TRAVELING FOR WORK – LESSONS FROM THE MARS CURIOSITY ROVER

Mt. Sharp, Mars, in white-balanced colors. NASA/JPL/MSSS

Most of us travel for work, but what about a trip to Mars? Recent headlines announced that a lucky couple is being sought for a trip to Mars orbit! In light of this buzz about Mars travel, it seemed appropriate to write an article about work travel, taking into account lessons from the Mars Science Laboratory (MSL) Curiosity rover's trip.

MAKING TRAVEL ARRANGEMENTS

Sending the Curiosity rover to Mars involved more than 8 years of preparation for the science team. The exciting descent of the rover into Gale Crater on Mars (Fig. 1) captivated many of us, but also required immense planning over many years by dedicated engineering and science teams.

Fortunately, work trips for geologists on Earth usually involve relatively simple logistics: we generally go on either research trips (to the field or a laboratory) or conference/meeting trips. In either case, transport needs to be arranged, accommodation has to be booked, and in some cases registration or access fees or training are required. When making your bookings, look out for "creeping costs" like parking fees, wireless fees, and bag transport or storage fees. Also, ensure that you have followed your workplace's protocols (see the "Questions to Ask" box).

PACKING FOR A WORK-RELATED TRIP

Of course, the Curiosity rover took all its work tools with it on its trip to Mars (http://msl-scicorner.jpl.nasa.gov/Instruments). Each tool was tested under many conditions, and there are backups of some of the important systems, which was important at the time of writing as the engineering team was fixing an error in one of the onboard computers.

For work trips, many of us depend on our computers for everything, and so it is important to have backup systems in case your laptop fails. One approach is to store electronic documents on the "cloud" where they are accessible through the Web. Another is to have documents backed up on a USB memory stick or backup drive.

Figure 1 An artist's concept of what the Curiosity rover looked like during the powered-descent portion of its trip into Gale Crater. NASA/JPL-Caltech, www.jpl.nasa.gov/msl

QUESTIONS TO ASK IN YOUR WORKPLACE BEFORE YOU LEAVE

- Will your institution arrange reimbursements and/or travel advances?
- Will you need receipts for all meals or is there a per diem?
- Are you expected to cover any of the costs yourself?
- Does your institution have a preferred rental-car supplier?
- Who pays for the rental-car insurance, and if your institution pays then what level do they recommend?
- Are you covered by health insurance (particularly if visiting another country)?
- Do you need to leave contact and trip details with your institution?
- Do you need to fill out any special forms (especially for field work)?
- Do you need a letter of invitation or special visa?
- Are there requirements for remote field work, such as frequent communication or particular forms (e.g. safety-evaluation forms)?
- Are separate arrangements needed for any personal travel during your trip

Many of us travel with rocks or waters in our luggage, and I have found it useful to include a letter to the airport safety officers with each box of samples. I write the letter on official letterhead paper and make sure to indicate the box contents (e.g. sample number, simple rock name) and the value of the samples (usually "no commercial value" or $5), and I also state whether the samples contain biological matter or soil (generally not). When I am carrying samples internationally, I include the Customs Tariff (Harmonized) Code for mineral samples for the country I am visiting. Sometimes, I send samples to my destination by courier because it is easier than having them accompany me.

ADJUSTING TO DIFFERENT TIME ZONES

To work effectively at the beginning of the mission, the MSL team worked on a Martian day (sol), which is ~24 hours and 40 minutes long. If work started at 10 pm one day, then the next day's shift would start at 10:40 pm. It was important for the team members to figure out the best times to sleep and eat each sol. One person was heard to say, "Breakfast tastes good at any time of day!"

Jet lag imposes similar strange time changes. People's body clocks respond differently to jet lag and so strategies vary. I usually stay awake until bedtime in the new time zone, and try to wake up and eat on a schedule similar to the new time zone. I also find that it is helpful to limit alcohol and caffeine, and instead drink water.

