THE GEOCHEMICAL NEWS

Quarterly Newsletter of The Geochemical Society

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In this issue:

Goldschmidt 2000
Oxford, U. K.
September 3-8, 2000

http://www.campublic.co.uk/science/conference/Gold2000

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THE GEOCHEMICAL SOCIETY

The **Geochemical Society** is a nonprofit scientific society founded to encourage the application of chemistry to the solution of geological and cosmological problems. Membership is international and diverse in background, encompassing such fields as organic geochemistry, high and low-temperature geochemistry, petrology, meteoritics, fluid-rock interaction, and isotope geochemistry. The Society produces a ***Special Publications Series***, ***The Geochemical News*** (this quarterly newsletter), the ***Reviews in Mineralogy and Geochemistry Series*** (jointly with the Mineralogical Association of America), and the journal ***Geochimica et Cosmochimica Acta*** (jointly with the Meteoritical Society); grants the **V.M. Goldschmidt, F.W. Clarke** and **Clair C. Patterson Awards**, and, jointly with the European Association of Geochemistry, the **Geochemistry Fellows** title; sponsors the **V.M. Goldschmidt Conference**, held in North American in odd years and elsewhere in even years, jointly with the European Association of Geochemistry; and co-sponsors the Geological Society of America annual meeting and the American Geophysical Union spring meeting. The Society honors the memory of our first President, F. Earl Ingerson, and our first Goldschmidt Medalist, Paul W. Gast, with the **Ingerson** and **Gast Lectures,** held annually at the Geological Society of America Meeting and the V.M. Goldschmidt Conference, respectively. The Geochemical Society is affiliated with the American Association for the Advancement of Science and the International Union of Geological Sciences.

Members of the **Organic Geochemistry Division** are individuals with interests in studies on the origin, nature, geochemical significance, and behavior during diagenesis and catagenesis of naturally occurring organic substances in the Earth, and of extraterrestrial organic matter. GS members may choose to be affiliated with the OGD without any additional dues. The OGD presents the **Alfred E. Treibs Award** for major achievements in organic geochemistry, and **Best Paper** awards (student and professional) in organic geochemistry.

Editor's Corner

Happy New Millennium!

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From President Mike Hochella

Greetings, thanks, and welcome -

As the new Geochemical Society President, it is a pleasure to be writing to you for the first time. Allow me to start by welcoming you to the Geochemical Society of the new century (or the last year of the old century if you want to be technical). I hope that you enjoy a productive and profitable year ahead.

Next, I wish to extend my warmest thanks to Mike Drake, Past-President, Don Elthon, retired Treasurer, and Karl Turekian, retiring *GCA* Executive Editor. These gentlemen worked wisely and diligently for the Society and skillfully guided us through some fairly rough seas. We owe them a great deal for the time that they pulled from the rest of their professional and personal lives to run this ship. In the same breath, allow me to welcome Judith McKenzie of ETH, Zürich, Switzerland, the new Vice-President, Becky Lange of the University of Michigan, Ann Arbor, USA, the new Treasurer, and Frank Podosek of Washington University, St. Louis, USA, the new *GCA* Executive Editor. All three are exceptionally capable and I am excited about what they will bring to the Society in the years to come.

Membership renewals –

If you haven't renewed your membership for 2000, please do so just as soon as possible. These renewals are absolutely critical. Without a reasonably sized paying membership, we have no Society. And why do we need it? *GCA* is better than ever and still by far the leading geochemical journal in the world (and on par with *EPSL* in terms of citation index strength), the quarterly *Geochemical News* has become a respected and sophisticated publication in its own right, the Goldschmidt conferences are exceptional events that have become the envy of several of our sister societies, and the medals that our Society bestows gain in worldwide prestige with every passing year. To do all this, we need a solid and hopefully growing membership base. As such, renewals become the life blood of everything we do. So again, if you haven't already, please renew today.

Membership application/renewal forms can be found within nearly every issue of GCA and *The Geochemical News*, or you can contact the business office directly, which brings me to the next subject . . .

The new GS Business Office –

As you know, the Business Office of the GS has been in Columbus, Ohio, for a number of years under the steady hand of Office Manager and former *GCA* Production Manager Lee Mobley. Lee has decided to move on (see her farewell letter in this GN issue), and the GS Business Office has moved on with our new *GCA* Executive Editor, Frank Podosek, to Washington University in St. Louis (*see p. 4 for the new address*).

The new GS website –

Our internet coordinator, Mark Bloom, has retired, and in his place is our new webmaster, Bob Nichols from Washington University. Bob is in the process of building a new website for the Society, and although it is still under construction, it is functional and already highly useful. The former site is still online, but I recommend that you bookmark the new site and start using it exclusively. The internet address is http://gs.wustl.edu

Upcoming Goldschmidt Conferences –

The Goldschmidt Conferences have become a tremendous international success for both the Geochemical Society and the European Association of Geochemistry. The next Goldschmidt will be held in Oxford, U.K., from September 3 to 8, 2000. Mark the abstract deadline (May 15, 2000) and your calendars now. For questions or inquires, visit the conference website at http://www.campublic.co.uk/science/conference/Gold2000/

Plans are already well underway for Goldschmidt 2001, to be held in Virginia, USA, from May 20 to 24, and Goldschmidt 2002, to be held in Davos, Switzerland, from August 18 to 23. The 2003 meeting has yet to be sited, although we will be glad to review any proposals that you may have, and the GS and EAG are considering holding the 2004 meeting in Japan at the invitation of the Geochemical Society of Japan.

Reviews in Mineralogy and Geochemistry –

Most of you are well acquainted with the exceptionally successful *Reviews in Mineralogy* series, published by the Mineralogical Society of America. Now, after 26 years and several hundreds of thousands of volumes sold, *Reviews in Mineralogy* is coming to a close, to be replaced by *Reviews in Mineralogy and Geochemistry*, a jointly sponsored series of MSA and the GS. This is clearly an extraordinary opportunity for the GS in which we can help provide high quality, low cost research and review books to the communities we serve. Look for the first *RiM&G* volume to appear later this year. If you are interested in organizing a future *RiM&G* volume, contact the GS Series Editor for *RiM&G*, Scott Wood, University of Idaho, USA (swood@iron.mines.uidaho.edu).

Finally –

If you have ideas, observations, complaints, or anything else we might be interested in, I'd be glad to hear from you and will do my best to respond to everyone who writes. My e-mail is hochella@vt.edu. And to all of you, all the best!

Mike

Visit and bookmark the new GS web site
http://gs.wustl.edu

Farewell to a Decade of Association with The Geochemical Society and GCA Authors

In this farewell note I would like to tell you a little about myself and what my association with The Geochemical Society and GCA has meant to me.

My association with The Geochemical Society and GCA began ten years ago at a major transition in my life. I moved to Columbus, Ohio, and was setting out to be the sole supporter of my family. I put aside my educational plans in favor of providing my children with the most contact I could give them while working full-time to support them. I had the good fortune to have apprenticed with an excellent Executive Editor for 5 years prior to my arrival in Columbus and prior to my employment with GCA. Due to the guidance of this Executive Editor in the matters of journal production, editing, and journal fulfillment, I gained valuable skills that were put to good use in the GCA office and The Geochemical Society office.

During this time I became a member of the geochemical community not as a participant in the field but as a spectator enjoying the show. But my role as a spectator was an active one involved with the publishing of the research that is an integral part of the show. I had the opportunity to experience first hand the contributions of the geochemical community to the world. And I thank you all for that opportunity.

I will always remember the connection that Steve Moorbath drew between the subject matter of the first journal that I managed and the subject matter of GCA. I will have to give you the background so that you will appreciate the astuteness of Steve Moorbath's perception.

The first journal I managed was a biblical studies and archaeology journal. No, I am not a biblical scholar or an archaeologist, just as I am not a geochemist. I was hired with no experience in journal production or fulfillment. And why was that? Simply that I could read German and Latin and the Executive Editor happened to be a Luther scholar. And so I began my apprenticeship in journal production and fulfillment. And at the same time I was able to put my major in Classical Languages and German to good use doing library research on Luther.

So with this background you will appreciate Steve Moorbath's chiastic phrase making a connection between the two differing fields: "From the Rock of Ages to the Ages of Rocks." And now I have accepted a job with Highlights for Children, an educational publication for children. So with Moorbathian insight I can follow his phrase "From the Rock of Ages to the Age of Rocks" with the "Cradle Rock Age."

So here's to the connections in our lives and the varied paths we follow. May we meet again and may the road not be too rocky unless, of course, they are great specimens!

Eavon Lee Mobley
Past Production Manager of GCA
Past Business Manager of The Geochemical Society

Letters

Dear Neil:

I have just seen the October issue, with the interview with Keith O'Nions and, on p.25 the photograph of the Oxford University Department of Geology & Mineralogy (as it was then called) in 1972. I would like to draw your attention to an error and some omissions in the caption to the photograph.

1. Front row: the 2nd person from the right is S.W. Richardson, not McKenzie (who was at the *other* place).
2. 6th and 7th from the right are Bell & Vincent.
3. 4th row directly behind David Bell, is Roger Powell.
4. On the left of Hawkesworth as we look is Mike Bickle.

Regards,
Bob Pankhurst

American Low-Temperature Geochemists

A reminder from the National Science Foundation

Life in Extreme Environments (LExEn) call for proposals

The FY00 LExEn Program Announcement can be found at: http://www.nsf.gov/cgi-bin/getpub?nsf0037. The deadline for submittal of proposals to this announcement is April 10, 2000.

More information about the LExEn Program can be found at: http://www.nsf.gov/home/crssprgm/lexen/start.htm.

Please Note: It is anticipated that there will NOT be a LExEn Special Competition in FY2001.

Geochemical Society Business

Please address all inquiries and correspondence concerning memberships, subscriptions, address changes, and charitable contributions to:

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e-mail: office@gs.wustl.edu

Attention Current and Recent Doctoral Students

Ever wonder how your graduate school experience compares to those of others? Curious which department has the best faculty mentoring? The worst career guidance? So are we. The National Association of Graduate-Professional Students (NAGPS) is conducting The National Doctoral Program Survey to examine graduate student satisfaction department-by-department in all academic fields, as funded by a grant from the Alfred P. Sloan Foundation. The survey will compile the experiences of doctoral students, present and past (any time within the last five years) on a department-specific basis, making those data publicly available on the Internet by Fall 2000. Based upon best practices in graduate education, as recommended by the American Association of Universities and the National Research Council, among others, the survey covers a number of issues, including career guidance, TA training and supervision, curriculum flexibility, faculty mentoring, time to degree, department climate, professionalism, and overall satisfaction.

Go to <http://survey.nagps.org/> before June 1, 2000, to complete the survey. A significant percentage of students must respond for the results to represent a broad range of experiences and a realistic picture of department and institutional practices. Encourage all your friends and colleagues to complete the survey by passing the URL on to them. This is your opportunity to open the doors to your department and to praise or pan local practices. Completing the survey only takes a few minutes but can stimulate change in graduate education for years to come.

