2009

# GSA Medals & Awards

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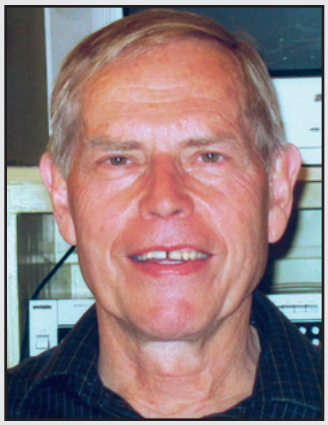
# PENROSE MEDAL

## Presented to B. Clark Burchfiel



B. Clark Burchfiel
*Massachusetts Institute of Technology*

### *Citation by Gregory A. Davis*

It is my pleasure and honor to compose this citation for the Society's 2009 Penrose medalist, Burrell Clark Burchfiel of the Massachusetts of Technology, my friend of 50 years. Our early careers in the Earth Sciences were closely intertwined with joint research on Cordilleran tectonics, but despite following his scientific accomplishments since then, I was "blown away" as I read, for the first time, Clark's remarkable CV. It documents his lifetime of contributions to our science, and in the word's of R.A.F. Penrose Jr. his "eminent research in pure geology" and his collective achievements in advancing the science of tectonics. Why was I so surprised to learn the enormous totality of Clark's scientific and professional contributions to the earth sciences? Because he does his research, writes his papers, guides his students, and serves this Society and others without fanfare or personal self-aggrandizement. He is truly an admirable man.

The Penrose Medal was intended to encourage and to recognize original work in pure geology. In Clark's case, this work is in continental tectonics. It is not unusual for tectonicists, in the broadest sense, to receive past Penrose Medals. The list in just the last two decades illustrates the wisdom of past Penrose committees with awardees like Hamilton and Dickinson, Dewey and Crowell, Oliver and Ernst, and, most recently, Burk and Thompson. Clark, in my opinion, stands equally tall amongst them, but differs from most in a fundamental way.

For five decades the foundation of his tectonics studies has been field mapping and field-related research — on the slopes of Everest, the deserts of the US Southwest, the Appalachian forests, the Scandinavian Caledonian arctic, the Carpathians, the ethnically-conflicted Balkan states, and the Tibetan Plateau and its transitional margins. At the ripe young age of 74 his fieldwork continues, most currently in Greece. I know of no earth scientist who has walked and climbed across more of the Earth, measured its outcrops, mapped its structures, sited GPS stations to measure its strains, and then sat down to write up his discoveries. Many of us "field types" use our fieldwork as an excuse for not writing large numbers of papers — an excuse Clark has never found appropriate. He has published some 180 papers, half of them as senior or first author. This is a remarkable legacy.

Clark's internationalism has landed him positions on editorial boards of publications from Norway, Turkey, Switzerland, China, and the US. Mention of this service is not in itself Penrose support material, because the medal is not awarded for administration or service. It is, however, meant to be a measure of the scientific impacts that Clark's research has had on different continental regions. For example, in recognition of his pioneering work in Tibet and China, beginning in the early '80s he was made a Foreign Member of the Chinese Academy of Sciences (one of only two American geologists so honored).

Specific scientific contributions? To list only a few among many that have influenced our understanding of continental tectonics: the recognition of the pull-apart origin of Death Valley (1966); early studies on the Appalachian Brevard zone (1967); recognition of the US Cordilleran orogen as being tectonically two-sided and the first plate tectonics interpretation of it (1968 and 1972, respectively, both with this writer); the geology of Romania (1974 and 1976); modes of extensional tectonics (1982, with his student Brian Wernicke); north-south extension within the convergent Himalayan region and a dazzling explanation for the Cordilleran Antler Orogeny (1985 and 1991, respectively, and both with Leigh Royden); the tectonic evolution of the US Cordillera (1992, Burchfiel et al); tectonics of the Longmen Shan (1995, with others; when the disastrous Wenchuan earthquake struck the region in May, 2008, Clark's pioneering work in the region supplied the geological and geophysical framework for understanding this tragic event); mid-crustal strain-partioning in the Norwegian Caledonides (1996, with C. J. Northrup); and various multi-authored GPS-related papers on the crustal flow of Tibet (ca 1995 to the present).

