You are invited!

A Dinner to Celebrate the Career of Professor Ed Spooner

FRIDAY, MARCH 3rd, 2017

Reception at 6:00, followed by dinner at 7:00

The Faculty Club

University of Toronto, 41 Willcocks Street

You may purchase a ticket and RSVP your attendance

http://alumni.utoronto.ca/march3

-Space is limited. One ticket per invite.-

A short video featuring past and present students impacted by Ed in their education and career can be viewed at

https://www.youtube.com/watch?v=os4aDAbdoNs&feature=youtu.be

Alumni & Friends Reception

in the

Library Room

at the

Fairmont Royal York Hotel

in Toronto

Tuesday, March 7, 2017

5:00pm to 7:30pm

We hope to see you there!

Cover:

Barbara Sherwood Lollar receives the Companion of the Order of Canada from His Excellency the Right Honourable David Johnson, Governor General of Canada

Photo: Sgt Johanie Maheu, Rideau Hall, OSGG.
©Her Majesty The Queen in Right of Canada represented by the Office of the Secretary to the Governor General, 2016.
Acting Chair’s Message

Welcome everyone to this year’s newsletter. Our Chair, Russ Pysklywec, has been on administrative leave this past year, busily involved in research and sunning himself in appropriate exotic locales! I have had the privilege of being acting Chair which has certainly given me a new appreciation of the trials and tribulations of administration.

We renovated a number of spaces in the department. These included the completion of Miriam Diamond’s environmental research laboratory on the second floor, a makeover of the reception area, renovation of the seminar room and construction of our new E-classroom (Electronic classroom). The latter was completed just in time for teaching this past fall and is a state of the art multi-function facility for small and large group teaching. For those of you who may have concerns for our previous chair portraits that were in ES2093, we have not sold them on Kijiji but will be giving them a new home (to be determined).

Professor Barbara Sherwood Lollar was the recipient of the Companion of the Order of Canada and winner of the Polanyi and Bancroft prizes. The Order of Canada is an amazing achievement for Barb. The Polanyi prize is awarded to an individual or team whose Canadian based research has led to a recent outstanding advance in an NSERC supported field, while the Bancroft award is for contributions to public understanding of science (see articles in this issue).

New appointments in the department in 2016 include Jörg Bollmann as Associate Chair, Graduate Studies and Sandra Kamo as the new director of The Jack Satterly Geochronology Laboratory. Charly Bank has returned from his one-year teaching fellowship at the Centre for Teaching Support and Innovation. Thank you to Uli Wortmann for taking over the role of Associate Chair, Undergraduate Studies for the past year, a role I will be reclaiming.

As in past years, we ran several international field trips for undergraduates including a trip to Spain with a great visit to the Rio Tinto mine, and one to the Southwest US. Furthermore, Professor Charly Bank took a group of ROP (Research Opportunities Program) students to British Columbia for some hands-on geophysical experience.

Finally, thanks to Professor emeritus Henry Halls as Editor and Karyn Gorra as assistant editor for assembling another excellent newsletter.

Grant Henderson

We acknowledge, with thanks, donations made in 2016 to the Explorers Field Education Fund and a variety of Scholarship Funds by the following individuals and organisations.

Cameron Allen
Jon G. Baird
Richard Bedell
Jennifer A. Clark
Dorothy R. De Haas
J. Jeffrey and Sylvia Fawcett
George A. Gorzynski
Donald G. Gratton
Emily E. Fairs Hobson
Ariella Hoffman
Felyce Hoffman
Michael Hoffman
Robert Hoffman
Ann F. Hubbs
Warren D. Huff
Deborah Hutchinson Gove
Richard S. James
Michael Lesher
James Maxwell
Timothy McConachy
Bernd Milkereit
Abdul-Hamid Mumin
M. Jean Pardo
Don Poirier
Norman A. Rukavina
Leslie Ruo
Walfried M. Schwendtner
Kevin A. Shaw
Brian J. Skinner
Alar Soever
Michael W. Sutton
Edward G. Thompson
A. S. J. Tozer
Paul Tozer
Dennis and Janet Waddington
Anonymous donors
Activation Laboratories Ltd
Classie Corporation.
University Professor **Barbara Sherwood Lollar** has received this year no less than three awards: the Polanyi award, one of the top awards made by NSERC, the Bancroft Medal offered by the Royal Society of Canada and to top everything, was made a Companion of the Order of Canada, the highest recognition that any Canadian can receive!

The John C. Polanyi award is an open-discipline award in the natural sciences and engineering that recognizes an outstanding advance in knowledge by a researcher or research team. It is one of the top awards given by NSERC, comparable to the Herzberg Medal in prestige for research. In recognition, Barb made an appearance during Question Period in Parliament!

The Bancroft award is given for publication, instruction, and research in the earth sciences that have conspicuously contributed to public understanding and appreciation of the subject.

Established in 1967 by Her Majesty Queen Elizabeth II, the Order of Canada is the cornerstone of the Canadian Honours System, and recognizes outstanding achievement, dedication to the community and service to the nation. The Order recognizes people in all sectors of Canadian society who have achieved national pre-eminence or international acclaim.

This year Barb was the only person to be awarded the highest honour, the Companion of the Order of Canada!

We offer Barb our highest praise and congratulations for her outstanding achievements which bring a milestone recognition for leading research and exceptional prestige to both our department and to the University.

*Henry Halls*

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**Companion of the Order of Canada**

Geochemist **Barbara Sherwood Lollar** has earned global renown for her contributions to environmental preservation and to our understanding of life underground. A Canada Research Chair and professor in earth sciences at the University of Toronto, she pioneered the use of stable isotopes to pinpoint sources of contamination in our groundwater resources, a breakthrough that is helping practitioners remediate polluted areas. While conducting field research in South Africa and Canada, she discovered and analyzed environments conducive to life deep within the Earth’s crust, a finding that has implications for the search for life on other planets.

*Citation from Order of Canada Investiture Ceremony webpage at https://www.gg.ca/gallery.aspx?id=11567*
Awards and Announcements

Our Congratulations to all on their achievements!

Marc LaFlamme received the Pikaia Award from the Paleontology Division of the Geological Association of Canada. The Pikaia Award is named after Pikaia, an early cephalochordate known from the Burgess Shale. It is awarded biennially by the Paleontology Division in recognition of a recent contribution to research on any aspect of Canadian paleontology, or by a Canadian for an outstanding contribution to the field of paleontology.

Grant Henderson was appointed as the W.M. Keck Chair in Geology for a five year term. The appointment was announced by David Cameron, Dean of Arts and Science, and the following is drawn from his memorandum: “The Keck Chair is intended for a researcher in Geology. Professor Henderson's expertise is in mineralogy (more specifically melts and glasses) which is a core field of the Geological Sciences. Professor Henderson is a leader in his field with over 110 career publications, a key committee appointment with Canadian Light Source synchrotron and a recent role editing a Reviews in Mineralogy and Geochemistry volume on spectroscopic methods.”

Nick Eyles was recognized in 2016 by an Award of Merit from the Association of Professional Geoscientists of Ontario which honours members “who have made significant contributions to the geoscience profession during the course of their career.” He also received a Geoscientists Canada Fellowship for “professional excellence through exceptional contributions to the geoscience profession in Canada”. In addition Nick received the Principal's Award at University of Toronto at Scarborough which includes $10,000 in research funds for “outstanding research.”

Sandra Kamo (PhD, UofT 2012), became an assistant professor in April, and the new Director of the Jack Satterly Geochronology Laboratory in September.

Jörg Bollmann has been appointed Associate Chair, Graduate Studies.

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 2016 event was held at the U of T Faculty Club.


UTSC: Srishtee Sokappadu, Jessica Foo, Raja Ramdial, Laila Said, Marvin Oliva, Vikash Narine, Kevin Ng.
Class of 2016

PhD Graduates

Phoebe Chan
Benjamin Moulton

MSc Graduates

Alexander Carey
Alister Cunje
Anisa Kassam
Zachary Kotowych
Julien Mailloux
Lailmah Malik
Cheyenne Sica
Patrick Watt
Robin Wolf

Bachelor of Science (BSc)

Kristyna Frances Buchan
Cassandra Clough
Felicia Da Silva
Maria Ines Gonzalez Ramos
Samia Islam
Rachel Joy Jongisma
Kristian Koschany
Michelle Ing Lee
Yong Kiat Lee
Weiting Li
Ewen Shann Chai Liew
Jesse Manna
Konstantinos Papadimitrios
Lingeswaren Rama Moorthy
China Shieh
Nelisa Nur Syaheera Suhaime
Victoria Szlachta
Ylenia Turchiaro
Stephanie Vaughn
Erica Veglio
Yu Yang
Lin Ye
Natascia Zuccarelli-Pegoraro

