastructure is being reviewed and replaced at the point of all land sales seemed like the best solution, however, new legislation can take many years to establish and there are no guarantees that the government of the time would even entertain new legislation.

With any problem in society we always look to education as the best short term solution. The main parties involved in the removal of the survey infrastructure are the contractors who are working on utility installations within the road allowances and major road reconstruction which is being done by the municipalities. It seemed like a quick win to engage these groups in an aggressive education awareness campaign. The desired outcome would be to have them help to resolve the situation or at the very least reduce the occurrences of the number of monuments that are being removed.

To use the education approach required that a "Best Practice" be developed and that is how the Special Provision (SP) Protection of Survey Monumentation for Municipal General Conditions of Contract was created and approved by the Council of the AOLS. A copy of this document can be found on the AOLS website for your review. http://www.aols.org/resources/special-provision-survey-monument-protection

In finalizing the SP the task force felt that the document should not be more than two pages and that the OLS who is assigned to the inventory would be in a better position to assess how to achieve good monument protection. There are many different ways to achieve this goal and as a professional each

member can create a procedure that works best for their individual survey practice and situation. The routine is very simple, a pre-inventory of all the monuments is taken prior to the start of construction, and by working with your client, the constructor, monuments are preserved during construction, and at the completion of the project, a post-inventory is performed.

The creation of the SP was the start of the education process and it gives the industry a sound document to be used in all construction projects. However, it will take years to see any change in the construction industry. But, change will happen if we all work together with the same common goal to preserve the monuments. To help members of the association spread the word, a PowerPoint presentation was also created by the MPTF. It can be found on the AOLS website to download and modify to meet individual needs.

The MPTF is willing to assist any member who also feels this is an important issue. We encourage members to speak with their municipalities to educate them on the importance of monument protection and the plight of our infrastructure. If we work together, we can rehabilitate the survey fabric to protect the public interest.

The Members of the Monument Protection Task Force are:

David Lamont – Chair
Paul Benedict
Bill Harper
Al Jeraj – Council Rep
Sabir Ahluwalia
Dave Bianchi
Mart Himma

Elected representatives and the public service can preserve infrastructure fabric by supporting

SPECIAL PROVISION (SP) PROTECTION OF SURVEY MONUMENTATION

GENERAL

Property Monuments are meant to provide lasting physical evidence of boundaries shared by adjacent land owners. Ontario regulations require that they be set by Ontario Land Surveyors (OLS) at all property corners and at regular intervals on boundaries. They may consist of, for example, 25mm or 16mm square steel bars, or 25mm plastic bars, of up to 1.2 m length, set vertically in the ground with tops flush to or near grade; or they may be pins set in rock, or crosses cut in concrete.

PROTECTION

Monument means either a Property Monument or a Control Monument.

Property Monument means any property bar, concrete pillar, rock post, cut cross or other object that marks the boundary between real property interests, including rights-of-way and easements.

Control Monument means any horizontal or vertical (benchmark) control monument that may be used to lay out or survey the work.

Prior to commencement of construction, the Contract Administrator and the Contractor shall locate on site those Monuments that delineate the Working Area and may be used to lay out the Work, all as shown on the Contract Drawings. These Monuments shall be protected by highly visible T-bars or 0.9m tall stakes with survey ribbon set near but no closer than 0.3 metres of them. Monuments shall be inventoried by a licensed Ontario Land Surveyor (OLS) showing location, condition, and monument details in the report format required by the Owner. Any Property Monuments that must be removed to facilitate the Work shall be identified as such as agreed by the Contractor and Contract Administrator and noted in the inventory report.

Missing monuments result in lost boundaries that can cause doubt for homeowners and quarrels in neighbourhoods potentially resulting in litigation. Misplaced buildings and roads are costly to fix and misplaced utilities such as gas can have catastrophic results.

The Contractor shall be responsible for the preservation of all Property Monuments while the Work is in progress, except those Property Monuments identified in General Provision 7.02.01 as needing removal to facilitate the Work. All Monuments disturbed, damaged, or removed by the Contractor's operations shall be documented in the inventory report and replaced under the supervision of an Ontario Land Surveyor. Monuments removed to facilitate the Work shall be replaced at the Owner's expense, and all others shall be replaced at the Contractor's expense.

The Monument inventory report shall included as a minimum:

- Contract Number, Contractor Name, Contact Administrator Name;
- Project/Site construction limits;
- Rough location, type, identification No., condition of each monument before and after construction;
- The solutions for protection of the monuments that may be impacted by construction;
- Referencing ties and any other information that the OLS may deem important; and
- A summary of those monuments affected by the work and how they were reset or replaced, and by what type of monument.

At the completion of major project works, when no further adverse impacts to the survey monuments are expected, the OLS shall complete and sign the report and submit it to the Owner, Contractor and the Contract Administrator. A copy of the report, along with copy of the read receipt from the owner and contractor, shall be retained by all parties.

Download a copy of the Special Provision (SP) from the link on the Home Page at www.aols.org.

Review the Best Practice for the Protection of Survey Infrastructure of the Ontario Regional Common Ground Alliance at: http://www.orcga.com/Portals/0/Publications%20and%20Resources/Documents/Best%20Practices/1208.05%20-Final.pdf page 5.

The Criminal Code of Canada R.S. 1985, c. C-46 under Part XI, Sec. 442 and 443 states.

"Every one who wilfully pulls down, defaces, alters or removes anything planted or set up as the boundary line or part of the boundary line of land is guilty of an offence punishable on summary conviction."

NEWS FROM 1043

Changes to the Register

Members Deceased

Kenneth A.J. Williams	827	Nov. 26, 2016
James Robert Sneath	927	Dec. 17, 2016
George T. Yates	778	Jan. 23, 2017

Retirements/Resignations

J. Herman Wimmelbacher	1624	Dec. 31, 2016
Barry W. Costello	CR19	Dec. 31, 2016
Frank B. Delph	1306	Dec. 31, 2016
Talson E. Rody	1096	Dec. 31, 2016
Nedim Oren	CR208	Dec. 31, 2016
Paul F. Forth	1311	Dec. 31, 2016
Paul J. Gregoire	1595	Dec. 31, 2016
Bruce Brouwers	1553	Dec. 31, 2016
Peter J. Stringer	1444	Dec. 31, 2016
Thomas A. Bunker	1323	Dec. 31, 2016
Bruce G. McPherson	1584	Dec. 31, 2016
William E. Parsons	1569	Dec. 31, 2016

CofA's Approved

Kad Lanka Surveying Inc.
Oshawa, Ontario, April 1, 2017

CofA's Revised

Was: Mitsche & Aziz Inc.
Now: A. Aziz Surveyors Inc., Richmond Hill, ON, Dec. 12, 2016

Was: Stewart McKechnie Surveying Limited
Now: McKechnie Surveying Ltd., Waterloo, ON, Feb. 6, 2017

CofA's Relinquished

WDB Consulting
Petersburg, Ontario, January 24, 2017

Surveyors in Transit

Nath Segaran is now the Managing OLS **of Barich Grenkie Surveying Ltd. (A division of Geomaple Canada Inc.)** in Stoney Creek, ON.

Steve Ruttan is now with **Greg Bishop Surveying and Consulting Ltd.**

THE AOLS IS PLEASED TO ANNOUNCE THAT THE FOLLOWING ONTARIO LAND SURVEYORS WERE SWORN IN:

Roger Grose	1999	Jan. 25, 2017
Alec Sloan Mantha	2000	Jan. 30, 2017
Michael Haines	2001	Jan. 26, 2017
Maryna Hanna	2002	Jan. 30, 2017
John Gauthier	2003	Jan. 30, 2017
Shajieeshane Rajakulendran	2004	Jan. 31, 2017
Kevin Wahba	2005	Jan. 31, 2017
James Dorland	2006	Jan. 31, 2017
Gregory MacDonald	2007	Feb. 7, 2017
Gavin P.T. Seaman	2008	Feb. 8, 2017
Farrokh Assaie-Ardakany	2009	Feb. 22, 2017

The Toronto office of **Monteith & Sutherland Ltd.** is now located at 515 Milner Avenue, Unit 5, Toronto, ON, M1B 2K9. Phone: 647-343-4603.

GEOPLAN Surveying Ltd. is now located at 40 Wynford Drive, Suite 209, Toronto, ON, M3C 1J5.

Vineetha Rathnayake is now the managing OLS at **Kad Lanka Surveying Inc**. located at 132 Nearna Drive, Oshawa, ON, L1L 0H1. Phone: 289-214-1375.

Amar Loai is now with **TTC Engineering Department** located at 5140 Yonge St., 6th floor, North York, ON, M2N 6L9.

Guido V. Consoli is no longer with **Ashenhurst Nouwens & Associates Inc.**

Peter de Haan is no longer with **J.D. Barnes Limited.**

Thomas Hoppe is now with **43 Degrees North Enterprises Ltd.** located at 104 Cranarch Road S.E., Calgary, AB, T3M 0V9.