The latter example introduces another facet of Burchfielian tectonics. I have emphasized his years of superb fieldwork, but Clark is not one-dimensional in his scientific practice. He uses whatever evolving techniques and technologies in geodetics, geophysics, geochemistry, and tectonic modeling he can find to augment his field studies. He was the first earth scientist to see the importance of establishing a GPS network along the eastern and northeastern margins of Tibet. As such, he mentored a cadre of Chinese earth scientists in funding and setting up the network that has led to strikingly new theories about the rheology of the Tibetan thickened crust and its response to continent-continent collision.

My final words celebrate the scientific/academic extension of Clark's remarkable contributions and abilities through his graduate students. Teaching is also not a criterion for the awarding of a Penrose grant, but recognition of the consequences of his advisement of 85 students, first at Rice University and then at MIT, might be! Imagine the collective advances of continental tectonics through the work of his students — 50 of them doctoral – some of whom may one day themselves qualify for a Penrose Medal. The list is impressively long and includes many whom have become professors and have passed on to their students Clark's foundations of civility, science and scientific methodology.

In closing, Clark Burchfiel, is profoundly worthy of Penrose Medal recognition for his "eminent research in pure geology and for his outstanding original contributions and achievements" that have marked decades-long major advances in our understanding of continental tectonics. His impact on the earth sciences has been genuinely enormous!

### *Response by B. Clark Burchfiel*

**"A Time for Gratitude and Reflection"**
*from Gold Medal Lecture Series*

I want to thank Greg for his wonderful citation. He and I have been close friends and colleagues for more than 50 years, and our fieldwork together in the Cordillera has been some of the most pleasant memories that I have in my scientific career.

GSA has been my societal scientific home for nearly half a century, and it was perhaps the most rewarding experience in my career to learn that I was awarded the Penrose Medal. It makes one reflect as to how this was possible, because my academic career certainly did not have a sterling beginning. In high school the only things of importance were surfing and athletics, and I got through my classes in unspectacular fashion. Everyone was amazed when I was accepted at Stanford, although on a football scholarship, where my first two years were also less than spectacular as I had to take bonehead English 4 times before I passed.

As I look back, it was the Stanford undergraduate education that changed my thinking and started me on my career trajectory. Introductory geology courses were well taught with a touch of humor and on the field trips I found that geology took me outdoors where I could climb mountains at the same time as doing science. In the last two years at Stanford my whole life changed to one in which academics along with field studies became my major interest. Mentoring by faculty was very important. Si Muller took the time to select a field area to study even before I had taken the field geology course, and he visited Bill Travers and me on several weekends in Coalinga, California. More importantly, I still recall when Hubert Schenck, my masters thesis advisor, asked me what would I do after my Masters degree. I said I would go into the oil business, an interest I had having worked on drilling rigs for Shell Oil Company for 4 summers while at Stanford. He said, "No, you are going to Yale to study for a PhD with John Rodgers". Looking at my less than sterling early academic record, I didn't think that was possible. What I didn't know was that Schenck had been an army general in WWII and Rodgers worked for him during the reconstruction of Japan's mineral resource base. I still believe, but no one admits it, that there was some pulling of rank that got me to Yale.

A second major change in my interests and motivation was at Yale. John Rodgers, a Penrose medalist (1981), introduced me in his courses to the geology of the world and instilled in me that you had to look carefully at the rocks from the outcrop to regional scale to unravel geological history. John often said he was a poor teacher, but nothing could be further from the truth as he taught by example and it changed my interests to field-based tectonics and regional geology. I had the great fortune to have for one year, Professor S. W. Carey as my major professor while John was on sabbitical leave. Even though Professor Carey was a proponent of earth expansion, he had a global view and continued my introduction to regional tectonics and inspired even greater interest in global geology

Upon graduating from Yale with my PhD in 1961, I faced a job market that is not unlike today. I had one job offer from an oil company, where my early interests lay, and one from Rice University. Because of my change in interests during my graduate studies at Yale, I chose the position at Rice University, hired by Carey Croneis, a geologist, but also one of the most wonderful administrators I have ever worked for. Rice was a wonderful school and a great place to begin an academic career where I received significant support for my field studies from the University (very early NSF days).

