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Message from the President (#136)

The Present and Future of the Goldschmidt Conference

Marty Goldhaber
GS President (2008-09)

As I write this, we are only weeks away from the start of the 2008 Goldschmidt conference in Vancouver Canada. The program is now solidly in place. Based on the exceptional breadth and high quality of the scientific program, the substantial numbers of registrants, and the exciting social events on the schedule, it's shaping up to be one of the best ever. This meeting will continue the long-term systematic growth in size and scope of the North American and European Goldschmidt conferences. This growth is gratifying. The success of each meeting is due in large part to the dedication and hard work of a group of scientists who put the meeting together. The continued growth and impact of the Goldschmidt is also a reflection both of the international impact of the conference and the vitality of the field of geochemistry. Innovative science is present in every session. Meeting participants realize that the key colleagues in their field are more likely than not to be present. The emphasis on student involvement always keeps the energy level high. A number of exhibitors find this meeting a great way to communicate with leaders in the field of geochemistry. Our ventures to meeting sites in Australia and Japan have yielded a positive impact in the form of increased scientific contributions to the meeting from these nations. The North American conference is also profiting from a new memorandum of understanding with the Mineralogical Society of America that recognizes MSA as an official sponsor. Overall, both the present and future of the Goldschmidt conference looks bright.

With the growing success of the Goldschmidt Conference come some challenges. The increasing size is one of these. The number of participants and associated space requirements for oral and poster sessions, the space requirements for exhibitors, and the realities of feeding and housing so many participants, makes the meeting a tight fit for the university campus venues that have hosted many of the previous meetings. The complexity of the meeting means that, although we have had extremely competent and experienced commercial help in many aspects of the planning process, the workload on the local meeting committee is still very high. We also face a situation in which a new group of volunteers organizes each meeting. We suffer from inadequate continuity between meetings, so that we tend to solve many of the same problems each time. For these reasons, the Geochemical Society is now considering instituting an expanded role for a professional meeting organizer. Having a professional organizer would relieve the local committee of dealing with many of the non-science meeting details and allow more focus on program. Part of this meeting-planning role might be to help select a suitable venue and deal with many of the on site logistical details. Because the Goldschmidt Conference is such a key function of our Society, I intend to make easing the meeting planning burdens on scientists one of the focuses of my presidency. If you have your own suggestions as to how we can better plan future Goldschmidt Conferences, please let us know by sending them to our Business Manager, Seth Davis, at seth.davis@geochemsoc.org.

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Ten Must Sees in Vancouver

Vancouver, BC, as one of the most sought after tourist destinations in the world, is a diverse, dynamic city, highlighted by its spectacular natural setting. It is a city that offers a wealth of tourism opportunities for its visitors, and offers the perfect backdrop for Goldschmidt2008. This list of ten 'must sees' offers only a few of the many reasons to come to Vancouver for Goldschmidt2008!

Grouse Mountain

A mountain resort, minutes away from the city centre. This rugged getaway is a year round source of breathtaking views and a wide range of activities. (www.grousemountain.com) *Photo credit: Grouse Mountain*

Vancouver Museum

Overlooking spectacular English Bay, the Vancouver Museum offers visitors a peek into the culturally rich and diverse history of Vancouver. (www.vanmuseum.bc.ca) *Photo Credit: Wikipedia*

Capilano Suspension Bridge

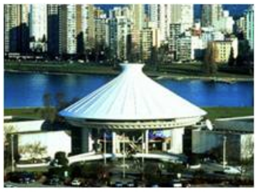
Suspended since 1889, the Capilano Suspension Bridge presents visitors with a breathtaking view of the Capilano River from a vantage point of 70 metres above! (www.capbridge.com) *Photo Credit: Capilano Suspension Bridge*

Stanley Park

Stanley Park is recognized around the globe as one of the great parks of the world! Vancouver's first park and one of the city's main tourist attractions, Stanley Park is an evergreen oasis of 400 hectares right next to the downtown core. (www.city.vancouver.bc.ca/parks/parks/stanley) *Photo Credit: Tourism Vancouver*

H.R. MacMillan Space Centre

See a 360 degree view of the heavens from Vancouver! The space centre offers its visitors a unique educational experience, as well as a gorgeous natural setting, with views of the city skyline visible from the centre's waterfront grounds. (www.hrmacmillanspacecentre.com)



VanDusen Gardens

Take the opportunity to visit a world-class bed of flowers, ranking among North America's top 10 gardens! (www.vandusengarden.org) *Photo Credit: VanDusen Gardens*