STAYING ON TOP OF COMMUNICATION

Each sol, Curiosity communicates with Earth through one of two satellites orbiting Mars: Mars Odyssey or Mars Reconnaissance Orbiter. This regular communication is necessary for both uplinking instructions to the rover and downlinking data. Both forms of communication are overseen by representatives from the instrument, science, and engineering teams and communicated within the entire team.

Traveling similarly exposes us to the need for multiple communication channels. We chat and network with colleagues and other scientists on

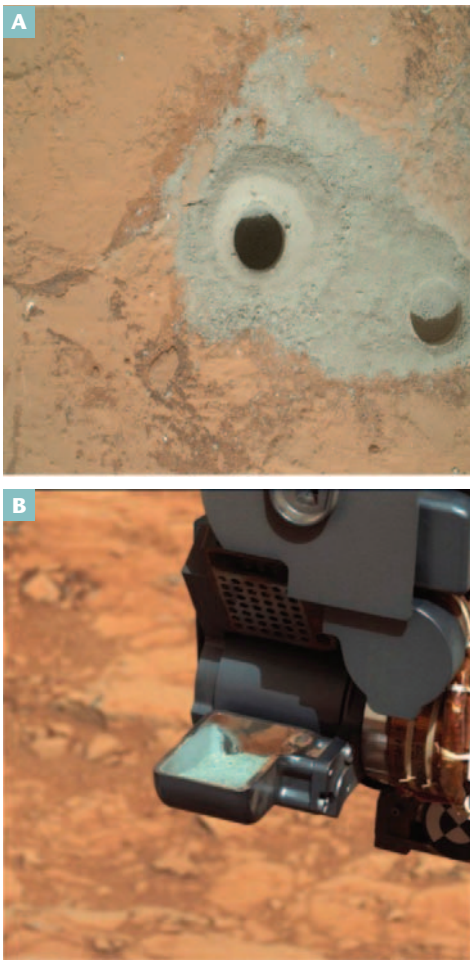
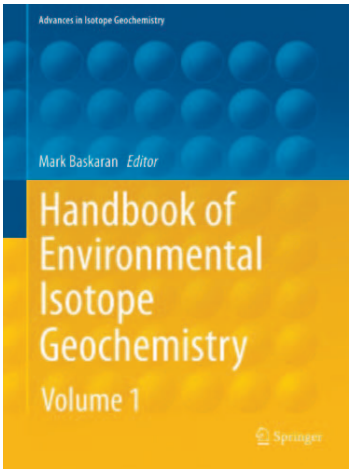


Figure 2 (**A**) Image taken when NASA's Curiosity rover used the Mars Hand Lens Imager (MAHLI) to show a drilled sample, on February 9, 2013, sol 182 of the Mars Science Laboratory mission. The diameter of the hole is 16 mm. (**B**) Image of the first sample of powdered rock extracted by the rover's drill; the image was taken after the sample was transferred from the drill to the rover's scoop. The scoop is 45 mm wide. The image was obtained by Curiosity's Mast Camera on February 20, or sol 193, Curiosity's 193rd Martian day of operations.
Credit for images: NASA/JPL/MSSS

HANDBOOK OF ENVIRONMENTAL ISOTOPE GEOCHEMISTRY[1]



The *Handbook of Environmental Isotope Geochemistry* represents a massive undertaking. Running to 950 pages in two volumes, it covers an array of environmental isotopic methods and applications that is mind-boggling in breadth. In the introductory chapter the editor states, "The purpose of this volume is to bring together recent applications of a much larger number of radioactive and stable isotopes in earth and environmental sciences." This goal is certainly achieved, inasmuch as the *Handbook* must describe the systematics of at least 75 different nuclides.