In my second year at Rice (1962) I was accepted to go on the first NSF-sponsored AGI Foreign Field Conference that was to the Alps. The six weeks trip into the Alps was conducted by several giants of geology, Rudi Trumpy, Augusto Gansser and Heili Badoux , whose explanations of the geology showed how detailed field study by several generations of geologists could unravel the finer details of mountain building processes. It was my first foreign trip, as it also was for my citationist Greg, and we were both inspired by the excitement of seeing how detailed geological understanding can be used to interpret the geology of orogenesis. Trumpy and I became good friends and every summer for about a decade following the field conference, he invited me to return to Switzerland when he visited students in the field so I could learn more about the Alps. But I wanted to work there, and in l967-68 I received a Guggenheim Fellowship for one-year study at the University of Belgrade to study the Dinarides in then Yugoslavia. It was during the early l960's that I was inspired to not only climb the mountains to do geology, but when you got to their summits to reflect on what you had studied, but also to see what was on the other side of the mountain. It showed me the way to future study and I still use this as a metaphor for a guide to future research. Looking east from the mountains of the Swiss Alps I could see the wonderful geology of the Alpine system stretching as far as I could see and beyond into SE Asia. That year in the Dinarides allowed me to study one of the most poorly known segments of the Alpine chain and also to read extensively on all of the eastern European part of the chain. From l968 to today I have not been able to stay away from it and have worked in the Carpathians, Dinaride-Hellenides and Turkish parts of the orogen. This gave me the opportunity to not only work on some fantastic geology, but to work with a host of wonderful geoscientists.

Looking on the other side of the mountain in 1968 led me to arctic Scandinavia because my students in metamorphic geology needed to have a place to work where the rocks were well exposed, after two of my first students labored in the forests of the southern Appalachians. I was blessed with an outstanding group of graduate students over a 25-year period to complete a cross section of the northern Caledonides. Although we did not realize it in the beginning, it became apparent that here was a deep level of an orogen exposing the subduction boundary down-dip for 200 km across the orogen, one that has possible analogs to the deep structure beneath the modern Himalaya.

While research in Eastern Europe and Scandinavia were in progress I was invited in l976 by Frank Press to join the Department of Earth and Planetary Sciences (now the Department of Earth, Atmospheric and Planetary Sciences) at MIT. This was another boost to my career to join a larger and more multidisciplinary group of scientists. This opened the doors to a wider range of interaction in many different areas of Earth Science research. I have often said that the department at MIT is a place I could never leave because of the stimulating multidisciplinary research and cooperation that is possible and, I would add, in a very friendly environment. The work in Eastern Europe and Scandinavia continued and in l980, I had the opportunity to see on the other side of the mountain in China, where Peter Molnar opened the door for me. I had the opportunity to begin a wholly new series of studies that have lasted to today. Peter introduced me to Quaternary Geology and Neotectonics as a part of geology that is more that just the dirt that covers real bedrock. China offered the opportunity to work on geology that has many aspects different and on a much larger scale from the Alpine system of Europe and Turkey. For nearly 30 years, Chengdu and Beijing have been a home away from home from which I could select field projects that I considered of regional and global significance. From Beijing, in cooperation with Deng Xidong, we worked on active tectonics on the Haihyuan fault and on the flanks of the Tien Shan. From Chengdu in a cooperation with Chen Zhiliang, with whom I have worked for 25 years, we went to the Himalaya to work on the South Tibetan detachment, the Longmen Shan and adjacent regions, and more recently on the Cenozoic

extrusion processes around the Eastern Himalayan syntaxis

I have worked briefly in other parts of the world, but the Western United States, Eastern Europe, Scandinavia and China have been the most long-lasting.