Peter R. Feren is no longer with **Kirkup Mascoe Ure Surveying Ltd.** and is now with **Public Works and Government Services Canada.**

Robert J. Fulton is now with **Schaeffer Dzaldov Bennett Ltd.**

Richard Emode is no longer with **SNC Lavalin, Toronto.** He is now with **CSS Inc.** in Brampton. Phone: 905-789-8338.

David M. Brubacher is now with **NA Geomatics Inc.**

John M. Beerkens is now with **exp Geomatics Inc**. in Timmins, ON.

Aviation Insurance designed exclusively for Land Surveyors

SurveyorsFirst provides coverage customized for drones, hull and aviation liability, non-owned aircraft liability and digital cameras used for surveying.

Arthur J. Gallagher Canada Limited, formerly The CG&B Group, provides cost effective insurance products designed exclusively for AOLS members.

Association of Ontario Land Surveyors

For information about Surveyors'Plan aviation and other programs contact:

Mark Sampson BBA, FCIP
Senior Vice President,
Commercial Insurance
800.267.6670 ext. **2631**
mark_sampson@ajg.com

SurveyorsFirst

Professional Liability · Insurance Protection for Retirement
UAV Insurance · Business Coverage

Squinting against the grandeur: Land surveying defines Canada[1]

By Dr. Brian Ballantyne[2]

Based on the NSC 2017 Keynote Presentation "Land surveying: An institution that has shaped Canada".

To start

Land surveying is an institution that has shaped Canada. As each fardel of land was demarcated, surveying became part of the very warp and weft of Canada.[3] Let's delve, using a cunning mélange of infrastructure, innovation, ideas, ideals, individuals, imagination and Indigenous lands.

Part 1 – Surveying as part of Canada's psyche

Institutions matter. In 2013, the *Survey on Social Identity* revealed that Canadians' average confidence in seven key institutions was 50%. Sadly, surveying was not one of the institutions measured. To compensate for that oversight, let's demonstrate the significance of surveying using frequency of phrasing, income, and observations from the courts:

Since 1867, "land surveying" has been used once in every 200,000 words, with peak usage in 1890, 1910, 1925, 1960 and 1970.[4] In a 2011 study, Canadian surveyors made bank: Median income ranged from $81,000 (salary) to $105,000 (self-employed).[5] To put these amounts in perspective – income over $80,000 was in the top 10% of all Canadians; the median individual income across Canada was $34,000.[6]

As for observations about surveyors:

- MacGregor called surveyors: "Highly intelligent men [and women] who are gifted astronomically, mathematically, and logarithmically."[7]
- It has been noted that: "Surveyors are expected to exhibit a higher standard of intelligence than the person on the street."[8]

In late-2016, the courts echoed these sentiments:

- "A surveyor acts in a quasi-judicial capacity … is treated as an expert and accorded deference … A land surveyor is acting in the capacity of an officer of the state."[9]
- "Surveyors adjudicate … Surveyors must approach their work with a judicial mind … Their primary duty of impartiality [is] owed to society at large."[10]

These sentiments have much lineage, because the *Royal Proclamation* of 1763 recognized the link between surveys and the land. In acknowledging that it was "just and reasonable" that Indigenous peoples should not be molested or disturbed in their possession of land, Canada could not "grant warrants of Survey" beyond "the Bounds of their … Government."[11] In 1839, the Earl of Durham's reforms to the two Canadas (Upper and Lower) focused on the role of surveying. If land "is so carelessly surveyed that the boundaries of property are incorrectly or inadequately defined" there is "a store of mischievous litigation for the people." Surveys were integral:

> "I have already pointed out the importance of accurate surveys of the public lands. Without these there can be no security of property in land, no certainty even as to the position of boundaries marked out in maps or named in title deeds."[12]

In 1873, the First Nations at Fort Ellice, Saskatchewan petitioned to stop surveys until their land issues were resolved.[13] At the Treaty ceremony the following year, the Crown was lambasted for allowing surveys to proceed before Aboriginal title had been addressed.[14] Here we have an early hint of the role of surveying in reconciliation – as an institution that links all peoples with the land. For any discussion of land tenure in Canada must acknowledge that Indigenous peoples knew parcels and boundaries.[15] The very word "canada" refers to a large parcel. In the Laurentian language of the 16th century, "canada" meant village, settlement, land, town, or cluster of dwellings. Cartier, in narrating his early voyages, labeled the St. Lawrence valley "le pays de Canada" (land of villages).[16]

As Joseph Brant led the Six Nations into Upper Canada in the late-1700's, the community understood fee simple, leases, severances, transfers; and advocated for a registry of land rights.[17] The parcel reserved by the Whitefish Lake First Nation in the 1850 *Robinson-Huron Treaty* was defined using nine monuments known to the community: From a lake known as "the place of high cranberries," to Keecheemenessing ("Great Island"), to "an island with a tree having a spreading top" and so on.[18]

Part 2 – Six vignettes

The assertion that surveying pervades Canada's psyche can be substantiated with six vignettes.

Vignette 1: Sometimes, inferior survey equipment rocks

The boundary between Canada and the United States has been described as "inconvenient to the point of freakishness."[19] The *Royal Proclamation* set out that the southerly boundary of Québec was "in 45 degrees of north latitude." In 1766, Governor Murray of New York (accompanied by Harpur, Professor of Mathematics) and Lieutenant Governor Carleton of Québec (accompanied by Collins,

Deputy Surveyor General) set out to survey said boundary.[20] Harpur surveyed the 45th parallel just south of Ilse a la Motte; Collins surveyed the 45th parallel through the north part of Missiskoui Bay. The two demarcations were five miles apart; Collins was north of the 45th and Harpur was south of the 45th. Each surveyor had established his provincial parcel **smaller** than the other's parcel, a scenario that "is perhaps unique in the history of boundary disputes."[21]

The two surveyors compromised by establishing a final monument midway between the initial lines.[22] The negotiated compromise was a function of technology and technique.[23] It established the monument that served as the start for the entire 250 km survey of the Québec-New York and Québec-Vermont boundary between 1771 and 1774.[24]

Vignette 2: Royal Canadian Institute & the Time-Lord

In 1849, surveyors in Ontario organized "a society for the better improvement of surveyors, in order that much … litigation … may be prevented."[25] The first meeting on June 20, 1849 at King and Yonge Streets in Toronto had the purpose of uniting three professions – surveyors, architects and civil engineers. By September 1849, surveyor Rankin was Vice-President, surveyor Dennis Sr. was Secretary, and surveyor Fleming was on the Standing Committee. By April 1850, Rankin had assumed the Presidency.

The "prospects of the young Institute were not brilliant" at that time – the meeting of February 8, 1850 drew only two people. Nevertheless, the Institute forged ahead, by:

- Debating legislation for admitting surveyors and surveying lands throughout the province; and
- Discussing topics such as accretion in Toronto harbour.

The Royal Canadian Institute still thrives.[26] The Institute crest – which was designed by Fleming – continues to feature surveying equipment: level, compass, theodolite and drafting square.

Surveyor Fleming also continued to thrive, for he was instrumental in promoting time zones. Until the 1880's, local time prevailed. Universal time meant a global system of time standards based on an international date line. In 1879, Fleming petitioned the Governor General to bring the matter to the attention of Britain; apparently, Canada's vast geography made us sensitive to progress. Finally, on November 18, 1883 Canada adopted time zones. Fleming's strength was in using institutions such as the Royal Society of Canada and the Canadian Institute to promote universal time in the face of "national rivalry and odious indifference."[27]

Vignette 3: The curious chapter of irrigation

What of the link between a grist mill on the Granby River in Québec in 1831 and a change to Ontario legislation in 1911? The mill dispute ended up at the Privy Council, which allowed a riparian proprietor to "dam up the stream for the

cont'd on page 32

purpose of a mill, or divert the water for the purpose of **irrigation**."[28] This decision inspired surveyors across western Canada and had an effect across most jurisdictions.

At the 1894 National Irrigation Congress, surveyor Dennis Jr. learned that the St. Mary's River (in Canada) was to be diverted into the Milk River (in the United States), depriving Canadian farmers. He proposed an International Commission "to adjudicate conflicting rights on the international streams of the North American continent."[29] Dennis' lobbying led directly to the creation of two institutions - the International Waterways Commission in 1905 and the International Joint Commission in 1909 (whose mandate continues to be all trans-boundary waters).

Concurrently, surveyor Pearce was instrumental in having the Powers-that-Be acknowledge that the southern Prairies were arid, and that agriculture was incompatible with the right to take water.[30] Members of Parliament were reluctant to acknowledge such a reality: "It is not advisable to advertise that the North-West is a country where irrigation is necessary."[31] Pearce persisted. At the 1890 AGM of the Association of Dominion Land Surveyors he argued for legislation that responded to the aridity. In 1894, his advocacy bore fruit in the *Northwest Irrigation Act*, which vested in the Crown all waters and the beds of most watercourses.