Coleman Gold Medal in Geology
Ewen Liew

The Wesley Tate Scholarship in Geology
Ewen Liew

The James P. Nowlan Explorers Fund Undergraduate Scholarship
Brock Edwards

The Daniela and Alexander Tintor Undergraduate Scholarship
Elizabeth Benner

The Nicholas Wemyss Undergraduate Explorers Fund Award
Gabriel Wee

The Alexander MacLean Scholarship in Geology
Julia Field

The Daniel Wilson Scholarship in Earth Sciences
Clara Thaysen

The Roger E. Deane Memorial Scholarship in Geology
Menxi Wang
Cassandra Clough

The H.V. Ellsworth Undergraduate Award in Mineralogy
Julia Field

The Don Salt Scholarship
Phaik Syn Leong
Yong Kiat Lee

Geological Association of Canada Student Prize
Lingeswaren Rama Moorthy

The Joubin James Scholarship and Prize
Ying Ooi

The Garnet W. Mc Kee-Lachlan Gilchrist Scholarship
Parham Adiban

The Dr. E.T. Tozer Scholarship in (Triassic) Stratigraphy/Palaeontology
Lingeswaran Rama Moorthy

Student Industry Field Trip (SIFT) — offered by the Canadian Society of Petroleum Geologists
Evelyn Moorhouse

Undergraduate Student Awards

NSERC Undergraduate Student Research Awards
Sabastien Dyer
Christian Tal Udovicic
Garnet Lollar
Brock Edwards

Garnet W. Mc Kee-Lachlan Gilchrist Scholarship
Parham Adiban

The Dr. E.T. Tozer Scholarship in (Triassic) Stratigraphy/Palaeontology
Lingeswaran Rama Moorthy

Student Industry Field Trip (SIFT) — offered by the Canadian Society of Petroleum Geologists
Evelyn Moorhouse
Graduate Student Awards

Connaught International Scholarship for Doctoral Students
  Eunji Byun

Faculty of Arts and Science Top Doctoral Fellowship
  Marissa Davies

Natural Science and Engineering Research Council of Canada Post-graduate Doctoral Scholarship
  Anna Phillips
  Natalie Szponar

Natural Science and Engineering Research Council of Canada Canada Graduate Scholarship-Master’s
  Katie Maloney

Ontario Graduate Scholarship (OGS)
  April Dalton
  Kirsten Kennedy

Queen Elizabeth II Graduate Scholarship in Science and Technology / J. J. Fawcett Graduate Scholarship in Science and Technology
  Cedrick O’Shaughnessy
  Kamil Chadirji-Martinez
  Vasa Lukich
  Man Yin Tsang
  Carter Grondahl

Queen Elizabeth II Graduate Scholarship in Science and Technology / Canadians Resident Abroad Foundation Graduate Scholarship in Science and Technology
  Siobhan Williams
  Amanda Facciol

Queen Elizabeth II Graduate Scholarship in Science and Technology / Reford Scholarship in Science and Technology
  Sara Mazrouei-Seidani

Queen Elizabeth II Graduate Scholarship in Science and Technology / Lamontagne Geophysics Graduate Scholarship in Science and Technology
  Payman Janbakhsh

Queen Elizabeth II Graduate Scholarship in Science and Technology / Harold O. Seigel Graduate Scholarship in Science and Technology
  Alexandre Boivin

Hugh Snyder International Scholarship in Earth Sciences
  Heriberto Rochin Banaga

Dr. Norman Keevil President’s Fellowship in Geology
  Yaw Adjei-Kyereme
  Joan De Vera

P.C. Finlay Q.C. President’s Fellowship in Geology
  Alice Alex
  Jeremy Rimando

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

Jeff Fawcett & John Gittins Graduate Explorers Fund
  Michael Jenkins

Emeritus University Professor A. J. (Tony) Naldrett Graduate Scholarship Fund
  Lev Karatun

Nick and Marilyn Tintor Explorers Fund Graduate Scholarship
  Jesse Manna

Cameron Allen Explorers Graduate Fellowship
  Gareth Parry

Laurence and Theresa Curtis Explorers Graduate Scholarship
  Elizabeth Phillips

James P. Nowlan Explorers Fund
  Hiromitsu Sato

Irene Gale-Rucklidge Explorers Fund Graduate Scholarship
  Erin Seagren

Dr. H. O. Seigel Scholarship in Applied Geophysics
  Dong Shi

H. V. Ellsworth Graduate Fellowship in Mineralogy
  Neal Sullivan

Richard Bedell Explorers Fund Graduate Scholarship
  Erica Veglio

Laurence Curtis Teaching Assistantship Award
  Lev Karatun
  Kirsten Kennedy
  Simen Johnsen
Women in Mining’s (WIM) University of Toronto Student Chapter was founded by two former alumnae, Felicia Da Silva and Rachel Jongsma in 2014. Their goal is to introduce a multidisciplinary student organization to connect those in geosciences, mineral engineering, and the Rotman School of Commerce. WIM UofT engages students with the skills and knowledge necessary to succeed in the mining industry. The organization was built with four fundamental values in mind: leadership, communication, integrity and respect; all vital for a smooth transition from university to the mining industry.

In its first year, WIM UofT attended the 2014 National Mining Competition in Saskatoon, Saskatchewan. The team participated in both the Crisis and 24-Hour Case Competitions. Here, the team presented solutions on a number of corporate challenges to a panel of industry judges. At the end of the academic school year, WIM UofT hosted the Leading Women in Mining Discussion Panel in Hart House. Panelists Siri Genik, Jodi Hackett, Maureen Jensen (BSc 1979), Deborah McCombe, and Steve Vaughan

The scholarship, created by the Seigel family in memory of Harold. O. Seigel, is awarded to students engaged in research and innovation of new procedures in applied geophysics.

The photo (above) shows, left to right, Mr. Joel Seigel, Dong Shi (PhD, Milkeriet), Mrs. Marilyn Seigel and Alex Boivin (PhD, Ghent) at a presentation of the scholarship awards.

Dong is working on a 3D three-component seismic imaging project for uranium exploration at an NSERC Footprint project study site, the Athabasca Basin.

Alex’s project involves the characterization of the dielectric properties of airless planetary body regoliths, such as those of the Moon and asteroids.

A plaque that will list names of the scholarship recipients was presented by Mr. Joel Seigel (above right) to Acting Chair Grant Henderson (above left). It is on display in the Earth Sciences office. The plaque reads:

Dr. Harold Seigel O. C., Phd., P. Eng was an extraordinary geophysicist, who conceived and pioneered several new methods of mineral exploration and was recognised throughout the world for helping establish Canada as the centre of excellence in mining geophysics.

Hugh Snyder International Scholarship in Earth Sciences

Through the generosity of Mr. Hugh Snyder, we were able to award the first Hugh Snyder International Scholarship in Earth Sciences, for international students from Latin America, Spain or Portugal to Heriberto Rochin Banaga, an international student from Mexico.

Working with Professor Jörg Bollmann the aim of Heriberto’s MSc project is to investigate the potential impact of ocean acidification on the most important calcareous phytoplankton (Coccolithophores) in the oceans. Heriberto’s project will be the first study to document the potential impact of environmental change over the last 20 years on coccolithophores at one of the best monitored ocean time series stations (ALOHA-Hawaii) in the world.

Women In Mining Student Chapter

Building Skills for Success

Women in Mining’s (WIM) University of Toronto Student Chapter was founded by two former alumnae, Felicia Da Silva and Rachel Jongsma in 2014. Their goal is to introduce a multidisciplinary student organization to connect those in geosciences, mineral engineering, and the Rotman School of Commerce. WIM UofT engages students with the skills and knowledge necessary to succeed in the mining industry. The organization was built with four fundamental values in mind: leadership, communication, integrity and respect; all vital for a smooth transition from university to the mining industry.

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Now in its third year, WIM UofT aims to further strengthen the student-industry relationship. It is achieving this through a monthly speaker series, networking events, outreach, and competitions. It will continue to build confidence and equip students to become excellent young professionals.

WIM UofT would like to thank 2016 sponsors Barrick Gold Corporation (Platinum) and Metro Inc. (Silver).

For more on WIM UofT, including upcoming events and photographs of past events, please see our website at http://womeninmininguoft.wixsite.com/studentchapter.

Danielle Shirriff (President) & Joshua Nguyen (Vice-President).

The opening of Miriam Diamond’s Environmental Geochemistry Laboratory in Earth Sciences

Friday September 16, 2016 saw the long awaited official opening of the new lab facility in Earth Sciences for Miriam Diamond and her research group. The new lab supports research which aims to connect the contaminant sources with environmental pathways and finally human and ecosystem exposure to several types of hazardous chemicals. The hazardous chemicals are those found in everyday products and materials, such as flame retardants used in furniture and building materials, and plasticizers found in fragranced personal care products and some flexible plastics. The new lab accommodates preparation for sampling, sample handling and sample analysis by gas chromatography coupled with mass spectrometers (GC-MS). The lab has three GC-MS units.

In the interim between leaving the Physical Geography Building in 2014 and moving into the new lab, Sarah Finkelstein generously provided lab space in Earth Sciences, and Mike Gorton carried out much of the trouble-shooting on that front!

