Inside:

Madeleine Fritz: a Pioneer Female Geologist - pg 17

Field Education: Outer Banks, Trinidad, Turkey - pg 18

Alumni Night & Lab Tours - pg 24

Accolades for Barbara Sherwood Lollar - pg 4

Steve Scott

1941 –2019
Welcome! It's a privilege to write to you here again in the Newsletter as Chair of our Department. Probably the best part of my job is bridging among long-time alumni, recent graduates, and our current group of geoscientists. This year’s Newsletter documents an exceptional breadth of activities and happenings. Personal highlights for me include: joining Barbara Sherwood Lollar at Rideau Hall to recognize and to celebrate her receipt of the NSERC Herzberg Medal; climbing high inside the ignimbrite fairy chimneys in Cappadocia with students on our 10-day adventures in Anatolia; enjoying a beer during the numerous performances of our departmental Faultsettos a cappella group; golfing on a perfect autumn day with Geology alumni and friends at Nobleton Lakes (apologies to members of my foursome for my various forest/lake/bunker shots and time spent digging potatoes into the Nobleton fairways...).

Who says the life of an academic Chair is drudgery?

We are in the midst of two new hires this year and look forward to two new faculty colleagues: an Assistant Professor in Igneous Petrology/High-T Geochemistry and at the Associate/Full Professor level in Applied Geophysics to fill the endowed Teck Chair. The latter position is a replacement for Professor Bernd Milkereit who retired in July. Bernd will be very much missed in the department, not only for his scientific expertise as one of the top applied geophysicists nationally and globally, but also as a great colleague whose wisdom, calm, kind demeanour, and gentle humour were such assets.

It was a year of transition for our staff as well with Jim Charters, Boris Foursenko, and George Kretschmann all retiring. These well-earned retirements are an especially tough blow to me: with Jim, I’m losing my departmental foil in the bitter Argos-TiCats CFL rivalry (and as I never minded reminding him: my Argos still led 3-0 in Grey Cups since my hire here in 2000); with Boris I could live vicariously through his stories and adventures in kayaking (and now an enviable life on the beaches of Tiny Township in a custom-built home); and with George a fantastic hockey partner going back more than 25 years (and now retirement is just giving George more time to work on his admirable defense skills, while I languish with only one game per week).
Our programs continue to be strong at both the graduate and undergraduate levels. I laud the many new and past donations of our exceptional alumni and friends in support of our geoscience education. The endowed scholarships provide student opportunities for an exceptional breadth and depth of graduate and undergraduate research and learning, and are only possible with this tremendous donor support. Field education continues to be the cornerstone of our undergraduate programs, with donations to our Earth Sciences Field Education Fund helping to support trips to Trinidad, SW US, Turkey, South Africa, North Carolina, and further. Your donations make direct and lasting impacts on training the next generations of geoscientists!

On a sad note, the loss of Steve Scott is still sorely felt in the department. Steve was the Chair of the department when I started here and his excellence in geoscience research, passion as a science communicator, and abilities as a leader and mentor were to me inspiring examples of how to shape a successful faculty career. While it's still hard to imagine the department without Steve, his impact and legacy in the department and in geoscience will continue: the Steve and Joan Scott Graduate Scholarship will continue to support future graduate students here in the department. Steve also mentored and trained a legion of students and researchers who populate all levels of academia and industry internationally.

Sincere thanks to Henry Halls as Editor and Karyn Gorra as Assistant Editor for assembling yet another top-quality publication. If you notice that it keeps getting a little bit longer year-by-year, it’s because we just have so many interesting stories to share about our alumni and the current activities around here. We haven’t heard any complaints yet, and we’ll just take the extra publication costs out of Henry’s editorial salary! Enjoy reading through the Newsletter.

Russ Pysklywec

---

Focusing on the Future

Focusing on the Future: Industry Panel 2020, a joint WIM, UESA, SEG event will take place on February 29th, 2020, the day before PDAC. This will be a panel and networking event intended for students and early career geoscientists to discuss the future and the potential outcome of the choices being made in the mineral exploration industry. John Burzynski, CEO at Osisko; Natalie Caciagli (BSc, 1998; PhD, 2010), Senior Geochemist at Barrick Gold; Chad Hewson, Manager of Geophysics and Innovation at Teck Resources Ltd.; Aoife McGrath Head of Exploration at Beadell Resources Ltd.; and Christine Petch from WIM Toronto will participate in a discussion of pressing issues the mining industry faces today, from revolutionizing current practices, to how to develop mining in the most unreachable places. This panel has been a trademark of the Women in Mining UofT Chapter. This year we are working with Society of Economic Geologists UofT Chapter and the Undergraduate Earth Science Association. An incentive for students to purchase early bird tickets was the opportunity to be selected for scholarships, available from sponsorship donations. The event is being coordinated by Sofia Panasiuk and Jessica Patterson.

Tickets are on sale on Eventbrite, just search Focusing on the Future: Industry Panel 2020
Another year of impressive accolades for Barbara Sherwood Lollar

The University Professor in the Faculty of Arts & Science’s Department of Earth Sciences added the prestigious Gerhard Herzberg Canada Gold Medal for Science and Engineering to her collection, along with three other honours in 2019 alone.

Awarded by the Natural Sciences and Engineering Research Council of Canada (NSERC), the Herzberg Gold Medal — Canada’s top science and engineering award — recognizes individuals who demonstrate “sustained excellence and influence in research for a body of work conducted in Canada that has substantially advanced the fields of natural sciences or engineering.”

Last fall, the Department of Earth Sciences hosted a celebratory event at Massey College — where Sherwood Lollar is a senior fellow — to toast her incredible year and the numerous prestigious acknowledgements of her work and contributions to science.

As one of Canada’s most renowned earth scientists, Sherwood Lollar is no stranger to noteworthy honours. Her career researching earth and environmental geoscience and isotope geochemistry has led to great acclaim in Canada and abroad.

Last year, Sherwood Lollar was named a fellow of the Royal Society — the U.K.’s national academy of sciences and the oldest continuously running and most prestigious scientific society in the world. She also received the C.C. Patterson Award from the American Geochemical Society — which recognizes “an innovative breakthrough of fundamental significance in environmental geochemistry” and was appointed co-director of the Canadian Institute for Advanced Research (CIFAR)’s new Earth 4D Subsurface Science and Exploration program.
Professor Lindsay Shoenbohm has been appointed as the new Chair of the Department of Chemical and Physical Sciences at UTM for a five year term. Always a challenging position when the diverse interests of Chemists, Physicists, Earth Scientists and Astronomers are at play! Lindsay joined UTM in 2009. Her research combines structural geology, geomorphology and tectonics to study the evolution of mountain ranges.

Professor Kim Tait has been elected as a Fellow in the Mineralogical Society of America (MSA). This distinction is given to members of the MSA who have contributed significantly to the advancement of mineralogy, crystallography, geochemistry, petrology, or allied sciences. The committee looks at the contributions of the scientist to advancing the field of mineralogy, through research, publications, teaching, mentoring and advising, professional service, development of textbooks and other educational materials. Dr. Tait was nominated by her peers and then designated by the Committee on Nomination for Fellows and election of Council.

Professor Melissa Anderson received the 2019 Léopold Gélinas Gold Medal at this year’s GAC/MAC meeting. The Gélinas medals are presented annually for “the most outstanding PhD, MSc and BSc theses written by Canadians or submitted to Canadian universities, which comprise material at least 50% related to volcanology and igneous petrology”. Melissa won first prize, (from the U. of Ottawa) for her PhD thesis “Relationships between tectonics, volcanism and hydrothermal venting in the New Hebrides and Mariana back arc basins”.

Qinya Liu was appointed by the department of Physics as the new J. Tuzo Wilson Professor of Geophysics, a five-year appointment (2019-2023), in which the professor gives a public lecture in the first year of appointment and then helps choose subsequent speakers addressing hot topics in geophysics for the following four years. She succeeds Prof. Stephen Morris of the Department of Physics. Our congratulations to Qinya for this prestigious appointment which interfaces geophysics with the general public. Qinya gave her inaugural talk in November entitled “Exploring the Earth’s Interior by full seismic waves”.

Dr. Yanan Liu received the Dean's Outstanding Staff Award for Technical Service. Yanan provides support in research and teaching with an exceptional level of professionalism and expertise, specializing in non-destructive, quantitative analyses of solid materials, with spatial resolutions down to microns and detection limits down to tens of ppm. She is responsible for user training on various analytical techniques, including electron microprobe (EPMA), scanning electron microscope and X-ray diffraction, machine scheduling, machine tuning, calibrating, troubleshooting and maintenance. Yanan provides project specific advice on analytical approaches, routine setup, data interpretation and evaluation, teaching support in mineral collection maintenance and sample preservation.

Maureen Jensen (BSc, 1979), the Chair of the Ontario Securities Commission, was recognized in May with an honorary Doctor of Laws degree by the University of Windsor.

Maureen is the first woman to be named Chair and Chief Executive Officer of the OSC, leading the largest securities regulator in Canada, where she has championed for improved investor protection and strong, efficient capital markets. She was a top 100 award winner in 2018 for Women's Executive Network (WXN) “Canada's Most Powerful Women,” and was twice named as one of “Toronto's 50 Most Influential” by Toronto Life.

She is recognized in Canada and internationally for advocating high standards of ethical behaviour and integrity in governance and policy setting.

Victoria Yehl, (BSc, 1993) was honoured with the 2018 Frank Woodside award for distinguished service to the Association for Mineral Exploration British Columbia (AME) and/or the mineral exploration industry. Vicki is currently Senior Geologist, Corporate Finance with the B.C Securities Commission (BCSC). Prior to joining the BCSC, she worked at Teck Resources Limited for just over 20 years in various capacities including time in Teck’s Exploration, New Ventures, Business Development, and Energy groups.
Jim graduated in Geology and Physics at the University of Toronto, (BSc, 1981) and worked for Geoterrex and Shell Metals in Australia, as a consulting geophysicist, and for Scintrex in Canada. A serious dislike of carrying heavy instruments over hills and through swamps while being bitten by black flies and mosquitoes, as well as some knowledge and interest in computing, led to positions as a programmer for geological and geophysical applications, as well as analytical instrument control and data acquisition software. These experiences provided the necessary background to become the System and Network Administrator for our department, a position Jim held for 30 years. When he joined the department in the newly-built Earth Sciences Centre in 1989, the building had network wiring to most locations but no networking infrastructure. By the time he retired just about everywhere in the department had fast wired connections, and operated its own email service and server, web server and site, and various network services.

Jim has had an interest in aviation since a young age and for many years has been a member of the Ontario Aviation Historical Society which owns and operates The Great War Flying Museum out of the Brampton/Caledon airport (https://greatwarflyingmuseum.org). He is currently the President. It is a volunteer group founded in 1970 and dedicated to building and flying representations of First World War aircraft of which GWFM currently has a fleet of five airworthy aircraft representing types from the mid to late war period.

A note from our Chair:
“On behalf of the department/university I want to pass on sincere thanks to Jim for his 30+ years of service here. His career here has been one of efficiency, competency, and professionalism (including, in recognition of this, an Outstanding Technical Staff award a number of years ago).

We will miss your expertise and presence in the department, but wish you all the best in adventures untethered from the workplace.”

Russ Pysklywec

George Kretchmann

George started his career at UofT in 1988, (in Chemistry, moving to Geology in the mid-90s), a 31-year career that has been defined by excellent professional assistance. He first started in Geology as an electronics technician, eventually taking on training and support for the SEM and many other related services. He received an Outstanding Technical Staff award in 2011.
New Staff

Alexander Di Marco

Alex Di Marco is our new Systems and Network Administrator.

Departures

Zoltan Zajacz

Zoltan and his family have returned to Europe where he will take up a position at the University of Geneva, Switzerland. On behalf of the Department we would all like to thank Zoltan, for his ~5 years of excellent research/teaching here, in which he established a modern laboratory and gathered about him a large research group. Although we are sad to see him go, we all wish him well in this next stage of his career.

Boris Foursenko

Boris graduated from Novosibirsk University as a Geochemical Engineer in 1969, receiving his PhD in 1972. As a researcher and later as Principal Investigator in the Russian Academy of Sciences he studied the Physics and Chemistry of Minerals at high pressures. By 2001 he was an author and co-author of more than 100 papers, published in Russian and international refereed journals. His best known and most cited works were devoted to in situ study of structural changes in natural zeolites under high pressure and/or temperature. In 1999 he immigrated to Canada for family reasons where he first undertook geophysical studies of Sudbury ore deposits, descending to the bottom of mine shafts!

He arrived in our Department in 2004 on a contract basis with Jim Mungall, melting alkaline glasses at hydrothermal conditions. After one year, he was hired as a permanent Laboratory Technician in the Department, a position he occupied until retirement. He was responsible for the maintenance, repair and exploitation of various instruments in the high pressure laboratory. Because his position was part time, he spent additional time in the Geochronogy Lab, helping to separate zircon and baddeleyite from their host rocks.

