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Five Questions with William Boynton

On the NASA Phoenix lander



William Boynton

GS member William Boynton is Professor of Cosmochemistry and Geochemistry at the University of Arizona. He has been involved with space exploration for several decades working closely with NASA to develop instruments for the Mars Polar Lander and Mars Odyssey Orbiter. Most recently, he was the scientific lead for the Phoenix Lander's on-board geochemistry lab TEGA. The Phoenix Lander continues to collect and analyze soil samples into October 2008, far surpassing its originally planned 90-day mission. Prof. Boynton recently answered these questions for GN via email.

1) How did you get involved with designing instruments for space flight?

I have always had an interest in building things with my hands. I began by building my own multichannel analyzer for gamma-ray spectrometry and neutron activation analysis when I came to Arizona in 1977. I wanted to get involved in the space program and took a sabbatical at Goddard Space Flight Center to learn about using gamma-ray spectrometers

(GRS) in space.

I proposed to be the team leader for the GRS on Mars Observer, but the instrument was built for me by NASA. After that mission failed just before arrival at Mars in 1993, I was given the opportunity to fly again on Mars Odyssey, and I proposed that we build it in house at Arizona rather than use an aerospace contractor. I feel that one can get a much better instrument for the money by building it in house.

2) What are some of the main challenges associated with designing instrumentation for operation on Mars?

Wow. There are lots. Mostly it is trying to find the right balance between available resources (schedule and money, mostly) and performance. There is the saying "faster, cheaper, better: chose any two" and achieving the right balance between all three is what is the most challenging. For specifics, building instruments for the harsh conditions on Mars and testing under those conditions are probably the toughest technical challenges.

3) What is TEGA and how does it work?

TEGA is the Thermal and Evolved-Gas Analyzer. It is a combination of a differential scanning calorimeter and a mass spectrometer. A small sample (~0.04 g) is sealed in an oven which is heated on a controlled temperature ramp to 1000 deg C. (typically at 20 deg/min). The energy required is carefully monitored 300 times a second and are used to detect either endothermic or exothermic phase changes. During the heating any minerals that decompose by release of a gas, such as CO₂ from a carbonate, are passed on to the mass spectrometer for analysis.

4) What has TEGA revealed about Mars that we didn't already know (e.g. the habitability of Mars, possibility of former life on Mars, Martian geology, etc.)?

One thing we have found was a high content of calcium carbonate that was not expected. This mineral is generally thought to require reaction with water and carbon dioxide (though there are other ways to make it).

Mars has evidence of flowing water in the lower latitudes, but seeing evidence at least suggestive of liquid water in the polar region was not expected. These data may suggest that the region could have been more habitable in the past, but, of course, that does not say anything about where there was or was not former life on Mars. The mission was designed to collect data on habitability, but not on the presence or absence of life.

5) What are some lingering questions that TEGA has the possibility of answering during Phoenix's remaining time on Mars?

At this writing there is not much time left for TEGA and the Phoenix mission, but we are hopeful that we can put constraints on the amount of organic material in the soil. This material, if found, would likely be from meteorite infall rather than some indigenous Mars source, but its presence would go a long way to showing organic molecules can survive in the highly oxidizing environment of Mars.

--NSW

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Science Policy in the U.S. Presidential Election

Sifting through the Candidates Scientific Positions

During the past few weeks, the grass-roots initiative called "[ScienceDebate 2008](#)" finally received what they have been working towards: U.S. Presidential candidates talking specifics about science and technology. Just a year ago this initiative had only six members but now has tens of thousands of supporters that form a unique collaboration of scientists, engineers, scientific organizations, university administrators, government officials, journalists, and business leaders. The two major party presidential candidates, Senators John McCain (R-AZ) and Barack Obama (D-IL), answered fourteen science and technology questions ranging from federal funding, energy, stem cells, and national security. The candidates' full answers to each of the fourteen questions can be found on the [Science Debate 2008 website](#). An example of their positions on a cap-and-trade system, for example, are provided below in a selection of their answers pertaining to this question about climate change:

The Earth's climate is changing and there is concern about the potentially adverse effects of these changes on life on the planet. What is your position on the following measures that have been proposed to address global climate change—a cap-and-trade system, a carbon tax, increased fuel-economy standards, or research? Are there other policies you would support?