Call for papers

GEOCHEMICAL TRANSACTIONS

Geochemical Transactions, a new, all-electronic journal is now accepting manuscripts for review. The journal is published by the Royal Society of Chemistry, in collaboration with the Division of Geochemistry of the American Chemical Society, and is devoted to all areas of geochemical research. *Geochemical Transactions* coverage includes the following:

- Organic and inorganic geochemistry, biogeochemistry
- Aquatic and marine chemistry
- Chemical and elemental cycles
- Numeric and computational models of geochemical processes
- Instrumental and analytical techniques

The launch date of the journal is January 2000. All manuscripts should be submitted to the Royal Society of Chemistry and will be reviewed by at least two expert referees. For information on how to submit a manuscript, visit the RSC website:

www.rsc.org/geochem

The editorial board includes:

Editor-in-Chief
Dr. Scott A. Wood, University of Idaho, USA

Associate Editors
Dr. Ken Anderson, Argonne National Laboratory, USA
Dr. William Casey, University of California, Davis, USA
Dr. George Luther, University of Delaware, USA
Dr. Martin Schoonen, SUNY - Stony Brook, USA
Dr. Jack Tossell, University of Maryland, USA
Dr. Heinrich Holland, Harvard University, USA
Dr. Vala Ragnarsdottir, University of Bristol, UK

Advantages of publishing in *Geochemical Transactions* are:
- Rapid publication
- Enhanced presentation of results
- Interactive images
- High refereeing standards
- Fully searchable
- Fully archived
- E-mail alerting services
- Covered in major citation index and abstracting services

The Doings at GCA

As Karl Turekian phrased it, "the baton has now passed" at *Geochimica et Cosmochimica Acta*. There is a new Editor and a new editorial office. Some things have changed, some things haven't, and I will take advantage of this forum to talk about which is which.

Most importantly, fundamental editorial policy has not changed. GCA remains committed to publishing the highest quality and most broadly relevant original research papers in geochemistry and cosmochemistry. The "look" of the final product won't change much either: The printed journal will have the same size, the same quality of paper, the same page format, the same basic layout of the covers, the same shade of orange, etc.

Although the change of editorship formally occurred on January 1, 2000, the actual transition has been more gradual, and is still going on. All manuscripts received at the Yale University editorial office prior to October 1, 1999, will be seen through to final disposition, either publication or rejection, by that office. The Washington University editorial office began receiving manuscripts on October 1, and all manuscripts received at Yale after that date have been forwarded to Washington University. Since it takes a while to filter through the review, revision and production processes, the papers actually appearing in print in the early issues of Volume 64 (calendar year 2000) are mostly those which have passed through the Yale office. Indeed, at the time this is written the Washington University office has yet to accept a regular research Article for publication (although several manuscripts have been returned to authors for revision in response to review, and we will likely have accepted some revised versions by the time this appears in print).

One change you can note just by looking at the front cover of Geochimica is that the Associate Editor system has been reinstituted (for manuscripts processed by the Washington University office). Each manuscript is assigned an Associate Editor (AE), who selects reviewers, evaluates the manuscript on the basis of his/her own scientific assessment as well as the advice of the reviewers, and formulates recommendations regarding acceptance, rejection and revision. The AEs do a lot of work and they are vital to the system. This is a good opportunity for me to thank them for all their efforts, and perhaps the next time you meet an AE (they're listed on the front cover) you might say thanks as well.

Another change, of which many (but evidently not yet most) are now aware, is that we encourage electronic submission of manuscripts. We will continue to accept hardcopy (paper) submissions as long as people send them in, but if you're preparing your manuscripts with an electronic word processor you might as well spare yourself the trouble, expense and time involved in printing the five copies and mailing them to St. Louis. The Washington University editorial office has a website (gca.wustl.edu, with no "www" in front of it) to facilitate electronic submission. This same website also provides information about submission procedures, manuscript requirements, the review process, and so on, as much information as you would want, and likely more, about how it works.

Manuscripts are also "distributed" electronically to AEs and reviewers, via password-protected locations on the editorial office website. When we ask for reviews we give the prospective reviewer a password to access the manuscript. The objective here is to eliminate the transit time involved in mailing manuscripts. We are fully aware that the main reason the review process takes as long as it does is reviewer inertia, not the postal service, but at least we can shave some time off the edges. Some reviewers (and some AEs) don't much like this system, either because they lack good internet access, have trouble navigating through the password protection, or are affronted by the need to print their own hardcopy if they want it. However the clear majority of reviewers (and authors) who offer some comment, however, are in favor of this approach, finding it not only fast but also easy and convenient. The latter group reassures us that we made the right choice in setting up this system; for the former group, who prefer the traditional approach of finding review copies of manuscripts in their mailboxes, we will mail out hardcopy manuscripts on request, for as long as you want it done that way. As with manuscripts, we encourage electronic submission of reviews (via the website) but are also happy to accept reviews by fax or by post.

While on the subject of reviewers, this is a good place to thank many and appeal to the rest. Almost everybody endorses and appreciates the value of the peer review system for evaluation of scientific manuscripts. This means that we need reviewers as well as authors. Many of you have already come through with careful and thoughtful reviews for this office, and many more will do so in the future; on behalf of the scientific community served by *Geochimica*, I'd like to extend sincere thanks for your acceptance and execution of this responsibility. To others I'd like to make an appeal: When you get our e-mail message requesting a review, please read the message and please respond. We hope you will respond affirmatively, of course, but if you can't do it this time, please take the few seconds needed to tell us "no". Perhaps it will break our hearts, but we'll get over it and move on. It is discouraging and burdensome to get no response to a request for review: We don't know whether you're traveling or ill, or whether we have an incorrect or obsolete e-mail address, or whether a review will magically appear a few weeks hence (all of which have happened). If you leave us hanging without a response, yes or no, we have to follow up on it through web searches, phone calls, etc., and considering that in about four months of operation we've made about a thousand requests for review, you can appreciate that getting no response is a major headache.

Our goal for the review cycle is three months from submission to report on results of review. We don't and won't make this goal in every case, but so far we're doing pretty well, even at the cost of a lot of hassling of reviewers (and sometimes AEs) and, in a few cases, abandoning delinquent reviews. We are determined that there will be no cracks through which manuscripts can fall, and we resolve to respond promptly to questions and complaints. Authors can access their reviews on the website and, to help insure that nothing gets lost, authors can also access a calendar which notes significant events in the progress of their manuscript (receipt in the office, assignment of an AE, receipt of reviews, etc.).

As a final note on logistics, the "editorial office" consists presently of three people: Linda Trower, Bob Nichols and me (a fourth person is being sought). Bob has built and maintains the website. Linda is the "main man", who posts manuscripts and most reviews, does most of the correspondence, keeps track of things, and in general provides the glue to keep things together. Both Linda and Bob have come through and delivered well beyond somebody just doing a job, so I am pleased now to publicly thank and congratulate them both for meeting and exceeding even my high expectations.

Frank A. Podosek
Executive Editor, GCA

Announcing

The Gaia Research Center for Biogeology

A global center of excellence

- to study self-regulating Earth through geological time
- to explore the implications of Gaia theory for society

Thirty years ago, when humans set foot on the moon, it was as if we looked into a mirror for the first time. There, against a pitch-dark background with brightly radiating stars, was a mysterious globe in blue-green, yellow and white. What we saw was our home, our unique native country, rotating in majestic solitude through infinite space. More than four-and-a half billion years ago this heavenly body was born from stellar dust and soon thereafter it had come to life. And we, humans? We had barely appeared on the scene and already we threatened to destroy this very ancient, but vulnerable jewel. The pictures of our planet, issued by the Apollo mission in 1969, changed the hearts of billions of people.

This strong impression soon faded away, until inventor James Lovelock captured its essence in a new and imaginative concept for science and the world at large. He named his concept Gaia, after the Greek goddess of Earth. Gaia science is unique in taking at heart the superb organization and self-regulating potential of the Earth. Despite claims to the contrary, Gaia is neither dogma nor belief. It is a genuine top-down systems approach to the living planet, helping us to study the interactions between life and the global environment over the full extent of geological time. We now begin to realize that Gaia science is superior in perspective to any classical discipline, and that it deepens public perception of global change.

In the academic world, with its emphasis on reductionist science, there was and still is little place for Gaia. Therefore, a small group of 20 scientists has decided to team up and use their specialist knowledge to further this theory. They have created an independent platform for free scientific discussion and collaborative research. The Gaia Research Center of Biogeology (GRC) will combine professional excellence with concern for the global environment. GRC is a strictly organized facility and will soon have ramifications all over the world, offering a coherent research strategy and organizational help to its fellows worldwide. GRC adds new relevance to science in particular by exploring the significance of the Gaia concept to the globalization.

Goals

1- To analyze the interactions between living and non-living components of the global system in the perspective of geological time.
2- To build a model of Earth system dynamics with genuine predictive range.
3- To evaluate the long-term effects of human activity.
4- To find a balance between economic prosperity and global sustainable development.
5- To disseminate the view of the Earth as a living system.

Activities

1- To further the cohesion of ongoing research, to formulate novel research strategies and to initiate commensurate research projects.
2- To coordinate comprehensive and converging modeling.
3- To provide a haven for free exchange of ideas for participating scientists

Initial responsibility

The first and prime concern of GRC will be to strengthen the seminal Global Emiliania Modeling Initiative (GEM). This is a 10-year old collaboration of some 100 scientists around the world that may be considered a pioneering stage for the current GRC. The tiny unicellular alga *Emiliania huxleyi* is considered as the major calcium carbonate producing organism in the present ocean. Its elegant calcite scales or coccoliths may be studied by satellite images as they proliferate in huge ocean blooms; coccoliths are a major component of the deep-sea sediments and have a distinct impact on the Earth's climate. The *Emiliania* system is exquisitely suited for Gaia-type research, since it is suited for integrated experimental and modeling studies at the molecular, organismal, ecological and global/geological levels of organization. We consider *Emiliania* as the fruit fly of the ocean, as the models representing this particular system are applicable to all living systems inhabiting the open seas.

Organization

By very selectively inviting fellows and providing them with a platform for free and unimpeded exchange GRC can promote the best of science. Within GRC, fellows and associate fellows perform research, while having their own academic affiliation. A Scientific Council is responsible for selecting fellows and formulating a research strategy. A Managing Board runs the day to day operations. An Advisory Committee assists the Council and Board in policy decisions. GRC endeavors to be a flexible low-cost organization with minimal bureaucracy.

Peter Westbroek, Co-director, P.westbroek@chem.leidenuniv.nl
Jan van Hinte, Co-director
Mark Budding, Managing Director
Rob Nagtzaam, Treasurer

Gaia was established on October 16, 1999 at the Royal Academy of Sciences and Arts in Amsterdam, the Netherlands. More information about Gaia will appear in one of the next issues of *The Geochemical News.*

Goldschmidt 2000:

The foremost geochemical conference in 2000

Goldschmidt 2000 is sponsored by both the European Association of Geochemistry, the Geochemical Society and the University of Oxford. The conference will cover all the most important topics in geochemistry, and a list of symposia already planned is given below. The conference will take place from September 3rd to September 8th, 2000 in Oxford, UK. Goldschmidt 2000 will build on the successes of the conferences in Toulouse in 1998 and Boston in 1999, and will provide a forum for geochemists from across the world to meet and discuss the latest developments in their subject. Further information on this conference will be available at the Goldschmidt 2000 website at

http://www.campublic.co.uk/science/conference/Gold2000/

Oxford is Britain's oldest University and is the beautiful and historic heart of a diverse and ancient city. From the founding of the first Colleges in the thirteenth century, Oxford established itself as a centre of academic excellence. The conference will be based around the Oxford University Museum and delegates to Goldschmidt 2000 will be accommodated in Christchurch, Keble, St Anne's and St. Hugh's Colleges. Oxford is less than an hour from London's Heathrow Airport, and is extremely well served by motorways and rail. It is set in the beautiful Cotswold countryside, and is within easy reach of the Shakespearian theatres of Stratford-upon-Avon.