Now that Boris has retired to his new home on Georgian Bay, he can spend more time on tennis, kayaking, hiking, fishing and travelling. He and his wife Irina are inveterate world travelers (South America, Far East and Europe) and have walked hundreds of kilometres along old pilgrim routes in Europe!
Joubin-James Distinguished Visitors

Three distinguished visitors to our department:

**Qinya Liu** invited Professor **Flora Sun** as a Joubin-James guest in the latter half of 2019. Dr. Sun received both her MSc (2004) and PhD (2009) degrees from the Department of Physics, University of Toronto, under the supervision of Prof. **Bernd Milkereit**, and working on measuring velocity dispersion and attenuation in the exploration seismic frequency bands. She is now an Associate Professor at China University of Petroleum (Beijing). She heads the ZEISS Technology Center for Microscopy as part of the state key laboratory of Petroleum Resources and Prospecting in China. She is a world leading expert on extracting structural and mineralogical features of rocks based on microscopic imaging at micrometre to nanometre resolution. While in the department Flora gave a research talk entitled ‘New applications of microscopic techniques in geoscience studies’, and then a short course with our in-house technician **Yanan Liu** on ‘A Brief Introduction to Microscopy’ and ‘Applications of scanning electron microscope in geosciences’.

**Dr. Andrei Swidinsky** was the Joubin-James lecturer in the Department of Earth Sciences in the Fall of 2019 at the invitation of **Bernd Milkereit**. Andrei received his PhD from the Department of Physics at the University of Toronto in 2011 and is currently on sabbatical from his regular faculty position as an Associate Professor of Geophysics at the Colorado School of Mines. During his time at the Department of Earth Sciences, Andrei gave a lecture on the activities of his research group, which includes marine mineral exploration, magnetic storm hazards on the electric power grid, geophysical look-ahead technology for underground tunneling operations, and characterizing the effect of steel infrastructure on reservoir monitoring. Andrei also gave a short course on the fundamentals of applied geophysics, as well as a more detailed lecture on electromagnetic methods in Charly Bank’s Environmental and Archaeological Geophysics (JGA305) class.

**Dr. Alberto Vitale Brovarone** is a CNRS permanent researcher at IMPMC Paris and holds a “Levi Montalcini” research position at the University of Turin. Alberto’s research interests centre on fluid-rock exchanges, metasomatism, and the evolution of volatiles (most notably C and H) from seafloor hydrothermalism to high-pressure conditions in subduction zones. His recent research has focused on the genesis of deep abiotic hydrocarbons and their role in deep energy production, carbon mobility, and strain localization at convergent margins.

Alberto was invited by **Xu Chu** as a Joubin-James Visiting Lecturer in late 2019. They have been collaborating for several years, through field research, paper publication, and student co-supervision. In the summer of 2019, MSc student **Ivano Gennaro** worked with Alberto in Turin and applied Raman spectra of carbonaceous materials (RSCM) to deriving the thermal structure of Northern Range, Trinidad. The samples were collected during an undergraduate field trip in the spring of 2019 (see page 19).

During his visit, Alberto delivered a research talk titled ‘Abiotic hydrocarbons on Earth: controversial theories, serpentinization, and new perspectives from subduction zones’, and offered two lectures. Alberto will revisit us in the summer of 2020, conducting field research in Vermont and Quebec.

This splendid picture of Donald “Digger” Gorman, the Department’s oldest living faculty member at age 97 years, was released by the Sunnybrook War Veterans Centre on the occasion of Remembrance Day 2019. On that occasion he was interviewed by CBC radio. The photo in the background shows him as a member of the Royal Canadian Navy Volunteer Reserve in WW II. We are all looking forward to celebrate your 100th, Digger!

*Photo by Kevin Van Paassen; courtesy Donald Gorman*
A Retirement Party for Dan Schulze

A retirement dinner in honour of Professor Dan Schulze was held at the UofT Faculty Club in March when many alumni were in town to attend the PDAC. Dan’s strong commitment to undergraduate teaching and to field work was noted in speeches (and videos) and those in attendance were proof of his influence across the field of exploration geology. Guests ranged from academic colleagues, to friends and former students who have been working across the world in a range of geoscience fields. He was welcomed with a traditional UofT chair by the group of Emeritus Professors in Earth Sciences and serenaded by the undergraduate student a capella group The Faultsettos.

Dan at the head of the table with family, friends and colleagues - his son pointing out the retirement story from last year's alumni news (above). The Faultsettos in action (below).

Class of 2019

PhD

Priyanka Chandan
Simen Johnsen
Vasa Lukich
Sara Mazrouei-Seidani
Cedrick O'Shaughnessy
Dong Shi
Magdalena Sobol
Siobhan Williams

MSc

Yaw Adjei-Kyereme
Francisco Bucchi Morales
David Bysouth
Kristina Da Silva
Margaux Daly
Brock Edwards
Julia Field
Cailin Gallinger
Camille Hebert
Camille Malcolm
Evelyn Moorhouse
Jordan Poitras
Cairan Keane Tirona
Hao Wang
Joanna West

BSc

Adam Brudner
Jia Yoong Chong
Aldo Fusiardi
Alexander Gambin
Ivano Gennaro
Jason Hinde
Zafir Sean Imamshah
Stephen Korchinos
Darrel Kwong
Peter Leith
Sang Moon
Thea Myrskog
Alzbeta Ondercova
Colin Roth
Amandeep Sahota
Ki Wan Song
Nathan Stoikopoulos
Shantel Turna
Elly Verlinden
Roopneet Virk
Naomi Welt
Sharon Wong
Emily Wong
Song Ye
Vanessa Yu

Earth Ring Ceremony

Graduating students who meet APGO’s requirements to become a Geologist-in-Training (GIT) are presented with an “Earth Ring” which represents their commitment to practise Geology in a responsible manner, and with integrity. The 2019 event was held at the UofT Faculty Club and students from the three campuses were presented with their rings followed by a reception with family and friends. Our congratulations!
2018/19 Undergraduate Student Awards

NSERC Undergraduate Student Research Awards
  Ivano Gennaro
  Timothy Lui
  Domenica Lee
  Dean Hiler
  Saleena Hak

Coleman Gold Medal in Geology
  Stephen Korchinos

Wesley Tate Scholarship in Geology
  Stephen Korchinos

James P. Nowlan Explorers Fund Undergraduate Scholarship
  Ivano Gennaro

Daniela and Alexander Tintor Undergraduate Scholarship
  Alexander Furlan

The Undergraduate Explorers Fund Award
  Sharon Wong

Alexander MacLean Scholarship in Geology
  Joslyn Davenport

Roger E. Deane Memorial Scholarship in Geology
  Andrew Rober

GAC Logan Prize
  Colin Roth

Joseph Michael Housam Memorial Leadership Award
  Jessica Patterson

Ed Spooner Undergraduate Scholarship in Mineral Deposits Geology/Exploration
  Michael Rego

The H.V. Ellsworth Undergraduate Award in Mineralogy
  Darryl Concepcion

Joubin James Scholarship and Prize
  Timothy Lui

Daniel Wilson Scholarship in Science
  Joy Carter

The Garnet W. McKee-Lachlan Gilchrist Scholarship
  Nathan Stoikopoulos

The Dr. E.T. Tozer Scholarship in (Triassic) Stratigraphy/Palaeontology
  Michael Rego

Student Industry Mineral Exploration Workshop (S-IMEW) — offered by the PDAC
  Joy Carter

Nicholar Wemyss Undergraduate Explorers Fund Award
  Xuefei Fan

Don Salt Scholarship
  Alzbeta Ondercova
  Nathan Stoikopoulos

KEGS Foundation Scholarship
  Alzbeta Ondercova
  Nathan Stoikopoulos

2019/20 Graduate Student Awards

Ontario Trillium Scholarship
  Tianshi Liu
  Mitchell McMillan

Natural Science and Engineering Research Council of Canada Post-Graduate Doctoral Scholarship
  Marissa Davies
  Daniel Dick
  Tanya Kizovski
  Natasha Leclerc
  Katie Maloney
  Elizabeth Phillips

Natural Science and Engineering Research Council of Canada Graduate Scholarship
  Natalie Szponar

Ontario Graduate Scholarship (OGS)
  David Aceituno-Caicedo
  Michael Rego
  Natalie Szponar

Queen Elizabeth II Graduate Scholarship in Science and Technology (QEII) Awards:

QEII / J. J. Fawcett Graduate Scholarship in Science and Technology
  Sofia Zamaria
  Stephen Korchinos
  Nathan Stoikopoulos
  Ivano Gennaro

QEII / Canadians Resident Abroad Foundation Graduate Scholarship in Science and Technology
  Man-Yin Tsang
  Siaf Al-Silwadi
QEII / Reford Scholarship in Science and Technology
Mostafa Khorshidi

QEII / Lamontagne Geophysics Graduate Scholarship in Science and Technology
Julia Andersen

QEII / Harold O. Seigel Graduate Scholarship in Science and Technology
Sara Vaezafshar

Faculty of Arts and Science Top Doctoral Fellowship
Marissa Davies
Natasha Leclerc

Connaught International Scholarship for Doctoral Students
Eunji Byun
Jacob Kvasnicka

Eric L. Hoffman Memorial Scholarship
Natalie Szponar

W.W. Moorhouse Fellowship
Max Chipman
Riddhi Mandal

James P. Nolan Explorers Fund Graduate Scholarship
Payman Janbakhsh
Riddhi Mandal

David Strangway Award in Earth Science
Stephen Korchinos
Talha Qadri

Hugh Snyder International Scholarship in Earth Sciences
Octavio Acuna Avendano
Heriberto Rochin Banaga

Dr. Norman Keevil President’s Fellowship in Geology
Tanya Kizovski
Afeez Popoola

P.C. Finlay Q.C. President’s Fellowship in Geology
Sophia Zamaria
Mostafa Khorshidi

Jeff Fawcett & John Gittins Graduate Explorers Fund
Octavio Acuna Avendano
Nabila Rahman
Erin Seagren

Emeritus University Professor A. J. (Tony) Naldrett Graduate Scholarship Fund
Junxing Chen
Natalie Szponar

Graduate Student Scholarship / Bursary Fund in honour of Emeritus Professor Steven D. Scott and Joan Scott
Julia Andersen

D.H. Gorman Explorers Fund Graduate Scholarship
Megan Swing
Tanya Kizovski
Sophia Zamaria
Krystal Nason
Bennett Wilson

Irene Gale-Rucklidge Explorers Fund Graduate Scholarship
Saif Al-Silwadi

Cameron Allen Graduate Scholarship
Nicole Atenza
Talia Moum
Zhenhao Zhou
Octavio Acuna Avendano
Afeez Popoola

Richard Bedell Graduate Scholarship
Jose Guballa

Nick and Marilyn Tintor Graduate Scholarship
Afeez Popoola
Emily Dazé
Alzbeta Ondercova

Laurence and Theresa Curtis Explorers Graduate Scholarship
Samantha Athey
Elizabeth Phillips

Dr. H.O. Seigel Scholarship in Applied Geophysics
Erkan Gün
Julia Andersen

H. V. Ellsworth Graduate Fellowship in Mineralogy
Ivano Gennaro
David Aceituno-Caicedo

A.T. Griffis Memorial Graduate Scholarship
Mostafa Khorshidi
Samuel Duckworth-Battye

Margaret Amelia Miller Scholarship
Daniel Dick

Eric Mountjoy Exchange Award
Katie Maloney

Laurence Curtis Teaching Assistantship Award
Jenny Lemberg
Erkan Gün
Sean Yokoyama
The inaugural department of Earth Sciences Staff/Student/Faculty and Alumni & Friends Golf Tournament was held on Friday September 27 at the Nobleton Lakes golf course. The Friday turned out to be a spectacular Fall day with 5 foursomes vying for department golf supremacy. Participants included staff, students, faculty, alumni and guests. The golfing talent ranged from complete beginners to some quite experienced players. Regardless of ability everyone had a great time with a lot of laughs, a few screams of frustration and the odd need to duck from a wayward golf ball (the main culprit being the department Chair who couldn’t seem to drive the ball in a straight line; on-course refreshments may not have helped). Overall, it was an excellent start to what we hope will be an ongoing event. This years (2020) event will again be held at Nobleton Lakes on the 3rd Friday in September (September 25) so hold the date. We hope to see more people out, regardless of skill level. Many thanks to Karyn Gorra for organizing the event and Sandra Kamo for helping out with registration and prizes.