Planning for the new lab started in earnest in 2013 and uncovered problems that required expensive solutions. The need to add more fume hoods to handle flammable and hazardous chemicals in the new lab required a rebalancing of the ventilation system of the entire Earth Sciences Building.

Renovation of the air handling system in Earth Sciences took place in 2015. With the new ventilation system in place, lab construction began in late 2015 and was 90% complete by spring 2016. Moving day was in June 2016, four years after Miriam joined the department.

Exciting research in the Environmental Geochemistry Lab is either underway or planned on topics ranging from sources of flame retardants and plasticizers in Toronto, Ottawa and Kingston homes, to measuring occupational exposure to these compounds in e-waste dismantlers and nail salon workers, to how your clothing acts to accumulate these chemicals with implications for human exposure, and effects of these chemicals on fish.

Miriam Diamond
**Newsbytes**

**Toxic Jewelry**

Miriam Diamond and Mike Gorton were featured on the CBC program *Marketplace* on toxic jewelry that aired on January 14, 2016. They are shown in the department’s XRF laboratory analyzing costume jewelry for toxic metals. More than 50% of costume jewelry comes from China and is a particular attraction to children who may put jewelry such as pendants into their mouths during times of stress or concentration. The XRF results revealed potentially dangerous levels of cadmium!

Photo shows a Youtube screen capture of the CBC show Marketplace featuring Miriam and Mike in the XRF lab reacting to the test results.

**Quebec Diamond Mine Opens!**

On October 19, 2016, Quebec’s very first diamond mine was officially opened and is now in full swing (for details see 2014 Alumni News, p.22). Matt Manson, (PhD 1996; Halls), President and CEO, commented “Today’s opening ceremony marks the culmination of approximately 20 years of work to bring the Renard Project from a green-field exploration concept to a fully operating new diamond mine”.

**A new book by Andrew Miall**


In this book Andrew has attempted to bring together the main themes in sedimentary geology that have been evolving since the 1960s, including the evolution of sedimentology, the emergence of sequence stratigraphy as a primary research methodology, dramatic improvements in the methods of chronostratigraphy, and the increasing power of the methods of reflection-seismology for subsurface mapping and stratigraphic interpretation. Together these have created what Andrew called, in a recent review paper for GSA, “Sophisticated Stratigraphy.”

**Three minute Thesis Competition Finalist**

The Three Minute Thesis (3MT®) competition is a University-wide competition for doctoral students. Participants have three minutes or less to present their research to a panel of non-specialist judges. The challenge is to present complex research information in an engaging, accessible, and compelling way. This year’s competition, held at the Medical Sciences auditorium before an audience of more than 100 featured our own Sara Mazourei (PhD, Ghent) as part of a roster of about 20 PhD students presenting results of their doctoral research covering a wide spectrum of disciplines. Although not placing in the top three, Sara gave an excellent and stimulating talk on “Determining the age of lunar craters” which can be viewed in the link below: https://www.youtube.com/watch?v=CIGUbdktt6Q

**Tuzo Wilson video donated to the Geological Society of London**

In May 2016, Henry Halls was invited to an Arthur Holmes conference of the Geological Society of London which concerned the legacy of the Wilson Cycle (the life-cycle of ocean basins from opening rift to closure by continental collision). During the meeting, he showed a 1974 video of Tuzo Wilson making a farewell speech at the end of his tenure as Principal of Erindale College (now UTM). The speech was made following a cabaret by students and staff depicting some of the hilarious episodes of his life at Erindale. The video of the speech was subsequently donated to the Society because Wilson received the Wollaston medal, its most prestigious award, in 1978. The video can be seen on the following link: http://uoft.me/tuzofarewell
Some Research Highlights From The Department

Lasting mantle scars may lead to long-lived plate boundaries.

A paper published in the June 10, 2016 issue of *Nature Communications* by Phil Heron, Russ Pysklywec and Randell Stephenson suggests that ancient mantle scars beneath continents may play a part in controlling plate tectonic processes.

Mid-ocean ridges, transform faults, subduction and continental collisions form the conventional theory of plate tectonics--much of it pioneered by UofT Professor J. Tuzo Wilson--to explain non-rigid behaviour at plate boundaries. However, the theory does not explain directly the processes involved in intra-plate deformation and seismicity. In many continental areas seismic studies have located mantle “scars” interpreted as preserved ancient subduction zones or sutures. Using 2D thermo-mechanical finite element modelling, ancient tectonic structures frozen into the mantle lithosphere beneath continents can behave as quasi-plate boundaries reactivated under far-field compressional forcing. Intraplate locations where proto-lithospheric plates have been scarred by earlier suturing could be regions where latent plate boundaries remain. In such regions the reactivated lithospheric weakness could promote movement along shallower faults in the crust, which may explain some zones of intra-plate seismicity.

The research presents a new map of global tectonics to reflect the new paradigm of long-lived plate boundaries, helping to add to Tuzo’s revolutionary ideas on Earth’s tectonics.

The map shown below locates mantle scars (yellow lines) that may be modifying present-day plate-tectonic activity.

South African Bushveld Complex is a stack of sills!

Faculty members James Mungall and Sandra Kamo have teamed up with South African geologist Stewart McQuade to publish an iconoclastic story in *Nature Communications* (November 14, 2016 issue) about the origins of the layered rocks in the 2 billion year old Bushveld Complex, which contain the world’s largest Pt and Cr resources. The layers have always been thought to have been laid down like sediments on the floor of a vast subterranean sea of magma 400 km wide and up to 9 km deep. In their new paper, Mungall et al. show that several of the principal economic layers including the Merensky reef and the Middle Group chromitites were emplaced as sills within and beneath older intrusive rocks of the complex. Their work calls into question the very idea of a large open magma body (i.e., a “magma chamber”), and suggests that large mafic layered intrusions may instead be composed of stacks of sills.

The OSIRIS REx asteroid sample return mission: Bringing back a bit of Bennu

OSIRIS-REx is a NASA-led mission that was launched September 8, 2016 from Cape Canaveral (the picture on page 12 shows the launch!). The objective of the mission is to return up to 2 kg of material from the surface of a dark carbonaceous asteroid called Bennu. Based on spectral analysis Bennu is thought to have initially formed in the cold, outer reaches of our solar system. These types of asteroids have apparently remained largely unchanged since their formation over 4.5 billion years ago. Due to collisions between asteroids and/or gravitational perturbations some of these distant bodies have been transported into the inner solar system, becoming Near Earth Objects (NEOs).

Bennu is expected to contain organic compounds and water-bearing minerals such as clays. It is partly for these reasons that it was chosen as the target body for this complex, seven-year mission. Its proximity to Earth provides a rare opportunity to study a remnant of the early stages of the Solar System, and makes the evolution of the asteroid’s orbit a key element of the investigations, because asteroids in Earth-crossing orbits could represent impact hazards. OSIRIS-REx will be the largest extraterrestrial sample return effort since the Apollo lunar missions in the 1970s, and the first time that
Canada has participated in such a program. OSIRIS-REx will reach Bennu in August 2018, and starting in October 2018, it will survey the asteroid for about a year, mapping it in total 3D, identifying strange or unique geological features and scanning for potential target sites for sample retrieval. Bennu and OSIRIS-REx part ways in March 2021 when the spacecraft fires up its engines for lift-off and returns its samples to Earth in September 2023.

Dr. Rebecca Ghent, (head of the University of Toronto Solar System Exploration Group) is a Co-investigator on OSIRIS REx, and Dr. Kim Tait (cross appointed to the Department) is a mission collaborator. PhD student Alexandre Boivin (Ghent), is a student member of the science team which is measuring dielectric properties of materials similar to those likely to be found on the asteroid’s surface.

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Aboard the *Chikyu*, the world’s largest drilling vessel for oceanographic research!

*Chikyu* is a Japanese ocean drilling ship built for the International Ocean Discovery Program (IODP). The vessel is capable of drilling 7.5 kilometres beneath the seabed, deeper than any other scientific drilling vessel.

Alice (Man-Yin) Tsang (PhD; Wortmann) was on the ship for two months, between mid-September and mid November, taking part in Expedition 370. The aim of the expedition is to find out the temperature limit of life in the sub-seafloor. Scientists have long attempted to find an answer by culturing in laboratories, but now the opportunity arises through *Chikyu* to verify if laboratory findings match reality in nature! Her PhD project models sulphur isotope signals from the sub-seafloor with a goal in line with the expedition – to find out if sub-seafloor bacteria leave isotope signals in sediments similar to processes we observe in laboratories. She collects sediment and porewater samples for isotope analysis and models the *in situ* activity of sulphate-reducing bacteria.

On board she looks for minerals related to common redox processes in the sub-seafloor. These minerals may define where different kinds of micro-organisms can live. As she works on the sulphur isotopes she has the most fun collecting pyrite nodules in the cores. A fellow scientist dressed up as a pyrite during Halloween and she is shown trying to capture him in the photo below!