Important Dates:

February 1	Second announcement, including logistical and registration information
May 1	Deadline for registration at special rates
May 15	Abstract deadline
July 1	Final announcement
September 3-8	Goldschmidt 2000

http://www.campublic.co.uk/
gold2000@campublic.co.uk

Terrestrial Planets and Meteorites
Alex Halliday & Ed Young

Chemistry and Dynamics of the Earth
Bernie Wood & George Helffrich

Subduction Zone Processes
Chris Hawkesworth, Jon Blundy & Dave Rubie

Rapid Climate Change (Continents/Oceans)
Edouard Bard & Frank McDermott

Biological Geochemistry
Derek Lovely, Rob Raiswell & Matthew Collins

Ocean Circulation: Past and Present
Bill Jenkins & Gideon Henderson

Flow and Reaction of Fluids in Crust
Marion Holness & Terry Seward

Weathering and Erosion: Mechanisms and Rate
Mike Bickle, Niels Hovius & Mike Summerfield

Mineral Surfaces and Reactions
Vala Ragnarsdottir & Andrew Putnis

Mantle Dynamics and Melting
Eric Hauri & Tim Elliott

Life in Extreme Environments
Mike Russell & Everett Shock

Computational Geochemistry
Keith Refson & John Brodholt

Chemistry and Microbiology of Pollution
Adrian Bath & Barbara Sherwood-Lollar

ACS Geochemistry Division Medal

The Division of Geochemistry of the American Chemical Society is currently soliciting nominations for the inaugural awarding of the Geochemistry Division Medal. The medal is to be awarded biennially to an individual for outstanding accomplishment in any area of Geochemistry. The award consists of a bronze medallion plus $2000. The awardee will receive an allowance for travel to the award ceremony, as well as registration costs for the ACS meeting at which the award will be conferred. The first award will be presented in conjunction with the celebration of the 20th anniversary of the Division at the 221st ACS National meeting to be held in San Diego, April 1-5, 2001.

Letters of Nomination and supporting material should be sent to Robert H. Byrne by April 30th 2000.

Nominations should include a detailed description of the nominee's outstanding accomplishments, relevant citations and, at the discretion of the nominator, any other supporting information. Letters from individuals other than the primary nominator will also be accepted by the committee. Nominators should confirm, prior to submission of the nomination, that the nominee is willing to be considered for the award.

Additional details of the award can be found at the Divisional web site at: http://membership.acs.org/g/geoc/

Dr Robert H. Byrne
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Second Biennial Geochemical SIMS Workshop

The 2nd Biennial Geochemical SIMS Workshop was held October 22-24, 1999 at Woods Hole Oceanographic Institution, building on the success the first workshop hosted by UCLA at Lake Arrowhead, CA in April, 1997. Sponsored by NSF Division of Earth Sciences (Instrumentation and Facilities Program), these workshops gather scientists from laboratories providing access to the US earth science community in the field of Secondary Ion Mass Spectrometry. They are designed to provide a regular opportunity to this group to highlight recent technical and scientific developments in their laboratories and discuss trends in SIMS-based geochemical research. The workshop included 16 scientific presentations on diverse topics in geochemistry and cosmochemistry. Two recurring themes were new technical developments allowing application of SIMS U-Th-Pb dating techniques to young (1-10Ma) rocks, and technical innovations in the application of SIMS to stable isotope ratio measurement of light elements (H, B, C, O, S).

Graham Layne (WHOI) spoke on the development of Pb isotope measurement in natural glasses and a novel technique for measurement of Th isotopes in young volcanic rocks, both using the IMS 1270 instrument. Nobu Shimizu (WHOI) discussed the application of the Pb isotope technique to melt inclusions and the implications of these data for the interpretation of basalt petrogenesis.

Several presentations were made by staff members of the UCLA IMS1270 Facility. Mark Harrison and Mary Reid discussed new developments in accessory mineral dating (zircon, monazite and allanite), including the dating of young zircons. Steve Mojzsis presented recent work on early life research using $\delta^{13}C$ and $\delta^{34}S$. Kevin McKeegan gave an overview of current applications of new IMS 1270 multi-collection array to problems in geochronology and light stable isotope measurement (particularly $\delta^{18}O$, $\delta^{17}O$ and $\delta^{13}C$).

Members of the Stanford/USGS Micro-Isotopic Analytical Center (SUMAC) also presented new results. Trevor Ireland (Stanford) summarized the design and performance characteristics of the newly installed SHRIMP RG (Reverse Geometry) instrument, and recent results for zircon and monazite geochronology analyses. Harold Persing reviewed technical aspects of installation of a Cs source and electron flood gun on the SHRIMP RG, and Joe Wooden (USGS) discussed geochronological applications of the SHRIMP RG including U-Pb and Th-Pb dating of very young zircons.

Laurie Leshin (ASU) outlined plans for their new IMS 6f instrument and reviewed current applications of the existing IMS 3f instrument. Rick Hervig (ASU) discussed the limits of microbeam mass spectrometry in general, and quantitative means of comparing the effectiveness of SIMS versus LA-ICPMS for a given type of analysis. Erik Hauri (CIW) discussed the application of their IMS 6f to the analysis of volatiles in volcanic materials, in particular, water and δD analysis of melt inclusions. Andrew Davis (U. Chicago) presented his current work on Mo and Zr isotopes in presolar grains and an update of recent technical achievements (with Mike Pellin, ANL) in the area of LA-RIMS and TOF mass spectrometry. Lee Riciputi (ORNL) discussed applications of light isotope (H, O) kinetics to natural and experimental systems to investigate timing and duration of fluid-rock events. Adam Kent (LANL) discussed constraints on the formation temperature of carbonates in Martian meteorite ALH 84001 through diffusion experiments. Vickie Bennett (Australian National University) presented a survey of current developments at ANU including $\delta^{13}C$ (in diamonds), Ni isotopes (in chondrite metals) and measurements of PGE partitioning.

Two instrument manufacturers presented details of their product lines for SIMS. Michel Schuhmacher (Cameca Instruments) described the new NANOSIMS instrument. Andrew Rastawicki and Neale McAlpine (Australian Scientific Instruments) described the newest SHRIMP ion microprobes and new SHRIMP RG.

Further information about many of these SIMS facilities is available through the NSF/EAR/I&F web page (http://www.geo.nsf.gov/ear/if/facil.htm) and links therein to individual web sites.

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A Conversation with Harold Helgeson

*Professor Harold Helgeson of the University of California at Berkeley is a familiar figure to many in the geochemical community. His pioneering efforts in aqueous geochemistry and mass transfer studies have fundamentally changed our understanding of the role of chemistry and its importance in the Earth sciences. He was awarded the Geochemical Society's highest honor, the Goldschmidt Medal, in 1988. Although his name is familiar to those acquainted with the geochemical literature, many of us do not really know Professor Helgeson all that well. Mitch Schulte (*Geochemical News AE*) recently (January 19, 2000) had the pleasure of spending a day with Hal in his office in Berkeley, California. The following represents a portion of their conversation.*

MS: *Hal, for those of us who don't know your background, tell us about yourself. How did you get into geology?*

HH: Well I was born in Minneapolis, Minnesota in 1931, but I grew up and went to school in the St. Anthony Park suburb of St. Paul. As a teenager I worked in the summers as a canoe trip guide in northern Minnesota and southern Ontario. After finishing high school I went to Michigan State University, where I started out as a chemical engineering major, but I didn't really like mechanical drawing and organic chemistry very much. I continued guiding canoe trips along the Canadian border in the summer of my Freshman year at Michigan State, when I ran into a friend who said, "Why don't you take geology? You can be outdoors and have adventure, it's something you can do physically. You don't just sit in an office." And I thought "Wow, this sounds good." So I went back to Michigan State and became a geology major. I graduated in 1953 with a geology degree, and a severe case of what I call the Kit Carson Syndrome; i.e. I wanted to go out and look for gold and diamonds, have adventure, travel around the world, and all that sort of thing.

MS: *You didn't go to graduate school right away, but became a mining geologist.*

HH: Yes, but the Korean War was on. I had enrolled in ROTC at Michigan State which required me to sign up for six years of reserve duty, subject to call up at any time. But they didn't call me up when I graduated, so I headed to Bay Street in Toronto where the Uranium boom was in full swing. I got a job with Technical Mine Consultants, which was headed by Frank Joubin who had recently discovered the Blind River uranium deposits. Frank had a right-hand man named Harry Buckles, who said "We'll hire you and send you to Blind River" I said "No, I don't want to go there. That's too close, I want to go up into the far north." He said "How about Uranium City?" And I looked at the map and said "Ok, that looks pretty good." It's on the North Shore of Lake Athabasca. So the next thing I knew I was looking after a diamond drill crew and mapping claims. Of course that was my first real encounter with Canadian black flies, which swarm out of the muskeg up there and attack you by the thousands every time you take a step. I wintered up there that winter.

MS: *You spent the winter there?*

HH: Yes, diamond drilling off the ice. The temperature got down to 80 below zero. You really can't move much at that temperature, the exertion causes you to bring air into your lungs too rapidly, which freezes your lungs. So you have to move in slow motion. I was staking some claims with a crew of lumberjacks just before Christmas 1953. One of the lumberjacks cut his thumb off. Of course it's all in the dark, you don't get much daylight during the winter. So I asked him where his thumb was and he said "It's out there somewhere." I said, "Well, come on, we've got to find your thumb." So we went out with flashlights and by some quirk, one of the lumberjacks actually did find the thumb at the scene of the accident. So I got the thumb back, stuck it on the stump, taped it all up, radioed in for a ski plane to get him to the hospital. We went along to celebrate Christmas in Uranium City. The surgeon saved his thumb. I was then sent out to another claim group alone. I was logging core; it was pretty cold, my radio went out and I was running out of food. I had been there for about four months, and the spring breakup was in progress. Nobody could come in with an airplane to get me. When they were finally able to land a sea plane on the lake it brought a letter from the President of the United States, "Greetings…." And soon I was on my way to San Antonio to become a Lieutenant in the U.S. Air Force.

MS: *What year was that?*

HH: 1954. We had our choice of what schools we wanted to go to. For example, you could be an air controller. That was very popular because that school was in Florida. Instead you could be an intelligence officer, which was also popular because that school was in Denver. Then there were other schools in Rapid City, South Dakota, and places like that. Nobody wanted to go to South Dakota. Everyone put down air controller first, and intelligence officer second. I got into the second category, so I was sent to Lowry Air Force Base in Denver. I spent eight months there, climbing mountains, tramping through the old mining camps, and studying photo-radar intelligence. The ratio of single women to single men in Denver was pretty high. I had a great time. At the end of the course I graduated with what seemed to be a thousand other second lieutenants. We were told we could request the theater of command we wanted to go to. Of course, no one wanted to go to Pork Chop Hill, so we all chose Europe. As it turned out, only three of us were sent to Europe, and I was one of the three! Nearly all of the remainder went to Rapid City, South Dakota, and a few went to Japan. So the next thing I knew, I was on an air transport bound for Wiesbaden Germany. I was assigned to the 497th Recon Tech Squadron in Schierstein am Rhein, on the outskirts of Wiesbaden. My job was to target airfields in Eastern Europe which was classified Top Secret. So we couldn't talk about it when we left the squadron, and we couldn't do any work on it other than when we were there in the squadron. So it was kind of either you were doing it or you're not doing it. There was nothing left to do in the evening or weekends but have a good time and travel around Europe.