Sign up for the Golf Tournament on 25 September 2020 by emailing Karyn at kgorra@es.utoronto.ca
Donors

We acknowledge, with thanks, donations made to the Department in 2019 by the following individuals and organizations to the Explorers Field Education Fund and a variety of Scholarship Funds:

Cameron Allen
Bancroft Gem & Mineral Club
Carl-Georg Bank & Katharina Heinz
Andrew F. S. Bau
Robert Beckett
Trevor Boyd
Robert Brodie
Susan Brown
Lawrence & Mary Cathles
Jennifer A. Clark
Jocelyn Elizabeth Clemson
Bruce Cooper
Les Csaszar
Laurence Curtis
Andrew Debnam
Enterprise Holdings
Arpad Farkas
J. Jeffrey Fawcett
Elizabeth Fear
Elizabeth Fodi
Joey Freund
E. Bruce Fulcher
Gem & Mineral Club of Scarborough
Jim Glen
Donald G. Gratton
Alan F. Gregory
Eva Haase
Raymond E. Hainsworth
Diana Halnan
Virginia R. Heffernan
Ariella Hoffman
Louise Z. Housam
Ann F. Hubbs
D. MacArthur Jarzen
David K. Joyce
Sandra L. Kamo

Chris Kennedy
Stephen E. Kesler
Stephen Kisin
Don Lapham
Helen Lasthiotakis
Karen Lechner
J. Douglas & Sheila D. Macdougall
Roger Macqueen
Timothy McConachy
Andrew Miall
Bernd Milkereit
Sean O’Connell
Jean Pardo
Don Poirier
Pierre-Yves F Robin
Frank Ruelhliche
Leslie Ruo
Brian M. W. Scholz
Walfried M. Schwerdtner
Kevin A. Shaw
Jane Spooner
Michael W. Sutton
Steven Szilard
Joan Templeton
Laura Thomas
Edward G. Thompson
Robin Tibbit
Touchstone Exploration (Trinidad) Ltd.
A. S. J. Tozer
Paul Tozer
C. Gale Walford
Walker Mineralogical Club
Ryan Weston
Dianne C. White
Mary Wiley

and several anonymous donors

An essential part of education in Earth Sciences is field training. Whether the topic is environmental geosciences, ore deposits, sedimentary or plate tectonics, students gain a genuine understanding of the material when they can study in the field. Our laboratory is the outdoors—and often that means unique geological sites around the globe.

We are turning to our alumni and friends to help make this possible. The Geoscience Field Education Fund gives an opportunity to support the field training of the new generation of geoscientists.

In 2019, The Jim Haase Memorial Award was created by family and friends of Jim Hasse, an award for undergraduate students in the Earth and Environmental Systems program.

To learn more about giving to UofT Earth Sciences visit: www.es.utoronto.ca/giving

Advances in Earth Sciences Research Conference

The Advances in Earth Sciences Research Conference is an annual graduate-student run conference that takes place in southern Ontario. This conference aims to provide an inclusive and academic setting for senior undergraduate and graduate students to present their research and gain feedback on their presentation skills. The 18th annual AESRC was held from March 29-31, 2019 at the University of Toronto, hosted by the Department of Earth Sciences. There was a total of 64 registered attendees, which included student delegates, faculty members, sponsor representatives, and keynote speakers. Talks and posters were from a breadth of earth science disciplines, including: Igneous and Metamorphic Geology, Economic Geology, Sedimentary Geology, Planetary Science, Quaternary Science, Geophysics, Environmental Geoscience, and Paleontology. A total of $1,600 in student prizes was given out at the conference. Thank you to APGO for sponsoring the conference and supporting Earth Sciences research in Ontario!

Marissa Davies

AESRC Organizing Committee back l-r: Alice Alex, Eunji Byun, Liz Phillips, Natalie Szponar; front l-r Marissa Davies, Carter Grondahl
During the Holocene, North American ice sheet collapse and rapid sea-level rise reconnected the Black Sea with the global ocean. Rapid meltwater releases into the North Atlantic and associated climate change arguably slowed the pace of Neolithisation across southeastern Europe, originally hypothesized as a catastrophic flooding that fueled culturally-widespread deluge myths. However, we currently lack an independent record linking the timing of meltwater events, sea-level rise and environmental change with the timing of Neolithisation in southeastern Europe. Here, we present a sea surface salinity record from the Northern Aegean Sea indicative of two meltwater events at ~8.4 and ~7.6 kiloyears that can be directly linked to rapid declines in the establishment of Neolithic sites in southeast Europe. The meltwater events point to an increased outflow of low salinity water from the Black Sea driven by a rapid global sea level rise of >1.4 m following freshwater outbursts from Lake Agassiz and the final decay of the Laurentide ice sheet. As the salt water poured into the Black sea, the upper layer of lower density fresh water flowed out. Our results shed new light on the link between catastrophic sea-level rise and the Neolithisation of southeastern Europe, and present a historical example of how coastal populations may be impacted by future rapid sea-level rise.


**Ground-penetrating Radar Reveals “Underground Railroad” Grave Sites**

The Underground Railroad is a striking example of human resistance and resilience in North America’s recent past. Many enslaved African-Americans made their way to Southwestern Ontario, Canada, through the Underground Railroad network (early to mid-1800s) in the hopes of gaining freedom from enslavement, only to be met with further prejudice upon their arrival. Despite Southwestern Ontario’s role during this important period in North America’s history, few researchers have explored freedom seeker communities in the region through an archaeological lens. In 2016-2017, as part of the undergraduate thesis of Liam Wadsworth (BSc, 2019), our team undertook, besides using other geophysical methods, a ground-penetrating radar (GPR) survey of a cemetery associated with the Dawn Settlement, one of many freedom-seeker communities in the area. During the mid-20th century, the cemetery fell into disrepair and the gravestones were rearranged into a central monument. The goal of our research was to identify the location of the now unmarked graves. The GPR was able to locate many of the graves (see figure). It was our privilege to be able to locate and protect the graves of these forgotten souls, recognizing their contributions in shaping Ontario’s heritage, and sharing their stories with descendants.

Liam is currently a graduate student in the Department of Anthropology at the University of Alberta, where he specializes in applying geophysics/remote sensing techniques to Canadian archaeology, primarily at the request of Indigenous communities.
Greenhouse conditions during the Cretaceous are traditionally thought to have been driven by high atmospheric CO$_2$ concentrations (>1200 ppm) contributed by enhanced rates of plate spreading and flood basalt formation. Recent work has suggested that CO$_2$ emissions from volcanic arcs, particularly those intersecting crustal carbonates, play a strong role in modulating the long-term carbon budget of Earth’s exogenic system. To estimate the magnitude of metamorphic CO$_2$ release and its climatic impact, Chu et al. (2019) model how variation of Carbon (as CO$_2$) input into the atmosphere over geological time, for Mid Ocean Ridge degassing and from metamorphic reactions due to magmatic processes on island arcs. Limits shown are the envelopes of all results.

Metamorphic CO$_2$ emission and its climatic impact

The trace element content of pyrite is used for many things ranging from determining the chemistry of past oceans to understanding the chemistry of fluids that form ore deposits. However, it has still not been determined how those trace elements are held within the pyrite: in the pyrite structure or as micro- to nano-inclusions. Which of these is occurring is important if we are to understand the composition of fluids from the pyrite composition because how different trace elements are held within the pyrite may affect the incorporation of other elements. For example, if As$^{3+}$ substitutes in the Fe site in pyrite it can increase the amount of large cations (like gold) that can be incorporated into the pyrite because for every two As$^{3+}$ in the pyrite there will be one void space to maintain charge balance which will provide the space needed to accommodate large cations. Unfortunately, most common techniques, such as laser ablation inductively coupled plasma mass spectrometry, do not have the spatial resolution to determine whether the trace elements are held within the pyrite structure or as nano-inclusions. To resolve this myself and MSc student Nicole Atienza are analyzing pyrite samples using atom probe tomography. Atom probe tomography allows for the composition of a 3-D solid to be determined at the atom scale allowing researchers to better understand how the different atoms are related to one another. In the figure we can clearly see that the green and orange copper and nickel atoms are related to each other and concentrated along an inter-grain boundary in this pyrite framboid (a common texture of microcrystalline masses of pyrite formed in ocean sediments). This suggests that these elements are not evenly distributed throughout the lattice as was previously presumed. These new data will cause the community to rethink how trace elements are held within pyrite and how we use pyrite chemistry to track past fluid chemistry.

**Figure:** Distribution of Cu (green) and Ni (orange) within a pyrite needle from a pyrite framboid. Each dot on this figure represents a single atom of the element. Note that most of these trace elements are concentrated along the inter-grain boundary suggesting they were incorporated into the pyrite relatively late.

Dan Gregory


Xu Chu
On May 22nd 2019, the Paleomagnetism Laboratory at UTM, variously known as the “Rock Lab” or “Lunar lab” closed its doors for the last time, after 50 years of operation, ironically in the same year as the 50th anniversary of the lunar landing! The lab was housed in a long, low building beside Principal’s Road that leads to Lislehurst, the UTM Principal’s residence. It was specifically designed to house a laboratory specializing in Paleomagnetism and the Physics of Rock Magnetism and was therefore made of non-magnetic materials including all furniture.

The idea for a magnetism laboratory at UTM was originally spearheaded by a group of geophysicists from the St. George Campus (Gordon West, George Garland, David Strangway and J. Tuzo Wilson), who needed an environment where the earth’s magnetic field could be virtually eliminated, thus allowing rock magnetic experiments and the testing of electromagnetic survey equipment. The group was spearheaded by Gordon West who supervised graduate students on the St. George and Scarborough campuses where magnetic noise due to traffic and especially street cars and the University subway line in Toronto, presented severe problems to experiments. A quiet, magnetically noise-free, area was sought. In 1967 a proposal was made to the then fledgling Erindale College in Mississauga (now UTM) for the construction of a suitable building in a rural setting, to be financed by the Department of Physics. Tuzo Wilson, earlier the leader of the St. George geophysics group and by that time Erindale’s de facto first principal, was a keen supporter of the project. Strangway, a future President of the University of Toronto and Chair of the Earth Sciences department, was at that time an Associate Professor in the Physics department, and the head of the Lunar sampling mission at NASA. Lunar samples were scheduled to be returned to Earth in 1969, and those destined for Canada, personally transported across the border by Strangway, required a laboratory for their study. The building of the laboratory was

which experiments could be conducted in a magnetically field free space. The laboratory did indeed receive the first lunar samples to arrive in Canada. To commemorate this spectacular event, Principal Wilson had a light in the shape of a crescent moon erected outside the lab (see photo).

1970 saw the arrival at Erindale of two scientists interested in carrying out research in Rock- and Paleo-magnetism; David Dunlop (UTM 1970-2006) and Henry Halls (UTM 1970-2010). During their careers these two scientists produced close to 300 journal publications, (~200 for DD and ~100 for HH), many of which were based on research carried out in the Paleomagnetism Laboratory.

Final decommissioning of the lab began in early April 2019, in response to the space being allotted to a new program in Artificial Intelligence. Most of the paleomagnetic equipment was moved to the Universities of Brock and Western to form a new paleomagnetic facility under the management of Dr. Phil McCausland of Western University. A particular challenge to clearing the lab was the eight-foot square shielded room made of more than 2,000 pounds of mu-metal, (a special metal that blocks an external magnetic field) and put together with hundreds of bolts and screws using a wooden framework. Initially a professional team of dismantlers was contacted who estimated that they could do the job for US$12,000. On learning that the shielded room was not built of a NASA design with which they were familiar, they finally declined their services. At the 11th hour, just when scrapping the room appeared the only option, a knight in shining armour appeared in the form of Chris Charles, an alumnus of the Earth Sciences Department on the St. George Campus. He had just taken a job at the TRIUMF facility in Vancouver where rare isotopes for medical applications and research were being produced, using a powerful linear accelerator. It turned out that a new accelerator was being built and the Earth’s external magnetic field needed to be locally excluded. So Chris came to UTM and supervised the dismantling and shipping of the mu metal to TRIUMF! In the end, despite the age of some of the paleomagnetic equipment, nothing was scrapped, and the precious mu metal found a new home!

A final photograph (below) shows a pile of used oriented rock core cylinders, the basic fuel for making paleomagnetic measurements. It illustrates the enormous number of cores (thousands!) that were measured during the lifetime of the lab. The pile does not include unused cores that were moved to Western in order to set up a storage facility for future research.

Acknowledgements: Dr. Phil McCausland for photographs, for help in packing unused sample cores, and for helping to make the decommissioning of the lab a more cheerful experience; Professors Emeriti Gordon West and David Dunlop for comments and corrections on an earlier version of the article; Gordon provided a file from 1967 in which the plans for the Lunar lab were first proposed.

Emeritus Professor Henry Halls
By the late 19th century Canadian women could obtain both higher education and enter the geological work force. Science became an alternative to traditional female occupations such as marriage and motherhood, teaching and nursing, but geology was slower than other sciences to accept women. Because of this, women geologists were kept in underpaid positions. They had few opportunities to improve their salaries through career advancement in academic and/or government institutions. Women scientists in the civil service and elsewhere were also expected to remain single. If they married they lost their jobs.

During the 1880s and 1890s the only science-related occupations available to women at the GSC were in the office or library. By WW1 women found employment as photographers and museum “assistants”. The latter performed the repetitious, undervalued indoor tasks that male geologists did not want to do, such as cleaning and sorting specimens.

The first Canadian woman to obtain a degree in geology was Grace Stewart (1893-1970) at the University of Alberta. Stewart soon found, however that there were no jobs for women geologists at Canadian universities and that there were strong prejudices against women at the GSC. She moved to the United States where she had a good career at Ohio State University.

Of the many women employed by the GSC before WW2, only paleontologist Dr. Alice Wilson (1881-1964) achieved a permanent scientific position. She was originally employed to work on fossil identification at the Survey’s museum. After obtaining her Doctorate in 1929 she applied for reclassification, but to no avail.