The 1894 legislation eliminated the right to take water, weakened the *ad medium filum* presumption[32] and was trend-setting. Soon thereafter, provinces and territories started to retain most watercourses in the public interest: to generate electricity; to regulate floodwaters in spring; to boost flows later in the year[33] (e.g. Ontario enacted the *Beds of Navigable Waters Act* in 1911). Thus, surveyors contributed to what has been called: "a curious chapter in the history of institutions."[34]

Vignette 4: Let the man go free[35]

The Alaska panhandle was first defined in an 1825 Convention between Russia and Britain. The easterly boundary of Russian influence paralleled the coast along the summit of the mountains. If the mountains lay more than 10 leagues (50 km) from the coast, then the boundary was to "parallel the windings" of the coast within 10 leagues. In 1867, Russia transferred Alaska (which included the panhandle) to the United States for $7.2M. Soon thereafter, a gold rush on the Stikine River meant an influx of miners and the need to survey the jurisdictional boundary between Canada (British Columbia) and the USA (Alaska). However, the cost of $1.5M over seven years dissuaded both countries from surveying.

Then, in 1876, there was an assault on the Stikine River. Peter Martin was arrested by BC officials. But wait: Did BC have jurisdiction to arrest Martin? The arrest was only valid if the assault took place in BC (east of the boundary). Surveyor Hunter was dispatched by the Surveyor General for Canada to survey the boundary at the Stikine River, which he established 25 miles east of the coast (Figure 1). The assault site was west of the boundary; the arrest was invalid and Martin was released. Surveying meant that a man to whom the presumption of innocence applied was spared the terrors of the BC justice system.[36]

Prompted by the Martin assault/arrest/release, Canada and the USA realized the need to survey the entire boundary.[37] Conventions of 1892 and 1903 established a temporary International Boundary Commission (IBC) to survey the panhandle boundary over 18 field seasons (1877 to 1920). This collaboration is the precedent for the permanent IBC, which continues to ensure jurisdictional certainty between Canada and the United States.[38] The IBC would not exist without an ambiguous description, the need to demarcate the boundary and a legacy of ad hoc surveys, meaning that there is a direct connection between Hunter's survey of 1877 and the IBC.[39]

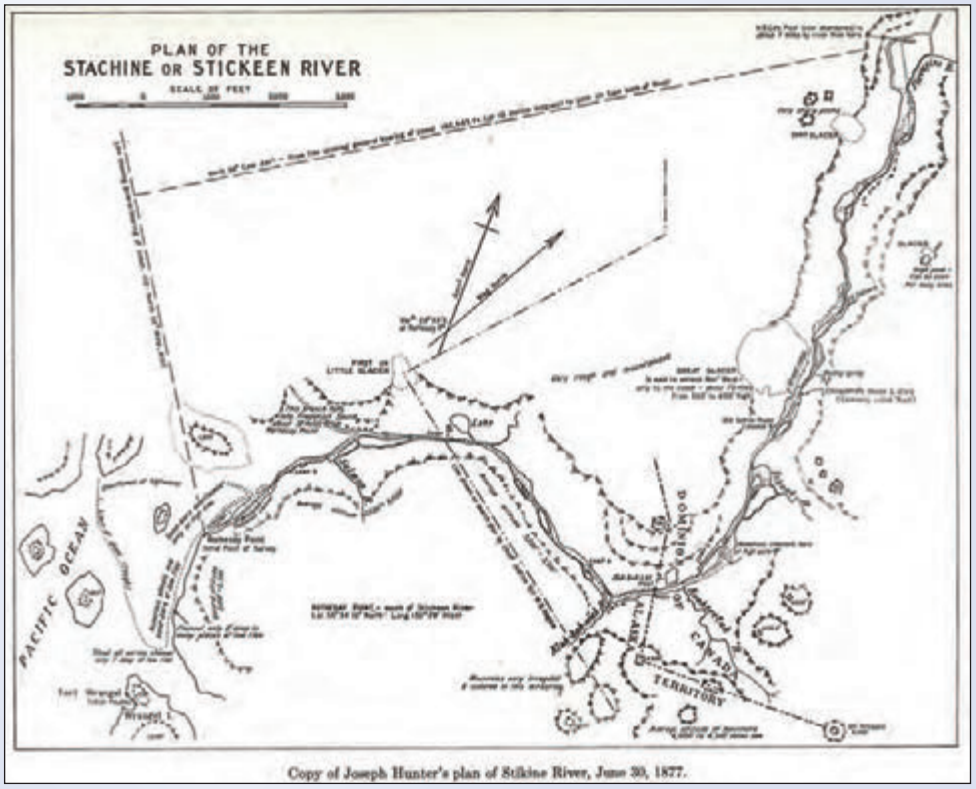


Figure 1 - Hunter's plan of survey, 1877

Vignette 5: Heavy moral responsibility

The decade between 1914 and 1924 saw surveyors **invent** land use planning in Canada. In 1914, surveyor Adams was appointed as the Town Planning Advisor to the Commission of Conservation.[40] At the 1915 ALSA – AGM, surveyor Seymour extolled the need for planning and the role of the surveyor. Seymour soon pursued town planning full-time,

chairing a Committee on Town Planning for the Association of Dominion Land Surveyors. By 1918, the Association of DLS, working with the Engineering Institute and the Architectural Association, lobbied for a Town Planning Institute of Canada because the surveyor "ought to be interested in the best use of land, not just in the accurate measurement of it."

In 1924, the editorial in the *Canadian Surveyor* journal promoted a School of Town Planning in Ottawa:

> Town planning has evolved and is the great sociological achievement of the age … The land surveyor has much influence upon subdividing and a heavy moral responsibility in the sociological results … The future of surveying would seem to hold great opportunities.[41]

Surveyors long served the Town Planning Institute: Seymour was an early President; Surveyor General Deville was an early Vice-President; and leMay was elected Vice-President in 1953.

Vignette 6: Friendly resolution of conflicts

Alternative dispute resolution (ADR) is "ideal for property disputes between neighbours."[42] The watershed in the history of ADR is the *Jay Treaty* of 1794 between Britain and the United States, which allowed boundary disputes to be settled impartially, not politically, by Commissioners appointed by the two parties.[43] The parameters of the 1794 Treaty – reliance on legal principles and objective facts - continue to resonate in the IBC and in the Alberta-British Columbia Boundary Commission.

A second form of ADR is third-party arbitration. The westerly section of the Canada – United States boundary was described ambiguously in the 1846 *Oregon Treaty*, as running:

- To the middle of the channel which separates the continent from Vancouver's Island,
- Thence southerly through the middle of the said channel,
- To the Strait of Juan de Fuca and the Pacific Ocean.

The question was: To the middle of which channel – Haro or Rosario? Uncertainty led to skirmishes on San Juan Island over sheep in 1855 and a pig in 1859; and to armed encampments.[44] The question was submitted to the Emperor of Germany for binding arbitration, who relied on three fact-finders.[45] Two of the three experts found the boundary to lie west of San Juan Island; the Emperor agreed in 1872.

Such binding arbitration informs the Ontario *Boundaries Act*. The legislation was drafted by a surveyor in 1959, has been used extensively by surveyors (on behalf of applicants and objectors), and has Tribunal hearings adjudicated by surveyors (as Examiners of Survey). In 58 years, few applications for confirmation have proceeded to a Tribunal; fewer still have been successfully appealed to the courts. There have been only 22 appeals to the courts; 80% of recent cases have been affirmed.[46] New Brunswick has a similar institution. Twice the courts there have chided litigants for not using the alternative process.[47] In a third example, the Ontario *Surveys Act* allows the Surveyor General to arbitrate a municipal resurvey (of a concession or side road).[48] There have been two resurveys in the past 35 years, and the court affirmed the one decision that was appealed.[49]

Part 3 – Speculating about future contributions

Speculating about the future is rife with uncertainty. As one cautionary tale, a pundit calling him- or her-self "Ralph Centennius" predicted in 1883 what Canada would look like now:[50]

> Population of Canada: 93M predicted; 35M actual
>
> Rocket cars: [51] 6,000 km/h predicted; 800 km/h actual

However, Ralph was correct in concluding that Canada is "heading for the waters of prosperity." Reconciliation is now lurking in such waters, which is a many-splendored thing for surveying:

- Policies in Nunavut that promote land availability, community planning, private-market incentives and diversified housing, given the need for 1,500 dwellings in Iqaluit alone.[52]
- Infill, laneway, non-traditional and affordable housing in Toronto, Vancouver and Edmonton.
- Common ground between resource extraction and transport (oil sands, shale gas, pipelines) and the social, cultural and environmental concerns of Canadians.