MS: *Sounds like a great gig!*

HH: That went on for I guess about a year. I met my wife to be, Velda, there. She was an American school teacher from California. We talked about what to do when my tour of active duty was over. I didn't really know but, I thought, "Well, maybe I'll be a jet jockey," so I applied to pilot school. And a month or two before I was to muster out, they told me that I had been accepted. I thought about that for a while. About that time, one of my pilot friends crashed and burned. He used to patrol the Mediterranean. It was kind of a milk run, and there wasn't much going on, so it was boring for the pilots. No one knows exactly how he bought it, but it was probably pilot error. So I thought, "Maybe I shouldn't be a jet pilot." Besides, I didn't feel that military life was really my kind of style. I started writing some letters.

MS: *I'm actually kind of surprised you put up with it for as long as you did.*

HH: [Laughs] I had to serve two years active duty. So I wrote to the Secretary of the GSA. I didn't know him, I just said "I'm over here in the Air Force, I'm going to be mustered out in Germany, and I'd like to go somewhere in South Africa and get a job in the diamond mines." I'd always wanted to do that. It happened that he knew Paul Kerr at Columbia University. Paul Kerr was a friend of Arnold Waters, who was the Chief Geologist for the Anglo American Corporation in South Africa. They own De Beers. Kerr talked with Waters who visited him shortly after that. Subsequently Waters wrote to offer me a job as a mining and exploration geologist in the diamond mines at the mouth of the Orange River in Southwest Africa. The salary was $225 a month, but there were 55 days of vacation every year that could be accrued. So Velda and I got married in Basel, Switzerland, and a few days later we were on a ship out of Southampton England, bound for Cape Town. That was our honeymoon. It was the spring of '56. We took a train to Johannesburg and met with Arnold Waters. He was very ebullient. I liked him immediately. So the next thing I knew, we were back on the train headed back down toward Cape Town. Then we turned around and took another train and went all the way back up to Southwest Africa. We ended up on a little narrow gauge train to Luderitz, and finally by jeep to Oranjemund, the De Beers town at the mouth of the Orange River. The trip took seven days. It was hot, really hot! There were about 5,000 Caucasians living in this town called Oranjemund. And of course there were large dormitories for the Bantu natives. We had a little house and everything was done in a very British way. The mine captains had better houses than the shift bosses, who had better houses than the miners. But they didn't quite know what to do with geologists. Anyway, for three months they put me in the garage to learn how to take apart and put together Land Rovers and then they put me in the diamond trenches to learn how to look for diamonds.

MS: *These were placer deposits?*

HH: Yes, very rich placer deposits. The other challenge I had was to learn Afrikaans, because if you're going to deal with the miners you have to speak Afrikaans. So it was taking apart vehicles, withstanding sandstorms in the diamond trenches, learning Afrikaans, and then at the end of the month, I was responsible for accounting for all of the diamonds taken from my trenches. So I had to weigh them. It was quite an experience the first time I did it. You have a heap of diamonds on the counter, which you can run your fingers through. It was amusing. Finally I was assigned with another geologist named Brian Thornley and a crew of about 20 Ovambo natives to go out on diamond exploration safaris in and around the Fish River Canyon in Southwest Africa. We had an Austin 4 x 4 truck and a Land Rover. We looked for diamond pipes by working our way up intermittent stream valleys. This usually required some real acrobatics from the vehicles. At one point we decided that we couldn't really use the vehicles for one stretch of the canyon. The Fish River was full of vehicular obstacles, including quicksand. So we bought some donkeys in Karasburg, and loaded every thing up on the donkeys for a three-week safari up the Fish River canyon. It was hot as hell. We didn't realize it but donkeys are more than reluctant to cross water and we had to ford the river repeatedly. The first morning we started to try to get them to cross the river, but they just put their feet down and all of us together couldn't push, pull, or beg or beat them into submission. By six o'clock that night we had moved exactly 5 feet. The next day we finally developed a technique that worked. I fired my rifle behind the donkeys, and that got them to choose the right thing to do. I did this for about a year, a string of six-week to two-month safaris, X-rayed from head to toe each time we left, which was company policy to prevent diamond theft. I didn't see my wife very often. During that year, my son, Chris, was born. I just managed to get back by chance to Oranjemund before he arrived in the world. This set me to thinking that maybe this kind of adventure wasn't perhaps the best thing I could do with my life. So finally I decided to ask for a

Hal heads into the bush again. Uranium City, Canada. 1953.

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transfer to the Witwatersand where I subsequently spent two years as an underground mining geologist on the President Steyn gold mine in Welkom. That was followed by a transfer to the Nkana copper mine in Kitwe, in what was then called Northern Rhodesia, just south of the Belgian Congo. It was all a challenge, exacerbated by untrustworthy hanging walls, methane explosions, racial and nationalistic friction underground, incredible heat and humidity, and underground fires and floods in the Witwatersrand, and the added threat of dysentery and malaria while carrying out geochemical surveys in the valley of the Zambeze.

MS: *Sounds great.*

HH: Right, so I started writing letters...again. I applied to three universities for graduate school. It was the only way I could think of to get out of my life in a hole in the ground.

MS: *How long were you in the mines altogether?*

HH: This was then 1959, so about three and a half years. Then I received news that Harvard and Stanford had accepted me as a prospective graduate student, but Berkeley turned me down. So that summer, (it would be winter in North America,) we set sail on a ship from Durban to San Francisco. We stopped in Singapore, Hong Kong, Japan, and finally sailed through the Golden Gate in March of 1959. I promptly enrolled at Stanford.

MS: *Spring quarter of 1959?*

HH: Right. Almost immediately I realized that I had forgotten a lot of geology. I had been in the mines and knew a lot about mining and exploration geology, but everything else was rusty. I hadn't looked down a microscope for a long time, but I nevertheless enrolled in Compton's petrography course. I had a tough time at Stanford, kind of culture shock. My son Chris was two years old and I ran out of money. So I wrote Frank Joubin, who I had worked for before, and he hired me to go up to British Columbia and Alaska to map and sample old gold mines. It was rough work, but I made $1500 that summer, part of which I used to buy a second hand car, packed up my family and drove across the country to Harvard.

MS: *Did you go to Harvard to work with someone in particular?*

HH: Yes, Hugh McKinstry, I had read his mining geology book in Africa.. I took all of McKinstry's courses the first year I was at Harvard. But my wife had a miscarriage, and I decided I had to withdraw from graduate school because I didn't have enough money to continue under the circumstances. I went in to talk to McKinstry and told him that I was planning to leave. He said "I think you should sit down here a minute and let me talk to you a little more about this." He pulled out his checkbook and said, "How much money do you need?" I said "Well, right now I think I can get by on $500 until I get another loan." He wrote out a check for $1,000 and he said "Pay me when you can," which I did. He was incredibly kind and generous. My fellow graduate students at Harvard included Bob Berner, Gene Simmons, Rob Roy, Bruce Hanshaw, Lew Gustafson, Dave Waldbaum, Robin Brett, Biff Reed, Jack Phillips, Jack Schmitt, and many others that went on to distinguish themselves in later years. We learned from each other and from Hugh McKinstry, Jim Thompson, Bob Garrels, Francis Birch, Cliff Frondel, Connie Hurlbut, Bernie Kummel, Ray Siever, Marland Billings, and postdoctoral fellows like Ulrich Petersen, Peter Howard, and Moto Sato. It was stimulating, challenging, a lot of fun, and a great time of my life.

But then unfortunately Hugh McKinstry was diagnosed with cancer, and he very rapidly deteriorated and died. It was really tragic. And so then I turned to Bob Garrels. Bob said "Well, what do you want to do?" and I said I wanted to do something significant in geochemistry. "Well," he said, "have you ever measured anything?" and I said "No, I don't want to measure the solubility of sphalerite or something like that. That's not going to really address the issue. I want to know how ore deposits form. How hydrothermal systems work." "Ok," he said. "Then you'll have to learn a lot about physical chemistry." And I said "Well, I'm not going to take physical chemistry because all they talk about are refrigerators and Carnot cycles— things like that. I'm not interested in heat pumps." He said, "Well, then you can't take my course if you don't take physical chemistry!" I said "Ok, then I won't take your course. But can I audit your course?" He finally gave up and said yes. And so the very first time he talked about anything in class that remotely involved physical chemistry, my hand was up, asking what it was. He said, "You see, if you had taken physical chemisry, you would know!" He finally said "Look, since you're so stubborn about this I'll come in on Saturday morning every week and teach you physical chemistry." I said "Thanks, that's a great idea!" So every Saturday morning for a year, Bob would come in and dedicate his time to teaching me all about physical chemistry.

MS: *No heat engines or refrigerators?*

HH: No heat engines, no Carnot cycles. I had a book or several books on solution chemistry, like Robinson and Stokes that he assigned me to read and I would ask him to explain things when I was stuck. Bob would patiently help me. That was an enormous gesture on his part. He was an incredibly generous person.

MS: *He must have seen something in you.*

HH: I guess so. Although we became fast friends in the process, I didn't stop calling him Dr. Garrels until I left Harvard. By this time I had run a huge debt. So I finished my thesis and left Harvard in 1962. The U.S. Geological Survey offered me a job to work with Julian Hemley, but the money wasn't enough. Shell Oil Company offered me a job as a research chemist down in Houston with a salary I really needed. I would have liked to have gone to work with Julian but I couldn't do it. I worked for Shell for about 3 years. My daughter Kim was born while I was there. Half of the time I was in Southern California working on the Salton Sea geothermal wells. And then at one point, Bob called me and said he had decided to leave Harvard and go to Northwestern and asked if I would like to go with him as an assistant professor. I had never even thought of teaching, but the prospect of being once again with Bob was too much to resist, so I said "Sure, I'll come!" So the next thing you know, we piled everything into this old car in Houston, Texas and drove up to Chicago. That was 1965. Fortunately, Fred McKenzie came there at that time as a postdoc. The three of us were very close and did many things together, including lunch and research. At that time Bob started working on mass transfer. He had a notion that he could see-saw his way up a reaction path along phase boundaries in activity dia-

Bob Garrels and Hal at Northwestern University, 1968.

grams. He always used a slide rule. He wouldn't use anything to calculate other than a slide rule, though at that time computers were available. But to put it into some perspective, my thesis at Harvard was the first thesis in the geology department that was done using a computer, and they didn't have a computer at Harvard. They had an IBM 704 at MIT that I learned to use. So computers were just beginning to take hold. By the time I got to Northwestern I was used to the IBM 7094 and was still very interested in trying to understand quantitatively hydrothermal ore deposits. I was looking for ways to devise equations of state that would allow me to calculate all the thermodynamic properties of aqueous species and minerals in order to minimize the Gibbs function. I turned to chemistry thinking I was going to find everything I needed in the chemical literature and rapidly became aware that such was not the case. Chemists were still using van't Hoff plots and straight lines. So I set off on what turned out to be about a 20 year research effort. There wasn't much in the way of experimental data and there weren't many equations of state that one could adapt, so I pretty well had to start from scratch. Bob subsequently left Northwestern and went to Scripps. In 1970 Chuck Meyer called me and asked me if I'd like to come to Berkeley and I said sure. I've been here ever since.