Born in Saint John, New Brunswick, Madeleine Alberta Fritz (1895-1990) believed that a woman could only have one career – marriage or a paid profession. She chose the latter. After a BSc in a general arts degree at McGill, she met Alice Wilson and spent a summer in the field with her. As a result she obtained her MA in 1923 and a PhD in 1926, both at the University of Toronto under the mentorship of Professor W.A. Parks.

She was the only female graduate student in her department, but felt accepted by the men and that no-one tried to discourage her from pursuing an academic career.

In 1927 she began working as an assistant at the Royal Ontario Museum of Paleontology, an institution affiliated with the university, eventually becoming Curator in 1955. Her academic career was slow to unfold. Although she became part-time Associate Professor in the Department of Geology in 1935, she did not become a Full Professor in the department until 1956. During this time she undertook field work in remote regions of Canada around Hudson Bay and wrote more than sixty research papers between 1923 and 1977. Her university career reached a peak in the immediate post-war years with the influx of large numbers of returning war veterans seeking post-secondary education. At one time she was supervising 15 graduate students, no mean feat in what at the time was very much a man’s world and one comprised largely of war veterans! Her influence was considerable as she provided a steady flow of highly trained scientists to the newly invigorated oil industry in western Canada. In 1942 she became the second Canadian woman scientist and the second woman geologist to be elected a fellow of the Royal Society of Canada. She was also a Fellow of the Geological Association of Canada and the Geological Society of America. In 1977 the University of Toronto conferred on her a Distinguished Service award. She retired as Professor Emerita in 1977 but remained a research associate at the museum well into her eighties. As a paleontologist, Fritz’s research interests ranged throughout the Paleozoic into the Mesozoic, especially the Ordovician. She was the first to describe Triassic Bryozoa and was responsible for describing a number of fauna sent to her by the GSC. In 1967 she was awarded the Centennial Medal of Canada in recognition of her many contributions.

For this article I have abstracted information from three references:

“Creating Complicated lives: women and science at English Canadian Universities 1880-1980” by Marianne Gosztonyi Ainley, McGill Queens U. Press, 2012 (pp. 81-82); her earlier paper “Women’s work in Geology: a historical perspective in gender division in Canadian Geoscience”, Geoscience Canada, v. 21, no.3 1995, and from the Department’s celebration of its sesquicentennial that was compiled and partly written in 1998 as a book by our Chair at the time, Jeff Fawcett.
Graduate Field Trip

Every year incoming graduate students join returning graduate students, professors, post-doctoral fellows, and alumni on a geology field trip. This year’s trip took place Oct. 4-6 and visited the Bruce Peninsula in southern Ontario. The enjoyable field trip was blessed with fantastic weather and only the knowledge of how cold Lake Huron is (and that it was Ontario in October) kept people out of the water.

The trip was organized by Julia Andersen and Saif Al-Silwadi and led by Professors Daniel Gregory, Russell Pyskywec and Professor Emeritus Pierre Robin. The trip started with a drive to Tobermory including a few stops along the way. The first stop was at Cheltenham Badlands where the group discussed the differing iron chemistry responsible for the fascinating colour banding as well as the processes responsible for the terrain that is more reminiscent of parts of southern Alberta than southern Ontario. Next, was a stop at Inglis Falls, near Owen Sound, to investigate the Niagara Escarpment and discuss why the escarpment is there and what it may look like in the future.

The following day was spent hiking and exploring the dramatic overhangs and short caves of Bruce Peninsula National park on the shores of Lake Huron. The group discussed how the wind and wave action at the lakes edge sculpted the beautiful scenery. At the end of the day we stopped at the bioherm near the Anglican Church in Tobermory to try and look through the lichen to see the Silurian fauna preserved in the rocks. This fantastic day was capped with a dinner of deep fried lake fish at a restaurant in Tobermory.

The final day saw our return to Toronto but not before a stop at Bruce’s Caves Conservation area where the group checked out the cave formations and made parallels between the caves that formed on the shores of glacial Lake Algonquin and overhangs forming on the shore of Lake Huron today. All in all the trip was a great chance for everyone to get to know one another the and geology of southern Ontario prior to the onset of winter.

Grad Students Travel to Outer Banks, North Carolina

In May 2019, ten Earth Science graduate students from the University of Toronto visited the North Carolina Outer Banks to learn about the local geology, ecology, history and culture. The Outer Banks are a 320-km long chain of barrier islands lining the Atlantic coast of North Carolina in the southeastern United States.

The barrier islands were formed approximately 18,000 years ago and are divided into a northern and southern zone by a topographic high. The northern zone is characterized by a Quaternary deposits record of multiple cycles of glacial eustatic changes through valleys backfilled with fluvial and marine sediments. The southern is defined by older Tertiary and Cretaceous units that offlap the Carolina Platform. Today, the island’s are made up of unique coastal habitats, including maritime forests, estuarine and freshwater marshes. They are home to a wide variety of wildlife, most notably a population of wild horses, known as the Banker ponies.

Apart from the area’s unique geological history and ecology, the Outer Banks has incredible historical and cultural significance. Among others, this area was home to the “Lost Colony” of Roanoke Island, the hideout of notorious pirate Blackbeard at Oak Island, the first National Seashore established in the US, and the Wright Brothers’ first flight at Jockey’s Ride State Park.

Graduate students visited sites across the northern and southern zones to observe the three-dimensional geomorphologic features that define barrier islands, and to learn how the local community and ecology have adapted to living on a constantly changing landscape.

A great example of the local community adapting to shifting islands is the story of the relocation of the Cape Hatteras Lighthouse in the late 1990s. The lighthouse was built in 1870 approximately 1,500 m inland from the shoreline. Over the next century, extensive shoreline erosion brought the sea only 120 m from the lighthouse, threatening the integrity of the 59-m historical structure (the largest brick lighthouse in the US). The shoreface geomorphology is governed by the complex variability of the underlying geologic framework as well as the dynamics of coastal depositional systems. These factors influence the composition and texture of beach sediments, their distribution across the barrier islands and erosion rates. In 1999, the community undertook the massive project of relocating the structure 880 m in-land using large pine timber beams. Because these local communities have the ability to adapt to the dynamic geological landscape of these islands, the group of graduate students were able to tour the lighthouse during the trip!

Sam Athey, Katie Maloney
Eleven mainly third- and fourth-year undergrads examined the geology, geophysics and geochemistry of the SE Caribbean region in February. The co-leaders were Ed Spooner, Laurent de Verteuil (PhD, UofT), who worked in the Trinidad petroleum industry for ~15 years, and Colin Roth (undergraduate leader). They were joined by recent alumnus, Zafir Imamshah, in Trinidad.

One objective was to examine the primitive mafic volcanism of St. Vincent which includes the most active subaerial volcano in the Lesser Antilles, La Soufrière, which erupts irregularly but with an average of only ~50 years – its last eruption in 1979 produced significant eruption columns almost 20 km high. La Soufrière is also famous for violently erupting a few hours before the 1902 Mt Pelée disaster in Martinique ~150 km away, probably a case of seismic triggering.

In Trinidad major geological features include: (i) The metasedimentary Northern Range, a topographic extension of the Andes, which was strongly deformed in the Miocene by transpressional plate collision; (ii) petroleum and natural gas from fossiliferous Cretaceous source rocks discharging as oil seeps, gas vents and mud volcanoes with the Pitch Lake being the largest natural surface bitumen accumulation in the world; (iii) paleo-Orinoco Delta front sediments, to be compared with those in the front of the nearby present-day Orinoco Delta which is about five times the size of Trinidad; (iv) mud volcanoes, two with active flammable natural gas discharge, giving the impression that they are everywhere, which they are; (v) exceptional raised beaches in NE Trinidad indicating that northern Trinidad is tilting westward about an approximately centrally located, ~N-S axis; (vi) the current aseismic, creeping Caribbean/South American plate boundary which is transpressional in central Trinidad, and (vii) a large, seismically-triggered landslide in SW Trinidad (~300 m x ~1 km) that was produced by a magnitude 7.3 earthquake off NE Venezuela ~6 months before, on 21 Aug., 2018. Note that the observed seismic trigger distance (~170 km) is similar to that between St. Vincent and Martinique.

Outstanding features/events in St. Vincent and Bequia were: (i) the exceptional airfall drape features shown by ~4,335-3,590 year old (C14 dates) yellow tuff; (ii) seeing the rugged volcanic centres of St. Vincent, which get older to the south (opposite to Montserrat), (iii) normal faults with 4-6 km strike lengths on Bequia produced by arc extension related to arc curvature, and (iv) going up and over La Soufrière volcano from the Atlantic side to the Caribbean side – the southern rim is at an elevation of ~900 m. The group were met with spectacular views of the large crater (~1.6 km across) and the 1979 lava dome before being attacked by howling gales and driving rain.
Turkey — Where Geology and Culture Mix and Continents Collide

To an aspiring geologist, southern Ontario leaves something to be desired sitting astride the geologically stable Canadian Shield. Not so the Cappadocia region of central Turkey.

“For geologists, Turkey is exciting,” says Russell Pysklywec, Chair of the Department of Earth Sciences (ES) in the Faculty of Arts & Science. “It sits on the boundary between two tectonic plates and, as a result, is geologically very active.”

“The African plate is moving northward, ramming into the Eurasia plate, and Turkey is right at that boundary where continents are colliding. And they’re still moving and pushing into each other, lifting up mountains and producing volcanoes and plateaus.”

A highlight for students was the daily, early-morning launch of balloons from Gorëme.

Photo: Anne Yolland

Late last year, Pysklywec and Grant Henderson – also a professor in ES – led a group of 13 students to this tectonic trove for the department’s Rocks and Minerals International/Indigenous Course Module (ICM). The Faculty’s ICM program gives students an opportunity to enrich their studies with a learning experience outside the country.

“In geology, we study how mountains, volcanoes and larger structures like plateaus form,” says Pysklywec. “We also study and sample smaller rocks and minerals with hammers and microscopes. So, it’s a challenge to give students a sense of both the macro and the micro.

“But in the field, standing at the edge of a volcano, you see the macro. And you see the micro when you’re chipping away at a little bit of rock and you look at it through a magnifying lens. The ICM trips give students a chance to experience both.”

“It can be difficult learning topics without being able to interact with them fully,” says undergraduate Danielle McGill, who took part in the trip. “To learn about plate tectonics, geologic formations and mineralogy in a geologically active part of the world in this hands-on way was truly rewarding.” McGill is a member of Trinity College and is enrolled in the environmental geosciences specialist program.

A typical day for the students included hikes to various sites of geological interest. The group saw the three volcanoes – Erciyes, Hasan and Melendiz Daglari – that dominate the region; they explored monasteries carved into the walls of the Ihlara Valley; and hiked amongst the geologically iconic Fairy Chimneys of Gorëme.

But students weren’t in Turkey just to learn about rocks and minerals. They were also there to see how geology is reflected in the culture and history of the region and how its inhabitants have been influenced by their geological surroundings.

“We explored the region through different questions,” says Pysklywec. “Why did people settle in the area? How did they interact with the land? How did the unique geology give rise to unique human habitation? For example, volcanoes eject ash and in time ash becomes rock. But the rock is soft, and so Cappadocia is dotted with settlements literally carved out of the volcanic layers. There are underground cities in Derinkuyu that go down eight stories, and at one time supported a population of 10,000 people. We climbed through these subterranean cities and examined how they were engineered and what it must have been like to live there.”

Rock formations known as “fairy candles” at Pasabag near the city of Gorëme.

Photo: Anne Yolland

In addition to giving students a view of the region’s geology and history, the ICM gave them insight into their current and future studies.

“This trip really confirmed that I want to work outdoors and travel,” says Alexander Copeland, a member of St. Michael’s College enrolled in the environmental geosciences specialist

20
program. “I’m still not sure whether I want to pursue a career in academia or industry, but I definitely want to see the world — and earth sciences is a great field for that.”

Nicole Freij, a member of Victoria College studying toward a specialist degree in geology, found similar food for thought on the trip.

“My experience in Turkey definitely provided me with ideas about my future studies,” she says. “It gave me the chance to explore where my interests lie within the field. And now I have more of a sense of which earth science courses to take and which research projects I might take on.”

It was the same for McGill. “This experience has solidified my interest in geology,” she says. “It’s opened my eyes to plate tectonics and I’m now looking forward to taking a fourth-year earth science course on global tectonics.”

For Pysklywec, the benefits of such an experience run even deeper than helping a student in their studies and in making academic decisions.

“Having these trips out into the field — especially early in someone’s academic life — helps them form relationships with other students and helps build a strong student community. It helps them get to know faculty. “What’s more, it’s a transformative experience,” he says. “If you want to create passionate students, give them experiences like this.”