The coverage of the volumes is so broad that it is very difficult to describe in a review of reasonable length. However, the contents are almost as notable for what they do *not* cover as for what they do. First, readers should not expect an updating of the classic 1986 two-volume work with the same title, edited by P. Fritz and J.-Ch. Fontes. That *Handbook* contained a relatively small number of chapters (24), each of which was a thorough, ~50-page review of a major field or technique in environmental isotope geochemistry. The present *Handbook* contains 40 chapters of about 20 pages each. The level of coverage varies widely. Many chapters consist of rather brief synopses of the systematics of the particular isotope considered, a short review of analytical methods, and a wide-ranging survey of recent applications. In contrast, others, such as the chapter on cosmogenic nuclides by D. Lal, contain a lengthy review of elementary systematics and no applications or recent developments.

Readers should be aware that in addition to the difference in treatment from the earlier *Handbook*, the topical coverage may be much different from what they are expecting. Most of the major areas of application of environmental isotopes are missing. For example, the volumes contain little or nothing on the isotopes of oxygen and hydrogen in the hydrological cycle, the interpretation of these isotopes in marine or ice cores, developments in carbon-14, stable isotopes in soil minerals, the application of stable isotopes to paleotemperature reconstruction, the applications to groundwater dating (except helium isotopes), and many other classical and widely employed environmental isotope applications. Instead, the new *Handbook* focuses on either less commonly used isotope systems (e.g. Li, Si, Ca, Cd, Cr, Se, Fe, Hg, Th, transuranic elements) or applications to fairly specialized problems (tracing phosphorus, perchlorate, nitrous oxide, polyhalogenated atmospheric compounds, oxyanions in ice cores, paleohuman diet). This makes the book a handy place to turn to for information on many fairly obscure topics and techniques, but not a resource to explain the systematics of the most commonly employed environmental isotopes.

The *Handbook* starts off with introductory chapters that nicely lay out the historical development of the environmental isotope field and present a systematic overview of nuclide physics, general isotope systematics, and measurement methods. These would be suitable reading for an upper-level undergraduate or graduate geochemistry course. The remainder of the book presents short chapters on tracers of continental and aquatic processes, atmospheric processes, environmental forensics, archeology and anthropology, and paleoclimate and paleoenvironments. In spite of the environmental-systems organization of the book's sections, most of the chapters are isotope-specific rather than presenting overviews of the methods that can be applied in particular settings.

The chapters on tracing perchlorate in the environment (by N. Sturchio and others), measuring soil erosion rates using natural and anthropogenic radionuclides (by G. Matisoff and P. J. Whiting), and isotope dendrochronology (by S. R. Managave and R. Ramesh) offer particularly thorough and readable coverage of their topics. The most entertaining chapter is that on light-element isotopes as tracers of fast-food meals in the American diet, by L. A. Chesson and others Cows turned into grocery-store ground beef eat more corn than those whose meat is sold at McDonald's, contrary to popular perception! The oxygen and hydrogen isotope compositions of ground beef, hamburger buns, and milk reflects the geographical location of production, but those of french fries cannot so easily be interpreted. Here is a frontier where more research is needed!

Given the cost of these volumes, they probably will not end up on the shelves of very many individual researchers, but they are an obvious recommendation for library purchase. The *Handbook* does not offer anything like a comprehensive coverage of the most important areas within the broad field of environmental isotope geochemistry, but it does bring together in a quite compact way all of the essential information on a very large number of isotopic specialties where reviews are not readily available. As such, most environmental isotope geochemists will want to at least have access to it.

Fred M. Phillips
New Mexico Institute of Mining & Technology

1 Baskaran M (ed) (2012) Handbook of Environmental Isotope Geochemistry. Springer, Heidelberg, ISBN 978-3-642-10637-8, two volumes, 951 pp, US$279, e-book US$219

trips, while at the same time attempting to stay on top of e-mail and work communication and contact family and friends at home. Some travelers swear by setting up an "away from the office" return e-mail, while others find that taking time in the early morning or evening to deal with e-mail helps. I have become a fan of using Skype when traveling overseas for both business and family conversations. Wireless modems (on your phone) combined with free phone services (e.g. Google phone) are also another helpful option.