MS: *How did you get into doing mass transfer research?*

HH: Well, I worked the mass transfer equations out at Northwestern because Bob had the original idea. He said "Why don't you come to Bermuda and think about this problem?" Every summer he'd go to the Bermuda Biological Station with Fred. And that was really nice. Bermuda is a great place. I was supposed to think about how to calculate mass transfer. But I didn't really understand it very well so I had to go back to scratch and start working on equations. But it slowly became clear how to proceed, and I was lucky to have some great students around me, including Tom Brown, Andy Nigrini, Dick Beane, Bob Leeper, Bill James, and Tom Jones. We were really excited, because they were young guys and I was reasonably young at the time, so we had the energy necessary to make a difference. It finally dawned on me that it was really a problem in matrix algebra. We then generated matrix overlays representing the differential equations for conservation of mass, local equilibrium states, activity coefficients, solid solutions, etc. From then on it was a matter of programming. The graduate students did the programming. We had a lot of good times. So by the time I came to Berkeley, I was back on trying to get equations of state that would return thermodynamic properties of aqueous species. There were of course the conductance data that Franck had published, but there were just too many holes. So I hired David Kirkham as a research assistant, and we decided we were going to have to start with H2O. One of the breakthroughs was made by Jim Ellis in New Zealand, who published a couple of papers back in the 60s. He used an asymptotic type of limit to describe some partial molar volumes of some salts and that set me to thinking about the idea of breaking it into an electrostatic and non electrostatic term. The whole concept of electrostriction was well entrenched in the literature as being dependent on the electrostatic permittivity of the solution. From there we developed equations of state for aqueous species in general. And this involved my students, notably John Walther, John Tanger, and Everett Shock. In addition, many of my other graduate students, research assistants, and postdoctoral fellows, as well as visiting scientists in my laboratory contributed to the development and application of the equations of state to unravel various geochemical processes. These include Joan Delany, Dennis Bird, Per Aagaard, George Flowers, Connie Frisch, Bill McKenzie, Carol Bruton, Terri Bowers, Ken Jackson, Bill Murphy, Eric Oelkers, Barbara Ransom, Jan Amend, David Kirkham, Annette Knox, Christine Owens, Gil Alfonso, Jim Wood, Wayne Nesbitt, Franco D'Amore, Luigi Marini, Peter Lichtner, Sergio Gurrieri, Vitallii Pokrovskii, Laurent Richard, Hans Rudi Pfieffer, Denis Norton, Dimitri Sverjensky, and Jim Johnson. The goal was to understand and use effectively high temperature solution chemistry to interpret and decipher the causes and consequences of geochemical processes like metasomatism and ore deposition. Eventually we reached the point where we felt that we had the aqueous phase reasonably well characterized, but not the thermodynamics of minerals. That led to the mineral paper in 1978.

MS: *Why did you get into doing the organic material?*

HH: I'm not sure when this happened. It was before Everett was my graduate student. Let's see, when did Everett leave?

MS: *1987.*

HH: So this must have been probably around 1980, I'm not sure. But into my office walked this rather rotund guy with a beard and he said "Helgeson, what are you doing about the origin of life?" And I said "Nothing. Who are you? What are you doing here?" He said "I'm Hyman Hartman." He was at the time associated with someone at Berkeley, I think in biochemistry, I don't remember exactly. So Hyman sat down and started explaining to me that the raging thought at that time was that clay minerals were the keys to the origin of life, and presumably we know something about clays. So we talked and I said "Well, what kind of thermodynamic data do we have for biochemical molecules?" He said "We don't have very much." He turned me on to the literature, which I soon realized was sparse and confined to 25° and 1 bar. The origins of life became more and more interesting to me. We went to the Gordon Conference on the origins of life and met people like Carl Woese and Sherwood Chang, who insisted at the time that thermodynamics had ²absolutely nothing to do with the origins of life². I understand he has since recounted that assertion.

Everett Shock became a graduate student in my laboratory about that time and our paper on the thermodynamics of aqueous organic species at elevated temperatures and pressures was

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published in 1990. As time progressed, I became more intimately aware and interested in microbial life associated with black smokers. I became intrigued with the fact that microbes could function at these extreme temperatures. I have visited Sicily frequently over the years and have many friends there, including Marco Leone, Mariano Valenza, Sergio Gurrieri, Mario Nuccio, and Franco Italiano, all of whom I came to know through my friendship with the late great Marcello Carapezza. As a consequence I knew well Karl Stetter's collecting localities on the island of Vulcano. So I arranged with the Sicilians to take some samples there and see if we couldn't understand a little bit more about the environment of these hyperthermophilic microbes. So we went to Vulcano in the summers of 1991 and 1992 to collect samples of the spring waters and sediment, measured the pH and so forth. On the way we stopped and met Stetter in Regensburg and the concept of the biochemical/microbial-geochemical interface slowly gelled in my mind. As a result, I became more and more interested in what I call biomolecular geochemistry, which led to our thermodynamic studies of biomolecules at high temperature. Many fundamental questions need to be answered like what stabilizes the biomolecules that make up the cell? And of course, perhaps the most important of these are enzymes. So I became extremely interested in protein chemistry and I began to look through the biochemical literature to see what I could find about the thermodynamic behavior of these molecules. It was very similar to the situation back in the 60s when I started looking for information in the literature on the thermodynamics of inorganic aqueous species. Not much to be found. Thermodynamics is not a first consideration for most biochemists. But I finally found papers by Privalov, Makhatadze, and their colleagues. Privalov dedicated his life to measuring with calorimeters the heat capacities of unfolding of proteins. Nevertheless, of the many thousands of proteins that are functioning as enzymes in the human body, we only have calorimetric data for relatively few, maybe 30 or so.

MS: *And all those data are at 25° or 37°?*

HH: No, Privalov measured them over various temperature ranges. Privalov and George Makhatadze and the other people that have been his students and worked with him both in Russia and since he came to this country really generated high quality data which could be fit to equations of state. I thought why not take an equation of state that works pretty well for inorganic species, and as we've already demonstrated for relatively simple organic molecules, and try to see if we couldn't use it to represent protein unfolding? And I've been working on it ever since. We're now reaching the point where we'll publish it soon. The notion is that we can take the same equations of state and, using group additivity principles, obtain parameters for biomolecules. First we considered the amino acids, which was part of Jan Amend's thesis. Our paper on unfolded proteins will be published I think in a few months in Biophysical Chemistry. We then turned to the folded protein and put the entire unfolding process into the context of classical solution chemistry. We're interested now in trying to predict what is it that stabilizes a protein at hyperthermophilic temperatures, like 113°. On the other side of the coin, what about cold denaturation? Psychrophiles are becoming more and more interesting, geologically. Psychrophiles can exist at very low temperatures, much below freezing. So we're studying cold denaturation, trying to take our equations of state down into the refrigerated region where we can make some predictions about whether or not a given enzyme will or will not function under extremely cold conditions. We hope to collaborate in this research with Jody Deming. Now I have a new graduate student, Doug LaRowe, whom you know very well. We are in the process of applying the same approach to DNA in both single strand and double helix forms to understand the thermodynamics of DNA melting. Then we hope to take on RNA and explore the thermodynamics of the genetic coding by DNA of protein sequences, which connects to the protein unfolding work we are doing.

MS: *So do you think this is the future of geochemistry, that it becomes more biologically oriented?*

HH: I think it's very clear that there's a growing biological component. The more we become aware of microbial activity in geochemical systems, the more likely it becomes that the microbiological world in nature is much greater than is generally thought to be the case. John Baross is of the opinion that the deep biosphere is huge and extensive, and I think we're coming to realize that wherever there is energy, an open system, nutrients, and carbon, there's life. That doesn't mean the entire mantle is full of

Nancy, France, August 25, 1974. Left to right: Phil Orville, Hugh Taylor, Hal, Mimi (Bernard Poty's secretary), Desmond McConnell, and Hans Rudi Pfeiffer.

life, but certainly wherever these hydrothermal systems are, there probably is life. And certainly it shouldn't be confined only to the upper mantle under the oceans. It's probably also true in deep sedimentary basins. As you know, Laurent Richard, Leigh Price, and Bill McKenzie are working with me to characterize thermodynamically the generation and maturation of crude oil and kerogen in these basins, which may well be microbially mediated. So, I think that we're on the verge of a very exciting time in biogeochemistry, which goes far beyond exploring mineral surfaces as substrates for microbes in surficial environments. I think biogeochemistry will ultimately be a huge and incredibly exciting discipline that will bridge many disciplines, including biotechnology and medicinal chemistry.

MS: *So this is why you've proposed that we start a new society?*

HH: Yes, I think we need a new society. Or at least we need some kind of a grouping within an existing society. That's why I proposed in Denver that we form an International Biogeochemical Society, which, as you know, we did. We don't have a lot of members yet, but....

MS: *In fact, I think I'm the first and only one.* [Note: Anyone interested in the newly formed International Biogeochemical Society, or IBGS, should contact Doug LaRowe by e-mail at larowe@uclink4.berkeley.edu]

HH: Yes, so far we have mostly officers.

MS: *Well, you have to start somewhere. What do you foresee for the society?*

HH: I think right now, biogeochemists are kind of diluted out. It's hard to communicate. Biogeochemical papers are not generally presented in a coherent fashion that would bring people who are interested in this subject together often enough. I think we need to communicate more. We need probably a journal in this area. We need to establish referees in this area. We need to recognize that it's not just a branch of mineralogy or not just a branch of other disciplines that now exist, but is in fact a much broader and substantial discipline than is generally recognized. Geomicrobiology is a term that is used, I guess, but again geomicrobiology is fairly broad and hard to define. It seems to me that it would be a perfectly good term to use in the context of biogeochemistry, but it isn't biogeochemistry.

MS: *Let's move on to perhaps some more philosophical topics. You've mentioned a lot of your students and postdocs. How important is it to you to have trained good scientists?*

HH: Oh, incredibly important. I mean, that's what it's all about. That's why you do it. I use an apprentice system of teaching, so I work intimately with all of my students and have ever since I began. I'm very proud of them. I think they've gone on in many cases to make important contributions. Without students, I don't think any of my academic career would have gone the way it has.

MS: *What do you think is your greatest contribution to geochemistry, geology and science?*

HH: Well, I like to think that I've carried on Bob Garrels' traditions and vision, that I helped to contribute along the lines that he pioneered. I have tried to build a framework that we can all operate in to better understand the geochemical phenomena that we're interested in. I feel that all I've really done is carry on what Bob started. He went different directions at different times, but overall the philosophy that he had is the one that I've tried to continue and communicate to my students.