Bard on the Beach

A Vancouver mainstay, Bard on the Beach is a professional Shakespeare Festival that brings life to the magic of Shakespeare's great plays - at the beach! (www.bardonthebeach.org)

Dr. Sun Yat-Sen Classical Chinese Garden

In the heart of Vancouver's bustling Chinatown, retreat into the peace and tranquility of the first full-scale classical Chinese garden built outside of China. (www.vancouverchinesegarden.com)

Vancouver Aquarium

The aquarium invites its guests to view and interact with over 70,000 different aquatic species. (www.vanaqua.org) *Photo Credit: Destination360*

Science World

One of the most popular tourism sites in Vancouver, Science World is also one of the most educational attractions for visitors of all ages and interest. (www.scienceworld.bc.ca) *Photo Credit: Destination360*

--Heidi Dale-Johnson

Five Questions with Ed Boyle

Ed Boyle

Election into the U.S. National Academy of Sciences is considered one of the highest honors an American scientist can receive. This past April, NAS elected 72 new members, including Edward A. Boyle, Professor of Ocean Chemistry at the Massachusetts Institute of Technology. Ed is a longtime member of the Geochemical Society and past recipient of the 2000 C.C. Patterson Award. With his induction, 34 current or former GS members are members of the NAS. Last month, Geochemical News asked Ed a few questions via regarding his newest honor. Ed responded via email from sea aboard the first GEOTRACES cruise. GEOTRACES is an international program to determine the global-scale distributions of key trace elements and trace element isotopes—see the October 2003 issue of Geochemical News for a feature article. At the time of his response, Ed was in the western North Atlantic Ocean, near Bermuda.

GN: What are you doing on the GEOTRACES cruise?

EB: This cruise is a sampling and analytical technique intercomparison effort, in order to get all of the international groups agreed about how to obtain a globally consistent data set.

GN: How did it feel when you were notified of your nomination into NAS?

EB: I was surprised (I didn't even know that I was being considered) and of course I was pleased with the recognition. It took awhile for it to sink in that it was real.

GN: How does this honor compare to receiving the 2000 Patterson Award?

EB: The Patterson Medal told me that my work was appreciated by a community of people who do related research and are familiar with what I do. The NAS fellowship indicates that a broader community of scientists also recognizes value in my scientific work.

GN: The role of the NAS is to advise the U.S. government on a wide range of national issues. What issues will you be most qualified to address? For which national issues do you think the NAS has an urgent obligation to advise the government?

EB: Obviously: climate change, ocean acidification, fisheries, and related issues. The extent of human impacts on local, regional, and planetary chemistry (and its impact on life) is also important. Also, how important the overall scientific enterprise is to the nation and to humanity, and why it must be supported.

GN: How has the landscape of the field of geochemistry changed over the course of your career? With many environmental issues (e.g. climate change) receiving increased media coverage in recent years, what scientific role do you see geochemists serving in the future? Do you have any advice for students studying geochemistry?

EB: When I was a student, you could get to know almost everyone in the field, including the top figures, by face and name (and most of them would know who you were as well). Now, when you go to a Goldschmidt meeting you are lucky to recognize a small fraction of the people there. Growth obviously indicates that we are valued, but I do miss the familiarity and smaller scale of our scientific meetings in the past. The role of scientists including geochemists is to focus on the most important unknowns in our field, to fill in the holes surrounding the things we know, and explore the frontiers of the unknown. As we find interesting things, we should communicate these to the public, and respond to public concerns by explaining what we know (and admitting what we don't know).

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Forensic Geochemistry

Whodunit, and where did he do it?

Earth science is gaining importance in forensics and it is not just about the microfossils embedded in the soil that got trapped in the soles of the murderer's shoes of which traces were then left behind at the crime scene. Geochemistry is a useful forensic tool as well.

The journal Environmental Chemistry Letters already published a review on the use of stable isotopes in environmental and forensic geochemistry in 2006. The article discusses how the past decade has seen a huge increase in the application of geochemistry in litigation. It mentions the use of biomarkers to link spilled crude oil and oil products to their origins. It also explains that, although the use of isotope compensation is not new, the ability to determine the isotopic composition of individual compounds in mixtures has not been around yet very long.

Excavation site De Balije II, Vleuten-De Meern (near Utrecht, The Netherlands) with ship De Meern 4 and revetment.