All these areas of research have involved four groups of people who have been the major influences on my career. There are the mentors whom I have mentioned above, and all of us in the academic business should be aware of the powerful influence mentors have. Second, are the graduate students with whom I have worked. All 50 PhD's and 35 MSc's have been great fun to work with and even though there was a teacher/student relationship I must admit I often learned just as much from their fertile and unencumbered minds as they learned from me. To watch them grow to become leaders in our science after they left Rice and MIT has been a continuing source of satisfaction and pleasure, and remains the most long-lasting legacy of teaching. Third are colleagues. My colleagues both at Rice and MIT have been very influential in opening my eyes to new ideas, technologies and ways of thinking. I can single out two in particular, Peter Molnar and Leigh Royden, both of whom have great physical insight and taught me much about the physics of the Earth and new ways to think about geotectonic processes. Bob King and Rob van der Hilst have collaborated on our projects and helped me to understand how modern geodesy and geophysics can be used to help solve major geological problems. No thanks for the Penrose Medal would be complete without expressing my deep appreciation to Greg Davis for both his friendship and geological discussions beginning more than 50 years ago, from our time as fellow undergraduate students at Stanford. The fourth group of scientists who have greatly influenced in my studies are my foreign colleagues, almost too many to name. They have also given me new insights in geological thinking that often do not infiltrate into North American thinking. The ones I have worked most closely with have been Rudi Trumpy, Knut Heier, David Gee, Frank Horvath, Mircea Sandulescu, Kosta Petkovic, Boris Sikosek, Dimitios Papanikalou, Tsako Tsankov, Radoslav Nakov, and last but not least Celal Sengor, the only one of these people whom I have know as both a student in class as well as a fellow research scientist and about whom I could tell numerous stories, but perhaps only in private conversation.

Every one whom I have heard give thanks for receiving the Penrose Medal offers very similar thanks to all those who have influenced their careers, and it is clear that no one stands alone in receiving this award.

For the future while I am still healthy I plan to continue to do field geological research as long as the body is willing for this is much to see on the other side of the mountain.

# ARTHUR L. DAY MEDAL

**Presented to Kenneth A. Farley**

# DAY MEDAL

**Presented to T. Mark Harrison**

T. Mark Harrison
*University of California at Los Angeles*

***Citation by Frederick J. Ryerson***

It is a great pleasure to present T. Mark Harrison as this year's recipient of the Arthur L. Day Medal. The Day Medal recognizes "outstanding distinction in contributing to geologic knowledge through the application of physics and chemistry to the solution of geologic problems" perfectly describing Harrison's career contributions. Central to all geologic problems and processes are the issues of timing and rate. For the past 3 decades, Mark Harrison has been one of the world's leaders in the application of thermochronology to geologic problems. Recognizing the thermal signature inherent in tectonic and plutonic processes Harrison developed and applied a variety of geochronologic tools to tectonic processes, leading to thermal histories of unprecedented detail. Harrison is a geochemist with relentless energy and vision, and his accomplishments are fully deserving of the prestigious award.

Over the course of his career he has developed a wide range of geochemical and geochronologic tools, combining field-based investigations, geochemical/geochronological analysis, thermal/tectonic modeling and fundamental laboratory experiments to constrain relevant kinetics and phase equilibria. His work comprises seminal contributions in the fields of thermochronology, the tectonic evolution of the Himalayan-Tibetan mountain system, crustal geochemistry, and isotopic microanalysis. Most recently he conceived and organized an international consortium to investigate the Hadean (>4.0 billion year old) zircons of Western Australia. Realizing the full potential of the geochemical information encapsulated in these Hadean samples required elevation of ion probe-based zircon geochronology to an almost industrial scale with over 100,000 zircons dated — a truly audacious undertaking.

Harrison's contributions have focused largely on the thermal and chemical evolution of the Earth's crust. As most geologic processes involve changes in crustal heat flow (e.g., thrusting, rifting, plumes, magmatism, etc.), understanding the thermal history of the lithosphere is essential. When Harrison began his career, there were relatively few strategies that permitted this information to be gleaned. The principal goal of geochronology was then seen as determining crystallization ages, and the K-Ar dating system was in disrepute relative to more robust systems like zircon geochronology. The idea that 'leaky' isotopic systems could be made useful was laid out in Dodson's classic 1973 paper. Its potential went largely unnoticed until Harrison picked up the thread in the late 1970's and, over the subsequent 30 years, has been its leading proponent.

Mark's initial approach empirically calibrated closure temperatures ($T_c$) for a variety of Ar-Ar mineral geochronometers and then obtained a thermal history by interpolating between the individual *T-t* data. A major advance, and Harrison's signature contribution to Ar-Ar thermochronology, was the development of K-feldspar multi-diffusion domain model (MDD). Developed in collaboration with Frank Richter and Oscar Lovera, Harrison showed that continuous, high-accuracy thermal histories could be extracted using intra-grain isotopic gradients. The enhanced sensitivity of the MDD model has permitted numerous advances in our understanding of continental tectonics. While the MDD model was initially the focus of considerable debate, Harrison and his colleagues have systematically evaluated the underlying assumptions over the past 20 years and the model has now achieved paradigm status. That his efforts to perfect Ar-Ar thermochronology is demonstrated by recent paper that applies and experimentally calibrated a multi-diffusion domain model to Ar outgassing in muscovite, adding an additional mineral to the Ar-Ar thermochronologic toolbox.