Chris Sasaki, A&S News
Geological rock gardens are an important form of geoscience public outreach. On September 9, 2019, Canada’s newest geological rock garden, the Anita and Eric Mountjoy Geology Garden, opened on the grounds of the Jasper-Yellowhead Museum & Archives in Jasper. A World Heritage site, Jasper National Park illustrates, protects and celebrates one of the world’s better geological records - a stack of sedimentary and metamorphic rocks about 14 kilometres thick, deposited in ancient seas over approximately 635 million years. The Mountjoy Geology Garden displays eight large boulders from various bedrock exposures in the region. Each boulder illustrates an important element in Jasper National Park’s geological history. The boulders are arranged from oldest (Neoproterozoic gritstone) to youngest (Recent hot-springs travertine). Information provided on small signs includes formation names, ages and rock types, with brief comments on the sedimentary environment in which each originated. Visitors can enter the museum building to see Eric Mountjoy’s 1985 geological map and cross-sections of the Jasper area. Two large interpretive panels on the museum’s deck display annotated photos of the surrounding scenery.

Eric Mountjoy (1931–2010; PhD, 1960; Beales), FRSC (Fellow of the Royal Society of Canada) was a pioneer geologist of Jasper National Park. Following completion of his BSc in engineering geology at the University of British Columbia in 1955, Eric enrolled as a graduate student at the University of Toronto. Because Eric showed promise in geological mapping, the Geological Survey of Canada (GSC) funded him to study and map the geology of the Miette map-area, located northeast of Jasper and covering 929 square kilometres. Rock exposures there are excellent, permitting a variety of structural and stratigraphic studies.

Eric’s reward for a stellar job? He was awarded a PhD from the University of Toronto. In 1963, following three years with the Geological Survey of Canada, Eric joined the Geology Department (now the Department of Earth and Planetary Sciences) at McGill University in Montreal. Soft-spoken, loyal, trusting, and dedicated to excellence in all things, Eric was an exceptional teacher, field leader and mentor. Over his career, Eric kept returning to Jasper National Park. With continuing GSC support while at McGill, Eric published seven geological maps of the Jasper region. He also developed outstanding expertise in Devonian reef geology, and undertook a number of carbonate-centred research projects in the area with his students. Eric’s impressive legacy is both his geological mapping and the efforts that he and his students have made to help unravel the mysteries of Alberta’s oil-rich buried reefs under the Western Canada plains.

Many of the Miette area lies within Jasper National Park, which at the time was largely remote. Mapping was carried out by means of horse parties, at a time (the 1950’s) before helicopter support. During the summers of 1957 and 1958, Eric and his field assistants, with Roger Macqueen as Eric’s senior field assistant in 1958, explored the wilderness valleys and scrambled over the rocky ridges. Eric’s reward for a stellar job? He was awarded a PhD from the University of Toronto.

During Eric’s field-research summers in the park, Anita often visited Jasper. Their shared love for the community grew such that they provided funds to the Jasper Museum & Archives to create the Anita and Eric Mountjoy Geology Garden, a superb introduction to Jasper National Park geology.

Roger Macqueen (MA, 1960; PhD, Princeton) is a retired Geological Survey of Canada geologist and former Professor of Earth Sciences (now Earth and Environmental Sciences), University of Waterloo, Ontario.

Climate Action Rally

A group of Earth Sciences students, faculty and staff participated in the Climate Change Rally at Queen’s Park in September, in solidarity with climate activists around the globe. In a movement of massive proportions they demanded immediate action to counter the global climate crisis. News outlets reported crowds of over 15,000.
Emeritus Corner

Career turning points

In response to the Editor's general request for stories relating to how readers entered careers in the Earth Sciences, four Professors Emeriti sent in their stories:

Greg Anderson writes: I was born and grew up in Montreal, and took mining engineering at McGill. I spent two summers working underground and one as junior assistant mapping in the Cobalt area for the Ontario Department of Mines. Having found that I liked being in the field more than being underground, on graduation I decided to do another field season before finding a real job. I signed on as field assistant with the Buchans Mining Company in Central Newfoundland. When I got there they said they had a project exploring for sulphides along the Grey River (photo, looking south) that ran from the interior of the island to the south coast, but the planned leader of the expedition never turned up, so I got the job! There were four of us in our party. A Beaver float plane took us to the headwaters of the Grey River where we made camp. We had two tents, three canoes, a little wood stove, some food and our gear. The Grey River is full of white water rapids, is deeply incised, and flows straight south to the ocean. The surrounding country is inhabited mostly by moose and caribou. Our job was to go down the river in stages, looking at the rocks on both sides. That summer was not only a turning point in my life but the most interesting and eventful few months I ever experienced. We had lots of adventures; shooting rapids, and encounters with a hungry bear and an angry moose. On one move one of the canoes was swamped and sank going through a chute between two huge rocks, losing most of our food. Another time we were camped on an island in the river and woke up to find the river flowing through the tents. We reached the south coast in early September. This was the only place we actually found traces of sulphides, but no time was left to fully explore. Having seen so many rocks I wanted to learn something about them, so I applied to U of T to do graduate work, and went there soon after returning home. That was a major turning point.

John Gittins writes: At Grammar school in England I had a teacher who was a keen amateur geologist. He took us on several field trips and lent me a copy of Arthur Holmes’ Principals of Physical Geology which I read avidly. When I emigrated to Canada at 15 (on my own), I brought my own copy with me. In my first intelligence test in Canada I was told that I was slightly sub-average and should not consider university. Thus began a life of rebellion against authority! I joined the Hamilton Olympic Club and devoted enormous amounts of time to athletics and won bronze in the Ontario Championship quarter mile under 17 category. But it was my undoing, I failed grade 13 spectacularly! Athletics had to go and I repeated Grade 13 well enough to get into McMaster. I pushed towards medical school but with my grades I did not have a ghost of a chance. Geology was what I had always really wanted to do. I scraped through first year at Mac, but a summer with the GSC sealed it. I eventually had the good fortune to be mapping part of Haliburton County for the Ontario Department of Mines, when Professor Tilley, a world famous petrologist from Cambridge University, spent several weeks with us looking at nepheline syenites, for which the area is famous. He suggested that I go to Cambridge to continue studying them for a PhD. At Cambridge, the Vice President for Research at Penn State was on leave and asked me if I was interested in experimental petrology. This led to an offer to become assistant to Professor Tuttle to study carbonatites. And the rest is history.

Henry Halls writes: I am at High School in England and aged about 15. I pick up a small book entitled “The Observer’s book of British Geology”. The revelation that ancient life forms were preserved as fossils, piqued my interest. Geology was not taught at our School, so I wondered who could enlarge my horizons on the subject. My thought process was “Geology…..Geo… Geo……ah…. Geography ! That was taught at my School. So I went along and asked my Geography teacher about Geology. A wistful look came into his eyes. “You know” he said, “I have two degrees, one in Geography but also one in Geology but it wasn’t good enough and so I had to teach geography”. In my short experience at the time this was an unprecedented expression of failure by a high school teacher! On hearing my Geography teacher’s confession, I immediately asked him if his first choice was to be a geologist. “Oh yes” he confided, “you travel the world, often in wild and remote places; it’s a life full of adventure …”. That was enough…. immediately I wanted to become a geologist!

Years later, after obtaining my PhD, I returned one late afternoon to the school for my one and only return visit. In the carpark, on his way home, was my Geography teacher. He was of course delighted to know that he had changed my life, adding that he had just retired and this was his very last day at school. Our meeting was an amazing coincidence!

Tony Naldrett writes: I was fortunate to be in my school’s (St Paul’s School, London) first rowing eight. At the time, as now, rowing was important at the school and we regularly did quite well at Henley Royal Regatta. After leaving school at 18, and two years compulsory service in the Royal Air Force, I went up to Cambridge to study Chemistry, which was a subject that I had always enjoyed at school, and at home with my personal chemistry set. The Cambridge curriculum required natural scientists to take 2 years over Part 1, in which 3 subjects were taken, followed by a third year, Part 2, in which one was allowed to specialise.

At Cambridge, I was selected for my college (Trinity Hall) first eight. This involved my rowing on the river 6 days per week from 13.30 to 17.30 hrs, besides coaching a junior boat. Therefore all of one’s lectures and labs had to be in the morning! As an intending chemist, I chose chemistry, along with physics, for my Part 1, both of which fitted the requirement, but I needed a third subject, and Geology, a subject that I had barely heard of, was one of the few that fitted into the morning, so I opted for this. Rapidly I found that geology allowed me to combine my love of chemistry with that of travel, and so I switched majors and the die was cast.
Alumni Night with Earth Sciences Laboratory Tours was held in the fall bringing a group of alumni to speak about their career experiences with undergraduate students and to offer advice on their entering the workplace. Stories of experiences and adventures, from remote mine sites to the boardroom, and how their own skills and interests influenced their career directions was followed by a networking event. A tour of Earth Sciences research labs was a highlight for students and alumni - an opportunity to talk with researchers and lab managers about what is happening with current research in the department. Labs open for the tour included: Environmental Research, Geobiology Isotope Lab, Geochronology, Laser ICP-MS, Trace Metal and Metal Isotope Lab, Microprobe/SEM, Stable Isotope Lab and the Tectono-physics Lab.

The speakers were:

Thea Myrskog, (BSc, 2017)
Thea is an Exploration Geologist at Orix Geoscience, a geological consulting firm. She has worked on several advanced stage gold exploration projects in Nunavut and Quebec as a core logging geologist. As a recent graduate from the University of Toronto (with a B.Sc. in geology and geographic information systems), she is excited about sharing her early experiences.

Alex Pernin (BSc, 2013; Coleman gold medal; MSc, 2014), PGO
Alex is the Chief Executive Officer of Star Royalties, an emerging royalties and streaming company based in Toronto. He was previously responsible for capital allocation and investment management at Barrick Gold, where he was involved in the $6.5B Randgold Resources acquisition and the $5B Barrick Gold – Newmont Mining Nevada Joint Venture.

Shilika Mathur, (BSc, 2014; MSc, 2015)
Shilika has 5 years of professional experience working as both a geologist and an environmental scientist. She is currently working as an environmental consultant for Jacobs in brownfield remediation, infrastructure and transportation with a focus on project management, data management and business development. Within the mining industry she has held various positions in grassroots exploration, advance exploration, production and corporate environment in Ontario, Manitoba, and Nunavut.

Ramona Verma, (BSc, 2010; MSc, 2016; MBA, 2019), PGO
Ramona has 10 years of professional experiences in the Mining and Metals sector. She has had a very successful career in Geology including work with PDAC-Mining Matters, Barrick Gold, Vale and Osisko Gold Corporations where she gained experience in field mapping, designing, underground mining operation, exploration and definition drilling and helping to write 43-101 technical reports. She recently completed an Executive MBA program from Western University.

Rabi Nizami (BSc, 2013), PGO
Rabi Nizami is an Associate Analyst at National Bank of Canada. His role focuses on researching and evaluating precious and base metal companies around the world. His day to day activities include in-depth analyses demanding a strong understanding of finance, mining, geology, engineering as well as geo-political risks. His interest in combining these varied disciplines stemmed from his diverse work experiences at Rio Tinto, Talon Metals, Tau Capital and Detour Gold.

Juliana Morales (BSc, 2013), PGO
Juliana is a surface mine geologist with TMAC Resources. Juliana is responsible for ore grade control at the Hope Bay mine, Nunavut. Before this, she worked for De Beers Canada as a mine geologist at several operations in Ontario and NWT, and was previously in their Mining Professionals in Training (MPIT) program where she worked in exploration and in the kimberlite petrographic unit. Previously, she undertook silver exploration in Jalisco, Mexico for Soltoro, and in gold exploration in Quebec for Northern Superior Resources.
b2B provides opportunities for students to meet alumni and faculty members from their academic unit and enjoy their guidance, career advice and encouragement. In March, four alumni joined Professors Becky Ghent, Xu Chu, several undergraduates and graduate students at the U of T Faculty Club for a meal and discussion on future career paths and the possibilities that their Earth Sciences degree offered. Earth Sciences Alumni interested in becoming a mentor and participating in upcoming mentorship events can learn more at: https://alumni.artssci.utoronto.ca/backpack-to-briefcase-description/

The four alumni were:

**Yannick Beaudoin**,
(MSc, 2001; PhD, 2006; Scott)

Since 2018, Yannick has been the Director General, Ontario and Northern Canada for the David Suzuki Foundation. He has joined a dynamic team of researchers, communicators and advocates working to bring about transformative change to benefit people and Nature. Yannick has come to the David Suzuki Foundation after 12 years as Chief Scientist at GRID-Arendal, a Norway-based United Nations Environment Programme (UNEP) collaborating centre and partner of the United Nations Economic and Social Commission for Africa.

Over the past decade, he has been fundamentally involved with overseeing environmental and sustainable development efforts that include: adaptation to uncertain climate futures in polar and mountain regions; embedding of local, traditional and indigenous knowledge in policy-, decision- and choice-making; enabling conversations and innovation for new development and economic paradigms; promoting a transition to a sustainable relationship between society and the ocean.

Yannick has dedicated much effort to the application of new economic thinking, a science of change and participatory social 'technologies' to global efforts touching on green and blue economy initiatives. This has meant working with countries, communities and industry to implement approaches that increase human well-being while preserving and enhancing ecological health and quality. He has also provided advisory services on green economy/blue economy to the East Asia Pacific group of the World Bank and to various UNEP Regional Seas Conventions.