Inorganic geochemistry also features in forensics albeit often of a somewhat different nature. In February of 2002, the Dutch weekly "Intermediair" published an article partly based on an interview with Dutch geochemist Gerard Klaver of NITG-TNO. It discusses the rule of geochemistry as, basically, a decision-making tool in cases of lead pollution.

Lead-polluted soils can be found at sites that were previously occupied by gas stations - because of the lead that was formerly added to gasoline. If that is the case, attempts to recover the remediation costs from the polluters make sense. The first instances of lead pollution in the Netherlands, however, can be attributed to the Romans and some later occurrences of lead pollution are related to mills that produced the paint for painters like Rembrandt.

So how do you determine who to (pur)sue in such cases, if anyone at all? This is where geochemistry steps in. The isotope composition of the pollution often reveals the lead's source region. The Romans' lead came from Cornwall, but lead from ores mined in Broken Hill, Australia has a different isotopic signature and the latter is the lead that is generally associated with gas stations.

Archaeologists also conduct a type of forensic investigation, although in a broader sense as it does not relate to crimes (which is what the word "forensic" refers to, to the Roman practice of judging criminals before a forum). There definitely is an aspect of whodunit and where did he do it to some of these investigations, however.

One of the blocks from the excavation site.

A Dutch paper will soon be published which describes a study of basalt blocks used by the Romans around 100 A.C. near the Dutch city of Utrecht. The Netherlands is a large delta and has a very few rock occurrences, let alone any igneous rocks. The Romans, therefore, must have mined these blocks somewhere else and transported them to Holland on ships along the Rhine River.

The Dutch archaeologists had nineteen blocks, from a revetment along a fossil branch of the Rhine and from aboard the remnants of a Roman ship, and also included some blocks from a Roman watchtower. Thinking that these rocks must surely originate from the Eiffel region, the archaeologists contacted hard-rock geologists in the Netherlands and asked them to help determine from where exactly in the Eiffel these rocks originated.

All blocks were alkali olivine basalts with peridotite xenoliths and quartz xenocrysts. All but one also contained resorbed plagioclase xenocrysts. Archaeological constraints made it likely that Romans acquired these rocks from only the German part of what is known as the Cenozoic European Volcanic Province. This translates into a fifty-kilometer-wide belt with a length of three hundred and fifty kilometers.

To the surprise of the archeologists, the geologists first ruled out the Eiffel as the source region on the basis of petrography alone. Any further distinction had to be made on the basis of geochemistry: a comparison against available analysis data for rocks from various areas and quarries. The actual paper by Linthout et al. will reveal the details.

This type of research is not as straightforward as it may sound. After all, what may appear to be a good

candidate quarry nowadays may well have been located at a too large distance from the course of the River Rhine in the past, and make it a logistically unlikely possibility. Also, currently still lacking is actually simple database-building: more sampling and analysis of rocks from potential source areas, needed to pinpoint the Roman mining sites more precisely.


The probable site where these blocks came from.

Now, going back to our murderer at the beginning... If you happen to be contemplating bashing in someone's head, of course, what you should do is call the person and invite him over for a beer and a BBQ and work it out amicably. But if you must, then it would be best not to use a rock you picked up somewhere locally or, eh, during one of your recent field trips.

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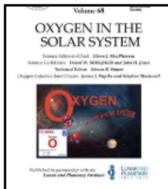
Book Review: RiMG v. 68



Reviews in Mineralogy and Geochemistry, Volume 68, Oxygen in the Solar System edited by Glenn J. MacPherson et al, The Mineralogical Society of America, Washington D.C., 2008, 598 pp. US $40 (ISBN 978-0-939950-80-5).

For many years, the study of the fractionation of oxygen isotopes was limited to measurements of 16O/18O ratios, the rare 17O being neglected. But when Bob Clayton and Tosh Mayeda in 1973 first measured 17O, in attempting to study the condensation temperatures of the refractory inclusions or CAIs in Allende, they opened a box that might have daunted Pandora. Plots of the isotopes on a three isotope diagram (the now-famous Clayton-Mayeda diagram) revealed unexpected complexities.

Samples from the Earth, Moon and eucrites indeed behaved as expected, showing linear temperature-controlled fractionations related to the masses of the isotopes. But data from other meteorites occupied separate areas, showing that they had distinct initial abundances of the three isotopes. Most spectacular of all were the data from the CAIs that fell along a line that was unrelated to mass and at first glance seemed due to an enrichment or spike in pure 16O. One immediate benefit for meteoriticists was to remove the concept of a common parent (CI ?) from which the wide variety of meteorites might be derived.