Once the cores arrive they are split longitudinally, one half for the archived collection and the other for multi-disciplinary studies. Alice and other sedimentologists describe the archival half in lithological detail, whereas the working half is sequentially looked at by a whole team of onboard scientists. For example, the core will be studied from the viewpoint of structural features, physical properties, paleomagnetism, porewater chemistry, ash layers, and pyrite nodules. Samples are then made available to individual scientists for research in the countries they represent.

An online video of the the expedition can be seen at: https://www.youtube.com/watch?v=7-WgYZVYYWQ
Magmatic mercury anomalies coincident with end-Triassic biotic extinction and low diversity recovery

In a paper published in the April 6, 2016 edition of Nature Communications, lead author Alyson Thibodeau, (our department’s first Roger E. Deane PDF in 2013) working with Bridget Bergquist, have carried out a study of mercury (Hg) concentration and isotopes that bears on the timing of biotic extinction and low-diversity across the Triassic-Jurassic boundary, and their relationship to volcanism. It is shown for the first time that Hg concentrations and isotopic compositions in a marine continental shelf sedimentary sequence from Nevada, record the timing of massive volcanism that correlates with the ~201 Ma old Central Atlantic Magmatic Province (CAMP). The results strengthen the case for CAMP’s potential role in the mass extinction. Robust biotic recovery, which initially occurred in the form of bio-siliceous deposition, did not begin until Hg concentrations returned to pre-extinction levels. Furthermore, no significant mass independent fractionation (MIF) of Hg isotopes is present within the extinction and low-diversity faunal intervals, consistent with a volcanic origin for the Hg anomalies. This inferred timing of faunal recovery contrasts with previous suggestions that the recovery was underway as CAMP was still active.

Undergraduate first author on Nature paper!

A paper published on January 11, 2017 in Nature Communications, has made headlines in the Globe and Mail and the BBC! The first author is Joe Moysiuk, a 3rd year undergraduate doing a joint Biology-Earth Science degree at the University of Toronto. Working at the Royal Ontario Museum¹ he and co-workers have studied 1500 fossilized specimens of a species of a distinctive extinct animal called a hyolith, including 254 with preserved soft-body tissues collected from the Burgess shale in British Columbia. Hyoliths had a cone-shaped shell which was capped at its wide end by a smaller shell with two spines emerging from between the shells to lift the body off the seafloor while feeding. Since their discovery 175 years ago hyoliths have been an evolutionary enigma but now on the basis of the newly described soft tissue structures, they can be assigned to the Lophophorata, a group that includes brachiopods.

For more information about how Joe's most inspiring research career began, go to http://www.rom.on.ca/en/blog/mystery-of-conical-fossils-solved-after-175-years

¹With support from the Faculty of Arts and Science’s Research Opportunity Program.
Ed Spooner retirement and scholarship

Edward (Ed) T. C. Spooner retired from our Department of Earth Sciences on June 30th, 2016 after a distinguished 39-year career. We lost not only an exemplary researcher and teacher but, more importantly, an inspirational true friend of countless undergraduate and graduate students.

Ed received his PhD in 1976 from the University of Manchester in the U. K. where he studied under the renowned Bill Fyfe, who later moved to the University of Western Ontario (now Western U.). Previously, Ed had been at Cambridge and Oxford. What a pedigree! Ed joined our department in 1977 and remained here for his entire career achieving the rank of Professor in 1990. He chaired our graduate programme from 1990 to 1995 and again (what a bear for punishment!) from 2010 until 2013. He established the F. Gordon Smith Fluid Inclusion Laboratory in 1982, at that time one of the world’s leading research labs of its type. He held our department’s inaugural W. M. Keck Chair in Geology from 2005 until retirement and was an unpaid (!) Research Associate in the Earth Sciences Section of the Royal Ontario Museum for 5 years.

Initially, when he first arrived in Toronto, Ed worked on ore deposits of many types, avoiding but later coming back to work on the ores that colleagues Tony Naldrett (magmatic nickel, platinum), Frank Beales and Greg Anderson (lead-zinc Mississippi Valley-type) and Steve Scott (volcanic-hosted massive sulfides) investigated. He was, nevertheless, very knowledgeable about these ore types that he expounded on in his teaching and later delved into with his meticulous research. This early era of Ed’s career was our department’s heyday of research on ore deposits when it was among the best, if not the best, in the world in this field. We covered virtually all major types of ore deposits with Ed and his students contributing to a wide spectrum. Upon his arrival in the department, Ed was an integral part of our annual “Ore Deposits Workshop” organized by Tony Naldrett and Steve Scott that ran from 1974 to 1997. The workshop attracted company geologists from all over the world and, at one time, had a wait-list of 100.

Ed was very eclectic in his research at University of Toronto, much of it done with both undergraduate and graduate students. For many years, he led a large research group working on Archean gold. He was particularly keen on elements and industrial minerals necessary for advancing alternatives such as vanadium, cobalt and graphite for storage batteries, tellurium for solar panels, etc. He explored the early Earth’s hydrosphere and atmosphere, the use of “hot cathode” cathodoluminescence in the earth sciences to illuminate primary mineral textures with a machine he obtained (the first in the country) with an NSERC grant, hydrothermal and magmatic systems in several countries, banded iron formations and granite pegmatites. His F. Gordon Smith Fluid Inclusion Lab had many visitors who, with the help of Colin Bray, Ed’s long-time research associate, analyzed bulk samples of fluid inclusions for anions, cations and gases. Ed was very successful in receiving a multitude of research and equipment grants, often, but not always as a co-applicant. For example, he was the principal applicant to NSERC for the scanning electron microscope that was the predecessor to the one we have now. Our department is much richer for Ed’s successes.

As significant as these achievements were, I think that Ed’s lasting contribution to our department was his involvement with students, both graduate and undergraduate. He inspired and nurtured countless students to go beyond the ordinary. He involved undergraduates in many of his projects. He supervised Master and Doctoral students who have gone on to become leaders in exploration, academe and finance. Ed initiated long-distance field trips for students soon after his arrival. The first, in which I participated, was to the California-Nevada borderlands looking at impressive geology and ore deposits. I used some of the photos I took on that trip in teaching for many years and I am still using one of the Mono Hills rhyolite domes in workshops. The 2016 trip was to St. Lucia and Barbados. Ed’s most recent trip with students was in February 2017 to Montserrat in the Caribbean to examine volcanic features.

We all owe a debt of gratitude to Ed for his contributions to our department and wish him all the best in retirement.

Steve Scott
The Ed Spooner Undergraduate Scholarship in Mineral Deposits Geology/Exploration

Professor Ed Spooner’s courses in Economic Geology have been immensely popular over the decades and he has influenced a generation of students. Consequently a special undergraduate scholarship fund has been initiated specifically to support students in this field. The fund is entitled The Ed Spooner Undergraduate Scholarship/Bursary Program in Mineral Deposits Geology/Exploration.

We encourage all of you to donate to this scholarship fund in recognition of Ed’s commitment to teaching.

I am supporting a scholarship in his honour because I believe it is really important to support the Canadian minerals industry in general, and it all starts with a good education. Ed’s enthusiasm for the science as well as the practical application of the science in the minerals industry has had a strong and important influence on his students, encouraging them to consider a career in this varied and exciting business.

Ed was always cheerful and engaging, and funny in his lectures. He has always had a passion for Economic Geology and I am sure that is what rubbed off on myself and so many of his students. Thanks for the memories Ed and very best of luck to you in your retirement!

I encourage all of you to donate to the Ed Spooner Undergraduate Scholarship/Bursary Program in Mineral Deposits Geology/Exploration in recognition and memory of Ed’s commitment to undergraduate teaching over nearly four decades.

A donation to the “Ed Spooner Undergraduate Scholarship in Mineral Deposits Geology/Exploration” is an investment in the future of ore deposits research in Canada. I sincerely hope that this scholarship will be part of Ed’s legacy to science as it symbolizes all that is positive about hard work and the testing of hypotheses in order to advance knowledge.

Ed’s strong ties with the mining and exploration industry also helped considerably to place a lot of “his students” in the mining industry, not just in exploration but in the mining and financial side of the business. This will be, I feel, one of his greatest legacies.

Read their stories about Ed as their Professor on page 17 and a video with comments from others at the following link: https://www.youtube.com/watch?v=os4aDAbdoNs&feature=youtu.be

Information on how to donate is available on the pledge sheet on page 16.
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Thank you for your generous support!
Thanks for the memories Professor Spooner!

During his career at University of Toronto, Ed has shared his knowledge and enthusiasm for science and economic geology. His interest in the education of students has gone beyond the classroom or lab and he has stayed connected and followed the careers of many alumni.

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**Eira Thomas**

I studied Geology between 1986 and 1990 and Ed was my fourth year thesis supervisor. Ed was enthusiastic about economic geology and exploration in particular. He encouraged me to consider a career in mineral exploration as a practical and worthwhile career option for a geologist, and he was always supportive.

I have been involved in the exploration and mining business now for 25 years, initially as a field geologist but eventually taking on executive and directorship roles in a number of public companies mostly involved in diamond exploration and development. I was involved in the discovery and development of Diavik, Canada’s second diamond mine and was most recently CEO of Kaminak Gold Corporation, which was bought out by Goldcorp in 2016 for $520 million.