His recent project activities include: co-design and co-facilitation with GIZ of a one year innovation lab on climate leadership in Central Asia, the development of a global UNEP TEEB (The Economics of Ecosystems and Biodiversity) for Oceans and Coasts Global Environmental Facility effort, the management of the UNEP Global Outlook on Methane Gas Hydrates and co-coordination of the EU-funded SPC-SOPAC – UNEP Pacific Marine Minerals and Deep Sea Mining Assessment. He has also been a geoscientist with the Continental Shelf Project which has been providing technical assistance to developing states working to delineate the outer limits of their continental shelf according to criteria outlined in Article 76 of UNCLOS.

From 2001 to 2006, Yannick was a project geologist with Falconbridge Ltd managing “green fields” nickel, copper and platinum group element exploration projects in Canada and Norway. He has also worked in geological exploration for Phelps Dodge of Canada Ltd. and in the high Arctic for the Geological Survey of Canada. During his time at the University of Toronto, his research focused on deep ocean hydrothermal vent systems; he participated on nine international marine research campaigns from Antarctica to the western Pacific.

Since returning to Toronto and joining DSF, Yannick has engaged with other U of T student groups including the U of T chapter of the Sustainable Engineers Association and the U of T undergrad Commerce Student Association. In both cases the desire to explore, learn and act on the knowledge that innovative forms of economics are not only possible but required if Canada is to move into a socially and ecologically responsible generation.

**Sarah Hirschorn**
(BSc, 2001; PhD, 2007; Sherwood Lollar)

Sarah is Director of Geoscience at the Nuclear Waste Management Organization (NWMO). She started at the NWMO in 2008 as a geochemist, working with both the site evaluation and the research and development programs associated with Adaptive Phased Management, Canada’s approach for long-term management of used nuclear fuel. In her current role, she is responsible for NWMO’s geoscientific site investigations activities, as NWMO continues to assess the suitability of potential sites for hosting a deep geological repository. Sarah was appointed an Adjunct Professor in Earth Sciences at U of T in 2019.

**Kanita Khaled** (BSc, 2013)

Kanita Khaled is a Professional Geophysicist with experience in the mining, oil and gas resource industries. She obtained a BSc in Geophysics from the University of Toronto. She is currently a Geophysicist at Sneequeet, where she works closely with business, sales, marketing and technical teams to provide high quality solutions for geoscience professionals. Previously, she had the opportunity to work as an Exploration Geologist for Teranga Gold, operating out of Senegal. Following this, she moved to Kingston, Ontario to work as a Geophysicist in the oil and gas field, practicing micro-seismic geophysics at ESG Solutions. She then returned to Toronto to take on a role in potential field geophysics as a Geophysical Data Processor at Geotech Airborne Ltd, working with airborne electromagnetic, magnetic, gravity and radiometric data sets. She eventually administered several airborne geophysics projects in a Geophysicist-Project Manager role at Geotech. Kanita is passionate about advances in big data solutions.

**Rabi Nizami** [see previous biography, pg 24]
David Harquail (BEng, 1979)

David graduated as an E. (exploration) Geological Engineer from UofT in 1979, after having taken many courses in our department including Economic Geology and Geochemistry. He has been CEO of Franco-Nevada since late 2007 and has been with the company for ~30 years, since ~1987. Franco’s market capitalization in mid-August, 2019 was ~US$17.6 billion.

He is also currently Chairman of the World Gold Council.

In The Northern Miner for 19 Aug – 1 Sept., 2019 (p. 15) he is quoted as saying at a 22 May, 2019 symposium in London: “I’m told that with our number of employees at 34, we have the highest market capitalization per employee of any company on the New York Stock Exchange…” This is a quite incredible achievement by the people at Franco, and not many Earth Science/Geology departments in the world can include something like this in their Alumni News.

Avrom Howard (BSc, 1979)

In his own words, Avrom stumbled into Professor Nuffield’s introductory Geology class in 1975, not knowing quite where he was going. However, he loved the subject, loved the creaky old Mining building, the field trips, the people in the class (three of whom are friends to this day), and loved the fact that nobody was there because they were trying to get into something else (i.e. medicine or dentistry), as had been his experience in Biology, his major until then. Not realizing that there was actually a productive career as a geologist, he travelled to Europe and Israel for four months and then after a chance encounter with a former GSC geologist who inspired him with stories of canoeing using the Algoma Central Railroad as a stepping-stone to remote wilderness lakes, and stories from his UofT colleagues about summer jobs zooming around in helicopters in the NWT, he decided to finish his degree at UofT. For the past several years Avrom has been working as an independent mineral exploration consultant. He has also been involved creating and managing junior mining companies focused in several countries around the world. He began his career in 1980 as an exploration geologist, first with Sherritt Gordon Mines in northern Manitoba and then with Kennecott, based in Toronto.

In October, 1978, Avrom participated in Frank Beales’ annual field trip to the Florida Keys as part of his fourth year Environmental Interpretation of Limestones course. An unanticipated event during the trip led him to write the following article that appeared in the October 11, 1978 edition of The Varsity, parts of which are included in the inset:

A Close Shave

Four UofT geology students and their Professor escaped serious injury when their twin-engine aircraft crash-landed at the Key Largo air strip in Florida. The accident occurred when the students and their Professor, Frank Beales, were landing in a Piper Seneca II after getting a firsthand look at the shallow waters surrounding the Florida coast. The plane taxied down the runway at an unusually high speed. It then disappeared behind a clump of trees and a muffled explosion was heard. Spectators rushed to the end of the runway to find the aircraft lying intact in knee-deep water. Although no one was injured, the wheels were shorn away and the propellers were twisted like corkscrews. The first to emerge was Professor Beales, (see photo), remarking, “Don’t tell my wife”! Four of Avrom’s classmates were in the airplane, as well: David Harquail (see below), Nushy Stephanian, Marcia Foster and Bruce Reid.

The purpose of the field trip was to show students the environment where limestones are forming today. The study involved snorkeling among the coral reefs and hiking, often through mosquito-infested mangrove swamps and knee-deep mud. The pilot reported that the aircraft brakes had failed and that “when you are flying every day you gotta expect things like this to happen”. He added that this was his fourth such incident in twenty years of flying.

David Harquail (BEng, 1979)

Henry Halls with contributions by Avrom Howard
Fran Manns has had a 25 year career in the exploration industry in Canada as a geologist in exploration for lead, zinc, and gold ranging from the Queen Elizabeth Islands to Newfoundland to Alaska with particular experience in the Canadian Shield, and the Canadian Rockies. He arrived from the USA in 1972 on the very day that Henderson scored his famous last minute goal when Canada beat the Russians in a historic five game hockey series. He liked Toronto and the Department so much that he stayed for 10 years! His first PhD assignment was mapping in Cornwallis Island, although he thought his supervisor Frank Beales said “Florida Bay” and not the frozen wastes of an Arctic Island! He considers Beales the best mentor he could ever have had and always appreciated his having soup on the stove and square dances in his legendary barn on his farm, the scene of many Geology parties.

On Cornwallis Island Fran Manns found a cairn and inside, dating from 1851, were three pieces of identical paper on which were written a message from Captain Sir John Ross during his search for the lost Franklin expedition. The cairn appears to be a rendezvous point for Ross and other searchers involved in the hunt. Fran kept one copy (see the picture) and sent the other two to Ottawa, but never had the courtesy of a reply.

Francis Tucker (Fran) Manns (PhD, 1981; Beales)

Fran was CEO of an exploration team in Indonesia, was a mining analyst for a brokerage firm dealing in small cap equities, and a consultant to the mining industry, having experience in resource audits and statistical issues concerning resource estimation. Fran is an expert in Nugget Analysis, which is concerned with how, in a resource estimation, to statistically take into account large but relatively rare ore “nuggets” in a sample.

From 2000 to 2014 Fran joined the Compliance and Disclosure Department of the Toronto Stock Exchange where he was responsible for technical due diligence with respect to the listing requirements for mining companies.

Since 2014 he has been the Principal of a consulting firm, Artesian Geological Research in Scarborough, which undertakes stratigraphic analyses for sedimentary-hosted mineral deposits and consultations with mining companies.

Fran Manns, Henry Halls

Grant Troop (BSc, 1980; MSc, 1984; Scott)

My career has taken an interesting and non-linear path over the years that has led to the unexpected and very rewarding opportunity in which I’m currently involved.

The first part of my career was directly related to my degree in geology, doing exploration field work for various companies across Canada and beyond. I completed my graduate work on banded iron formations associated with volcanogenic massive sulphide deposits in New Brunswick. Subsequently, I worked for the Ontario Geological Survey doing research into Archean lode gold deposits in New Brunswick. Subsequently, I worked for the Ontario Geological Survey doing research into Archean lode gold deposits in...
L. Taras Bryndzia (PhD, 1985; Scott)

My interest in Earth sciences began in early high school after serendipitously discovering outcrops of Ordovician-Silurian shales near our home in my native Australia. The outcrops contained, for me, a fascinating trove of fossil graptolites and crinoids. Collecting and studying fossils became my hobby and in the second year of High School I won a third prize Honorable Mention in a state-wide science competition. Two years later in 1969, I won second prize and received $50 for my efforts (see certificate in photo).

I completed my undergraduate studies at La Trobe University in Melbourne. A totally fortuitous visit by Steve Scott, persuaded me to pursue MSc and PhD graduate studies with him at the University of Toronto. Both degrees focused on economic geology; Kuroko style volcanogenic massive Cu-Pb –Zn sulphide deposits in Japan (MSc) and experimental sulphide-silicate petrology (PhD).

After a stint as a post-doc at University of Chicago (1986 - 1988) I became Research Professor at Northwestern University, pursuing petrological studies on the oxygen thermo-barometry of Earth’s upper mantle. Little did I realize that my ultimate destination would be the oil industry!

In 1990 I joined the Basin Analysis team at Shell’s Bellaire Research Centre in Houston, Texas, where I ultimately became the in-house expert in acoustic fluid properties.

After crude oil prices collapsed in 1993, I enjoyed a 4-year sabbatical at the US Environmental Protection Agency in Cincinnati, Ohio. At the EPA I worked as a Research Geologist studying abiotic degradation and remediation of chlorinated solvents in clay-rich soils.

I rejoined Bellaire Technology Centre (renamed after BRC) in 1998 to investigate the rock physics of unconsolidated and geopressed sediments in the Gulf of Mexico. This work culminated in a Shell patent for the identification of Shallow Water Flow Sands using seismic techniques. In 2007 I helped to establish Shell’s research program on Unconventional Resources. Recently, I was appointed as the Senior Principal Scientific Expert for Earth Sciences at Shell. I am also the Subject Matter Expert for Inorganic Geochemistry and an expert on H₂S prediction. My current research activities focus on the solubility and transport of Hg in hydrocarbons.

Since 2009 I have been an Executive Committee member of the Deep Carbon Observatory, a multi-disciplinary international research group involved in the study of Carbon in Deep Earth, including its abundance, forms, distribution and flux to Earth’s exosphere. I am grateful for Shell’s support of my participation in this decadal program sponsored by the Sloan Foundation.

L. Taras Bryndzia
Elizabeth has been a Professor of Sedimentary Geology and Paleontology in the Harquail School of Earth Sciences at Laurentian University since 2005. A predominantly field-based geologist, she invested 30 years in understanding Proterozoic and Paleozoic basins of northern Canada (NU and NWT), but lately has expanded her focus to include research in other sedimentary-rock-hosted base-metal districts, including the central African copperbelt (DRCongo and Zambia) and the Irish midlands. Prior to joining Laurentian she was based in Iqaluit as a Research Scientist at the Canada-Nunavut Geoscience Office. Before starting her BSc in our department she had taken a BA in languages also at Toronto.

She hit the headlines in May 2019 as a coauthor of a paper in Nature describing the discovery of the oldest known fungus fossil, approximately one billion years old and found in Proterozoic shale in eastern mainland NWT. The paper was produced by a small group of specialists, with Elizabeth playing a major part in the multiple years of field work aimed at elucidating the early evolution of eukaryotes – all organisms more complex than bacteria. The appearance and diversification of eukaryotes is exceptionally poorly known owing to the poor preservation of fossils that lack hard parts, and the need for unmetamorphosed but quite old rocks. The existence of fungi 1 billion years ago – half a billion years earlier than the next-youngest undisputed fossil fungus – implies that eukaryotic diversity was much better developed at 1 Ga than previously thought, that marine ecosystems were more complex, and perhaps most intriguingly, that the divergence of the lineage shared by fungus and their closest evolutionary relatives, animals (us!), had already taken place by 1 Ga. All of this profoundly revises how we understand the timing, causes, and meaning of the evolutionary appearance and diversification of eukaryotes.

Elizabeth gave a Quirks and Quarks interview and can be heard on the following web site: https://podcast-a.akamaihd.net/mp3/podcasts/quirksaiobE9pUjC5-20190524.mp3


Andy Abraham (PhD, 1995; Spooner)

My first foray into geology was fossil hunting on an English beach at Lyme Regis in Dorset. Those pyritized Ammonites took me into a world I’ve never left. A geology degree was the complete package for someone like me with a love for the outdoors, nature and the excitement of seeing new places and new geology.