TAKING DETOURS AND ALLOCATING TIME FOR YOUR TRIP

Many research trips, including the Curiosity rover's trip, encounter the dilemma of whether it is best to travel long distances or spend time in one place. In fact, one of the first decisions of the Mars mission was to decide whether to detour to a fascinating area to the east when the ultimate goal was Mt. Sharp to the west. The team decided to go east, which has proven a good choice because rocks with high potential for habitability have been drilled and analyzed (Fig. 2; www.jpl.nasa.gov/news/news.php?release=2013-092).

To successfully complete research, it is important to ensure that adequate time has been assigned for the task at hand. Murphy's Law ("Anything that can go wrong will go wrong") seems to apply particularly in the cases of trips for analysis and field work. For such trips, it is always best to have the option of reanalyzing a sample or revisiting a location in the field, but this is not always feasible. My suggestion is to estimate how long a task might take and then multiply by three to five, depending on the uncertainties involved. If traveling by air, try to find a flexible ticket.

IN CLOSING

Traveling is one of the perks of being a geologist. It allows us to explore Earth and our Solar System and opens our eyes to new discoveries. Our thanks to the people who stay at home with the family when we are exploring! I thank Mary Hapel for her comments on this contribution.

Penny King, Australian National University

2013

May 22–24 Geological Association of Canada/Mineralogical Association of Canada Annual Meeting, Winnipeg, Manitoba, Canada. Website: http://gacmacwinnipeg2013.ca

June 9–14 Water–Rock Interaction 14 (WRI 14), Avignon, France. E-mail: contact@wri14-2013.fr; web page: www.wri14-2013.fr/en/home.html

June 17–19 Mineralogical Society Annual Meeting – Minerals for Life: Living with Resource Constraints, University of Edinburgh, Scotland. Web page: www.minersoc.org/minerals-for-life.html

June 23–26 Workshop on High-Resolution Proxies of Paleoclimate, WiscSIMS Lab, Madison, WI, USA. E-mail: valley@geology.wisc.edu; web page: www.geology.wisc.edu/~wiscsims/Hi-Resproxies/index.html

June 24–28 SEM 2013, XXXIII Reunión de la Sociedad Española de Mineralogía, Murcia, Spain. Web page: www.ehu.es/sem/congreso/CONGRESO.HTM

July 3–5 Second International Workshop on the Geology of Critical Metals, Ulaanbaatar, Mongolia. Website: http://criticalmetalsmeeting.com

July 3–6 Conference on Raman and Luminescence Spectroscopy (Corals-2013), Vienna, Austria. Web page: www.univie.ac.at/Mineralogie/Corals2013

July 7–11 XV International Clay Conference, Rio de Janeiro, Brazil. E-mail: info@15icc.org; website: www.15icc.org

July 7–12 18th European Symposium on Organic Geochemistry, Marseille, France. Website: http://esoc2013.eu

July 8–10 11th International Council for Applied Mineralogy (ICAM) Congress, Mianyang, China. Website: www.icam2013.org

July 15–19 Eighth International Mars Conference, Pasadena, CA, USA. Web page: www.lpi.usra.edu/meetings/8thmars2013

July 29–August 2 Annual Meeting of the Meteoritical Society, Edmonton, Alberta, Canada. Web page: www.meteoriticalsociety.org

August 4–8 Microscopy & Microanalysis 2013, Indianapolis, IN, USA. Web page: www.microprobe.org/events/microscopy-microanalysis-2013

August 4–9 Gordon Research Conference: Clusters, Nanocrystals and Nanostructures, South Hadley, MA, USA. Web page: www.grc.org/programs.aspx?year=2013&program=clusters

August 11–16 17th International Conference on Crystal Growth and Epitaxy (ICCGE-17), Warsaw, Poland. Web page: http://science24.com/event/iccge17

August 11–16 Gordon Research Conference: Nanoporous Materials and Their Applications, Holderness, NH, USA. Web page: www.grc.org/programs.aspx?year=2013&program=nanopor