MS: *You mentioned that the reason you got into biogeochemistry was because of an interest in the origin of life.*

HH: Well, that's what started it, but I don't work directly on the origins of life now because I don't want to compete with my students who are working in that field. There are so many interesting things to do that I have chosen and am primarily concerned with proteins, DNA, RNA, etc. I think it's a field that deserves a lot of attention on the part of geochemists and biogeochemists. We have many geochemists with laboratories that are lying idle because they can't get funds to support the kind of high temperature studies they used to do. We have a lot of talent out there, of people who know how to do hydrothermal experiments and we have relatively few experimental data for biomolecules. I imagine there is an understandable reluctance on the part of geochemists to learn the necessary biochemistry and biology to do such experiments, but I don't think that really needs to be a problem. If you look at the amount of experimental work that's been done, for example on DNA, from a thermodynamic point of view, it's limited to pioneering studies by Bresslauer, Turner, and Santa Lucia. There's a huge area of potential experimental study that could be done to great advantage. And it would benefit not only our community in the context of microbial life, but also the biochemical community. And I think we could contribute there, considerably.

MS: *Do all geochemists need to go out and learn biology?*

HH: I think that the degree to which we require the biosciences in our curricula is a debatable issue. I certainly would say that broad courses in biogeochemistry that would require some biochemistry as prerequisites would be perfectly appropriate for geology or Earth science departments in the future. I think that geomicrobiology is another course that would be very appropriate, to take all the information available from microbiologists about life at high and low temperature and learn from it. However, there is a problem here. Although the microbiologists that have studied hyperthermophiles have done an outstanding job of figuring out clever ways to enrich their cultures and grow isolates, they generally select a particular genus and species, and then find an ingenious way to grow it up by supplying all kinds of nutrients and energy sources that are not necessarily available in the natural environment. They then get a large population of a particular microbe and determine the optimal and maximal growth temperatures and various other details about it. But at the same time, they don't connect it with the natural system from which the microbe came, nor are they equipped to understand these systems. That's where we come in. So it seems to me that it's up to us to learn their discipline because I don't think they are going to learn ours! And it's up to us to try to understand in the context of where they live, what these microbes do, and what they've done throughout geologic history. I mean, after all, 99 percent of the phylogenetic tree is invisible to the human eye. I think that biogeochemists have major contributions to make. But it has to start in our uni-

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versities; they have to generate appropriate courses, and we all have to encourage students to take the courses and to become literate in these interdisciplinary areas.

MS: *Well, two of your former students, Everett and Jan, who are both at Washington University, are doing exactly the kind of thing you're describing.*

HH: That's right. I'm very proud of them. Among other things, they are working on communities of hyperthermophiles. Just as humans have difficulty living and working in isolation, so too do microbes. Communities are important to the entire biochemical process. However, with the notable exception of John Baross, communities of extremophiles are rarely studied as such, perhaps because they're so difficult to study.

MS: *I've often thought that maybe the microbes are culturing us.*

HH: In some ways you could say that. Without them, we couldn't be here and we're at their mercy all the time, so in a way they are our keepers.

MS: *On a more personal note, how long do you plan on working?*

HH: I plan on working as long as my health holds up and the granting agencies continue to support my research. Those are the two key factors, but it would be nice to have a continuing supply of good students.

MS: *It is interesting that you keep accepting students at this point. A lot of people would perhaps be reluctant to get too deeply into a new subject or have to go through training a new student again, but you seem to enjoy that.*

HH: Well, I learn from my students, right? I give them challenges that are usually in areas they know little about at the time, and they come back with information and ideas. We educate each other. That's how we keep it exciting. Something different every day.

MS: *What do you do for fun?*

HH: I do three things now. I play with my daughter, Broghan, who's 11. We play catch and go to the Giants baseball games. I love skiing and sailing. Brogie, France (my wife) and I ski a lot at Northstar in the winter and Brogie and I sail on San Francisco Bay in the summer. I've had my sailboat on the Bay since 1974, a Catalina 27'.

MS: *I've never been on your boat.*

HH: Well, we'll correct that. I recently moved it to South Beach Harbor in San Francisco. So it's only about a mile or two from where I'm living, because I live in the city now. We'll take you sailing this summer!

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The Geochemical Society (Co)Sponsors Sessions at the Spring Meeting of the AGU in Washington, D. C., May 28-June 3, 2000

Electronic Abstract Deadline March 9, 2000
http://www.agu.org

GS01 ***Accessory Minerals: The Current State of Knowledge from Isotopes, Experiments, and Trace Elements (Joint with MSA, V)***
Convener: John M. Hanchar, Geology, The George Washington University, Tel: 202-994-4336, E-mail: jhanch@gwu.edu

GS02 ***Astrobiology Biosignatures (Joint with B, MSA, PS)***
Convener: William W. (Bill) Barker, Geology and Geophysics UW-Madison, barker@geology.wisc.edu, 608-262-3738

GS03 ***Biological-Chemical Interactions in Hydrothermal Systems***
Conveners: Jay A. Brandes, Marine Sciences Institute, The University of Texas at Austin, 750 Channel View Drive, Port Aransas, Texas 78373, Phone: +1-361-749-6756, Fax: +1-361-749-6777, E-mail: brandes@utmsi.utexas.edu; and John A. Baross, Dept. of Oceanography, The University of Washington, Seattle, WA 98125, E-mail: jbaross@u.washington.edu

U05 ***Global Carbon Cycle (Joint with A, B, OS, GS)***
Conveners**:** Jorge Sarmiento, Princeton University, E-mail: jls@splash.Princeton.edu; Steve Wofsy, Harvard University, E-mail: scw@sol.harvard.edu; and Eric Sundquist, U.S Geological Survey, E-mail: esundqui@nobska.er.usgs.gov

B08 ***Ocean Carbon Cycle (Joint with OS, A)***
Conveners: Jim Orr and Ray Najjar

B16 ***Evolutionary Implications of a "Snowball Earth" (Joint with A, GP, GS)***
Conveners: Chris Scotese and Rob Van der Voo

H02 ***Fate of Agricultural Nitrate in Drainage Basins (Joint with B, GS)***
Conveners**:** J.K. Bohlke, USGS, Reston, VA (definite); Patricia Glibert, Horn Point Environmental Lab, University of MD; and Mary Voytek, USGS, Reston, VA

M01 ***Mineral Physics and Chemistry: Symposium in Honor of William A. Bassett (Joint with GS, T V, MRP, SEDI)***
Conveners: Ho-Kwang (David) Mao, Geophysical Laboratory and Center for High Pressure Research, Carnegie Institution of Washington, 5251 Broad Branch Road, NW, Washington, DC 20015-1305, Phone (202)686-4454 or (202)686-2410 ext 2467 (voice mail), Home phone (703)273-8076, Fax (202)686-2419, Email mao@gl.ciw.edu; and Russell Hemley, hemley@gl.ciw.edu, Geophysical Laboratory and Center for High Pressure Research, Carnegie Institution of Washington, 5251 Broad Branch Road, NW, Washington, DC 20015-1305

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Meeting Report: Progress in Chemical Oceanography (PICO) III

About 50 delegates from various European countries gathered in Plymouth in September 1999 for the third Progress in Chemical Oceanography meeting. PICO III was organized by researchers from the University of Plymouth and from Plymouth Marine Laboratory. The meeting was sponsored by The Challenger Society for Marine Science, the Centre for Coastal and Marine Sciences in Plymouth and the AstraZeneca Brixham Environmental Laboratory. Prizes for best posters and best talks by a post-graduate student registered for a PhD were awarded to Mrs Tracey Jones-Hughes, Mr. Andrew Bowie, Ms Virginia Hart and Mr Adnan Al-Aziz. The atmosphere was informal and most of the participants also signed up for the social event, which was an evening cruise on the Tamar River.

The oral presentations were divided into five sessions: carbon chemistry, organic micropollutants, cycling and inputs of nutrients, trace metal processes in oceans and coastal seas and trace metal processes in estuaries.

The organic micropollutant session was in a sense dominated by the offshore oil industry. During oil production and drilling, large volumes of brine, called produced waters, are discharged into the ocean or stored in pits on land. These produced waters usually contain heavy metals and radionuclides, including naturally occurring radium-226, barite, which is part of the drilling mud, and often carbonates and a variety of other substances. Oil platforms in the northern part of the North Sea discharge approximately 40,000 cubic meters produced water per day, at temperatures between 50 and 90°C. The fate and effects of these discharges are still largely unknown.

This topic is part of the ongoing marine chemistry research at the University of Plymouth and in particular of the program on Managing Impacts on the Marine Environment (MIME), which aims to evaluate the fate of metals and petrogenic compounds discharged as a result of oilfield production. The findings will later be incorporated into a numerical model for the prediction of contaminant dispersion from oil platforms in the Northern North Sea.

The discharge of produced water has also raised some concern in other countries. In the United States, notably but not only the Hazardous Substance Research Centers (HSRC) and the USGS Produced Waters Project research this issue. For comparison, in early 1993, the discharge of brine into the Galveston Bay system in Texas was estimated to be 137,000 barrels per day (Texas Railroad Commission, 1993).

Part of the research presented in Plymouth focuses on the sorption behavior of compounds like toluene, PAHs, nonylphenol, sodium dodecyl sulphonate and polar corrosion inhibitors. All of these are present in North Sea production waters and waters from the Thistle and Magnus platforms are used for this work. A preliminary result so far is the finding, that phenanthrene, a-naphtol and nonylphenol show an increased affinity for the particles present in the produced waters from the Thistle platform, when these waters enter the cooler marine environment. This is probably at least partly a temperature effect. This effect is less obvious in cooler waters from the Magnus platform. The particles from both platforms have diameters between 100 and 300 nm and are composed of mainly Fe, Si and Ca. The produced waters have salinities of 32, DOC contents of about 90mg per liter and a dissolved oxygen saturation of less than 2%. One finding of the ongoing research was that particles from drilling operations, such as barite, get dispersed over surprisingly large areas.

Take a look at the web site for a more complete picture of the PICO III meeting:
http://www.science.plymouth.ac.uk/DEPARTMENTs/Environmental/marchem/picohom.htm

Brixham Environmental Laboratory can be found at http://www.zeneca.com/brixham/

PICO III certainly was a very fruitful meeting and we're all looking forward to PICO IV.

Susan Holley, Southampton Oceanography Centre
Angelina Souren, Armadillo Research Services

Susan Holley (l) and Joyce Boyd (r), both from the Southampton Oceanography Centre, attended PICO III.

Boron Isotope Measurements Intercomparison

The Istituto di Geocronologia e Geochimica Isotopica (IGGI), Pisa, Italy, on behalf of, and in collaboration with, the International Atomic Energy Agency (IAEA), Vienna, Austria, is organizing an intercomparison exercise of boron isotope measurements. All laboratories and institutes having analytical capabilities for boron isotopes are invited to take part in the exercise.

The following intercomparison materials, which cover adequately the natural range of boron isotopic composition, have been prepared for distribution:

B-1	Mediterranean Sea Water (Ligurian Sea)
B-2	Groundwater, alluvial aquifer, Cecina R. lower basin (Tuscany)

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M02 ***Mineral Surface Chemistry and the Origin of Life***
(Joint with GS)

Conveners**:** Joakim Bebie and Timothy Filley, Geophysical Labloratory, Carnegie Institution of Washington, 5251 Broad Branch Road, Washington, DC 20015, Phone 1-202-686 2410, extension 2478, Fax 1-202-686 2419

M03 ***Advances in Mineral Structure Analysis***
(Joint with GS, V)

Conveners: Jeffrey E. Post, Dept. of Mineral Sciences, Smithsonian Institution, Washington, DC 20560-0119, Phone: (202) 357-4009, FAX: (202) 357-2476, email: post.jeffrey@nmnh.si.edu; and Peter J. Heaney, 309 Deike Building, Dept. of Geosciences, Penn State University, University Park, PA 16802, Tel: (814) 865-6821, Fax: (814) 863-7823, heaney@geosc.psu.edu

OS04 ***Holocene to Modern Carbon Dioxide Sources and Sinks***
(Joint with A, B, GS, H)

Conveners: Eric Sundquist, U.S. Geological Survey, Woods Hole, MA; and A. Indermuehle, University of Bern.