Undergraduate geology was fantastic and in the UK field trips were the essence of those courses. As a newly minted geologist, realising that jobs in the UK were like four leaf clovers, I left for northern Saskatchewan mapping amphibolite facies Proterozoic meta-sediments (in the La Ronge Belt) for the Saskatchewan Geological Survey and also for my MSc thesis.

Requiring a PhD to continue working with the Saskatchewan survey, I came to the University of Toronto, where Ed Spooner informed me that he had a project which required some mapping of a gold deposit on the Arctic coast of Nunavut. I was sold as soon as he mentioned the Arctic and spent three summers in the field. Back in Toronto and working under the guidance of Don Davis and Sandra Kamo, I discovered the joys of zircon picking. Life in UofT’s Earth Sciences department was incredible. I was part of the Spooner group: Dave Burrows, Nick Callan, Dom Channer, Cornel de Ronde, Justin Smith, Ed’s post doc Dick Jemielita and of course Colin Bray. We worked alongside Tony Naldrett’s and Steve Scott’s grad students and all three groups combined were a powerhouse, advancing the mining industry’s knowledge of mineral deposits geology.

After my PhD, I worked in Saudi Arabia as a senior exploration geologist, before joining Barrick’s exploration team in China, where I explored the Kunlun ranges of Xinjiang, and evaluated a number of Au mines. Subsequently I joined the consulting firm Micon International. For four years I worked alongside mining engineers, metallurgists and an environmental specialist on project evaluations in Canada, Mexico and Central and South America.

I then became an adjunct professor with the Lassonde program and subsequently spent a year with WGM, Geological and Mining consultants. The industry was going through one of its downturns and I found work in sales with KPMG, a multinational professional services network, specialising in auditing, accounting and tax issues. Returning to geology after three years I joined Jun Cowan and the Leapfrog Software team. I helped establish the 3D software’s presence in North America.

Last year, I started something new. As a lover of art and geology I combined them through digital imagery (see photo). These days I meld the science of geological processes with psychological and sociological issues and through my art I try to identify their meaningful connection. I also took up curling. A great technical winter sport and social activity, and these days, it’s often the closest I get to rocks!

An image from Andy’s website
https://artisticrocktextures.com/
**From Our Readers**

**Dennis Waddington** writes:

Thanks for your efforts working with Professor **Digger Gorman** to produce his 2-part reminiscences of the early days in the Geology Department. Working laterally from your part 2 just published, Digger’s description of the Peacock/Fritz dynamic brought back to me a memory of talking with Mel Bartley (BSc, 1934, U Manitoba; MSc 1937, PhD 1940, Uof T), sometime in the early 1980s. His PhD oral exam started well until he was faced with a stumper of a question on some aspect of mineralogy or crystallography that could only have come from Professor Peacock and which he was struggling mightily to answer. When his desperation was showing, Professor Fritz spoke up and said something like “Mr. Bartley, in other words what you are telling us is…” and then proceeded to fill the blank by providing the perfect answer. Mel answered something like “Yes, of course” and he was through it all thanks to a paleontologist’s support, for which he was forever grateful.

**Lindsay Schoenbohm** writes:

The photo of Dr. Madeleine Fritz on page 21 of last year’s magazine caught my eye. I have always wondered who the lone woman on that wall in the Rio Algom room was, so I was looking forward to finally finding out in the article. There are some interesting reminiscences, but I was caught off guard by the sexism of the times... two examples are that she was referred to as “Miss Fritz” and that “she was a bit prudish at times.” I wish this had been noticed before publication.

This sparked a bit of a discussion with some of my colleagues - it turns out I’m not the only one who wondered who she was.

Any chance we can see a follow-up article in the next newsletter profiling Dr. Fritz, and perhaps also discussing some of the challenges she faced as one of the few women in geology at that time?

**The Editor** replies:

The second installment of Digger Gorman’s memoirs was given to me for inclusion in the 2018 Alumni News by the late Steve Scott. When I read the account, I did indeed notice the terms used to describe Dr. Fritz but they would have been typical of the times and the age of the person recalling the events (age 95 at the time) who I think meant no disrespect, especially in view of his very positive account of Dr. Fritz’s exploits against a formidable male presence in the department at that time and his most favourable opening encounter with Dr. Fritz. However times have changed and your editor apologizes for the appearance of descriptions of Dr. Fritz that are no longer considered acceptable. In response to your request I have included an item elsewhere in the magazine about Dr. Fritz’s life and achievements, partly in the context of gender attitudes existing at the time.

**Roger Maqueen** writes:

Congratulations to Henry Halls and Karyn Gorra for the excellent Alumni News magazine of February, 2019. I see a number of similar publications from geology departments in Canada and abroad: none I have seen reach the standard of your Alumni News, surely an academy award winner if there was such a thing for geology department news magazines. Keep up the great work!

**Udayan Dasgupta** (PhD, 1978; Currie) writes:

In June this year my wife Sharmila and I visited Toronto, as a part of our Canadian and Alaska trip. It was Sharmila’s first trip whilst for me the trip was a part of nostalgia having spent 9 years in Canada as a research worker over 40 years ago.

It was an autumnal day in 1971 when I landed in Montreal, the entry port to Canada on a delayed Lufthansa flight. Lengthy immigration queues resulted in missing my Air Canada connection to Toronto. On reaching Toronto late in the evening, I discovered that my baggage would arrive by an even later flight. This was my first experience of entry into a North American country.

The subsequent years were full of a variety of experiences. The Geology department was located in the imposing Mining Building. I stayed for a year at the lovely Wycliffe College hostel and then moved clockwise around the table: Sharmila Dasgupta, Udayan Dasgupta, Janet Waddington, Monique Lanoix, Francis Manns, Emeritus Professors Jeff Fawcett and Pierre-Yves Robin, and Dennis Waddington.
to the comfortable lodgings of the Graduate residence at Bloor and St. George. Later, a number of us grad students decided to share a house (Dave Moore, Graeme Dales, Mike Jackson, Jim Bambrick and I) decided to share a house on Dupont Street with six large bedrooms and a rent of $250/month, which later became a centre for impromptu parties. Toronto, in those days, was a bit of a laid back town with Yonge Street being the heart of downtown. Eaton’s and Simpsons were the main attractions. For us, it was the Brunswick House with its Jazz quintet. I remember watching out of my office window and photographing the CN Tower being built with Sikorsky sky-crane helicopters lifting various segments and putting them in place almost like kids do with building blocks.

Downtown Toronto now appeared to be a forest of skyscrapers with mismatched designs which had replaced the quaint buildings of the yesteryears (including the Graduate residence and the old houses where I had lived). However, I was glad to see that some of the imposing old landmarks such as the carved granite building of CIBC, the Hockey Hall of Fame and St Lawrence Market still existed. The UofT Convocation Hall (with its fabulous acoustics) stirred up memories of many concerts I had attended. So did Hart House where I spent the winter weekends playing tennis and badminton (both indoor) and the UofT arena where I learnt to play ice-hockey. The biggest changes to the life in Canada that I noticed were the presence of “Tim Hortons” in every neighbourhood, Indo-Asian grocery stores within easy driving distance and the Raptor’s games. For us, game-night in Toronto was associated with the Maple Leafs, the UofT Blues, the Argonauts and the Blue Jays (there being no basketball team).

There were two departmental events which I really enjoyed. One was the Friday afternoon talks with beer and cheese which gave all of us in the Geology department a chance to get to know each other. The second was the thoroughly enjoyable annual football match between Geology and Geophysics. (Samir Deysarkar from the Geophysics Department was the thoroughly enjoyable annual football match between Geology and Geophysics. (Samir Deysarkar from the Geophysics Department was the initial drivers behind this event).

1The Geophysics Division in Physics moved to the Earth Sciences Department about five years ago, but even before that the annual match was discontinued, probably in the early eighties. Ed.
In Memoriam

Steve Scott
(1941 – 2019)

Steve was a very special person because of the scientific contributions of himself and his research group (e.g. 133 refereed journal articles and seven book chapters between 1969 and 2014), the outstanding research opportunities he provided for graduate students, undergraduate students and post-docs (~83), his contributions to undergraduate and graduate teaching, his contributions to the University of Toronto from 1969 to retirement in 2006 (e.g. Chair of the Division of Geological and Mineral Engineering, 1988-1997; Chair of the Department of Geology, 2001-2005), and his exceptional support of family (e.g. Joan, Susan and Donald), friends and visiting researchers (e.g. Peter, 2019).

So it’s interesting to think about Steve’s key steps along the way.

Steve’s family is deeply rooted in Canada. His father was from St. Thomas, in southwestern Ontario; his grandfather, William Murray Scott, an early photographer, had carried out mineral exploration in the Cobalt area between 1909 and 1911; and earlier forebears had raided into New York State as members of Brant’s Rangers during the American War of Independence. His mother (née Casselman) was from London, Ontario and her family were United Empire Loyalists who initially settled near Cornwall in southeastern Ontario having been displaced by the American War of Independence.

His father’s first job was teaching science at Fort Frances High School in far northwest Ontario and that explains why Steve was born in Fort Frances. When Steve was ~10-11 the family moved back to southwestern Ontario where his father rose to being Inspector and Director of Education for South Western Ontario. Steve and Joan met at Stratford Collegiate Institute, when he was in Grade 13 and she in Grade 11, and they jived away. Joan even had a pair of saddle shoes! She would have looked just like Olivia Newton-John!

Early signs of excellence are often seen in unusual people and sure enough Steve was a Gold Medallist in Honours Geology when graduating in 1963 from the University of Western Ontario. During this time he did significant chemistry that served him well throughout his career. He stayed on at Western where he completed a Master’s in 1964 entitled “Silver mineralization in the Number 13 vein system, Sisco Metals of Ontario, Gowganda”. Steve’s supervisor Gordon Suffel (1904-1982), a respected Canadian economic geologist, had built up an exceptional collection of over ~35,000 catalogued ore system and mineral specimens (Hutchinson, 1983). Hence, Steve had early exposure to “volcanogenic massive sulphide” assemblages and ore systems, which were little understood in the early 60’s.

Thus Steve was well prepared to carry out research on sulphides and/or ore systems anywhere in the world. He made an excellent choice going to Penn. State, completing his PhD between 1964 and 1968. His thesis title was “Stoichiometry and phase changes in zinc sulphide”, so here is the sphalerite/würzitze connection. His supervisor was the exceptional Hu (Hubert) Barnes who made key early contributions in the field of experimental sulphide solubilities and who was editor of the important text “Geochemistry of Hydrothermal Ore Deposits” (1967) in which our own Greg Anderson contributed a paper.

In 1969 Steve was appointed Assistant Professor at the U. of T. being promoted after only three years.

A significant event in Steve’s early career was spending part of a 1977 sabbatical examining the Kuroko ore systems of northern Honshu in Japan as a Visiting Professor at Tohoku University. This visit enabled Steve to examine these young Miocene, submarine, VMS deposits and to initiate at least three graduate student research projects in Toronto (Taras Bryndzia, MSc, 1979; Stavros Kalogeropoulos, PhD, 1982 and Beth Farr [Clemson], MSc, 1984).

Before 1977 Steve, his early graduate students (e.g. Arpad Farkas; Murray Hutchison; Steve Kissin; Ulrich Kretchmar) and associates published 15 research papers and 3 refereed book chapters, including six papers on experimental work on phase relations and compositions in the Zn-Fe-S system, which include well known work on the sphalerite geobarometer. Three papers were on applications, two on regionally metamorphosed terrains including sulphide deposits (e.g. Broken Hill, New South Wales, Australia); and one very innovative contribution with Henry Schwarcz of McMaster and Steve Kissin on estimating internal formation pressures in iron meteorites.

The book chapters include two in Min. Soc. America Short Course Notes vol. 1 (1974); one is sole-authored by Steve and entitled “Experimental methods in sulfide synthesis” and the other co-authored with Jim Craig of Virginia Polytechnic Institute and State University and entitled “Sulfide phase equilibria”. Both were state-of-the-art contributions and essential reading in graduate classes. One additional book chapter in particular pointed the way to the future – a 93 page paper entitled “Precambrian, stratabound massive Cu-Zn-Pb sulphide ores in North America”, co-authored with Don...

Steve and his associates’ research directions can be clearly confirmed by the topics of four lectures he gave in Tokyo in May, 1977: Precambrian VMS deposits; the Ag deposits of the Cobalt area; applications of the sphalerite geobarometer; and the geology and sulphide petrology of Broken Hill.

The idea of VMS deposit formation by discharge of hydrothermal fluids on the sea floor had been around for some time, and high depositional temperatures of between 260 and 370°C had been predicted from fluid inclusion studies (e.g. 1974-78, Spooner 1981).

But black smokers had still not been discovered. That changed on April 21st., 1979 when black smokers were first seen, at 21°N on the East Pacific Rise (e.g. Wikipedia). Their discharge temperatures were measured at 380°C+/-. 370°C had been predicted from fluid inclusion studies (e.g. 1974-78, Spooner 1981).