Ed believed in the importance of mining to society and encouraged us all to get out there and seek practical work experience in the field to build on our academic credentials. With his encouragement, I left early in my fourth year to work for Urangesellschaft in the eastern arctic. As a result, my fourth year thesis (which I turned in just before I left), somehow got misplaced and Ed forgot to mark it! My marks got mailed to Vancouver and I received the news from my mother over an SPX-11 radio while I was still up north in the bush, that I had somehow managed to achieve a perfect “0” on my economic geology thesis, which obviously did not bode well for my future job prospects. It was not easy sorting this all out over the radio, but Ed eventually found it and my academic record got adjusted!

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**Cornel de Ronde**

As a young New Zealander entering the Department of Geology back in the Fall of 1985, I was impressed with the scale of the University in Toronto and indeed the Department which was host to many well known academics, particularly in the field of ore deposits research. Upon meeting Prof. Ed Spooner and soon after his students and staff, I realised that I had arrived at a place of great learning where nothing less than your very best will do.

Ed had a very inquiring mind and was interested in detail; he was always very interested in all that his students did. I appreciated the rigour of doing good science under Ed and fully supported his insistence on good field work being the framework upon which we hang all subsequent laboratory studies; a practice I have followed throughout my own career.

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**Keith Barron**

I finished a 4 year BSc in Geology in 1985. I remember Ed Spooner’s Economic Geology course very well and I even have my notes stashed away somewhere. Certainly, there was a lot about tin, since Ed had spent a fair bit of time down in Cornwall and it was one of his favourite topics. We were therefore well-prepared for the collapse of the Tin Cartel just about the time we graduated! I think in the 30 years hence it is the only commodity I have never looked for!

Ed decided to innovate with something new as our term projects. We were each given a snippet out the Northern Miner and told to research it in entirety. I think we all eventually made our way to the old Labatt Avenue offices of the Miner to go through back issues, and the Librarian was very patient with “Spooner’s Students”.

Ed was always cheerful and engaging, and funny in his lectures. He has always had a passion for Economic Geology and I am sure that is what rubbed off on myself and so many of his students. Thanks for the memories Ed and very best of luck to you in your retirement!

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**Dave Burrows**

I had the good fortune to complete an MSc and PhD between 1981 and 1990 under Ed Spooner’s excellent supervision. They were the best of times in the Department and Ed had assembled a vibrant group of graduate and post-doc students primarily working on Archean gold deposits and other types of magmato-hydrothermal deposits around the world. I felt privileged to be there at that time, and left with a thorough knowledge of economic geology, not only in my field of study under Ed’s guidance, but ore deposit geology in general.

Even in that time Ed’s undergraduate classes were renowned for their content, applied nature, but above all for their style of presentation and lecturing. Teaching is of course about transferring knowledge, but Ed, like the very best of teachers, also had the ability to inspire students; inspiring them to want to learn but also inspiring with a love of geology and a strong desire to continue in economic geology, despite its ups and downs. Ed’s strong ties with the mining and exploration industry also helped considerably and a lot of “his students” have ended up in the mining industry, not just in exploration but in the mining and financial side of the business. This will be, I feel, one of his greatest legacies.
During August 2016, I was the Guest of Honour at the 7th International Dyke Conference (IDC) meeting in Beijing China, having organized the inaugural meeting back in 1985 at UTM. The meeting was held in the enormous Friendship Hotel where a 10 minute walk was required to go from hotel room to restaurant, all while remaining inside the hotel!

The logo of the meeting (above figure) was particularly clever and appropriate... the Chinese Yin and Yang symbol surrounded by eight groups of radiating lines (all different) with mythological and spiritual significance (representing the Eight Diagrams, also known as "Bagua" in Chinese). So appropriate for the meeting because the circular symbol resembles the top of a mantle plume with dyke swarms radiating from it!

At a banquet in my honour, I was presented with a polished slab of diabase (typical rock type of mafic dykes) on which a dedication was inscribed (above figure on left).

Afterwards everyone was treated to an on-stage cavalcade of superb, brightly-coloured, professional artists who performed Peking Opera, Chinese instrumental music, acrobatics, magic, plus a troupe of performers doing a barrel-balancing act. This final act consisted of four assistants helping to balance a large heavy metal barrel so that a lady lying on her back with her legs in the air, could twirl it around supported only by the soles of her feet! After her performance was over I was invited, accompanied by loud applause, to enter the barrel before the act was repeated. I volunteered, forgetting that (i) I might be unable to squeeze inside owing to lack of flexibility that 75 year olds usually experience, (ii) that I was perhaps too large to fit in the barrel and (iii) my weight (200+ pounds) may have been too much for the lady to hold up!

As the picture shows, everything turned out perfectly and I had nothing to fear! A video, courtesy of Mike Hamilton, of the barrel act is shown in the following link: http://uoft.me/barrel

The next IDC meeting will be held in Marrakesh, Morocco in 2020.

Henry Halls

Steve Scott to receive the Penrose medal from the Society of Exploration Geologists

Steve has done it again with the receipt of yet another award! This time it is the prestigious Penrose medal from the Society of Economic Geologists which will be presented to him this coming September, during the SEG’s next conference, at the China University of Geosciences in Beijing, where he is an Honorary Professor.

The R.A.F. Penrose Gold Medal was established in 1923 to be awarded primarily in recognition of a full career in the performance of “unusually original work in the earth sciences,” which shall be broadly interpreted to encompass major contributions to (a) the science through research, (b) the profession through teaching, program administration, and development of exploration technology, and (c) the development of mineral resources through mine geology, exploration, and discovery. The medal may be awarded annually, but no less frequently than once every three years. The only other member of our department to receive this award was Tony Naldrett in 2002.

Cross-folds in the Grenville Province

Fried Schwerdtner is the lead author in a paper that has just appeared in the Canadian Journal of Earth Science (July, 2016), which details cross folds that are approximately normal to the Grenville front and which are thought to have formed during the late collapse stage of the orogen. In October, Fried, together with Toby Rivers from Memorial University, Dennis Waddington (M.Sc., 1973; Schwerdtner) and Pierre Robin organized this year's Canadian Tectonics Group meeting in Bracebridge which included a day of talks on various aspects of structural geology, followed by a field trip to view gneisses and boudins in the Grenville Province.
Undergraduates undertake field work in Spain

In February 2016, Ben Moulton (PhD 2016; Henderson), U of T Earth Sciences professor Grant Henderson, and Masters candidate Cheyenne Sica (MSc 2016; Sherwood Lollar) led 20 students on a rockhound’s dream in Spain, exploring the waters of the Rio Tinto (Red River) in Andalusia, the multi-layered Ronda Peridotite, the soaring cliffs of Gibraltar, and the breathtaking beauty of the Alhambra, the famous Moorish palace.

First stop was an open pit along the Rio Tinto, an area that’s been mined for more than 2,000 years for copper, iron, manganese, gold and silver. “The whole area was spectacular,” says Moulton. “Students got to see Roman-age slag — the melted glass-like by-product left behind after gold was extracted — directly beside a modern open pit.” Acid mine drainage from heavy metal concentration and the acidity of the rock in the area have turned the waters of the Rio Tinto river blood red. It has been an environmental disaster area for some time but ongoing mining is now carrying out its environmental responsibilities to the highest degree.

Day two saw the exploration of the Ronda Massif, near Gibraltar. The massif, formed by peridotite, represents a slice of continental lithospheric mantle which was exhumed during Miocene extension and emplaced into continental crust. The overlying crust displays extreme thinning and the underlying units show multi-phase metamorphism at shallow crustal levels, indicating a somewhat complex tectonic history. After visiting the Alhambra (UNESCO World Heritage site) on day three, the students toured the famed limestone Rock of Gibraltar on day four to learn the geologic history of the Mediterranean.

Thick salt deposits suggest that the Mediterranean nearly dried up by about 5.66 Ma ago. Then at about 5.3 Ma, the Gibraltar Strait was breached, causing water from the Atlantic Ocean to fill the Mediterranean, a dramatic event of a few months to a couple of years duration! Estimates are that the flood had a volume a thousand times more than the discharge of the Amazon River!

Students returned to the Ronda Peridotite on the fifth and final day, with fourth years showing second years how to take measurements in the field and evaluate rocks in different contexts, including their economic potential. The field trip solidified several students’ academic plans, with several mentioning that they learned more in these five days than they did in the previous semester!

Edited from an A&S News article by Peter McMahon

A visit to the Victor Diamond Mine

Six graduate students from Professor Dan Schulze’s Mineral Resources class had the rare opportunity to visit the Victor diamond mine in Attawapiskat, Ontario on November 22-23 where Yakun Liu (BSc 2013, MSc 2014; Mungall) and Victor Toth (BSc 2013), above left, geologists with De Beers, led a tour of the open pits, including riding in haul trucks to the bottom and back, witnessing a blast, touring the processing plant and learning about diamond mining in general. The department offers appreciation to De Beers for facilitating this special opportunity, the first of its kind to the mine.