V01 ***Volatiles in Magmas: The Current Perspective***
(Joint with GS, MSA)

Conveners: Youxue Zhang, Department of Geological Sciences, The University of Michigan, Ann Arbor, MI 48109-1063, USA; Tel. 1-734-763-0947; Fax 1-734-763-4690; e-mail: youxue@umich.edu; and Donald B. Dingwell, Bayerisches Geoinstitut, Universitaet Bayreuth, D-95440 Bayreuth, Germany; phone: +49 921 55 3708; fax: +49 921 55 3769; e.mail: don.dingwell@uni-bayreuth.de

V02 ***Towards an Understanding of the Kerguelen Plateau-Broken Ridge and Ontong Java Plateau***
(Joint with GS, T)

Conveners: Fred Frey, Department of Earth, Atmospheric and Planetary Sciences, MIT, Cambridge, MA 02139; tel: 617-253-2818; FAX: 617-253-7102; e-mail: fafrey@MIT.EDU; Dominic Weis (dweis@ulb.ac.be); Paul Wallace (Paul_Wallace@odp.tamu.edu); and Michael Coffin (mikec@utig.ig.utexas.edu)

V04 ***Recent Advances in Re-Os Geochemistry***
(Joint with GS, OS)

Conveners: Harry Becker, Department of Geology, University of Maryland, College Park, MD, 20742; Phone: (301) 405-0084; Fax: (301) 314-9661; e-mail: hbecker@geol.umd.edu; John T. Chesley, Dept. of Geosciences, Gould-Simpson Building # 77 , University of Arizona , Tucson AZ 85721; Phone: 520 621 9639; Fax: 520 621 2672; e-mail: jchesley@geo.Arizona.EDU

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B-3	Groundwater, alluvial aquifer, Cecina R. upper basin (Tuscany)
B-4	Tourmaline, Elba Island (Tuscan Archipelago)
B-5	Basalt, Etna Volcano (Sicily), eruption July '98
B-6	Obsidian, Lipari Island (Eolian Archipelago)
B-7	Miocene Marine limestone (Abruzzi)
B-8	Pliocene Clay (Tuscany)

Those wishing to take part in the intercomparison exercise are kindly requested to contact Dr. Sonia Tonarini of IGGI (E-mail S.Tonarini@iggi.pi.cnr.it). The results obtained should be sent to Mr. Manfred Gröning, International Atomic Energy Agency, Division of Physical and Chemical Sciences, P.O. Box 100, 1400 Vienna, Austria (E-mail: M.Groening@iaea.org). IGGI will take part in the exercise under the same conditions as others.

The isotopic results should be expressed in terms of isotopic ratio $^{11}B/^{10}B$ and $\delta^{11}B$ ‰ vs. the reference material NBS-SRM 951 (boric acid) distributed by NIST (National Institute for Standards and Technology, US Department of Commerce, Gaithersburg, Maryland 20899, USA), with $^{11}B/^{10}B = 4.04362 \pm 0.00137$ (Catanzaro et al., 1970). This reference material is normally available in all laboratories performing boron isotope measurements. The results should be submitted by October 2000. Afterwards, a draft report with the individual data and their statistical elaboration will be prepared, which will be distributed to the participating laboratories for comments before preparing the final version. The report and the results will be further discussed in meetings organized by IAEA at regular intervals on reference samples and intercalibration of isotopic measurements in geochemistry and hydrology. The portions of unused samples will become available at IAEA for future distribution and intercalibration purposes.

Sonia Tonarini
Giorgio Ferrara
Roberto Gonfiantini
Maddalena Pennisi

Istituto di Geocronologia e Geochimica Isotopica del CNR, Area di Ricerca di Pisa – Loc. San Cataldo, I-56010 Ghezzano (Pisa), Italy

Phone +39-050-588276; Fax +39-050-588360; E-mail S.Tonarini@iggi.pi.cnr.it

Reference:

E.J. Catanzaro, C.E. Champion, E.L. Garner, G. Malinenko, K.M. Sappenfield, K.M. Shields, 1970: Boric acid: isotopic and assay standard reference materials.. US Nat. Bur. Standards, Spec. Publ. 260-17, 70 pp.

Goldschmidt 2000, Oxford, U. K.
September 3-8, 2000
http://www.campublic.co.uk/science/conference/Gold2000

Meetings Calendar

March 14-17, 2000: II Latin American Sedimentological Congress and VIII Argentinian Meeting of Sedimentology, Mar del Plata, Argentina. Web Site: http://cig.museo.unlp.edu.ar/congreso/

March 26-31, 2000: Organic Solids in Petroleum Production, ACS Spring Meeting, Geochemistry Divisision Symposium, San Francisco, CA, USA. Contact: Dr. B.Artur Stankiewicz, Shell E&P Tech Co., 3737 Bellaire Blvd., Houston, TX 77025, USA; E-mail: artur@shellus.com. Dr. Erik Tegelaar, Baseline Resolution, Inc., 2000 Avenue G, Suite 810, Plano, TX 75074, USA; E-mail: ETegelaar@brilabs.com. Web Site: http://www.acs.org/meetings/future/newsanfran.htm.

March 26-31, 2000: The Integration of Organic Geochemistry and PVT Studies in Petroleum Exploration and Production, ACS Spring Meeting, GeochemistryDivision Symposium, San Francisco, CA, USA. Contact: Dr. Gordon Macleod, Shell E&P Tech Co., 3737 Bellaire Blvd., Houston, TX 77025, USA; E-mail: gmac@shellus.com. Dr. Peter Meulbroek, Woods Hole Oceanographic Institute, 360 Woods Hole Rd, MS#4, Woods Hole, MA 02543, USA; E-mail: pmeulbroek@whoi.edu . website: http://www.acs.org/meetings/future/newsanfran.htm

April 16-19, 2000: Eighth International Symposium on Experimental Mineralogy, Petrology and Geochemistry (EMPG VIII), Bergamo, Italy; Web Site: http://imiucca.csi.unimi.it/~spoli/empg.html

April 24-28, 2000: Morphology and dynamics of crystal surfaces in complex molecular systems (Symposium M), Materials Research Society, San Francisco, CA. Abstract Deadline Nov. 1, 1999 (online). Contact: J. DeYoreo, L-487, Department of Chemistry and Materials Science, Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, CA 94551; Phone: (925) 423-4240; FAX: (925) 423-9242; E-mail: deyoreo1@llnl.gov. Web Site: http://www.mrs.org/

April 24 -29, 2000: 5th International Symposium on Environmental Geochemistry, University of Cape Town, South Africa. Pre- and post-conference technical tours available. Abstract deadline 30th September 1999. Registration and other details on the web site: http://www.uct.ac.za/depts/geolsci/menviro/main.html

April 25-29, 2000: Millennium Conference of the European Geophysical Society on Earth, Planetary and Solar System Sciences, 25th General Assembly, Nice, France. http://www.copernicus.org/EGS/egsga/nice00/nice00.htm

May 7-11, 2000: Salt Symposium, The Netherlands Congress Centre, The Hague,The Netherlands. Contact: Secretariat Organizing Committee 8th World Salt Symposium, P.O. Box 25, NL-7550 GC Hengelo (Overijssel), The Netherlands; Phone: +31 74 244 3908; Fax: +31 74 244 272; E-mail:Salt.2000@inter.NL.net. Web Site: http://www.salt2000.nl/

May 8-11, 2000: 2nd International Conference on Applications of Stable Isotope Techniques to Ecological Studies, Braunschweig, Germany. Dr. Anette Giesemann, Institute of Agroecology, Federal Agricultural Research Centre, Bundesallee 50, D-38116 Braunschweig Tel.:++49 531/596-217; FAX: ++49 531/596-366; e-mail: anette.giesemann@fal.de; http://www.pe.shuttle.de/slater/anette

May 15, 2000: Geology and ore deposits 2000: the great basin and beyond - AGeological Society of Nevada Symposium, Reno/Sparks, Nevada, USA. Co-sponsored by: Nevada Bureau of Mines and Geology, U.S. Geological Survey, Society of Economic Geologists and The Association of Exploration Geochemists. Deadline abstract drafts: October, 1999. Contact: GSN Symposium Editor, P.O. Box 12021, Reno, NV 89510-2021, USA. Tel: +1 775 323-3500; Fax: +1 775 323-3599; E-mail: gsnsymp@unr.edu; Web Site: http://www.gsnv.org/symp2000.htm

May 15-20, 2000: 2nd EMU School and Symposium on Environmental Mineralogy, Eötvös University, Budapest, Hungary. Contact: EMU Secretariat, Department of Mineralogy, Eötvös University Múzeum krt. 4/A, H-1088 Budapest, Hungary: Fax: +36 1 266 4992; E-mail: emu@ulixes.geobio.elte.hu. Web Site: http://ulixes.geobio.elte.hu/emu.htm

May 17-20, 2000: EMAS 2000: Electron probe microanalysis today, Trest (Czech Republic). Contact: EMAS 2000 Secretariat, Dr. Karel Masek, Matematicko-fyzikalni fakulta UK, V Holesovickach 2, CZ-180 00 Praha 8,
Czech Republic. E-mail: EMAS2000@mbox.troja.mff.cuni.cz. Web site: http://www.mff.cuni.cz/eng/news/emas2000/

May 21-24, 2000: Biogenic Iron Minerals, Kastély and Park Hotels, Tihany, Lake Balaton (Hungary). Contact: Mihalý Pósfai, e-mail posfaim@almos.vein.hu: Web Site: http://www.vein.hu/conference/bim/

May 23, 2000: Tracers and Modelling in Contaminant Hydrology, Liège/Luik, Belgium. E-mail: adassarg@lgih.ulg.ac.be

May 24-28, 2000: Meteorite Impacts in Precambrian Shields, Lappajarvi, Finland. Abstract deadline: March 15, 2000. Contacts: Dr. Lauri J. Pesonen; Geological Survey of Finland; P.O. Box 96, FIN-02151 Espoo, Finland; Phone: +358-205 50 2269/+358-40-5015533; Fax: +358-205 50 12; Email: Lauri.Pesonen@gsf.fi; and Dr. Martti Lehtinen; Geological Museum; P.O.Box 11, FIN 00014; University of Helsinki, Finland; Phone: +358-9-19123424; Fax: +358-9-19123466; Email: Martti.Lehtinen@helsinki.fi; Web Site: http://psri.open.ac.uk/esf

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May 27-June 1, 2000: Mineral Surface Reactivity, San Feliu de Guixols, Spain. Euroconference on The Interaction of Mineral Surfaces with Organic and Inorganic Species in Aqueous Solution: Experiment and Theory. Deadline: March 1, 2000. Andrew Putnis and Martin Dove, Conveners. Web site --- http://www.esf.org/euresco.