It was around this time that the present author connected Steve with Dick Chase of UBC about getting involved with sea-floor sulphide research. Six CASM (Canadian American Seamount) cruises (1983-1986) to Axial Seamount on the Juan de Fuca Ridge and to Explorer Ridge were the outcome with two involving the Vancouver-built PISCES IV submersible. This was the start, and Steve was directly involved in a further 24 oceanographic expeditions until 2014; in total he was Chief/Co-Chief Scientist of 13. On many he was accompanied by graduate students, post-docs and/or visiting researchers, and remarkably he arranged for ~20 people to participate in ~25 additional cruises. Examples of research locations, in addition to those mentioned above, include the Tuzo Wilson seamounts, ~200 km northwest of Vancouver Island; the East Pacific Rise at 11°N; the Mid-Atlantic Ridge; the Indian Ocean Ridge; the Manus and Woodlark Basins in the western Pacific; the North Fiji Basin; and the northern Aegean. For all the participants the experiences were unforgettable, and led to very good science.

Hence, from ~1982 to 2014, the publication date of the most recent recorded refereed papers he was involved with, Steve’s group’s research programme was an exceptionally innovative mix of sea-floor, on-land and, not forgetting (that’s for you, Paul and Taras!), experimental geochemistry projects.

With regard to the sea-floor projects, Steve’s group was one of the most important in the world for ~30 years, in advancing the scientific knowledge and genetic understanding of sea-floor sulphides and their volcanic/tectonic contexts. Significant contributions included detailed analysis of the compositions and textures of the sulphides; detailed volcanic/structural mapping of black smoker fields (e.g. McConachy and Scott, 1987); tectonic analysis of the Western Woodlark Basin (e.g. Benes et al., 1994); most importantly, analysis and modeling of the Au and Ag contents of sea-floor sulphides (e.g. 11 papers involving Mark Hannington and Roger Moss, separately; 1986-2001); examination of the geochemistry of Fe-Si-Mn hydroxyxide precipitates (Trevor Boyd; 1993-2001); contributing evidence for a magmatic geochemical component in some sea floor hydrothermal fluids, as discussed, for example, by de Ronde (1995) (e.g. three papers between 1996 and 2005 with Kaihui Yang); and examination of the role of bacteria in the formation of sea floor Fe oxides and hydroxides (e.g. five papers involving Chris Kennedy and Grant Ferris; 2003-2010).

Steve and the Toronto/Canadian geological community were right on top of these developments as can be seen from two talks that Steve gave in 1981, one to the Toronto Geological Discussion Group (“Comparison of modern sulfide mineralization on the East Pacific Rise and ancient massive sulfide deposits”) and the other, appropriately, to the Geological Discussion Group in Rouyn-Noranda, Quebec (“Black smokers of the East Pacific Rise”). Featured in both talks was a 7 minute edited footage of black smokers shot at 21°N using the submersible Alvin in 1980. An edited copy of the film, courtesy John Edmond, the Chief Onboard Scientist, is currently in the safe-keeping of the Department.

Steve and group examining samples on board a research vessel

Steve and some of the Scotiabank Marine Geology Research Laboratory team

On-land projects involved significant research on the large Windy Craggy VMS system in northern B.C. (Jan Peter); on VMS deposits

Steve climbing into a submersible

So now the critical question for Steve was – how do I get involved? At a Gordon Conference in August, 1981 he learnt of a possible space for a geologist on an Alvin diving expedition in January, 1982 in the Gulf of California to the Guaymas spreading-related pull-apart basin. Steve got in touch with Peter Lonsdale the Chief Scientist and was invited to participate because of Steve’s detailed knowledge of sea floor sulphide assemblages and systems. Steve saw active black smokers on the sea floor at a maximum measured temperature of 315°C (one dive); and Steve became the first Canadian to initiate research on actively forming sea floor sulphides. The Guaymas site was surprising because of the amounts of liquid and solid hydrocarbons – Steve even saw on a monitor a large globule of oil detach from a sulphide chimney. Material from Guaymas was the basis for Jan Peter’s MSc. (1986) and Jan discovered liquid petroleum fluid inclusions. Another UofT Professor, Derek York in Physics, was writing excellent general interest science articles for The Globe and Mail at the time and wrote one on Steve’s experiences (“Oil, minerals found at hot vents on sea floor”; February 1st., 1982).

Hence, from ~1982 to 2014, the publication date of the most recent recorded refereed papers he was involved with, Steve’s group’s research programme was an exceptionally innovative mix of sea-floor, on-land and, not
in the Finlayson Lake District in the Yukon, some of which are unusually Se rich (Dan Layton Matthews); and on the Boló Cu-Co-Zn deposit in Baja California Sur, Mexico (Andrew Conly).

Projects involving experimental work and thermodynamic analysis included research on Zn-rich spinels in metamorphic sulphide-silicate-oxide assemblages (Paul Söry); on chlorite-sulphide-oxide equilibria, also applied to the Snow Lake deposit, Manitoba (Taras Bryndzia); and an interesting group of five papers (1991-2002) on the gallium-bearing Fe-Zn-S system at high temperatures (Takeo Ueno; currently Professor at Fukuoka University, Japan).

Canada has a record of generating chemically-oriented geoscientists for more than 100 years, and Steve can clearly stand with greats such as N.L. Bowen (PhD, MIT, 1912); Patrick Hurley, in geochronology (PhD, MIT, 1940); F. Gordon Smith (PhD, UofT, 1942); Greg Anderson (PhD, UofT, 1961); and Tom Krogh (PhD, MIT, 1964). To these can be added a number of exceptional people who came from elsewhere, examples including Bill Fyfe at Western (PhD, Otago, 1952); Tony Naldrett (PhD, Queen's, 1964); Derek York, in geochronology (PhD, Oxford, 1960), and Richard Armstrong at UBC (PhD, Yale, 1964).

N.B. There will be a session dedicated to Steve at the Goldschmidt Conference on geochemistry in June, 2020; it is entitled “Ore deposits formed at or near the seafloor: a perspective from ancient and modern examples”.


Ed Spooner, with Joan Scott; who provided much significant information.
We are very grateful to Ian Peter for reviewing an early draft.

-------------------------------

Paul Kavanagh
(1928 – 2019)

Distinguished University of Toronto alumnus Paul M Kavanagh passed away on September 11, 2019, at the age of 91.

Paul graduated from UofT, not in geology, but with a BA in English in 1950. During his undergraduate years he took as many geology courses as possible, inspired by a relative of the eminent consultant William F James. He then studied geology at UBC before moving to Princeton where he completed his PhD in geology in 1954.

To quote from his Globe and Mail obituary: “He was a mainstay of Canadian mining exploration for almost 40 years with senior positions at Kerr Addison, Rio Algom, Newmont and Barrick. He served as President of the Geological Association of Canada (1975-76) and was a recipient of the Past Presidents’ Gold Medal awarded by the CIM in 1972.”

My own association with Paul came about through his service to the Canadian community of geologists. In the mid 1970’s, at the urging of alumnus Duncan Derry, he took on the chairmanship of the local organizing committee for the 1978 joint annual meeting of the GAC, MAC, GSA and associated societies. As a committee member, I witnessed Paul’s great skill in human relations. He oversaw a “team” drawn from the local mining industry, WAMIC (the Women’s Association of the Mining Industry of Canada), government (then it was the ODM based in Toronto, now the OGS, Sudbury) and the University - a mix with great potential for conflict between competing egos. That no such conflicts arose was due to Paul’s exemplary leadership and his talent for making everyone feel they had a key role leading to the success of the convention. Over 4,800 attended, and the organizing arrangements devised by Paul served as a model for several subsequent conventions through to at least 1998.

Jeff Fawcett, Emeritus McRae-Quanec
Professor of Geosciences

-------------------------------

Andreas Lichtblau
(1951 – 2019)

Andreas obtained his BSc in Geology at the University of Toronto Mississauga in 1976. Since 2000, Andreas resided in Red Lake, Ontario, as Regional Resident Geologist with the Ministry of Energy, Northern Development and Mines, until retiring in 2019. Prior to 2000 he worked for international and junior mining companies in Quebec, Manitoba, Nunavut and Ontario. During this time he led a team that discovered the Ansil massive sulphide deposit in Rouyn-Noranda which went into production in 1989.

Andreas was a special person for a group of classmates, all graduating in 1976, who assembled at the PDAC every year for a dinner immediately after our department’s social evening. It included the two Professors who taught them, Henry Halls and Pierre-Yves Robin. The group was featured in the 2012 issue, volume 21 of the Alumni News. Alas, the group has now diminished by one.

Henry Halls

-------------------------------

Jeremy Peter Richards
(1960 – 2019)

Born in 1960 in the UK, Jeremy was awarded a BA Honours (1st Class) degree from the University of Cambridge, an MSc degree from the University of Toronto in 1986 with mentor Ed Spooner, and a PhD degree from the Australian National University in 1990. He did post-doctoral work at the University of Saskatchewan between 1990 and 1992, and taught
Dave Watson  
(1936 – 2019)

Dave passed away on July 28 in Tweed Heads, New South Wales, Australia. He was an innovator in the use of computational topology to study and model many geological processes and was the author of a well-known text “Contouring: A Guide to the Display and Analysis of Spatial Data”.

On leaving high school after the second year he spent the next ten travelling the world - the Americas, Europe, Africa, India and Asia, spending time as a draftsman for Delhi Oil in North Africa, where he became acutely aware of the problems associated with the contouring of drill hole data. Returning to Canada he attended night school to complete high school and then was accepted in UofT’s prestigious MPC program from which he graduated as a BSc in 1973. His MSc, completed in 1974, concerned a combination of computing and topology of crystal structures, under the supervision of Prof. F Gordon Smith. Afterwards he completed his PhD at the U. Sydney, Australia in 1981. Subsequently he worked in both the Mathematics Department of the U. Western Australia and Western Australia’s department of the CSIRO (Commonwealth Scientific and Industrial Research Organization).

His unique book on contouring was published in 1992. He published more than 80 peer-reviewed papers.

Henry Halls, Keri Watson, and Eric Grunsky

Brian Skinner  
(1928 – 2018)

Brian Skinner, a great friend of our department, was born in Wallaroo, Australia, and received a degree in geology and chemistry from the University of Adelaide in 1950. He obtained his PhD from Harvard, and after three years on the Adelaide faculty joined the US Geological Survey, becoming chief of the branch of Experimental Geochemistry and Mineralogy from 1962-1966. This was a period when the USGS led the world in the application of physical chemistry to the understanding of geological and mineralogical problems. He then moved to Yale University where he shortly became Chair, and remained on the faculty until his death. While there he authored or co-authored over 20 books and for 26 years was the editor of Economic Geology, building it to be the premier journal in the field.

Brian contributed much to our Earth Sciences department, encouraging and acting as a mentor to our faculty in the mineral deposits field, serving on our departmental review committee and as a Joubin-James lecturer. His association was recognised when he was awarded an honorary degree by the University at our 150th Anniversary celebrations. We will miss his wise advice enormously.

Tony Naldrett  
Emeritus University Professor

Owen Lister White  
(1926 – 2018)

Owen was born in Melbourne, Australia, where he completed his geology degree from the University of Melbourne. He came to Canada to pursue his MSc, (1961; Deane) in geology and civil engineering, at the UofT. Owen and his wife Elizabeth were instrumental in negotiating Mrs. Deane’s estate that led to the establishment of the Roger Deane Fellowship. In 1960 Owen was recruited to join the fledgling University of Waterloo to teach geology and soil mechanics while pursuing a PhD at the University of Illinois. He led several geotechnical teams to China long before it was open to the West. In 1977, Owen joined the Ontario Geological Survey as a Senior Manager, retiring in 1991. He was President of the International Association of Engineering Geology from 1986 to 1990, and was widely recognized for his contributions to the geotechnical community. In retirement Owen was involved with the AGID Canada Book Donation Project that distributed technical books and journals to libraries in developing countries. From the age of six, Owen was an avid stamp collector, initially specialising in Chinese stamps. This no doubt led to his interest in travel, culture and support for Chinese students at the University. He was a Fellow of the Royal Philatelic Society of Canada.

Graham Wilson  
Turnstone Geological Services Ltd.
Alumni News

Editor: Henry Halls
Assistant Editor: Karyn Gorra

Comments and contributions are most welcome – especially news of former students.

Acknowledgements

Special appreciation to Ed Spooner for his obituary of Steve Scott, Jeff Fawcett for his contributions and ideas, and many faculty, students, staff and alumni and friends who provided articles, ideas, photos and all forms of assistance and input to help create this newsletter. Special thanks to Joan Scott, Sue Killey Silvanna Papaleo, Scott Moore, Leigh Chestnut Halls, and Brendan Bradley.

Send your contribution by e-mail to:
alumni.newsletter@es.utoronto.ca

or by regular mail to:

The Editor, Alumni News,
Department of Earth Sciences
University of Toronto,
22 Russell St.
Toronto, ON, M5S 3B1.

Please update your mailing preference (email or print) and contact information at alumni.newsletter@es.utoronto.ca

www.es.utoronto.ca