For Indigenous peoples, Canada has ridden the wave of reconciliation – initially honoured, then given lip service, and now being made real.[53] Given its links with **both** the land and the past,[54] surveying is **well-positioned** to encourage reconciliation of Indigenous peoples and, in fact, of **all Canadians** with the land. In 1870, Prime Minister MacDonald hinted at this surveying-reconciliation nexus, as Canada expanded west across the Red River:

> "It is, of course, important to have land surveyed for settlement …, but that is a **secondary** condition to **the general assent and support of the people**."[55]

MacDonald recognized that surveying is as much about social negotiation as it is about measuring distances and directions. This recognition means that surveying might now assist with:

- A boundary tribunal for parcels of Aboriginal title land.[56]
- Surveying and mapping capacity within Indigenous communities, as exemplified by:
  - The current partnership with Wikwemikong First Nation.[57]
  - The curriculum which is now being drafted for the Certificate to be offered by the Tulo Centre of Indigenous Economics.[58]
- Fit-for-purpose surveying, as a function of land use, parcel value and location.[59]

To borrow from Graeme Sandy of the National Aboriginal

cont'd on page 34

Land Managers Association (NALMA):

> "First Nation's people have always had an acute sense of where we are in the world. We navigated throughout our territories guided by our stories, landmarks, waters and the heavens. Mapping and geospatial tools and technologies will help guide us in the future as adaptation has always been our strongest asset."[60]

To conclude

Canadian surveyors are "agents of change."[61] As shown in the vignettes, surveying has long embraced existential challenges in the public interest. Scanning, phoning, droning,[62] lidaring, pdf-ing and gps-ing are certainly part of the evolving institution that is surveying.[63] However, it's a false dichotomy to focus on technology at the expense of socio-cultural issues. **The equation is both**, not either-or.

Thus, there is no need to "change the public's perception of surveyors." Surveyors are regarded as "trusted professionals," meaning that raising "awareness and understanding of the value of the surveying profession" is redundant.[64] Land surveyors have a comparative advantage in Canada;[65] the future's so bright, you gotta wear shades.[66]

Dr. Brian Ballantyne advises on land tenure and boundaries for the Surveyor General Branch of Natural Resources Canada. He can be reached by email at **brian.ballantyne@canada.ca** for further discussion.

[1] Title inspired by: *Hail Caesar* film. 2015. This is a truncated version of a Keynote Address that had 10 vignettes: Land surveying: An institution that has shaped Canada. National Surveyors Conference. Ottawa. March 1, 2017.

[2] Of course, this does not necessarily reflect the views of Natural Resources Canada or the Government of Canada.

[3] If two fardels = nook, and four nooks = yard-land, and yard-land = 50 acres, then fardel = 6.3 acres.

[4] Using Google's *Ngram Viewer*, which measures how often a phrase is used in literature.

[5] Framework Partners Incorporated. *Findings from the 2011 PSC national compensation survey*. January 15, 2012.

[6] StatsCan. Education and occupation of high-income Canadians. 2011 Census.

[7] MacGregor. *Vision of an ordered land*. Western Producer Books. px. 1981.

[8] Hossie (1928) quoted by Holloway (1952). In: *Legal principles & practice of land surveying: A series of 12 papers covering various aspects of cadastral surveying*. Department of Mines &Technical Surveys. 1961.

[9] *Mackay v Mackenzie*, 2016 PECA 16.

[10] *Burke v Watson & Barnard (a firm)*, 2016 BCCA 439.

[11] In: Patterson. *Land settlement in Upper Canada, 1783-1840*. Ontario Archives 1920. p219. 1921.

[12] *The Report & Despatches of the Earl of Durham, Her Majesty's High Commissioner and Governor General of British North America.* pp 145 & 166. 1839.

[13] "They would sometimes express their resentment by defecating upon the top of every survey stake, which added nothing to the amenities of the job." In: Shaw. *Tales of a pioneer surveyor*. p105. 1970.

[14] Indigenous peoples were puzzled as to how the Hudson's Bay Company parcel was sold for 300,000 pounds to Canada: Daschuk. *Clearing the plains: Disease, politics & loss of Aboriginal life*. Univ of Regina Press. p95. 2013.

[15] Ballantyne. Aboriginal title: Bounds & parcels of Aboriginal lands in Canada and Norway. Chapter in: Battarbee & Fossum (eds). *The Arctic contested*. PIE Peter Lang. p217. 2014.

[16] Bref Recit et Succincte Narration de la Navigation faite en MDXXV et MDXXXVI par le Capitaine Jacques Cartier aux Iles de Canada, Hochlega, Saguenay at autres. Paris Librarie Tross. 1863.

[17] Riley. *The once and future Great Lakes country: An ecological history*. McGill-Queens Univ Press. p77. 2013.

[18] *AG Ontario v Francis, et al*, ON HC, January 19, 1889: PAO, Aemilius Irving Papers, Box 42, file 42, item 9.

[19] Jones. The Cordilleran section of the Canada-US borderland. *Geographical Journal*. v89-n1. p349. May 1937.

[20] Collins might have surveyed earlier: PAO. RG 1-1, v2, p44, MS 7422. Ladell. *They left their mark*. p56. 1993.

[21] Mayo. The forty-fifth parallel: A detail of the unguarded boundary. *Geographical Review*. v13-n2. P258. 1923.

[22] McEwen. The Collins-Valentine boundary. *Geomatica*. v51-n2. p174. 1997.

[23] Although Collin's instrument was somehow superior, Harpur's location was more accurate.

[24] Pratt. *Report of the Regents of the University on the Boundaries of the State of New York*. vII. 1884.

[25] Fleming. *The early days of the Canadian Institute*. 1900.

[26] Winter 2017 RCIScience Talks: Friedman. *The biological basis of obesity*. January 15, 2017.

[27] Creet. Sandford Fleming and universal time. *Scientia Canadensis*. v14-n1. p68. 1990.

[28] *Minor v Gilmour*, 1859 CR 3 AC 230.

[29] Dreisziger. A surveyor advises the government. *The Canadian Surveyor*. p141. March 1975.

[30] Doctrine of appropriation. Mitchner. William Pearce and federal government activity in the west, 1874-1904. *Canadian Public Administration*. p235. 1967. Allen. Riparian rights in the west. *Geomatica*. v50-n3. p314. 1996.

[31] Wilson. 1890. In: Burchill. The origins of Canadian irrigation law. *The Canadian Historical Review*. p359. 1948.

[32] Eroded, but not eliminated, because the 1894 Act did not apply to undertakings before 1894 (e.g. as with the HBC and the CPR), nor did it apply to First Nation Reserves.

[33] Ballantyne. *Water boundaries on Canada lands: That fuzzy shadowland.* Appendix 2 - p63. SGB-NRCan 2016.

[34] Burchill. The origins of Canadian irrigation law. *The Canadian Historical Review*. p353. 1948.

[35] Inspired by: Zappa. The Illinois enema bandit. *Zappa in New York*. 1977.

[36] "In an iron coffin, with spikes on the inside." Monty Python - Ralph Mellish. *Matching Tie & Handkerchief*. 1973

[37] The USA accepted the surveyed boundary at the Stikine River only for customs and jurisdiction purposes: International Boundary Commission. *Report – Tongass Passage to Mount St Elias*. p190. 1952.

[38] Ballantyne. The thinning of the boundary: The genesis of the IBC. *Conference: Re-imaging the Canada-United States border.* Carleton University. January, 2010.

[39] Ballantyne. "One waits, shiver" or "Madness, betrayal & the lash": Defining & surveying the British-Columbia- Alaska boundary. *46th Annual Alaska Surveying & Mapping Conference.* Anchorage. February 2012.

[40] Ladell. *They left their mark*. p239. 1993.

[41] Editorial. *Canadian Surveyor*. v1-n10. p2. 1924. In: Thomson. *Men and Meridians*. Volume 3. Minister of Supply and Services Canada. pp180-193. 1969.

[42] Madame Justice Conrad. University of Calgary. February 7, 2000.

[43] Kaikobad. *Interpretation and revision of international boundary decisions*. Cambridge Univ Press. p61. 2007.

[44] Vouri. *The pig war: Standoff at Griffin Bay*. Griffin Bay Bookstore. 2006.

[45] Hunter (ed). *Northwest Water Boundary: Report of experts summoned by the German Emperor as arbitrator under the Treaty of Washington, preliminary to Award dated October 21, 1872*. Univ of Washington. 1942.

[46] *Halliday v Nicholson* (2005); *Nightingale v Brooks* (2008); *Ellard v Tiny Township* (2012); *Bass Road v Michnick* (2015); *Godfrey v Ontario* (2016).

[47] *Norris v Black*, 2013 NBCA 62.

[48] Barzo & Stanton. The municipal resurvey: The resurrection. *Ontario Professional Surveyor.* p30. Winter 2014.

[49] *Dale v Tiny Township*, 2015 ONSC 7340. A second decision is now being appealed.

[50] Centennius. *The Dominion in 1983.* 1883. See: Young, et al. *Moving natures*. Introduction. 2016.

[51] Collisions were predicted to never happen, owing to "the rigid adherence to very strict regulations."

[52] Nunavut Housing Corporation. *GN long-term comprehensive and homelessness strategy*. 2012.

[53] Truth and Reconciliation Commission of Canada. *Calls to Action.* 2015.

[54] Cameron. *William Drewry & land surveying in BC, 1887-1929.* MA thesis. Univ of Victoria. p112. 2009.