May 28 - June 10, 2000: World Geothermal Congress 2000, Kyushu - Tohoku, Japan. Contact: Secretariat of WGC2000, c/o New Energy and Industrial Technology Development Organization, 3-1-1 Higashi-Ikebukuro, Toshima-ku, Tokyo 170-6028, Japan. Phone: +81-3-3987-5793: Fax: +81-3-3987-5796: E-Mail: info@wgc.or.jp. Registration Office of WGC2000, c/o International Communications Specialists, Inc., Sabo Kaikan-bekkan, 2-7-4 Hirakawa-cho, Chiyoda-ku, Tokyo 102-8646, Japan. Phone: +81-3-3263-6474; Fax : +81-3-3263-7077; E-Mail: wgc2000@ics-inc.co.jp. Web site: http://www.wgc.or.jp/

May 29-June 2, 2000: GeoCanada 2000, Calgary, Alberta, Canada. http://www.geocanada.com

May 30-June 3, 2000: AGU Spring Meeting, Washington, D.C., U.S.A. Sponsor: AGU. Contact: AGU Meetings Department, 2000 Florida Avenue, NW, Washington, DC 20009 USA. Tel: +1-202-462-6900; Fax: +1-202-328-0566; E-mail: meetings@kosmos.agu.org; Web Site: http://www.agu.org/meetings

June 6-8, 2000: Groundwater 2000 - International Conference on Groundwater Research, Copenhagen, Denmark. Aquifer properties, governing processes, and fate of organic compounds, redox processes in contaminated and pristine aquifers, groundwater protection and remediation technology. Contact: E-mail: gw2000@isva.dtu.dk. Web sites: http://www.isva.dtu.dk/grc/gw2000) and http://www.vandressource.dk/gvc-dk.htm

June 9-23, 2000: International Glaciological Society, Fairbanks, Alaska, U.S.A. Contact: International Glaciological Society, Lensfield Road, Cambridge, CB2 1ER U.K. Tel: + 44 1223 355974; Fax: +44 1223 336543. Web site: http://www.gi.alaska.edu/seaicesymposium/

June 21-24, June 2000: GREEN3, 3rd International Symposium on Geotechnics Related to the European Environment, Federal Inst. for Materials Research and Testing (BAM), Berlin, Germany; Contact: Dr. Paul H. McMahon, Civil and Environmental Engineering Subject Group, Faculty of Technology, Bolton Institute, Deane Road, Bolton BL3 5AB; E-mail: pm4@bolton.ac.uk; Web Sites: http://www.acs.bolton.ac.uk/~pm4 and http://www.technology.bolton.ac.uk/civils/

June 26-30, 2000: Mineralogical Museums in the 21st Century – International Symposium on the History of Mineralogy, Mineralogical Museums, gemology, Crystal Chemistry, and Classification of Minerals, St. Petersburg, Russia. Contact: Galina F. Anastasenko, Vladimir G. Krivovichev, Faculty of Geology, St. Petersburg University, Universitetskaya Emb. 7/9, St. Petersburg 199034, Russia. Tel: +7 812 328 9481: E-mail: dept@mineral.geol.pu.ru.

July 1-6, 2000: Isotope Workshop V, Krakow, Poland. European Society for Isotope Research. Contact: Dr. P. Wachniew, University of Mining and Metallurgy, Michiewicza 30, 30-059 Krakow, Poland. Tel. +48-12-617-29-66; Fax. +48-12-634-00-10; E-mail: VIW@ftj.agh.edu.pl; Web site: http://www.ftj.agh.edu.pl/~viw

July 3-7, 2000: 15th Australian Geological Convention, University of Technology, Sydney, Australia. Contact: 15th AGC Convention Manager, PO Box 236, Roseville NSW 2069, Australia. Tel: +61 2 9411 4666; Fax: + 61 2 9411 4243. Web site: http://www.science.uts.edu.au/agc/agchome.html

July 5-7, 2000: BOGS 2000, British Organic Geochemical Society, Bristol, U.K. http://www.chm.bris.ac.uk/bogs

July 9-12, 2000: Catastrophic Events and Mass Extinctions: Impacts and Beyond, Institute of Geochemistry, University of Vienna, Austria. Co-sponsored by the Lunar and Planetary Institute, ESF-IMPACT Programme, Austrian Federal Ministry of Science and Transport, Geological Survey of Austria, Vienna Convention Bureau, City of Vienna. Web Site: http://cass.jsc.nasa.gov/meetings/impact2000/

July 10-14, 2000: Symposium on the Role of Erosion and Sediment Transport in Nutrient and Contaminant Transfer, University of Waterloo — Waterloo, Ontario, Canada. International Association of Hydrological Sciences. Web Site: http://www.fes.uwaterloo.ca/Research/IAHS2000/

July 11-12, 2000: 1st International Professional Geology Conference,Universidad de Alicante, Spain. Web Site: http://www.ua.es/sri/1IPGC.htm

July 12-14, 2000: GEOFLUIDS III ´2000. Third international conference on fluid evolution, migration and interaction in sedimentary basins and orogenic belts, Barcelona, Spain. Abstract deadline: November 15, 1999. Contact: Geofluids III, Institut de Ciències de la Terra, C/ Lluis Solé I Sabarís s/n, 08028, Barcelona, Spain. Tel: +34 93 409 5410; Fax: +34 93 411 0012: E-mail: geofluids@natura.geo.ub.es; Web Site: http://www.ub.es/geoquimi/geofluids.ht

July 18-22, 2000: International Association of Volcanology and Chemistry of the Earth (IAVCEI) General Assembly 2000, Bandung, INDONESIA. Abstract Deadline: February 29, 2000. Sponsor: IAVCEI. Contact: Secretariat, Volcanological Survey of Indonesia, Jalan Diponegoro 57, Bandung 40122, INDONESIA. Tel: +1-62-22-772606; Fax: +1-62-22-702761; E-mail: iavcei@vsi.dpe.go.id; Web Site: http://www.vsi.dpe.go.id/iavcei.html

July 24-28, 2000: 10th International Meeting of the International Humic Substances Society, Toulouse, France. Information : PROGEP - Florence FOUCAUD, "IHSS 10", 18 chemin de la Loge, 31078 Toulouse Cedex 4 (France), Tel : 33 (0)5 62 25 23 80 - Fax : 33 (0)5 62 25 23 18, <Progep@ensigct.fr>. Eric Lichtfouse <Eric.Lichtfouse@ensaia.inpl-nancy.fr>

July 25-28, 2000: Joint Sixth International Symposium on Hydrothermal Reactions (ISHR) & Fourth International Conference on Solvo-Thermal Reactions (ICSTR), Kochi, Japan. Abstract deadline: Feb. 20, 2000. Contact: K. YANAGISAWA, Joint ISHR & ICSTR, Res. Lab. Hydrothermal Chem., Faculty of Science, Kochi University, Kochi 780-8520, Japan. FAX:+81-88-844-8362 TEL:+81-88-844-8352; e-mail:shr@cc.kochi-u.ac.jp

Aug. 6-17, 2000: 31st International Geological Congress, Rio de Janeiro, BRAZIL. Sponsors: International Union of Geological Sciences (IUGS), Brazilian Geological Society, The Brazilian Ministry of Mines and Energy, others. Abstract Deadline: September 1, 1999. Contact: Secretariat Bureau, 31st International Geological Congress. Av. Pasteur, 404, Anexo 31 IGC, Urca, Rio de Janeiro, RJ, CEP 22.290-240, Brazil. Tel: +1 55 21 295 5847; Fax: +1 55 21 295 8094; E-mail: 31igc@31igc.org.br

August 30-Sept. 3, 2000: GEOANALYSIS 2000, 4th International Conference on the Analysis of Geological andEnvironmental Materials. Pont à Mousson, Lorraine, France. http://crpg.crpg.cnrs-nancy.fr/NEWS/Geoanalysis-2000/

Sept. 3-8, 2000: Goldschmidt 2000, Oxford, UK. Sponsors: Geochemical Society, European Association for Geochemistry, The University of Oxford. Contact: P. Beattie, Cambridge Publications, Publications House, PO Box 27, Cambridge UK CB1 4GL. Tel: +44 -1223 -333438; Fax: +44- 1223-333438; E-mail: Gold2000@campublic.co.uk; Web Site: www.campublic.co.uk/science/conference/Gold2000/

Nov. 13-16, 2000: GSA Annual Meeting, Reno, NV USA. Contact: GSA Meetings, Box 9140, Boulder, Colo. 80301-9140. Tel: +1-303-447-2020, ext. 164; Fax: +1-303-447-1133; Web Site: http://www.geosociety.org/meetings/index.htm

Dec. 15-19, 2000: AGU Fall Meeting, San Francisco, Calif., U.S.A. Sponsor: AGU. Contact: AGU Meetings Department, 2000 Florida Avenue, NW, Washington, DC 20009 USA. Tel: +1-202-462-6900; Fax: +1-202-328-0566; E-mail: meetins@kosmos.agu.org; Web Site: http:/www.agu.org/meetings

May 20-24, 2001: Goldschmidt 2001, Roanoke, VA, USA. Contacts: Mike Hochella (hochella@vt.edu) and Bob Bodnar (bubbles@vt.edu), Department of Geological Sciences, Virginia Tech, Blacksburg, VA 24061-0420.

June 10-15, 2001: 10th Water-Rock Interaction Symposium, Tanka Village Congress Centre, Villasimius, Sardinia, Italy. Organized by the University of Cagliari in cooperation with the Working Group on Water-Rock Interaction of the International Association of Geochemistry and Cosmochemistry. Contact: WRI-10 Scientific Committee Secretariat (Prof. L. Fanfani, secretary general), Department of Earth Sciences, University of Cagliari, Via Trentino 51, I-09127 Cagliari, Italy; Phone.: +39 070 6757724; Fax: +39 070 282236; E-mail: wri10@unica.it. Web Site: http://www.unica.it/wri10/

August 19-24, 2001: Gordon Conference on Inorganic Geochemistry, Proctor Academy, New Hampshire. The theme will be the formation, modification and preservation of ore deposits, with a focus on geochemical processes related to tectonic, climatic, and surficial factors. Attendance will be limited; subsidies for students are anticipated. Convened by Jean Cline, Jeff Hedenquist and John Thompson. Contact Jeff Hedenquist, gordongeochem@aol.com.

Sept. 17 - 21, 2001: 7th International Conference on Paleoceanography (ICP7), Sapporo, Japan. Abstract Deadline: March 10, 2001 Co-Conveners: Hisatake Okada (Dept. of Earth and Planetary Sciences, Graduate School of Science, Hokkaido University, Sapporo, 060-0810, Japan. Phone: 81-11-706-3537. Fax: 81-11-746-0394. E-mail: oka@cosmos.sci.hokudai.ac.jp), Itaru Koizumi, and Tadamichi Oba

Nov. 5-8, 2001: GSA Annual Meeting, Boston, MA USA. Contact: GSA Meetings, Box 9140, Boulder, Colo. 80301-9140. Tel: +1-303-447-2020, ext. 164; Fax: +1-303-447-1133; WWW: http://www.geosociety.org/meetings/index.htm

Sept. 9-13, 2002: Mineralogy for the new millenium (IMA 2002), 18th General Meeting of the International Mineralogical Association, Edinburgh, United Kingdom. Contact: Mr K. Murphy, Executive Secretary, Mineralogical Society of Great Britain and Ireland, 41 Queen's Gate, London SW7 5HR, United Kingdom: Phone: +44 171 584 7516; E-mail: IMA@minersoc.demon.co.uk.

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