Senator Obama's answer:

"Specifically, I will implement a market-based cap-and-trade system to reduce carbon emissions by the amount scientists say is necessary: 80 percent below 1990 levels by 2050. I will start reducing emissions immediately by establishing strong annual reduction targets with an intermediate goal of reducing emissions to 1990 levels by 2020. A cap- and-trade program draws on the power of the marketplace to reduce emissions in a cost- effective and flexible way. I will require all pollution credits to be auctioned."

Senator McCain's answer:

"To dramatically reduce carbon emissions, I will institute a new cap-and-trade system that over time will change the dynamic of our energy economy. By the year 2012, we will seek a return to 2005 levels of emissions, by 2020, a return to 1990 levels, and so on until we have achieved at least a reduction of sixty percent below 1990 levels by the year 2050..."

For me, evaluating each candidate's response was similar to grading an essay exam. There was no clearly defined rubric and sometimes one candidate had specific answers while the other's were very general. Each candidate agreed on big picture details like the need for federal funding of the basic sciences, use of a cap and trade system to reduce CO₂ emissions to mitigate global warming, and the need for further developing alternative energy. Their differences were more evident when examining their plans to accomplish these tasks. Listed below are summaries of their stances on other issues specifically relevant to a geochemist but I highly encourage you to read their complete responses to all fourteen questions.

Research: Sen. Obama outlined a proposal that would double the budget of basic science funding in physical and life sciences, mathematics, and engineering over the next decade. Sen. McCain response emphasized his support of federal science funding over his tenure in the Senate. While his plan did not offer any specific promises of increased funding (because of budget constraints), his plan will try to maximize its investment into science funding by better management of funds and eliminating wasteful spending.

Energy: Sen. McCain's energy plan calls for the construction of 45 new nuclear power reactors by 2030 and the use of tax and monetary incentives, like a \$300 million prizes for development of new battery technology, to jump start economic growth in the fields of alternative energies. Sen. Obama plans to spend \$150 billion for research, development, and deployment of alternative energy sources, carbon sequestration, and new generation of nuclear electric technology.

Water: The candidates agree that better efforts need to occur in the arena of water conservation and efficiency at the federal, state, and local levels. Sen. Obama will use price and policy to provide incentives for conservation as well as training and if necessary, economic assistance to aid individuals and business to transition into better water practices. Sen. McCain does not believe water rights should be decided in courts. He calls for states and water uses to come together for increase dialog to find cooperative agreements for water rights.

Space: Sen. McCain vows to make space exploration one of his top priorities. He has already asked the Bush administration to suspend its plan to decommission the current space shuttle and promises to keep appropriate funding levels for space exploration. Sen. Obama wants to bolster NASA's research abilities by involving international partners and the private sector. He will also re-establish National Aeronautics and Space Council to orchestrate space exploration throughout all sectors of the government.

Science Integrity: Each candidate stated that science policy should be based on scientific evidence and not by governmental politics. Sen. McCain plans to appoint a Science and Technology Advisor within the White House and to place qualified scientist in various positions within his administration. Sen. Obama will make government more transparent by establishing an Executive Order that guarantees the timely release of non-distorted government publications and he will establish the nation's first Chief Technology Officer who will oversee scientific and technical issues within governmental agencies.

Overall ScienceDebate 2008 can be viewed as a great example of how scientists and engineers can successfully become lobbyists. Even though the numerous benefits of federal research funding seems obvious to people within the field, it can be very helpful to give a first hand reminders to elected officials who agree to pay the bills. This may seem like a daunting task but it is not a job one has to go alone. There are many organizations that provide general science and technology (e.g., [AAAS](#)) or geology-specific (e.g., [American Geological Institute](#)) legislative information that allow scientists and engineers easy access to information. The ability of scientists and engineers to continue to be effective lobbyists could turn out to be vital for science over the next few years with increasing amounts of stress on the federal budget.