August 12–15 SGA 12th Biennial Meeting, Uppsala, Sweden. Web page: www.akademikonferens.uu.se/sga2013

August 18–23 EnvironMetal Isotopes 2013, Ascona, Switzerland. E-mail: emi2013@env.ethz.ch; website: www.emi2013.ethz.ch

August 21–22 7th Biennial Geo-SIMS Workshop, Potsdam, Germany. Web page: www.gfz-potsdam.de/SIMS/BGSW7

August 23–24 Short Course: Thermodynamics of Geothermal Fluids, Florence, Italy. Web page: www.minsocam.org

August 24–25 ExTerra: Understanding subduction through the study of exhumed terranes, Florence, Italy. Details: Maureen Feinman; e-mail: mdf12@psu.edu; web page: goldschmidt.info/2013/workshops#event12

August 24–25 Boron Isotope Workshop, Pisa, Italy. Web page: www.geoanalyst.org/index.php/workshop-and-courses/13-workshop/30

August 25–29 ECM-28: European Crystallographic Meeting, Warwick, UK. Website: http://ecm28.org

August 25–29 MedGeo 2013: 5th International Conference on Medical Geology, Arlington, VA, USA. Web page: http://rock.geosociety.org/GeoHealth/MEDGEO_2013/Welcome.html

August 25–30 Goldschmidt 2013, Florence, Italy. Website: www.goldschmidt2013.org

August 26–30 Meteoroids 2013, Poznan, Poland. Web page: www.astro.amu.edu.pl/Meteoroids2013/index.php

September 2–4 Metamorphic Studies Group: Building Strong Continents, University of Portsmouth, UK. Details: craig storey@port.ac.uk; web page: www.port.ac.uk/special/buildingstrongcontinents

September 2–10 10th International Eclogite Conference, Courmayeur, Aosta Valley, Italy. Web page: www.iec2013.unito.it

September 8–12 246th American Chemical Society National Meeting & Exposition, Indianapolis, IN, USA. Web page: www.acs.org

September 11–15 2nd International Conference on Clays, Clay Minerals, and Layered Materials (CMLM2013), St Petersburg, Russia. Website: www.ruclay.com

September 16–19 Geofluids: Lubricants of the Dynamic Earth, Joint Annual Meeting DMG and GV/Sediment, Tübingen. Web page: www.dmg-gv2013.de

September 22–27 Applied Isotope Geochemistry 10 (AIG-10), Budapest, Hungary. Web page: www.aig10.com

September 24–27 Whistler 2013: Geoscience for Discovery, Whistler, BC, Canada. Website: www.seg2013.org

September 30–October 5 International School on Fundamental Crystallography, Guletchitza, Bulgaria. Web page: www.bgcryst.com/index.php?option=com_content&id=62

October 2013 CMM Autumn School: Moisture Measurement in Porous Mineral Materials, Karlsruhe Institute of Technology (KIT), Germany. Web page: www.cmm.kit.edu/english/index.php

October 6–10 50th Clay Minerals Society Meeting, Urbana-Champaign, IL, USA. Website: www.clays.org/annual%20meeting/50th_annual_meeting_website

October 21–24 AGU Chapman Conference on Soil-mediated Drivers of Coupled Biogeochemical and Hydrological Processes Across Scales, Tucson, AZ, USA. Web page: chapman.agu.org/soilmediated

October 21–30 Short Course: Introduction to Secondary Ion Mass Spectrometry in the Earth and Environmental Sciences, Helmholtz Institutes in Dresden, Leipzig, Potsdam. Web page: www.gfz-potsdam.de/SIMS/

October 27–30 Geological Society of America Annual Meeting, Denver, CO, USA. E-mail: meetings@geosociety.org; web page: www.geosociety.org/meetings

October 27–31 MS&T'13: Materials Science & Technology Conference and Exhibition, Montréal, QC, Canada. Web page: www.matscitech.org/about/future-meetings