Oxygen, as every beginning student in geochemistry is reminded, is the most abundant element in the crust and mantle of the Earth. The present volume is a tribute to how far this study has come in the past 30 years. But the book covers a much wider spectrum than oxygen isotopes. It contains something for everyone. There are separate chapters on oxygen in the interstellar medium, the Sun, the solar nebula, asteroids, comets, interplanetary dust particles, every variety of meteorite, discussions of redox conditions in planets and it also deals with redox conditions throughout the inner solar system. Editing such multiauthor volumes (over 60 in this instance) has been compared to herding cats; the present volume results from the heroic efforts of Glenn MacPherson and his team.

Following an historical survey by Bob Clayton, Bob Criss and Jim Farquhar give a very useful survey of the abundance, notation and fractionation of the light stable isotopes, although they note that “these processes are more diverse than anticipated only ten years ago”. The origin of oxygen through nucleosynthesis in stars is reviewed by Brad Meyer and co-workers, who note the useful information on such sources that is contained in pre-solar grains in meteorites.

The question of oxygen in the interstellar medium (ISM) is next discussed by Adam Jensen and colleagues. The gas phase abundances are well-known but those of the dust phase are opaque, although perhaps located mainly in silicates. Andrew Davis and another international team look at the problem of oxygen in the Sun, noting that the current value (468 ppm) is significantly lower than earlier estimates. Producing such "state of the art" summaries is never without hazard. Just as this book appeared, the vexed question of the oxygen isotopic composition of the Sun may have been resolved. Long disputed between 16O-poor (ANU) and 16O-rich (French) claimants, analysis of the Genesis samples of the solar wind at UCLA by Kevin McKeegan and associates shows that the Sun, like the CAIs, appears to be rich in 16O.

Larry Grossman and co-workers discuss redox conditions in the early solar nebula, based on extensive experimental work, concluding that “ perhaps …. the solar nebula inherited..heterogeneities …. from the parent interstellar gas cloud”. A long review of oxygen isotopes in the components of chondrites by Hisayoshi Yurimoto and an international group of experts provides a very useful summary, noting that “ efficient large scale mixing “ seems to be required to assemble 16O-rich and 16O-poor components “from widely separated regions in the nebula”.

The vexing question of oxygen isotope variations in the solar nebula that are independent of mass is addressed by Ed Young and a team of Japanese and US colleagues, who note that the isotopic composition of the Sun is a crucial parameter needed for further progress , although chemical processes in the nebula, as first suggested by Mark Thiemens, look increasingly attractive. Even the giant planets and their satellites do not escape attention, as discussed by Michael Wong and associates; a field that shows much promise for interpreting giant planet and satellite formation scenarios, but one that requires much more data. Scott Sandford and others look at the oxygen record in comets and interplanetary dust, noting that comets contain “mixtures of both volatile and refractory bearing materials” and have perhaps sampled “the entire radial extent of the solar nebula”.

Tom Burbine and colleagues and separately Ian Franchi review oxygen in asteroids that indicate the great complexity of the topic and the difficulties in interpreting reflectance spectra due to space weathering. 'Duck' Mittlefehldt and coworkers

note that the oxygen isotopic composition of planets appears to be decoupled “from other compositional characteristics” of planets, food for thought indeed. Next Mike Zolensky and colleagues assess the record of low temperature aqueous alteration in meteorites, something that seems to have happened for up to 15 myr after Tzero in their parental asteroids.

Jim Farquhar and Dave Johnson examine the record of changes in the oxygen cycle in the hydrosphere, geosphere and biosphere of the Earth through geological time that includes some reference to John Valley's work. Meeni Wadhwa, in a discussion of redox conditions on small bodies, notes that they vary by six orders of magnitude among the differentiated meteorite parent bodies, a fruitful field for research in trying to understand early conditions in the early nebula while Bob Criss discusses the complexities introduced by the upward migration of 18O within the outer regions of the Earth.

The oxidation state of the Earth’s mantle is reviewed at length, but it is a subject fraught with difficulty. Chris Herd in a discussion of basalts as probes of planetary redox state notes the pitfalls as summarised by Cin-Ty Lee in “Haiku” style:

> *“Fugacity has no memory*
>
> *It has no past*
>
> *Only what it sees last”*

A penultimate chapter by Steve Mackwell discusses the rheological consequences of the redox state of planetary mantles. One learns that although oxygen fugacity varies latterly and vertically in the mantle by factors approaching 104, they may result "an order of magnitude variation in viscosity" while variations "in water fugacity and lithology may be more significant". Sober words indeed for modellers of mantle dynamics. The volume concludes with a useful "brief tutorial" on meteorites for the uninitiated.