Harrison's development and application of geochemical and geochronologic tools extends well beyond the temperature range sampled by the Ar-Ar system. Although U-Pb dating of accessory minerals (e.g., zircon, monazite, apatite) had been widely used for determining crustal histories for over 40 years, the full potential of these systems could not be realized without characterizing their petrologic and geochemical behavior. In a series of novel papers in the early 1980s Mark and Bruce Watson experimentally documented the saturation behavior and dissolution kinetics of zircon and apatite in crustal magmas and began measurement of the diffusion properties of geochemically important species in these minerals and associated melts. This work formed the basis for what we now know as "accessory mineral thermometry," leading to the first quantitative understanding of the widespread phenomenon of zircon inheritance in terms of mineral-melt equilibria. Harrison also recognized the potential of monazite as a recorder of prograde pressure-temperature metamorphic histories, due of its unusual behavior during diagenesis (absent in pelitic sediments) and its unexpected Pb retentivity at lower crustal conditions. In 1997, he published the first *in situ* Th-Pb analysis of monazite inclusions in garnet allowing him to relate the age of monazite crystallization to the pressure-temperature conditions provided by compositional zoning in garnet.

Mark's efforts in developing accessory mineral parameters and secondary ion microscopy collided in 2001 when his group co-discovered heavy oxygen isotopic compositions in >4.0 Ga zircons from the Jack Hills of Western Australia, a result that strongly suggested the presence of a liquid water hydrosphere on the earliest Earth. Harrison assembled an international consortium focusing on the systematic geochemical investigation of these samples and their implications for this most poorly sampled phase of Earth evolution. The accomplishments to date include vastly expanded databases of Hadean ages, oxygen and Lu-Hf and Sm-Nd isotope systems, as well as detection of fission-Xe related to the U/Pu ratio of the early Earth. With Bruce Watson he also developed and applied a novel Ti-in-zircon geothermometer to obtain crystallization temperatures from these detritral zircon grains, and continuing analysis of mineral inclusions is providing

P-T data to constrain a Hadean geotherm. Taken together, the results argue strongly for the existence of continents as early as 4.4 Ga (perhaps even 4.5 Ga), and crustal cycling and plate boundary interactions much like those of today.

Harrison's efforts to develop geochronologic and geochemical methods to interrogate crustal motions and granite petrogenesis came to fruition in his investigation of the ongoing evolution of the Himalayan-Tibetan mountain system. In the nearly 20 years that Mark has been investigating Indo-Asian tectonics, the view of its evolution has changed dramatically from a simple picture of uniform, distributed shortening to a specific, time- and spatially-dependent transfer of convergence among competing processes, often with multiple mechanisms operating simultaneously. He has been a significant agent in fostering this changing vision. Among his contributions are the establishment of the uplift history of the Himalaya and southern Tibet, application of *in situ* Th-Pb monazite dating directly leading to the discovery of the age paradox in the classic Himalayan inverted metamorphic sequences, and establishment of the temporal and kinematic connection between the tectonic extrusion of Indochina and the opening of the South China Sea.

Mark Harrison has successfully developed both the underlying theoretical framework and experimental realization of numerous geochemical and geochronologic approaches. He's always been motivated by fundamental issues concerning the evolution of the Earth's crust and his pursuit of these interests does not recognize boundaries between experimental petrology, analytical geochemistry and field-based investigations. One of Mark's colleagues has often described him as "the world's luckiest geochemist". Luck is not so persistent. Like previous recipients of the Day Medal, Mark has the ability to recognize important problems in the geological sciences, and the intellect, enthusiasm and persistence to bring novel new techniques to bear on their solution. It is my great honor to present T. Mark Harrison as this year's Arthur L. Day Medalist.