[55] Thomson. *Men & Meridians*. Volume 2. Minister of Supply and Services Canada. p15. 1967.

[56] Ballantyne. A modest proposal: a boundary tribunal for Aboriginal lands. *Geomatica*. v70-n1. p60. 2016.

[57] Shout-out here to Gavin Lawrence, despite his Springbok rugby allegiance.

[58] Ballantyne, et al. Establishing property rights systems to facilitate development. Chapter 3 in: *Building a competitive First Nation investment climate*. Tulo Centre of Indigenous Economics. 2014.

[59] FIG/World Bank/GLTN. *Fit-for-purpose land administration*. 2014. Knight, et al. *Community land protection: Facilitators guide.* Namati. 2016.

[60] Graeme Sandy. National Aboriginal Lands Managers Association. Shared on January 25, 2017.

[61] Cameron. *William Drewry & land surveying in BC, 1887-1929.* MA thesis. Univ of Victoria. p107. 2009.

[62] Jenkins. *Application of aerial drones in zoning and urban land use in Canada*. M Plan thesis. Ryerson Univ. 2015.

[63] Also, beware of re-wiring brains by navigating with gps: Hutchinson. Global impositioning systems. *The Walrus*. November 2009. Milner. *Pinpoint: How gps is changing technology, culture and our minds*. Norton. 2016.

[64] Professional Surveyors Canada. *Join PSC and together let's change the public's perception of surveyors!* 2016.

[65] Perhaps this advantage extends to mimicking the Polynesian navigator's technique of "dragging his testicles" on the canoe hull to feel the vibrations of waves and currents. In: Milner. *Pinpoint.* Norton. p14. 2016.

[66] Inspired by: Timbuk3. The future's so bright, I gotta wear shades. *Greetings from Timbuk3*. 1986.

Musings from the Net

By Julia Meldrum Smith, O.L.S., C.L.S.

I can feel myself smiling.

I'm watching a puck battle in the corner - one guy is on his knees and still manages to make the pass. On the ice, in Cansel jerseys that commemorate Canada's 150th Birthday, (white team and red team), there are players in full gear, others with skates and helmets only, older players, younger players, English, French, men and women. Shouting, panting, laughing.

In the net, I'm doing all of those things - yelling at the puck, "No! No! No!" as it slides dangerously close; laughing as I glove Pat Hills' shot; still laughing when that pesky forward parked by my crease gets the pass from the point and puts it past my elbow, out of breath, as I shuffle from post to post to post while they fight for possession in front of me. I'm having a blast at this annual hockey game. I'm closer to 50 than 40; I've played hockey for just four seasons, rec leagues only. I'm a woman, and I'm welcome here.

The goalie position is a solitary one – no bench comradery – with time to muse when the puck is at the other end. I find myself thinking about what a great group this is, and what a great group it has always been.

I'm remembering my first AOLS AGM in Toronto, around 1988. Jack Young was my professor in surveying at Erindale, and Maureen Mountjoy was my survey lab teacher. In my year there were 27 men and three women. It was a group of intelligent, fun, motivated, open-minded students. Both Jack and Maureen encouraged us all to head over to the Welcoming Party of the AGM, so I did. I walked into a roomful of strangers and before long, I was meeting surveyors and getting introduced to more surveyors. I wasn't yet 20, in first year of surveying, and I was welcomed.

Just like I had been welcomed when I was first hired by David B. Searles the winter before I started university. My only experience was in my dad Hazen Meldrum's surveying office - typing, filing and drafting. And yet Dave hired this 5'1" eighteen-year old to work in the field. Like my dad, Dave Searles always encouraged me, and so did Bob Stephenson, the OLS/party chief who got stuck with me. I had no field experience, but was determined to be an OLS, and I was welcomed.

As I proudly explained to our newest lay councillors last year, the women in the AOLS have a wonderful relationship with their male colleagues – a relationship of mutual respect and friendship, of teamwork and professionalism.

Women may be in the minority in land surveying, but we are never in the background. Women have held the positions of AOLS Executive Director, President, Deputy Registrar; Regional Group Chair, and AOLS AERC Chair, Public Awareness Chair; ACLS Practice Review Manager and President of the ACLS; President of the Ordre des arpenteurs-géomètres du Québec (OAGQ); MGS Regional Surveyor, and Assistant Examiner of Surveys, MTO Project Manager, Surveyor General of Ontario, and President/CEO and Manager of government offices and owners of private practices. No position is out of reach – for women, or for anyone. In this industry, inclusivity is the norm. If you work for it, you can have it, you can do it, and you can achieve it.

And if you want to play Canada's game at a surveyors' conference, just show up ready to play – you're part of the team, and you are welcome.

Sites to See

Struggle & Story: Canada in Print

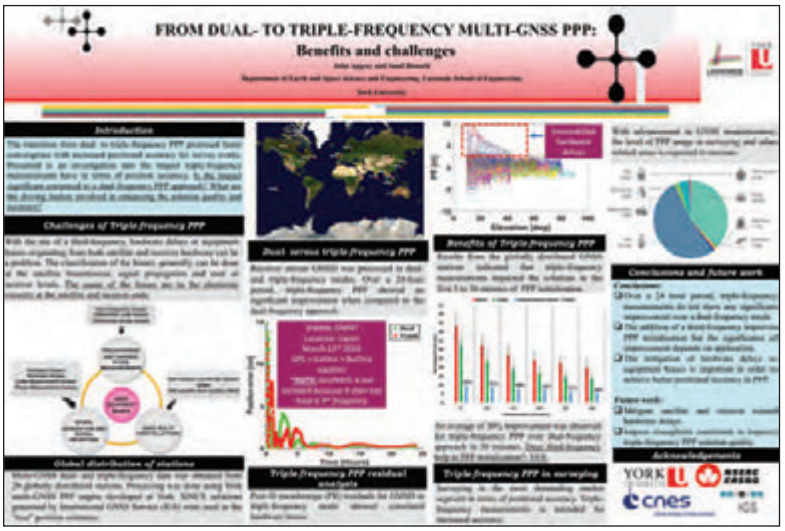
https://fisher.library.utoronto.ca/exhibition/current

In celebration of Canada's Sesquicentennial, the Thomas Fisher Rare Book Library (University of Toronto) is running *Struggle and Story: Canada in Print* from March to September 2017. The exhibition will showcase manuscripts, printed books, engravings, maps and photographs to tell the story behind the making of a nation and trace Canada's social history from the period of exploration to the first generation after Confederation. The exhibit will include the principal documents from Charlottetown and Quebec that ultimately led to the British North America Act of 1867 and a rare copy of the proclamation of Confederation.

ELEVENTH Annual AOLS Graduate Student Geomatics Poster Session Award Winners

FIRST PLACE: **John Aggrey,** Ph.D. Candidate, Department of Earth and Space Science and Engineering, Lassonde School of Engineering, York University, supervised by Dr. Sunil Bisnath.

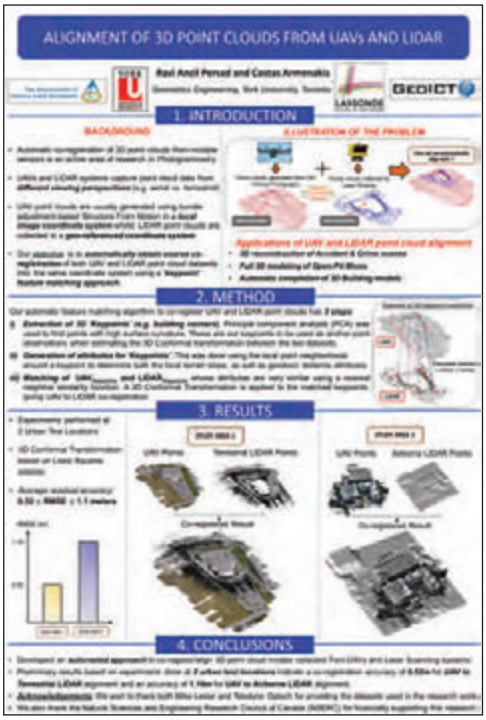
FROM DUAL- TO TRIPLE MULTI-GNSS PPP: BENEFITS AND CHALLENGES



ABSTRACT — With an increase in the number of satellite systems, redundant measurements, improved satellite orbit and clock products, the convergence of dual-frequency PPP borders on tens of minutes to achieve an accuracy of a few centimetres. Though the level of improvement is better than compared to conventional PPP convergence of 30 minutes to reach 10 cm, dual-frequency PPP still remains impractical for many real-time applications. The idea of a third frequency promised faster convergence and almost instantaneous integer resolution of ambiguities. However, the expectation of triple-frequency PPP has not even been met with reliable quick fixing of float ambiguities. The analyses presented concentrates on the first few minutes of PPP convergence in dual and triple-frequency scenarios to analyze and contribute to improvements of the float solution before the resolution of ambiguities. The objective is to draw attention to the challenges and methods available in attaining faster accurate position initialization in the float solution case, while analyzing the intricacies of issues that have to be dealt with in doing so. Questions intended to be addressed include: Does triple frequency PPP significantly improves solution quality as compared to dual frequency approach? Are there any challenges with the triple frequency PPP approach? Does the choice of GNSS satellite constellation in data processing have an impact on the solution quality? Email: jeaggrey@yorku.ca

SECOND PLACE: **Ravi A. Persad,** Ph.D. Candidate, Geomatics Engineering, Lassonde School of Engineering, York University, supervised by Dr. Costas Armenakis.