The cause of these spectacular variations among the isotopes of oxygen has long been controversial. Bob Clayton long suggested that they were due to a spike of pure 16O, with this highly stable nucleus (8p, 8n) probably derived from a nucleosynthetic source. But the absence of other predicted isotopic variations in elements such as Mg or Si ruled out such an origin. . Attention has now focussed on chemical processes within the nebula, following prescient suggestions 20 years ago by Mark Thiemens (UC San Diego). Curiously he does not appear as an contributor to this volume, nor is his significant contribution, although referenced, much highlighted. But it is now generally appreciated that the useful and dramatic variations among the three oxygen isotopes arise from late-stage processes within the inner solar nebula.

As is evident from reading this book, replete with enigmatic data and unexplained phenomena, there is no shortage of problems in this expanding field. The identity of oxygen isotope signatures between the Earth and the Moon remains as one such curiosity As it seems unlikely that the Moon-forming impactor had an initial oxygen signature identical to that of the Earth, Dave Stevenson and co-workers (Cal Tech) have suggested that this identity results from equilibration in the vapor cloud following the collision, something that opens yet another compartment in Pandora's box.

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GS on Facebook (update)

211 (and counting). That's the number of users that have joined the Geochemical Society group on Facebook, almost exclusively through word of mouth, in just over six months. There were two primary reasons we decided to experiment with GS on Facebook: 1) to reach out to a large number of people--particularly students--interested in geochemistry regardless of their membership status, and 2) facilitate networking between members and discussion of relevant issues. So far, with over one person joining a day, I'd say we can look forward to reaching many more as the GS presence on Facebook continues to expand. To put this in perspective, AGU—a much larger society—only has 122 members. And it's not just students that we're reaching; many faculty members and others outside academica have joined up with us as well.

Unfortunately, the second goal is still a major work in progress. It seems people are willing to join but not take advantage of what the group offers. The reason for this is not entirely clear. It could be that people are cautious about what they say/do online because of the high visibility of their comments. If you've ever 'googled' your name, you probably understand that there is a lot out there on almost all of us. And on a site like Facebook, there is a blurry line between your personal and professional life.

A more likely reason that there is lack of activity on the GS Facebook page is that people really just aren't ready. Personally, I believe that online networking will become a ‘must' for any scientist in the future. Not only is the technology amazing, but if one simply considers the rising costs of traveling to scientific meetings and the environmental impact of such travels, it will become necessary to network online. Sites like Facebook, Nature Network, etc. represent a new means of scientific communication like e-mail did twenty years ago. Back then, professionals argued that they simply didn't have the time for such trivialities like e-mail, but now I bet these same people spend a good bit of their time in front of their computer sifting through their inbox. E-mail has undoubtedly revolutionized the way science is done, at least in terms of collaboration, publishing, and overall access to information.

But what about networking sites? How will they revolutionize science in the 21st century? Imagine online conferences complete with talks and poster sessions. Imagine discussing a new idea with a physicist and biologist in an online forum and starting up a collaboration with them. Imagine having access to all of your colleagues favorite and/or most-read papers available with the click of a button. These are already a reality with today's technologies. However, there is very little benefit to participating in such activities if you are the only one in your field doing so. Afterall, twenty years ago, what was the point of e-mailing someone if they couldn't send you an e-mail back? Eventually we, as in scientists, will catch on to these new online communication tools and when that happens, imagine the next wave of technological advances that will benefit science. Twenty years from now, will we look at Facebook like we now look at e-mail?

Think of the GS on Facebook experiment as simply a trial period. I doubt it will be the final form of whatever sort of networking presence(s) GS has online, but it provides an entry-point for us to connect a little more online. It will be interesting to observe, from the inside, the evolution of these online tools in the coming years. For example, the American Chemical Society just started it's very own online networking site (ACS Member Network) where ACS members can post their publications, join groups related to their research interests, and discuss a wide range of issues in chemistry with experts in the field.

As always, the success of these online tools—*Web 2.0* they call it—is proportional to the number of people using it and how much each user participates. I encourage everyone reading this to explore these new tools and see what they have to offer (for a primer, read my last commentary here). Additionally, if you have concerns/comments on this topic, please e-mail them to me at wigginto@vt.edu (or join Facebook at make a comment on the GS page!)

Nick Wigginton

GS on Facebook

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