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U.S. Presidential nominees John McCain (left) and Barack Obama (right).

ScienceDebate2008

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A Preview of Goldschmidt 2009



The 19th annual V.M. Goldschmidt Conference will take place June 21 - 26, 2009 in Davos, Switzerland. The Organizing Committee invites you to come and discover the landscape, architecture, sporting and urban delights.

Challenges to Our Volatile Planet

This year the conference focuses on past, contemporary and future challenges to the Earth's resources and environment. The 20 themes and over 100 sessions will be joined by high-profile speakers and compelling panel discussions to highlight the future of geochemistry in its global context.

Important Dates

Abstract submission and early registration will be open at the conference website on January 1, 2009, and the deadline for submission of abstracts is February 22, 2009. Early registration, at reduced cost, closes May 22, 2009.

Venue

Davos is set in the breath-taking mountain landscape of the Grisons Alps, and at 1560m above sea level the town is the highest in Europe. Most famous for hosting the World Economic Forum, Davos is also known as a place for exhilarating summer and winter sports. It was founded in the Middle Ages, and from the middle of the eighteenth century Davos became a popular destination for wealthy visitors and those who sought the clear mountain air for their health.

Today Davos has a plenty of sights and entertainments for visitors and their families including horse-drawn carriages, pony trekking, mountain biking, watersports, rambling, museums, shopping and the botanical garden. For those who want more science there is the Physical and Meteorological Observatory and the relic Silderberg mines. If you would rather relax, try a visit to the golf course, casino, brewery or spa centre.

Davos Congress Centre

Goldschmidt2009 will take place at the Congress Centre in Davos Platz. Located within easy reach of accommodation, shops and restaurants, it is also served by excellent bus services to the nearby valleys and sites. Davos has over 35 years of experience in hosting international congresses, including Goldschmidt2002. The Congress Centre offers a selection of modern and comfortable theatres, equipped with hi-tech presentation technology. The entire Centre has wireless network access.

Travel

Reliable public transportation connects Davos to key places in Switzerland and Europe, making your journey through the scenic landscape a relaxing start to the conference. By car, the journey from Zurich International Airport takes just 2 hours, and by train, 2.5 hours. Detailed information on how to reach Davos can be found on the official Davos website: www.davos.ch

Accommodation and Food

Davos has 20-30,000 beds in accommodation to suit every budget, from self-catering to 5* hotels. There are also nearly 100 restaurants and bars in which to enjoy a wide range of international cuisine. Detailed accommodation, travel and amenities information will become available on the conference website.

Social Events and Field Trips

The conference Ice-breaker, Banquet and other social events will be held in the Congress Centre. A number of short Field Trips are planned to take a look at the varied orogenous geology of the Alps. Details of the excursions will be posted on the conference website.

Conference Website

See the conference website for the list of themes, all the latest news and information, and to sign up for the mailing list: www.goldschmidt2009.org. (Editor's note: Join the Goldschmidt 2009 Facebook event page [here](#).)

We look forward to seeing you in Davos!

Conference organisers:
Chris Ballentine
Judy McKenzie
Eric Oelkers

Make a Nomination

- V.M. Goldschmidt Award
- F.W. Clarke Award
- C.C. Patterson Award
- Alfred Treibs Award
- John Hayes Award
- Geochemical Fellows
- Best Paper Award
- Distinguished Service
- Endowed Biogeochemistry Lecture
- F. Earl Ingerson Lecture
- Paul Gast Lecture
- Robert Berner Lecture
- Award Committee Guidelines

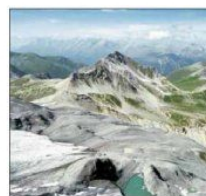
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Davos in its valley setting



The Grisons Alps



Morstein church



Congress Centre

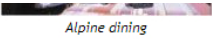


Kirchner Museum



Family hiking





Alpine dining

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A New Type of Subscription to GCA

RSS feeds and *Geochimica*

From submitting manuscripts through the GCA Editorial Office's [online manuscript submission system](#) to finding PDFs of over ten years of GCA's back catalog, it is now possible for today's geochemists to get all of GCA's content without receiving a hard copy. Not to say this is preferred, but it is a decision geochemists are making more and more every year. The web provides fast access to virtually any manuscript through simple searches in online databases which now index many papers even before they appear in print—features that hard copies simply cannot compete with.