ALIGNMENT OF 3D MODELS FROM UAV AND LASER SCANNING SYSTEMS



ABSTRACT — Point cloud-based 3D models are useful for a wide-scope of applications such as 3D building modelling and reconstruction, cultural heritage, urban and environmental planning, as well as accident and crime scene reconstruction. For these and other mapping applications, it is not uncommon that there will be a need automatically co-registering multi-temporal 3D models that have been acquired from multiple sensors, with different specifications over a period of time. For a pair of multi-sensor models, alignment issues include different scale, different point densities, different point distribution and varying overlapping coverage for identifying common features.

In this study, we propose an approach to automatically align photogrammetrically-derived 3D point cloud models from UAV imagery, with point clouds generated by laser scanning systems. The alignment method begins by automatically extracting 3D surface "keypoints" on both the UAV and laser datasets. These "keypoints" are candidates for the anchor points to be used for the determination of the 3D similarity transformation parameters between the two datasets. Afterwards, regions of interest around each keypoint are established to generate attributes that characterize each keypoint. We generate these attributes based on the height image maps of the 3D models. Keypoint correspondences are established by matching their attributes. We will present our proposed method and report on the accuracies for the alignment process. Email:ravi071@yorku.ca

THIRD PLACE: Shahram Sattar, Ph.D. Candidate, Geomatics Engineering, Department of Civil Engineering, Ryerson University, supervised by Dr. Songnian Li.

POTHOLE DETECTION USING GPS AND SENSOR DATA FROM SMART PHONES

ABSTRACT — Road surface hazards affect the driving safety and comfort to various road users. For a responsible government, it is vital to monitor and maintain road surface conditions. Traditional approaches to monitor the condition of road surfaces, such as drivers' reports, statistical data and field visual inspections not only are time consuming and costly, but are also not accurate and reliable. More recently, mobile mapping equipped with laser scanning has been used to monitor road roughness through the detection of road anomalies (e.g., potholes, cracks, and bumps) on the road surface. Geotagged images or videos from the roadways were also used to detect the road anomalies. However, existing studies are limited to identifying roadway anomalies mainly from a single source, or lack the usage of combined and integrated multi-sensors in terms of accuracy and functionality, especially in real-time mode. However, continuous monitoring of road surface conditions is necessary due to the dynamic changes on the road surface, such as the development of potholes and cracks over time. Therefore, a real-time method should be developed to integrate multi-sensors to detect road anomalies with higher level of accuracy and more functionality. The poster will present the implemented approach for pothole detection from embedded sensors and GPS in the smartphones. Email: shahram.sattar@ryerson.ca

FOURTH PLACE: Julien Li-Chee-Ming, Ph.D. Candidate, Geomatics Engineering, Lassonde School of Engineering, York University, supervised by Dr. Costas Armenakis.

ASSESSING THE MAPPING ACCURACY OF MOBILE 3D SCANNERS

ABSTRACT — Many low-cost (~US $500) mobile 3D scanners, that is smartphones and tablets equipped with a depth sensor, have recently hit the market, for example the Occipital Structure Sensor for the Apple iPad (iOS), the Google Tango tablet (Android), and most recently the Lenovo Phab 2 Pro (Android). Consequently, various 3D scanning applications have been released that leverage these platforms. For example, 3D point clouds can be generated from Android-based platforms using Google's Tango Constructor app, the Matterport Scenes app, Voxxlr's Scanning app, or Scandy Pro's app. iOS-based platforms feature 3D scanning apps such as the Occipital Room Capture app, and the ItSeez3D app. The platform manufacturers claim depth measurement accuracies of 1% of the range, with a maximum range of 4 to 5 meters. However, the quality of the resulting point cloud is a function of not only the depth sensor's measurement noise, but also the navigation sensors' noise and the data processing techniques. This work quantifies the mapping accuracies of these systems. The point clouds generated by each of these consumer-grade products are compared with a ground truth point cloud captured by a survey-grade Lidar scanner, specifically Optech's ILRIS-3D. This work also provides an assessment of each product in terms of data collection time, data processing time, indoor/outdoor performance, and hardware/software costs. Email: julienli@yorku.ca

FIFTH PLACE: Salem Morsy, Ph.D. Candidate, Geomatics Engineering, Department of Civil Engineering, Ryerson University, supervised by Dr. Wai Yeung Yan, Dr. Ahmed Shaker and Dr. Ahmed El-Rabbany.

MAPPING HIGHWAY 401 USING MOBILE LASER SCANNING SYSTEM

ABSTRACT — Maintaining a comprehensive 3D road database is essential for building 3D city models to facilitate road maintenance, tourist guidance, and driving assistance systems. 3D road environment receives its data from aerial and/or terrestrial sensors in the format of either images or laser point clouds. Mobile Laser Scanning (MLS) is a more rapidly accepted solution for surveying long road sections. MLS produces huge amounts of 3D point clouds, thus requires automatic processing algorithms that run in an acceptable time. Pole-like objects are one of the irreplaceable features in 3D road mapping. In this context, a workflow for automatic extraction of highway light poles from MLS data is presented. The workflow starts with an automatic ground filtering mechanism to separate non-ground from ground points. After that, the non-ground points are clustered, and then the clusters are identified as light poles using a set of decision rules. A dataset for a section of highway 401 located in Toronto, Ontario, Canada was tested and the workflow achieved over 91% detection rate for five types of light poles. Email: salem.morsy@ryerson.ca

EDUCATIONAL FOUNDATION

Lifetime Members at March 31, 2017 (Individual)

BOB MORROW (Honorary)
ANNA AKSAN
DONALD ANDERSON
DREW ANNABLE
GEORGE D. ANNIS
DOUG ARON
BRUCE BAKER
J.D. BARNES
JOHN BARBER
ANDRÉ BARRETTE
GRANT BENNETT
WILLIAM E. BENNETT
ANDREW BOUNSALL
GRAHAM BOWDEN
GEORGE W. BRACKEN
WILLIAM A. BREWER
BRUCE BROUWERS
HARRY BROUWERS
TOM BUNKER
KENT CAMPBELL
WILLIAM H. CARD
J.B. CHAMBERS
PAUL CHURCH
DAVID CHURCHMUCH
A.J. CLARKE
ROSS A. CLARKE
W. BRENT COLLETT
RICHARD H. CREWE
ERIC CRONIER
DANIEL A. CYBULSKI
TOM CZERWINSKI
JAMES D. DEARDEN
ARTHUR DEATH
RON DENIS
TERRY DIETZ
DAN DOLLIVER
DAN DZALDOV
PAUL EDWARD
RONALD EMO
DON ENDLEMAN
WILLIAM M. FENTON
CARL F. FLEISCHMANN
ERNEST GACSER
DONALD H. GALBRAITH
BOB GARDEN
JAIME GELBLOOM
CHARLES W. GIBSON
GORDON GRACIE
HOWARD M. GRAHAM
JOHN GRAY
NANCY GROZELLE
ROBERT C. GUNN
ROBERT HARRIS
JOHN M. HARVEY
GORDON W. HARWOOD
ED HERWEYER
JAMES HILL
RUSS HOGAN
HAROLD S. HOWDEN
ROY C. KIRKPATRICK
CINDY KLIAMAN
ANNE MARIE KLINKENBERG
WALLY KOWALENKO
LENNOX T. LANE
RAYMOND T. LANE
JARO LEGAT
ANITA LEMMETTY
OSCAR J. MARSHALL
BLAIN MARTIN
RAYMOND J. MATTHEWS
LARRY MAUGHAN
MIKE MAUGHAN
KENNETH H. MCCONNELL
JAMES A. MCCULLOCH
SCOTT MCKAY
RONALD G. MCKIBBON
LAWRENCE A. MILLER
PAUL A. MILLER
MANOUCHEHR MIRZAKHANLOU
W. HARLAND MOFFATT
J.W.L. MONAGHAN
PATRICK A. MONAGHAN
JOHN D. MONTEITH
PETER MORETON
BOB MOUNTJOY
JIM NICHOLSON
DONALD W. OGILVIE
FREDERICK J.S. PEARCE
E.W. (RED) PETZOLD
N. LORRAINE PETZOLD
JOHN G. PIERCE
HELMUT PILLER
ROBERT POMEROY
YIP K. PUN
VALDEK RAIEND
PAUL A. RIDDELL
RONALD W. ROBERTSON
TALSON E. RODY
HENRY ROESER
GRENVILLE T. ROGERS
CARL J. ROOTH
ERICH RUEB
FRED SCHAEFFER
ANDY SHELP
H.A. KENDALL SHIPMAN
DOUG SIMMONDS
JOHN SMEETON
EDWIN S. (TED) SMITH
RALPH A. SMITH
TAD STASZAK
JAMES STATHAM
RON STEWART
NORM SUTHERLAND
MARK TULLOCH
MIKE TULLOCH
E. HENRY UDERSTADT
DAN R. VOLLEBEKK
BRIAN WEBSTER
GORDON WOOD
DAVID WOODLAND
AL WOROBEC
ROBERT H. WRIGHT
GEORGE T. YATES
JACK YOUNG
GEORGE J. ZUBEK

Individual Sponsoring Members

PAUL FRANCIS
BILL HARPER
RUSS HOGAN
MARC FOURNIER
TRAVIS HARTWICK
GEORGE WORTMAN
DAVID WYLIE

Corporate Sponsoring Members

D. CULBERT LTD.
LESLIE M. HIGGINSON SURVEYING LTD.
RON M. JASON SURVEYING LTD.
CUNNINGHAM McCONNELL LIMITED
ADAM KASPRZAK SURVEYING LTD.
KIRKUP MASCOE URE SURVEYING LTD.