Dan Schulze
Obituaries

David Strangway
(1934 - December 2016).

David William Strangway, BSc, MSc, PhD, DSc (honoris causa), F.R.S.C., Chairman of our Department from 1973 to 1980, Vice President and Provost then President University of Toronto, President University of British Columbia and founding President and Chancellor, Quest University, died on December 13, 2016 at the age of 82.

Immediately prior to his appointment to Geology, David was Acting Director of the Lunar Science Institute in Houston, Texas during the peak years of NASA's Apollo program. He had previously served in several leadership positions at NASA during a leave from his position as Professor in U of T's Department of Physics. Details of David's many accomplishments and honours would fill many pages of our Newsletter. His career achievements and his impact are chronicled on two links shown at the end of the article and here I will comment mainly on his years as a member of our Department.

I had served as Associate Chairman for several years when E.W. Nuffield abruptly resigned as Chairman in 1972 and the search committee, urged on by several faculty including the late Frank Beales and Tony Naldrett invited Strangway to return “home” as Chair of Geology. Following a period of “Yes and then No”, negotiations and arm twisting plus persuasion by Naldrett, the offer was accepted but only if David could secure a one year deferral in assuming the position. This was granted and I was asked to be acting chair during that year. It was a foretaste of things to come. With what I assumed to be a sixth sense David always managed to turn up unannounced in my office whenever anything significant was about to happen – such as a visit from the Dean or even the President or a discussion on the coming year’s budget. It was only later that I found out David had secured a travel grant from the Dean to be used during that year to let him visit from Houston when he wished. He must also have been very active on the “bush telegraph”.

Despite his onerous duties in Houston David immediately began to think of ways to mark his entry into Geology. He arrived in my office one Friday with a thick handwritten document outlining a proposal for a negotiated development grant to be submitted to NSERC. Never one to think small, he had titled it “The Continental Crust and its Mineral Deposits” in which there was a role for almost all of the existing faculty. There were many iterations of the document as well as visits to Ottawa to lobby NSERC and generate support from the GSC and other government offices. In the end, a grant of about $1M over 5 years was awarded and the face of the Department was forever changed by this unprecedented success.

Equipment was ordered and support personnel were appointed, followed by new faculty positions and the transfer of David’s Physical Properties research laboratory from Houston to the Erindale campus (see accompanying article by Henry Halls). These appointments were the first in a remarkable series of 26 between 1973 and 1980, including tenure stream, CLTA, research associates, technical staff and cross appointments from the ROM, with all three campuses benefitting from the increased activity.

Not surprisingly for a person with ideas and ambition, not all of David’s initiatives found universal acceptance. He was frustrated by delays and bureaucracy, particularly related to personnel matters; relationships with the Human Resources Department and the Faculty Association became somewhat frayed at times. However, he was very persuasive, especially on a one to one basis and on most, but not all issues, he usually prevailed.

David's earlier academic appointments at the University of Colorado and more particularly at M.I.T. persuaded him of the value of a Visiting Committee that would assess all aspects of Departmental activity and report to the Dean. This is now a standard feature of Departmental renewal but may have been unique and certainly was rare on our campus at that time. From a departmental perspective the key to a successful outcome was to select committee members who were high profile scientists and who would act, through their report, as departmental advocates to the senior administration. At first, committee members were nominated by Strangway and included U.S. Presidential Science Advisor, Frank Press, Duncan Derry and Bill Fyfe. Their reports were partially responsible for some of the 26 appointments noted above.

Documentation provided to the Visiting Committees included, in addition to a comprehensive overview from the Chairman, a Departmental annual report comprised of an array of statistics on enrolment, budget, research grants and publications plus progress reports on research from all faculty. The production of these reports placed a great strain...
on some faculty and on the secretarial staff in the days before word processing.

Another lasting innovation from David was the creation of Rockfest in 1973. This Friday afternoon series of research talks by faculty and graduate students continues to this day and forms a valuable part of departmental life.

Early in his chairmanship David began to rebuild relations between the University and the Toronto centred Canadian mining industry. This effort was aided by helping facilitate the annual Ore Deposits workshops that, first of all, brought in as participants, local geologists from industry attending the PDAC meetings and later expanded to a thoroughly international clientele. Through David’s leadership the department became, according to external reviews, the best in Canada and of worldwide importance.

In addition to his work on behalf of the Department, David served during his chairmanship, as President of the Geological Association of Canada, Chair of the Canadian Geophysical Union, President of the Canadian Geoscience Council and was a member of many external review committees for government and academic institutions in Canada and the USA. He was awarded several honourary degrees including a DSc from U of T in 1994.

A further Strangway initiative that was carried out mainly after he became Vice President and Provost in 1980, was the redevelopment of the SW Campus which included the new Earth Sciences Centre that was brought to fruition by his successor as chairman, Geoff Norris.

David seemed to retain an affection for our department as he moved on to higher academic positions. He readily agreed to be the main speaker at our banquet celebrating the 150th anniversary of Geology at U of T in 1998 and returned in 2013 as the principal speaker at the dinner launching the A. J. Naldrett Graduate Scholarship when he told of Naldrett’s role in his decision to accept the department Chairmanship in 1972.

David Strangway was a most remarkable man who has left a deep impression on Canadian science and in his time as Chair of Geology effected changes that have impact to this day. We express our condolences to his wife Alice and her family.

Jeff Fawcett
Emeritus McRae-Quantec Professor of Geosciences.

For further information on David Strangway see:

https://www.utoronto.ca/news/memoriam-u-t-president-david-strangway


Dave Strangway: A remembrance from the perspective of the University of Toronto Mississauga (UTM)

It was a most pleasant surprise for me, when Dave Strangway, who was a Professor in the Department of Physics, decided to accept the position as the Chair of the Department of Geology in 1973. At that time I had the office next door to Dave and got to know him quite well, especially when he asked me to proof-read his book on Paleomagnetism!

Dave's entry into the life of the Geology department led to several important changes from the viewpoint of Erindale College, (now UTM), the western arm of the University of Toronto which was formed in 1967:

The first was his establishment of a Physical Properties Laboratory at Erindale which led to the hiring of several faculty members including Bill Pearce and Bob Stesky, together with technicians, graduate students and postdoctoral fellows, all engaged on research related to magnetic and electromagnetic properties of rocks as functions of fluid content, temperature and pressure, with applications to the lunar environment. The arrival of large and impressive equipment from NASA which filled a double-sized laboratory was a notable event, together with the arrival of the first Lunar samples in Canada, some of which were housed in the laboratory and subsequently displayed in the Erindale library, drawing a crowd of over 3000 people.

At Erindale in 1973 Geology was taught by several faculty members including myself and Pierre Robin under the banner of Earth and Planetary Science, which had been formed by Tuzo Wilson, the de facto first Principal
of Erindale. All of the Geology faculty at Erindale, including myself, were basically hired by Tuzo but had faculty positions that were somewhat tenuous because they were not tenure-track and their exact university status was something of a mystery! At that time hostility existed between Tuzo and the Head of the Geology Department, because Tuzo's activities at Erindale were naturally viewed as setting up a rival Earth Science department within the University! Once Dave was installed as Chairman of the Department, it wasn't long before all the faculty members at Erindale were incorporated as Tenure Track positions within the Geology Department, enabled by the happy circumstance that Tuzo and Dave were kindred spirits!

Henry Halls

Subhash Shanbhag (1945 - December 2016)

Subhash, a native of Goa, in western India, joined the Department of Geology as the Graphic Artist in 1976 until his retirement in 2000. He had worked in India as a geologist, drilling engineer and mine foreman before coming to Canada to attend University of Western Ontario as an MSc student in Geology. After a year of study he took a position with the Geological Survey of Canada, which led to other work opportunities in industry as a draftsman and he didn't return to his studies at Western, something he would reflect on and wonder where that path would have taken him.

He was a talented draftsman and enjoyed working with faculty and students during a particularly productive period in the department that included Al Goodwin's monumental treatise on Global Precambrian Geology! Along with the many figures he produced for scientific publications related to the research at the department, some may remember seeing his colourful “Suby-chromes” in the classroom or conference slide shows. Keeping up with technology was an interest and he spent many hours at a digitizing table redrawing figures he had previously spent hours creating at his original drafting table. He worked with many graduate students, some practically taking up residence in his lab to learn from him and create figures for their thesis. He was always interested and happily took on new challenges. Towards the last few years working in the Geology Department he was approached by the English Department to help with a mapping project which led to a casual position in English after his official retirement.

In his retirement he planned to travel and stay active. He moved close to campus, becoming a regular at the Athletic Centre swimming pool and during his visits to the department he would talk about his family, adventures and travels. He looked forward to someday becoming a grandfather and was pleased to welcome twin granddaughters in early 2016.