October 29–November 1 First Latin American Crystallographic Meeting, Córdoba, Argentina. Web page: www.cristalografia2013.com.ar

November 4–7 7th International Workshop on Chemical Bioavailability, Keyworth, Nottingham, UK. E-mail: cbio7@bgs.ac.uk; web page: www.bgs.ac.uk/news/events/bioavailabilityWorkshop

November 18–21 26th International Applied Geochemistry Symposium 2013, Incorporating the New Zealand Geothermal Workshop, Rotorua, New Zealand. Web page: www.gns.cri.nz/iags

December 1–6 MRS Fall Meeting & Exhibit, Boston, MA, USA. Web page: www.mrs.org/fall2013

December 9–13 AGU Fall Meeting, San Francisco, CA, USA. Web page: http://sites.agu.org/meetings

2014

January 26–31 38th International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, FL, USA. Details forthcoming

February 2–6 94th Annual Meeting of the American Meteorological Society. Web page: http://annual.ametsoc.org/2014/index.cfm

March 16–20 247th ACS National Meeting & Exposition, Dallas, TX, USA. Web page: www.acs.org

April 6–9 AAPG 2014 Annual Convention & Exhibition, Houston, TX, USA. Web page: www.aapg.org/meetings

April 21–25 MRS Spring Meeting, San Francisco, CA, USA. Web page: www.mrs.org/spring2014

May 21–23 Geological Association of Canada /Mineralogical Association of Canada Annual Meeting, Fredericton, Canada. Web page: www.unb.ca/conferences/gacmac2014

May 24–28 American Crystallographic Association Meeting, Albuquerque, NM, USA. Details forthcoming

June 8–13 ZEOLITE 2014, Belgrade, Serbia. Web page www.inza.unina.it/upcoming-events/111-zeolite-2014-full

June 9–13 Goldschmidt Conference, Sacramento, CA, USA. www.geochemsoc.org/programs/goldschmidtconference

June 30–July 4 Asteroids, Comets, Meteors, Helsinki, Finland. E-mail: acm-2014@helsinki.fi; web page: www.helsinki.fi/acm2014

August 3–7 Microscopy & Microanalysis 2014, Hartford, CT, USA. Web page: www.microprobe.org/events/microscopy-microanalysis-2014

August 5–12 23rd Congress and General Assembly of the International Union of Crystallography, Montréal, Canada. Website: www.iucr2014.org

August 10–14 248th ACS National Meeting & Exposition, San Francisco, CA, USA. Web page: www.acs.org

September 1–5 21st General Meeting of the International Mineralogical Association (IMA2014), Johannesburg, South Africa. E-mail: info@ima2014.co.za; web page: www.ima2014.co.za

September 7–14 Annual Meeting of the Meteoritical Society, Casablanca, Morocco. Web page: www.meteoriticalsociety.org

October 12–16 MS&T'14: Materials Science & Technology Conference and Exhibition, Pittsburgh, PA, USA. Web page: www.matscitech.org/about/future-meetings

October 19–22 Geological Society of America Annual Meeting, Vancouver, BC, Canada. E-mail: meetings@geosociety.org; web page: www.geosociety.org/meetings

November 30–December 5 MRS Fall Meeting & Exhibit, Boston, MA, USA. Web page: www.mrs.org/fall2014

December 15–19 AGU Fall Meeting, San Francisco, CA, USA. Web page: http.sites.agu.org/meetings

2015

March 22–26 249th ACS National Meeting & Exposition, Denver, CO, USA. Web page: www.acs.org

May 31–June 3 AAPG 2015 Annual Convention & Exhibition, Denver CO, USA. Web page: www.aapg.org/meetings

July 27–31 Annual Meeting of the Meteoritical Society, Berkeley, CA, USA. Web page: www.meteoriticalsociety.org

August 2–6 Microscopy & Microanalysis 2015, Portland, OR, USA. Web page: www.microprobe.org/events/microscopy-microanalysis-2015

August 8–14 Geoanalysis Conference, Leoben, Austria. Web page : www.geoanalysis.info