Sustaining Corporate Members

A.J. CLARKE & ASSOCIATES LTD.
ANNIS O'SULLIVAN VOLLEBEKK LTD.
ARCHIBALD, GRAY & MACKAY LTD.
CALLON DIETZ INCORPORATED
GEORGIAN BAY REGIONAL GROUP
R. AVIS SURVEYING INC.
THE CG & B GROUP, PART OF ARTHUR J. GALLAGHER CANADA LIMITED
EASTERN REGIONAL GROUP
GALBRAITH, EPLETT, WOROBEC SURVEYORS
HAMILTON & DISTRICT REGIONAL GROUP
J.D. BARNES LIMITED
KAWARTHA-HALIBURTON REGIONAL GROUP
KRCMAR SURVEYORS LTD.
LEICA GEOSYSTEMS LTD.
LLOYD & PURCELL LTD.
STEWART McKECHNIE SURVEYING LTD.
MMM GEOMATICS ONTARIO LIMITED
MONTEITH & SUTHERLAND LTD.
NORTH EASTERN REGIONAL GROUP
NORTH WESTERN REGIONAL GROUP
SOKKIA CORPORATION
SOUTH CENTRAL REGIONAL GROUP
SOUTH WESTERN REGIONAL GROUP
STANTEC GEOMATICS
TARASICK McMILLAN KUBICKI LIMITED
TERANET INC.
THAM SURVEYING LIMITED

Members as of March 31, 2017 (Individual and Corporate)

DINO ASTRI SURVEYING LTD.
BILL BUCK
RASCH & HYDE LIMITED
ROBERT McCONNELL
DAVID B. SEARLES SURVEYING LTD.
A.T. McLAREN LIMITED
JAMES SWINNERTON
PAUL TORRANCE
RUGGED GEOMATICS INC.
ROBERT C. THALER SURVEYING LTD.

EDUCATIONAL FOUNDATION NEWS

Report from the Annual General Meeting

One of the highlights of the AGM was the announcement of **Chris Fox, OLS** as the winner of the ***John Duncan Barnes Multimedia Award*** for his video "I am an Ontario Land Surveyor". This one-time award was presented by the Educational Foundation in honour of one of its founders and first donor, Jack Barnes. Chris received the award together with a cheque for $5000, the amount of Jack Barnes' first donation. Thank you to Mrs. Odette Barnes and her son John D. Barnes (photo on page 21) who attended the Convocation Lunch to present the award to Chris.

The Annual Meeting of Members was held at the AGM on Friday morning (photo below). The Board of Directors spends many hours throughout the year to help steer the foundation to make sure that it is working to attract surveyors to the profession. This year four of the fourteen OLSs who received their commissions at the AGM were Educational Foundation award winners.

The Board of Directors would like to thank the Exhibitors who donated a prize for the Exhibitor Draw at the Welcoming Party. A big thank you also goes to our ticket sellers; Lena Kassabian, Penny Anderson, Julia Savitch, Martha Reeve and Johanne Lemay. Your help was truly appreciated.

The 11th Annual Graduate Student Geomatics Poster Session attracted 11 entries from Ryerson and York Universities. The purpose is to give graduate students the opportunity to showcase their research projects and compete for monetary prizes, which are sponsored by the Educational Foundation. The top five winning posters can be found on page 36. Thanks to our judges; Boney Cherian, Reuben Mc Rae and Guy Fletcher.

BOOK REVIEWS

Great Lengths
A Celebration of the Surveyors of Ontario

By Charles Wilkins

Published by the Association of Ontario Land Surveyors

ISBN 978-1-894801-33-1

The story of surveying in Ontario is a rich and varied drama that, over the years, has featured a remarkable cast of intrepid bush lords, artful risk-takers, and irrepressible visionaries. Among them are soldiers, land barons, feminists... a globally respected inventor, an itinerant educator who worked in 25 countries, and a man often called the greatest geographer in history.

Surveyors have helped shape the foundations of every significant political and economic development in the history of the province: the building of the railways, highways and pipelines; of farms, towns and cities; of every form of communication and travel that connects the people of Ontario to one another and to the world.

In telling the story of surveying, *Great Lengths* embraces both the glories and the challenges of the profession, and does not shy away from the inherent controversies and shadows. The book follows the story from its wild, often incendiary, beginnings, through two centuries of development, into a compelling present, where the fabric and echoes of the past are never far removed from the wonders and potential of the future.

Information taken from inside the front cover.

Hostages *to* Fortune
The United Empire Loyalists and the Making of Canada

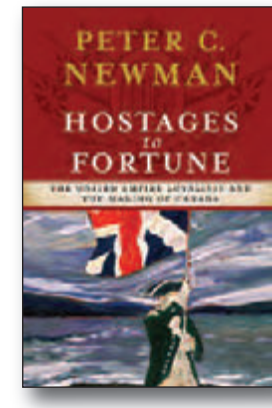
By Peter C. Newman

In 1776, tensions in the British colonies were reaching a fever pitch. The citizenry was divided between those who wished to establish a new republic and those who remained steadfast in their dedication to the British Empire. As the tensions inevitably boiled over into violence, fault lines were exposed as every person was forced to choose a side. Neighbours turned against each other. Families divided. Borders were redrawn.

The conflict was long and bloody, and no side emerged unscathed. But there is one story that is often overlooked in the American Revolutionary canon. When the smoke from the battles had settled, tens of thousands of individuals who had remained loyal to the crown in the conflict found themselves without a home to return to. Destitute, distraught, and ostracized – or downright terrorized – by their former citizens, these Loyalists turned to the only place they had left to go: north.

The open land of British North America presented the Loyalists with an opportunity to establish a new community distinct from the new American republic. But the journey to their new homes was far from easy. Beset by dangers at every turn – from starvation to natural disaster to armed conflict – the Loyalists migrated towards the promise of a new future. Their sacrifices set the groundwork for a country that would be completely unlike any other. Neither fully American nor truly British, the Loyalists established a worldview entirely of their own making, one that valued steady, peaceful, and pragmatic change over radical revolution.

Information taken from the publisher.

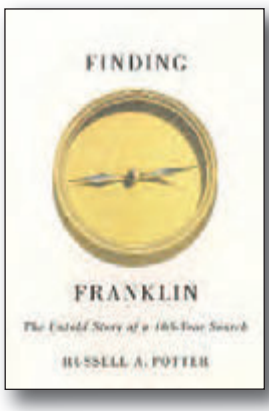


Published by Simon & Shuster

ISBN 978-1-4516-8609-8

Finding Franklin
The Untold Story of a 165-Year Search

By Russell A. Potter



Published by McGill-Queen's University Press

ISBN 978-0-7735-4784-1

In 2014 media around the world buzzed with news that an archaeological team from Parks Canada had located and identified the wreck of HMS *Erebus,* the flagship of Sir John Franklin's lost expedition to find the Northwest Passage. *Finding Franklin* outlines the larger story and the cast of detectives from every walk of life that led to the discovery, solving one of the Arctic's greatest mysteries.

In compelling prose, Russell Potter details his decades of work alongside key figures in the era of modern searches and elucidates how shared research and ideas have led to a fuller understanding of the Franklin crew's final months. Illustrated with images and maps from the last two centuries, *Finding Franklin* recounts the more than fifty searches for traces of his ships and crew, and the dedicated, often obsessive, men and women who embarked on them. Potter discusses the crucial role that Inuit oral accounts, often cited but rarely understood, played in all of these searches, and continue to play to this day, and offers historical and cultural context to the contemporary debates over the significance of Franklin's achievement.

Information taken from the publisher.