For most active members in the Geochemical Society, bimonthly issues of GCA in their mailbox serve as nice reminders to scan through the most recent articles and, if necessary, dive into a relevant manuscript. Without a hard copy, however, the onus is on the reader to remember to go to the journal's [website](#) and search through the newest issue, in press manuscripts, back issues, etc. With countless other job pressures, it is very easy to neglect this task and fall behind on new content in GCA without these reminders. One attractive option for many readers of GCA to stay afloat of new content is to subscribe to free email alerts through ScienceDirect for each new issue's table of contents. Unfortunately, these email alerts can just as likely get buried below several other more pressing emails until they start getting ignored by default.

Luckily, there is another free 'subscription' option becoming very popular that allows readers to stay current with the newest online content in GCA (and many other major websites) that you may not yet be aware of. This relatively new service is called [RSS](#) (Really Simple Syndication). Chances are you might know a little about it already but don't realize it. For example, have you ever wondered about a weird little orange or blue colored symbol that occasionally appears in your internet browser's address bar?



That symbol means that the website you are visiting provides the option to 'subscribe' to it through RSS. Using your preferred RSS reader (e.g. [Google Reader](#)), you get notified every time something new is added to the website you are subscribed to. Subscribing to [podcasts](#) uses essentially the same technology; every time a new podcast is available, it gets delivered to your computer.

With this type of subscription, you never have to remember to check out the new issue of GCA online, search Web of Science or GeoRef for new papers, or check for science in the news. It all comes to your RSS reader so you have all of your new content available in one location. If you make checking your RSS reader part of your daily browsing routine—along with checking the newspaper, your organization's website, or the GS homepage, it becomes incredibly easy to stay current with new online content from GCA as well as a wide range of other online sources including scientific journals, newspapers, blogs, press releases, etc.

Finding an RSS reader, or aggregator, for your operating system that you like is easy (for a list, see [here](#)) but virtually all are free and do the same thing. Most have their own website that you must check, but you can also use your email client (e.g. Outlook, Entourage, Thunderbird) to do the same thing. There are plenty of tutorials available online describing how to subscribe to a website's RSS feed (for a good introduction, watch this youtube video [here](#)), so I won't try and reinvent the wheel here. Instead, I thought I'd quickly run through how to subscribe specifically to the GCA RSS feed using Google Reader. Once you get that far, you'll be ready to subscribe to other websites and online scientific content come to you instead of seeking it out.

1) Finding RSS feeds on ScienceDirect

To find the subscription link to GCA, you need to have access to [GCA's main page at ScienceDirect](#) either with institutional access [Editor's note: apparently individual subscribers that access the journal through <http://www.sciencedirect.com/gca> do NOT have access to these feeds! We are working on resolving this issue with ScienceDirect. Thanks to Mark Williamson (TetraTech) for bringing this issue to our attention]. From that page, there should be a link towards the top of the page for RSS feeds—look for that little orange symbol again.



Once you click on that link, you will either see one of two things. Most commonly, you will be taken to a strangely formatted webpage (called .xml) with recent article names listed below.



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This is a list of the new content that has been added to ScienceDirect's GCA page and is what your RSS Reader 'reads' as new content. You will need to copy the URL in the address bar to paste into your RSS reader. Alternatively, you may see a new window with a link that you should copy and paste into your RSS reader (note, ScienceDirect has a link to a nice tutorial about RSS feeds on this page).

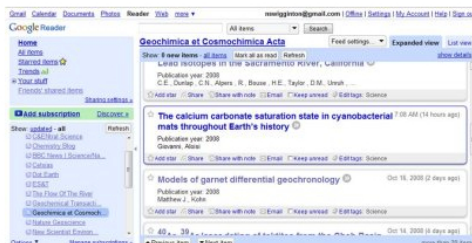
2) Adding the GCA feed to your RSS reader

Paste the link that you copied above into your reader. In Google Reader, which you sign into with the same Google account that you may already have set up for any other Google Services (Gmail, GoogleEarth, etc), the link is on the left side of the page and is titled 'Add New Subscription.'