### *Response by T. Mark Harrison*

Thanks Rick for your generous citation and to the Geological Society of America for selecting me the 2009 Arthur L. Day medalist. As honored as I am to receive this award for applying physics and chemistry to the solution of geologic problems, it pales in comparison to my astonishment given that I don't know much of either. Simply scanning the list of earlier generations of Day medalists gave my impostor complex a better feeding than it's had in years. But on closer inspection of that list, I sensed that my generation was presented with a unique opportunity that fortuitously fit well with what talents I do have. The first generation of awardees were largely pioneers of the geophysical and geochemical methods that we use today, but their approaches were unfortunately applied to a deeply flawed paradigm of how the Earth works. Many of the next generation of awardees were those that used the unifying theory of plate tectonics (and trips to the Moon and back) to discern the first order nature of planetary behavior. Thus when my generation came along, we encountered a field that could largely explain what had happened, but not how. The signature of the Day medalists over the past ten years or so has been their development of ways to see the Earth in a dynamic, rather than equilibrium, fashion. In that context, my contributions to the birth and growth of thermochronology provided useful information with which to understand the rates and mechanisms of geologic processes.

I arrived at UBC as something of an academic late-bloomer just as Dick Armstrong was getting established and a couple of years after publication of Dodson's largely unnoticed closure temperature paper. Dick's encouragement to come to grips with that theory coupled with Garry Clarke virtually adopting me gave me a giant head start in this new field that wouldn't have a name for another five years. The limitations of bulk closure theory drew me to 40Ar/39Ar and Ian McDougall's lab but it wasn't until collaborating with Frank Richter and Oscar Lovera that the method truly came of age. Together with students and colleagues, we took the new approaches out to the Himalaya for a test drive from which we've never really returned. I was fortunate while at ANU to watch the first SHRIMP instrument being built and saw immediately the thermochronological potential of a device that could resolve microscale gradients in other isotopic systems. This led to Kevin McKeegan and I conceiving of a new generation ion microprobe that helped usher in the development of prograde thermochronometry, which incorporated investigations of accessory mineral systematics begun years before with Bruce Watson. We've recently reunited in applying accessory mineral thermometers to the oldest known terrestrial minerals which led to a radically new view of earliest Earth.

I again thank the Geological Society of America for this great honor, my students, colleagues and mentors for sharing their great brainpower and friendship, and Susan, Matthew and Ainslie for your love and understanding of the pathological lifestyle of a research scientist.

# YOUNG SCIENTIST AWARD (DONATH MEDAL)

**Presented to Cin-Ty A. Lee**

Cin-Ty A. Lee
*Rice University*

### *Citation by Roberta L. Rudnick*

Cin-Ty Lee is a Renaissance man — the breadth of his interests is astonishing, not even considering his books, articles and paintings focused on birds. Cin-Ty is making a major impact in our understanding of how the Earth works; he has written on topics as diverse as the origin and evolution of the continents, the oxygen fugacity of the mantle through time, chemical fluxes between the solid Earth, hydrosphere and atmosphere, soil development in tropical weathering environments, thermodynamics of trace element partitioning in the mantle and even detecting nucleosynthetic processes through analyses of meteorites. Equally important, he has been an outstanding mentor of young scientists, who have flourished under his tutelage.

Cin-Ty has made important contributions to the study of the continents –for example, understanding why the continental crust is not made up of basalt and how it attained its average andesite composition. Using the Mesozoic arcs developed in the western US as natural laboratories, he has been able to determine the processes (arc accretion, suturing, partial melting, crystal fractionation and density foundering) by which arcs become continents. He has quantified the rate of mafic/ultramafic cumulate recycling to the mantle via density foundering and, in combination with the chemistry of rivers, the degree to which the bulk composition of the continental crust is influenced by weathering.

Cin-Ty has also made major contributions to understanding the origin of the strength of continental lithosphere. Archean cratons are generally considered to have strong lithosphere, likely due to the thick, viscous mantle keels that underlie them. By determining the age of lithospheric mantle beneath different portions of the southwestern US using Os model ages for peridotite xenoliths, Cin-Ty was able to show that Archean lithosphere underlies some regions (e.g., Mojavia terrane) that have not been particularly strong. Other regions, such as the Colorado Plateau, which consists of Proterozoic lithosphere, are stronger. The difference in strength is attributable to the degree of melt depletion experience by the lithospheric mantle, with more refractory lithosphere being stronger, irrespective of the age. His work on continental lithospheric strength continues with an investigation of the water contents of mantle peridotites from diverse areas, in order to deduce the influence of water on lithosphere strength.