The Last Word

Sergeant-at-Arms "David Thompson" and his Wife "Charlotte Small"

This year at the AOLS AGM/NSC 2017, the character of the Sergeant-at-Arms was chosen to be David Thompson (1770-1857), fur-trader, astronomer and surveyor; a man who mapped almost half of North America between the 46th and 60th parallels, from the St. Lawrence and Great Lakes all the way to the Pacific. Thompson's character was portrayed by Francis Kenny and Emélie Perron-Clow acted as his wife, Charlotte Small; a fitting couple to oversee such an historic meeting.

"Thompson's significance as a geographer and mapmaker cannot be underestimated. Not only was he the first to chart vast regions of the continent, but his work was so accurate that it remained the basis of all maps of the west for almost a century. The same meticulous observational skills that made him a superb surveyor also made him an excellent naturalist. His journals are full of acute details of the plants, animals and birds he encountered."[1] His writings have been transcribed and edited by William E. Moreau in a set of volumes published by McGill-Queen's University Press.

Charlotte Small (1785-1857) who was of Métis heritage was known as the "Woman of the Paddle Song". She and Thompson were married in 1799. Charlotte's native Cree and English language skills gave her and her husband a great advantage as they explored and mapped much of Western Canada; her ability to gather food from the land, find shelter, and make clothing and equipment was pivotal for their survival. Charlotte and David were married for 58 years and had 13 children.

Photo: David and Charlotte Thompson are remembered by a statue that is erected in Invermere, British Columbia. ***Credit Parks Canada, 2006***

[1] http://www.hbcheritage.ca/hbcheritage/history/people/explorers/david-thompson

Published by:
The Association of Ontario Land Surveyors
(Established 1892)
1043 McNicoll Avenue
Toronto, Ontario, Canada M1W 3W6
Phone:416-491-9020 FAX:416-491-2576
admin@aols.org * www.aols.org

Editor & Publication Manager:
Maureen Mountjoy, O.L.S., O.L.I.P.
Production Manager:
Lori Veljkovic
Advertising Manager:
Maureen Mountjoy, O.L.S., O.L.I.P.

Printed by Colour Systems Incorporated
Original graphics design by Uniq Graphics and Design, Toronto, Ontario
Computer implementation by nu Vision Images Inc., Toronto, Ontario

Advertising Rates:

	1 time	4 times
1st Cover	Not Sold	Not Sold
2nd and 3rd Cover	Not Sold	$715
4th Cover	Not Sold	$825
Full page 4 Colour	$705	$660
1/2 page B&W	$280	$245
1/2 page 4 Colour	$500	$465
1/4 page B&W	$190	$165
1/4 page 4 Colour	$410	$385

Inserts (supplied): Page rate plus 25%.

Mechanical Requirements:
Typed page: 48 picas wide by 63 picas deep
Bleed size: 8.75 wide by 11.25 deep
Non-bleed image area of a single page should be 7.5 x 10
D.P.S.: 17.25 wide x 11.25 deep with bleed
D.P.S.: 16 wide by 10 deep without bleed

Digital File Requirements:
Supplied files should be "Press Quality" PDFs with trim and bleed marks included and with all fonts applied in the ad embedded.
Note: The "Marks Offset" should be set to the same value as bleed (for example .125") to avoid marks protruding into bleed area and thereby reducing bleed.
Four Colour images should be in CMYK mode with a resolution of 300ppi.
Colour profile included in the file should be GRaCol_2006_Coated with Relative Colorimetric Intent.

Circulation (This Printing)

Ont. Land Surveyors & Associates	933
Other Professional Affiliations	262
Advertisers	20

The *Ontario Professional Surveyor* Magazine is published quarterly as a medium of communication between the Association and its members. Readers are invited to comment and express their opinions on relevant subjects.

The *Ontario Professional Surveyor* Magazine is distributed to all members of the Association.

Subscription Rates to others: $40.00 per year or $10.00 per copy. All rates to us - no provision for commissions or discounts.

Canadian Publication Sales Agreement
40064685
Postage paid Mississauga / Gateway

Published Quarterly:
next publication deadline:
May 15, 2017

ALL PRICES LISTED ARE SUBJECT TO 13% H.S.T.

mdMAPPER
1000DG

WORK SMARTER, NOT HARDER

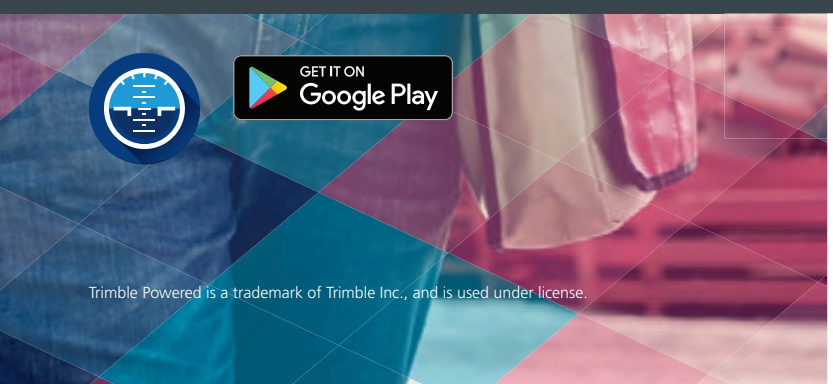
mdMapper1000DG is an integrated aerial mapping solution that employs Direct Georeferencing (DG). It helps you achieve survey grade accuracy using fewer ground control points – or no ground control points at all.

A Microdrones md4-1000 aircraft is paired with a single-board Trimble APX-15 module featuring a survey-grade GNSS receiver and a precisely calibrated IMU from Applanix, built specifically for DG. Images are collected via a 42.4 megapixel camera paired with a custom, lightweight, vibration-free, nadir mount.
Learn more: microdrones.com/mdMapper1000DG

You'll be able to survey hard-to-reach or dangerous sites without risking human injury. And because every Microdrones aircraft is built with specially molded carbon fiber, you won't be sidelined on harsh days that involve moisture, sand, or salt. Also consider the optional +i accessory kit, which turns your mdMapper1000 into a powerful aerial inspection tool.

No ground control points, less sidelap, more productivity.

mdCockpit was designed with surveying, engineering and construction professionals in mind. Perfect for use on a job site, mdCockpit lets you effortlessly plan, monitor, adjust, and analyze flights and image collection parameters.



Trimble POWERED

microdrones®

Software you can build on

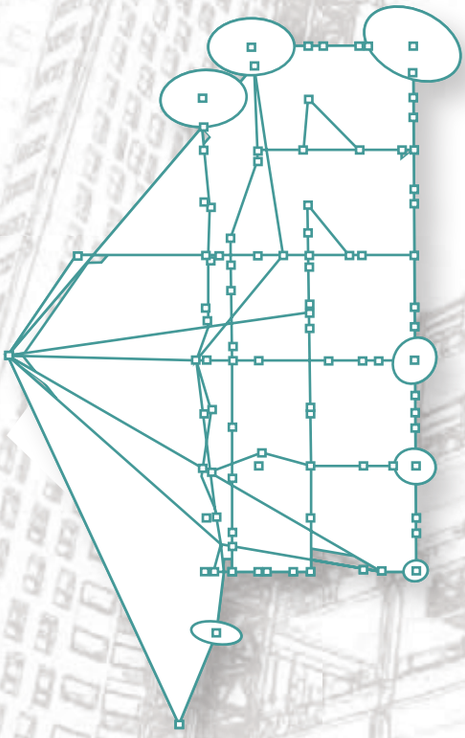
MicroSurvey STAR*NET and embeddedCAD are used around the world by thousands of users each day and you can too!

MicroSurvey STAR*NET

MicroSurvey STAR*NET is the world's best least squares adjustment software on the market

Network adjustments run much faster than previous versions, and the new Adjust Network with Cluster Detection command lets you combine measurement data for points with different names that fall within a specified 2D or 3D proximity of each other!

Download a free demo from our website:
www.microsurvey.com/starnet/demo

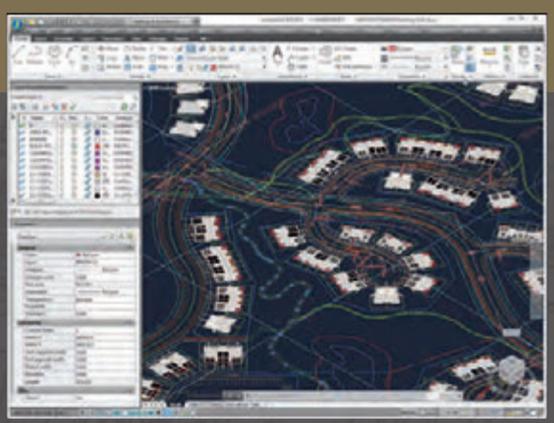


MicroSurvey embeddedCAD

Fully-featured standalone surveying powerhouse with an industry-leading CAD engine powered by the latest Autodesk technology™

The latest release provides users with the newest AutoCAD® OEM engine on a complete survey drafting toolkit, including COGO, DTM, traversing, adjustments, volumes, contouring and more.

Download a free demo from our website:
www.microsurvey.com/embeddedcad/demo



PART OF HEXAGON

www.MicroSurvey.com
1-800-668-3312

MicroSurvey®