August 16–20 250th ACS National Meeting & Exposition, Boston, MA, USA. Web page: www.acs.org

August 16–21 2015 Goldschmidt Conference, Prague, Czech Republic. Web page: www.geochemsoc.org/programs/goldschmidtconference

August 24–27 SGA 13th Biennial Meeting, Nancy, France. E-mail: sga-2015@univ-lorraine.fr

September 9–11 8th European Conference on Mineralogy and Spectroscopy (ECMS 2015), Rome, Italy. Details forthcoming

CANADA EXCELLENCE RESEARCH CHAIR IN GEOFLUIDS IN SEDIMENTARY BASINS

Department of Geological Sciences and Geological Engineering
Faculty of Arts and Science and Faculty of Engineering and Applied Science

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Queen's University is seeking an outstanding individual to take up a Canada Excellence Research Chair in GeoFluids in Sedimentary Basins. The CERC will be awarded to a world leading researcher, with selection based on the highest standards of research excellence. The CERC program dedicates $10 million over seven years to each chair holder and his/her research team, to support the pursuit of excellence in research (www.cerc.gc.ca/hp-pa-eng.shtml). In addition, the incumbent will be provided with the opportunity to make an application to the Canada Foundation for Innovation (CFI) program (www.innovation.).

The CERC holder will complement existing strengths by examining the details of fluid-rock interactions on all scales, from modeling large scale fluid flow in (hydrocarbon-bearing) sedimentary basins, to the origin and character of both mineralizing and barren fluids associated with energy-related commodities, to the pressure and chemical evolution of strata-bound fluids during earth history and into the future, to geochemical interactions between fluids and both natural and engineered materials. The Chair holder would focus on one, or both, of two major themes: (1) Energy and Mineral Resources (fluid evolution of sedimentary basins that potentially host petroleum and mineral deposits and exploration for buried deposits in basins); (2) Protecting and Managing the Environment (assessing element cycles in the environment that involve basins on all scales, or evaluating factors that affect waste disposal in sedimentary basins).

The successful candidate will be required to maintain a leading-edge research program, take a leading role in developing the GeoFluids program at Queen's, actively engage with industry, supervise graduate students, teach undergraduate and graduate courses, and make administrative contributions through service to the University, Faculty, and Department. Candidates must hold a relevant Ph.D. degree and have a demonstrated excellence in research, teaching and training of highly qualified personnel. Established research collaborations with industry and engagement in public policy will be considered an asset. Registration as a Professional Geoscientist or as a Professional Engineer in Ontario, or eligibility to acquire registration in Ontario is strongly encouraged.

Interested applicants are directed to the full details of the advertisement at:
www.queensu.ca/geol/department/employment.html

Applicants should send their curriculum vitae, contact information, the names of three referees including their contact information, along with a statement of research and teaching interests, and three examples of relevant publications to:

Dr. Cynthia Fekken, Chair, CERC GeoFluids Appointment Committee
Associate Vice-Principal (Research), Office of the Vice-Principal (Research)
251 Richardson Hall, Queen's University, Kingston, ON, Canada K7L 3N6
By email: fekkenc@queensu.ca

Review of applications will begin on April 1st, 2013.
Applications will be accepted until the position is filled.

The University invites applications from all qualified individuals. Queen's is committed to employment equity and diversity in the workplace and welcomes applications from women, visible minorities, aboriginal people, persons with disabilities, and persons of any sexual orientation or gender identity. All qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents of Canada will be given priority. The academic staff at Queen's is governed by a collective agreement between QUFA and the University, which is posted at www.qufa.ca.

www.queensu.ca

THE IMPORTANCE OF SERPENTINITE TO CAPE DORSET CARVERS

Kiugak Ashoona, a Master Carver

Cape Dorset is located on the south coast of Baffin Island in Nunavut, part of the Canadian Arctic. Kiugak Ashoona was born in 1933 and grew up in camps on southern Baffin Island. He began carving in the late 1940s and has had the longest artistic career of any artist currently living in Cape Dorset. He has received many honours during his career, including a National Aboriginal Achievement Award in 1997 and the Canada Council for the Arts Molson Prize in 1999. In 2000 he was inducted as an Officer of the Order of Canada. A solo exhibition organized by the Winnipeg Art Gallery is the first retrospective study of his artwork. It includes 30 serpentinite sculptures dating from 1952 to 2008, three of which are pictured here.