3) Checking your new feed

Once you are subscribed, you should be able to see all the content on the GCA page in one list starting with the newest on top. Each item is linked to the actual content on the ScienceDirect website so if you click on a paper's title, you will be redirected to the abstract and full-text options. In Google Reader, once you view an item in the list, it is marked as 'read' and no longer listed in the unread items but is still archived away with all of the other old GCA content that you have viewed. You can search your archived RSS feeds for content that you want to find later.



Other relevant RSS feeds

As I alluded to earlier, many journals have the option to subscribe to their feed. Other ScienceDirect journals work the same way as GCA while RSS feeds of other journal publishers might be slightly different. Usually, you can just click the little orange symbol in the address bar to subscribe. Some publishers, notably AGU, unfortunately do not provide RSS feeds for their journals. Search engines are also getting in on the mix; Thompson Scientific's Web of Science— provides the ability to subscribe to your favorite searches (institutional access required) and get updated any time a new paper fits your search constraints. *Geochemical News* is currently in the process of providing an RSS feed to our online content too. Below are some links to other RSS feeds that may be useful to geochemists. For links to RSS feeds, copy and paste the link below into your reader.

<i>Geochimica et Cosmochimica Acta</i>	RSS feed link
Goldschmidt 2009 Updates	RSS feed link
Science Magazine	RSS feed link
ACS Journals	List of feeds
<i>Geochemical Transactions</i>	RSS feed link
Nature Publishing Group	List of feeds
<i>Proceed. Nat. Acad. Sci. U.S.A.</i>	RSS feed link
<i>Geology</i> (journal)	RSS feed link
EurkeaAlert Earth Science Press Releases	RSS feed link
BBC Science & Nature News	RSS feed link
NASA RSS feeds	List of feeds
<i>New York Times Science</i>	RSS feed link

The key to fully realizing the potential of RSS feeds is to make it part of your daily internet browsing. Once you do that, you'll have all the information you want in one location without having to go get it yourself. It will end up saving you a lot of time and energy trying to remember to get the information yourself, especially if you don't have that bimonthly hard copy in your mailbox as a reminder.

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Moving GN Forward in 2009

A Call for New Contributors

As *Geochemical News* wraps up another year, we witnessed Carla Koretsky and Johnson Haas—who took over as Editors back in 2001—step down in the spring. Carla and Johnson deserve the society's highest level of gratitude for their countless hours of service over nearly seven years. With the emergence of *Elements* as the society's primary means of communication in print, they oversaw the transition of *GN* to quarterly web-based issues in 2007. This new format, while not as substantial as former print issues of *GN*, provides significant savings to the Geochemical Society as well as increased flexibility in the type of content available to readers.

In 2009, *Geochemical News* is looking to take further advantage of the web and our beautiful new website to allow Geochemical Society members to communicate and stay current with society-related news, perspectives, etc. Our vision includes a full integration into the geochemsoc.org website with blogs, research highlights, educational resources, online social networking, etc. However, for us to successfully take advantage of these resources, we need society members to step up—as Carla and Johnson did in 2001—to contribute new ideas and content.

There are two ways that you can help. First, *GN* always welcomes input on new article ideas, news tips, book reviews, interviews, and anything else you'd like to see in print. Secondly, we're looking for a few new Associate Editors to start in 2009. *GN* AE's are responsible for soliciting several articles over the course of a year and will be expected to write research highlights of exciting geochemical research across fields/disciplines. Contributors and AE's should have a range of research interests and experience levels (students also encouraged to contribute, especially to our conference blogs that we hope to debut at Goldschmidt 2009). All contributors and editors typically receive compensation for their time and efforts in the form of society membership fees, special publications, etc.

If you are interested in helping *GN* in either of these two capacities, and we hope you are, please send an email to the Editor at gnews@geochemsoc.org.

Nick Wigginton
Angelina Souren
Thilo Behrends
Mitch Schulte

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