Comments from some who knew him well:

John Westgate (Emeritus Professor and former Chair of the Department): “Our acquaintance goes back a long time. I first met him at Western in the early 60s; we were both students there at that time, and when I joined U of T in 1975, I was surprised to see him in the Department. Another connection – I inherited his drafting room in the basement. He was an affable person, always ready to help. I never heard him gripe or complain about anything! He was an immensely proud family man.”

Tony Naldrett (Emeritus University Professor): “Visiting Subhash in his office in the basement of the geology complex was always something to look forward to. He injected his sunny personality into his drafting so that the work that one had asked him to do always had a refreshing look. He transformed many dry pictures of phase diagrams and cartoons explaining one’s theories into figures that caught the eye and stirred the imagination. After he retired, and I had to master drafting myself, figures in my PowerPoint presentations and journal articles never had the same flair, were never so much fun.”

In 2015 Subhash went on a grand tour featuring Dubai, Hong Kong, Australia and New Zealand, but on his return to Toronto he fell, suffering a head injury from which, sadly, he never recovered.

Henry Halls, Karyn Gorra

Stangway continued
Frances Wagner (1927 - December 2016)

At a time when female geologists were a rarity, Frances Wagner (BSc, 1948) embarked on a career in micropaleontology, beginning with an undergraduate program at UofT and ending with a doctorate at Stanford University. Her love of the outdoors was fostered at her family’s summer cottage in Muskoka where she spent her youth fishing and canoeing amongst the Precambrian rocks of the Grenville Province.

Although rocks became a fascination, Frances’ main interest was in the origins of life and so her undergraduate degree was in paleontology. She was hired by the Geological Survey of Canada in 1950 to investigate the geology east of James Bay.

The prevailing attitude at the time was that women were too fragile for the rigours of geological field work, but Frances refuted this view with canoe trips out of Moose Factory on Hudson Bay and field work forays into the wilderness.

After her PhD she specialized in the study of single celled fossils such as pollen and plankton, and ultimately worked as a micropaleontologist aboard the CSS Hudson, the research vessel of the Bedford Institute of Oceanography, based in Dartmouth, Nova Scotia. This led to voyages in the high Arctic and a subsequent publication “The Holocene Marine Environment of the Beaufort Shelf”, a definitive and pioneering study that paved the way to a better understanding of the Arctic marine environment and of interest to companies engaged in petroleum exploration.


Ifor Davies (1933 - January 2017)

Ifor Davies, long time member of our technical staff died on January 21, 2017, in his 84th year,

Ifor was a highly skilled machinist, trained in the UK as a tool and die maker who first joined the University in the Department of Chemistry in the early 1960’s. Subsequently the Department of Geology embarked on a major expansion of laboratories that included a large experimental petrology/geochemistry facility used in the research programs of 5 faculty members. In-house machine shop facilities were considered essential for day to day operations and Ifor Davies was lured away from Chemistry to establish a state of the art machine shop in the SE corner of the Mining Building basement. Ifor was a perfectionist in terms of product design and production. He contributed to numerous research projects with skilled and patient interpretation of rough ideas and, if it was a good day, primitive drawings. A common opening phrase in a discussion of either a commercial or noncommercial piece of equipment was “Well of course it is very badly designed”. He would go on to demonstrate how it could be improved. Such talent led to his inclusion as a co-author in subsequent publications.

After the move from the Mining Building to the Earth Sciences Centre in 1989, the staffing level was gradually reduced. However, faculty and students throughout the campus knew of Ifor’s talents and, as well as research equipment, benches in the shop were often piled high with bicycles, tricycles, mechanical toys, chain saws, and similar articles waiting for a spare moment of shop time.

As he approached retirement age, Ifor was stricken with at least one major stroke that left him unable to work, though he recovered sufficiently to attend, together with his wife Eileen, Christmas lunches with emeritus faculty until quite recently. His retirement was recognised at a dinner in 1998 when he was serenaded with a full rendition of “Land of My Fathers”.

We send our condolences to Eileen and her family.

Jeff Fawcett,
Jerome Nriagu (PhD 1970; Anderson, Van Loon): an outstanding career in Medical Geology

Dr. Nriagu was born in a small town (Ora-eri) in eastern Nigeria to parents who did not finish elementary school. Although his dream as a youngster was to become a Catholic priest, he was quick to learn that being from a poor family in a tiny village in the tropical rain forest of Africa does not provide anyone with a clear track to professional success. One has to look sideways, backwards and around the corner for survival and opportunities, and must especially adhere to the simple principle that “excellence is the antidote to poverty, nepotism, racism and sexism”. Through a combination of luck, intuition and aptitude for science, Jerome was able to complete a BSc degree at the University of Ibadan (Nigeria), an MSc degree at the University of Wisconsin and attend the U of T as a doctoral student and refugee of the Nigerian-Biafran war. To a large extent, his successes and the professional track that he has followed were formed through the experience of looking at life and scientific problems through multiple prisms.

After graduating from the Department of Geology (now Earth Sciences) in 1970, Professor Nriagu followed a very unusual professional track to achieve success. He basically abandoned “geology” at the National Water Research Institute (Environment Canada) in Burlington, Ontario and embraced the then emerging field of environmental chemistry, thanks to the strong foundation in low-temperature geochemistry he gained from his mentors, Professors Greg Anderson and John van Loon. Jerome was a Research Scientist in Burlington for about 20 years (and an Adjunct Professor at the University of Waterloo). He went on study leave at the University of Michigan in Ann Arbor and was made an offer he could not refuse -- a Professor of Environmental Chemistry in the School of Public Health. After 20 years at the University of Michigan, he transitioned to Emeritus Professor two years ago. During a career that spanned nearly 40 years, he did research and/or conducted training in many countries including Nigeria, Ghana, South Africa, Zambia, Uganda, Qatar, Lebanon, India, Taiwan, Mongolia, Germany, Jamaica, Brazil, and Argentina.

It is rare for any graduate of an Earth Science program to become a leader in the field of environmental health sciences. How Jerome got there was simply predicated on the fact that he could not practice geology in Canada because the cold weather does not like him. He learned instead to work with multidisciplinary teams in cross-over fields to expand the range for his research skills. Although his work centered on sources, fate and effects of trace metals in the environment, his research embraced several fields including risk science, global health, environmental epidemiology and environmental justice. After nearly 400 journal articles (including 14 in Nature and Science) and book chapters; 30 books authored and or/edited, he has become one of the most cited researchers in the field of environmental studies (cited 22,600 times according to Google Scholar). He was the Editor of Science of the Total Environment (with impact factor over 4.0) for over 20 years and the Editor-in-Chief of the 5-volume Encyclopedia of Environmental Health published by Elsevier in 2011.

Professor Nriagu has received a number of accolades for his work. He received the first meritorious Doctor of Science degree ever awarded by the University of Ibadan (Nigeria). He was awarded the Frank Rigler Medal by the Canadian Society of Limnologists and the Miroslaw Romanowski Medal by the Royal Society of Canada for his contributions to research in the aquatic sciences in Canada. He received a Fulbright Senior Fellowship (spent at the University of the West Indies, Kingston, Jamaica) and an Alexander von Humboldt Distinguished Research Award. He has been recognized with a special session, “Sources, Transport, Fate, and Toxicology of Trace Elements in the Environment: A Tribute to Jerome Nriagu” at the 1999 Annual Meeting of the Geological Society of America, Denver, Colorado and a Distinguished Service Award by the International Union of Geosciences, Commission on Geoscience for Environmental Management in 2005. He was recently awarded an Honorary Doctor of Science degree by the University of Alberta for outstanding contributions to environmental health sciences, (a photo taken at this event is shown above). Dr. Nriagu has been a Fellow of the Royal Society of Canada for nearly 30 years.
Alan Wenban-Smith  
(MSc 1967; Rucklidge)

After 50 years it was great to see the mighty ARL Electron Microprobe Analyser again, as featured in your last Alumni News. As a geology Masters student, I got to play with it when pretty well brand new. Thanks to John Rucklidge’s trusting nature I was let loose at night with a room full of complex electronics, a couple of pages of instructions and his phone number in case of trouble. A massive deck of punched cards with his program (EMPADR) for turning X-ray data into a chemical analysis completed the kit.

The ability to analyse a single crystal of your choice on a thin section seemed almost magical. I was motivated to write my own program for turning Universal Stage microscope readings into optical parameters, in an attempt to relate the optical properties and chemical compositions of complex minerals like hornblendes. Although only a partial success, it did lead to my first (and only) scientific publication: a paper in the Canadian Mineralogist for 1967.

I ended up doing something completely different – I have been a town planner in the UK ever since then. I was not cut out to be a scientist, but I remember my brief scientific career with fondness, and feel a great admiration for those who stuck with it.

Stewart A. Jackson  
(MSc 1967; Beales)

Stewart Jackson obtained his MSc on the origin of zinc in the Lockport Dolomite, under Frank Beales as Supervisor, which he completed in 1966. Stewart, or just Stu as he was known in the department, recalls that Professors at U of T who inspired him included Bill Gross, Wilson Moorhouse, Peter Peach, Digger Gorman, Gordon Smith, Jeff Fawcett, Les Nuffield, Fried Schwerdtner, John Currie and Tuzo Wilson. Stu was brought up on a mixed farm in Grey County about 150 km northwest of Toronto, and became aware of geology, first through removing stones from the fields, then through his grade 13 teacher, and later, by family mining connections.