Kiugak Ashoona
Natturalik and Young Eating Fish, c. 1990 (47 × 62 × 18 cm)
Green serpentinite stone
Collection of Alaska on Madison

In the beginning, Kiugak made ivory carvings. At that time stone was not considered an appropriate material for carving, and this is revealed by the Inuktitut word for stone, *uqqusiqsaq*, or "material for making pots." However, in 1951 sculptures began to be exported to southern markets, and the use of stone rather than ivory was encouraged. Kiugak was one of the first of the South Baffin Island Inuit to sell carvings to the Hudson's Bay Company for export to the Canadian Guild of Crafts in Montreal. He remembers picking up very hard, coarse stone from the shoreline to make his carvings. Other people began carving soon after, including Kiugak's brother, Qaqaq Ashoona, as well as Osuitok Ipeelee and Sheokjuk Oqutaq, who are known internationally for their sculptures.

Kiugak Ashoona
Earth Mother,
1966-1967
(51 × 63 × 18 cm)
Green serpentinite stone
Collection of John Comrie and Salina Shrofel

In 1954 an excellent carving stone was discovered at a site Inuit know as Tatsiituq on southern Baffin Island at Aberdeen Bay. In the 1960s, stone of a nearly pure jade green to a greenish black colour came to define the sculpture by Cape Dorset artists. As the sources became depleted in the 1970s, carvers began quarrying at a large new site at Korok Inlet, known as Kangisukutaq,[1] located 100 miles east of Cape Dorset. During a Nunavut government project in 2010–2013 (Nunavut Carving Stone Deposit Evaluation Program), it was estimated that up to 1 million pounds of serpentinite stone is produced annually for carvers from South Baffin and Iqaluit.

Kiugak Ashoona, *Taleelayuk and Young*, 1986, (43 × 20 × 15 cm), green serpentinite stone, West Baffin Eskimo Co-operative Ltd.

The Nunavut Carving Stone Program is a project led by the Government of Nunavut's Department of Economic Development and Transportation in collaboration with the Canada-Nunavut Geoscience Office, the University of Manitoba, and Natural Resources Canada. Its primary goals are to verify the quality and size of hand-mined carving stone deposits and to identify new deposits throughout Nunavut. A total of 45 carving stone deposits have been defined so far, most of which contain serpentinite. These findings suggest that Nunavut carvers will have sufficient resources of carving stone for many years to come.[2]

Darlene Coward Wight
Curator of Inuit Art, Winnipeg Art Gallery

1 Information provided by sculptor Aqjangajuk Shaa to M. A. Beauregard

2 Information provided by M. A. Beauregard, Minerals & Petroleum Resources, Department of Economic Development & Transportation, Government of Nunavut

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> *– Dr. Mike Cheatham, Syracuse University*

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- New C-Flow 35 with uptake rate of 35uL/min +/-7uL/min
- C-Flow range for desolvators – standard fitment on the CETAC Aridus II
- C-Flow 700d with removable uptake line for high solids applications – up to 25% TDS
- All C-Flows can be backflushed without tools

Inert Kits

- PFA kits with Scott type chamber
- True double pass design gives lower RSDs
- O-ring free end cap
- Platinum or sapphire injectors
- Available for Agilent 7500/7700/8800 and Thermo Element 2/Neptune

NEW!
Purillex™ FEP and PFA Bottles

- Lowest metal background
- Highest seal integrity

For technical notes, videos and to find your local Savillex distributor, visit **www.savillex.com**.

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