A series of papers with Frank Beales paved the way for a PhD program at the University of Alberta. Several additional papers on the Middle Devonian carbonate hosted lead-zinc deposits led to a proposal of interest to explorationists: that the metals in such deposits, were deposited by a process of basin dewatering through compaction and the expulsion of ore-rich fluids and subsequent ore deposition around the cooler margins of the basin. This idea was followed by the proposition that the source of the zinc, lead, copper, cobalt and fluorite-barite of Mississippi-type ores was essentially from oil field brines. This fundamental idea has become the basis of many exploration strategies in the hunt for base metals, which almost immediately led to the discovery of a major zinc deposit in Kentucky by Cominco American, the first company he joined. Leaving Cominco (now Teck Corporation) behind, Stu joined Houston Oil and Minerals. A corporate change prompted him and a colleague to create Crown Resource Corporation, a company involved mainly in gold exploration. After a series of modest successes that led to producing mines, the company struck it rich in Washington State when a drill hole produced an ore grade intercept that immediately attracted investors, and has led to the production of about 4.5 million ounces of gold.

Stu has enjoyed an interesting and rewarding career and has inspired many junior associates to greater achievements. He firmly believes that new concepts, techniques and approaches can lead to many new discoveries in prospective mineral belts. His mentors include Dr. Neil Campbell, ex chief at Cominco, his Uncle Harold, a mining promoter, and Frank Beales, who he refers to as a humanist! His family includes his wife and five children. He now lives in a rural setting in Southeastern California, where hunting, fishing, raising exhibition poultry and rabbits, producing and canning fruit and vegetables, as well as beekeeping, help to occupy his time. In addition, he continues to run his full-time Geological Consultancy business.

Martin van Kranendonk  
(MSc 1970; Schwerdtner) and  
Eizo Nakamura  
(PhD 1986; Campbell)

Life has gone a full circle of sorts for Martin and Eizo, two Alumni of the department, who are now working together on a research project related to the origin of life and which involves analysing rocks in Eizo’s geochemistry lab that he has built at Okayama University in Misasa, Japan. The samples were collected by Martin from his field area in the Pilbara craton of northwestern Australia from a site with evidence of life at 3.48 Ga. Eizo is known for his work on boron isotopes and Martin had found ancient rocks with boron-bearing tourmaline crystals formed in a hotspring deposit where life flourished so long ago. These findings are important for understanding the origin of life because boron is an important element for making complex organic molecules, necessary for the formation of RNA and DNA.

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Mary Garland (PhD 2002; Gorton)

Mary, the daughter of former Geophysics Professor George Garland, has recently published a book about Mowat, one of the first communities within Algonquin park and now largely vanished. Congratulations, Mary! The following is taken from the Friends of Algonquin Park website:

The Friends of Algonquin Park, a non-profit Canadian registered charity for those passionate about Algonquin Park is pleased to announce the publishing of Mowat: Little Town of Big Dreams by Mary I. Garland.

Algonquin Park is a world-renowned tourist destination for its nature and recreation, but few people know of the towns that once dotted Algonquin Park. In 1897, just four years after the establishment of Algonquin Park, over 500 people lived in the sawmill town of Mowat on the shore of Canoe Lake in Algonquin Park. This small town site would go on to have a major influence serving as:

- the location for Algonquin Park's first park headquarters;
- home of the Gilmour and Company lumber mill, the major employer in Algonquin Park in the early 1900s;
- an important railway stop for the first tourists coming to Algonquin Park by train; and
- the summer home of Canadian artist Tom Thomson who stepped off the railway here in 1912 and was so inspired by the location it accounted for the subject of numerous paintings. Mowat was also the community that buried Tom Thomson in July 1917.

Today, time and forest regrowth have reclaimed most signs of the community of Mowat, originally named in honour of Sir Oliver Mowat, Premier of Ontario from 1872 to 1896. Only a few cottage leases, old foundations, and the Tom Thomson cairn commemorating the artist's life, remain.

Martyn Beckett (MSc 1984; Gittins)

Martyn, a Specialist Geology student from 1978 to 1984, subsequently pursued an MSc, under the supervision of Emeritus Professor John Gittins, in experimental petrology applied to carbonate magmas.

A former Director of Durham District School Board, he moved in March 2016 to become assistant deputy minister in the learning and development division of the Ontario Ministry of Education.

Jason Coumans (HBSc, 2010 Uof T, PhD 2016 McGill)

I started my studies in 2005 at the University of Toronto Mississauga Campus with the goal of being an astronomer. However, after taking an introductory geology class I became enamoured with the possibility of doing field courses/
work, and promptly switched programs. Igneous petrology courses taught by Prof. James Brenan, and a senior thesis on the paleomagnetism of Grenville basaltic dykes (supervised by Prof. Henry Halls) drove my interest in magmatic and volcanic processes, and I decided to pursue graduate school.

Following on my new passion for volcanoes and volcanology, I started a PhD with U of T alumnus Prof. John Stix (MSc 1985; PhD 1989; Gorton) at McGill University. By collaborating with David Clague at the Monterey Bay Aquarium Research Institute (MBARI), I participated in a research cruise to the Taney Seamounts west of California. These seamounts were the focus of my PhD research, particularly the largest volcano of the chain with 4 calderas exhibiting cross-cutting relationships - a truly unique seamount. I utilized lava, crystal and melt inclusion geochemistry in order to understand magmatic storage and evolution from formation in the mantle to eruption on the seafloor. I also performed analogue caldera collapse experiments in the lab to better understand the physical behaviour of the volcanic edifice during magma withdrawal. I was fortunate enough to be awarded the Leopold Gelinas gold medal by the Geological Association of Canada for my PhD thesis: “Magmatic and volcanic processes at near-ridge seamounts.” It was a great honour to be awarded the same medal as U of T alumnus (and my former TA) Duane Smyth.

I have since moved to Durham University in the northeast of England where I have started a postdoctoral position. My current research is focused on the growth, shrinkage, and interaction of bubbles in highly explosive volcanoes. We are investigating the use of water diffusion profiles away from vesicles, in conjunction with numerical modelling, to try and extract pressure, temperature and time histories of magma during highly explosive Plinian eruptions. I participated in a field season at Novarupta volcano and the Valley of 10,000 Smokes in Alaska (August 2016). Over a period of two weeks, we sampled the eruptive products of the 1912 Plinian eruption (largest in the 20th century) and late stage extruded dome. Alaska is a volcanologist’s playground - a truly amazing place!

I have fond memories of my time at the University of Toronto: Field schools/trips, studying in the undergraduate lounge, Rockfest, PDAC and the end of year party.

Adrian Van Rythoven (PhD 2012; Schulze) began a tenure track faculty position in geology at Bloomsburg University in Pennsylvania.

...from our mailbag

I had just received my eagerly awaited Alumni News issue of February 2016 when I was literally jolted to see, on the penultimate page, a brief entry concerning James Stuart Cranswick. Stuart was my uncle, a brief 10 years older than I, and the one who mentored me through high school and college, and literally shaped the outcome of my life. Because of him I, too, majored in Geological Sciences at U of T.

With absolutely no disrespect to Dr. Norford, I should like to mention a few very minor disparities in his account of Stuart’s college achievements and brief life. Stuart graduated from Victoria College in 1951, winning both the Coleman Gold Medal and the Cox Gold Medal from Vic for highest overall Science grades. The following year he obtained his MA Degree from U of T, with Professor Madelaine Fritz as his supervisor., and then obtained a scholarship at Gonville and Caius College, Cambridge; his chosen PhD thesis topic was on Ordovician graptolites. It was in the summer of 1954, two years into his thesis, that he was carrying out stratigraphic correlation work down in the canyon of the Many Beavers River, when, as Dr. Norford writes, Stuart and his Junior Assistant were overtaken by the rising waters, and swept down the river on a makeshift raft. The assistant (whose name I do not recall) managed to grab hold of overhanging branches and climb to safety, but Stuart “was swept around a bend in the river when last I saw him”. Despite several weeks of searching the river (now named after him, as Dr. Norford points out), Stuart’s body was never found. He was 29 years old.

Cambridge considered awarding Stuart his degree postmortem, but I never heard the outcome.

Respectfully,

Paul R. Van Loan, BA57, MA58, U of T; PhD 1968, McGill.
Alumni News

Editor: Henry Halls
Assistant Editor: Karyn Gorra

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

Special appreciation to:

- Jeff Fawcett for his Obituaries of David Strangway and Ifor Davies and for continually providing items to us throughout the year.

- Steve Scott for his tribute to Ed Spooner.

- Colin Bray for his help in our reporting of the Spooner banquet and scholarship.

- the many faculty, students, staff and alumni who provided articles, ideas, photos and all forms of assistance and input to help create this newsletter.

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