Unraveling the effects of composition from those of temperature on the seismic velocity of mantle peridotite has always been a problem. Cin-Ty has demonstrated that the composition of mantle peridotite can be gleaned, independently from temperature, by examining the velocity ratio of compressional (P-wave) to shear (S-wave) seismic waves and in this way, seismic velocities can be used to infer composition of cratonic keels. Most recently, he has published what is sure to be a seminal paper that demonstrates how basalt chemistry can be used to infer pressure and temperature of origin.

Cin-Ty began his career as an undergraduate at UC Berkeley, working with George Brimhall on the Sierra Nevada, a place near and dear to his heart and where he returns even today to unwrap their mysteries. I was lucky to attract him to work with me at Harvard for his Ph.D.; a trip to Tanzania helped me seal the deal, where he racked up over 400 life-birds in a brief three weeks. During his Ph.D., Cin-Ty built on his experiences in Tanzania to investigate continental mantle lithosphere underlying diverse regions of the continents and how this lithosphere affects the ultimate strength of the continents. After a one-year post-doc with Gerry Wasserberg at Cal Tech (where he still made beautiful paintings of birds), Cin-Ty took up a faculty position at Rice in 2002. Here he flourished, interacting with a wide cross-section of faculty, publishing at a prodigious rate and, most importantly, becoming a superb mentor to a remarkable array of young scientists (undergraduates, graduate students and post-docs) who have gone on to their own great accomplishments. The young scientists Cin-Ty has mentored have gone on to graduate study or postdoc positions at Columbia, Harvard, Princeton, CalTech, Stanford, Brown, UT Austin, Peking University and Yale. I think, more than anything, Cin-Ty has the ability to bring out the fun in science and instill this in his collaborators and students.

Based on his creativity, his cross-disciplinary collaborations and his focus on the "big picture", Cin-Ty is a clear leader among young Earth Scientists. He has received recognition for his creativity in the form of a Packard Fellowship, was chosen for the inaugural Kuno award of the AGU's Volcanology, Geochemistry and Petrology section and was this year's Clarke Medalist of the Geochemical Society. It seems fitting that Cin-Ty's work is also recognized by the Geological Society of America, as he is one of the best and brightest of the new generation of multi-disciplinary geoscientists whose work embraces geophysics and geochemistry but is fundamentally pinned in geology.

### *Response by Cin-Ty A. Lee*

I am incredibly honored to be receiving the Donath medal. However, the reason why I'm here is that many people helped me along the way. High school was a tough time for me, but my parents and my brother provided the emotional and intellectual support to get me through. I was also blessed to have Doug and Robyn Morton and John and Karen Bolm take me out on geology and birding trips as a teenager, infesting me with the love of nature and giving me something that I desperately needed to focus on. As a freshman at Berkeley, I wandered aimlessly, but then I took two classes, mineralogy from Wenk and intro petrology from Brimhall. Berkeley's impact on me was profound as to some extent, much of what I do now had its spores in Berkeley: Brimhall introduced me to the Sierra Nevada and xenoliths; DePaolo – crust and geodynamics, Carmichael – oxygen fugacity and silica activity, Manga – the art of making simple models, Helgeson – thermodynamics. As for grad school, I actually thought I was going to be a geophysicist, but in my last year at Berkeley, two things happened: (1) I was studying Sierran xenoliths with Brimhall, and

(2) Ducea and Saleeby came out with a paper on xenoliths and delamination. I realized then that what I wanted to do was work on xenoliths and study the deep lithosphere. One of few afflicted with xenolithic tendencies was Roberta Rudnick at Harvard. She was going to study the Tanzanian craton. I was hooked. Of course, when we landed in Tanzania, I was distracted by the birds. Don DePaolo had given me a piece of advice that I've never forgotten, "when you begin your Ph.D., it's monkey-see, monkey-do. Eventually, you'll develop your own twist." Well, to make a long story short, Roberta trained me, let me cut my teeth on the petrology of the Tanzanian cratonic peridotites, and encouraged me to focus both on details and the big picture. I couldn't have asked for a better adviser. Since then, it's been one fun journey to where I am now. Of course, many other people have also influenced me. Yin, McDonough, Jacobsen, O'Connell, Hoffmann, Dziewonski, Grove, and Frey at Harvard/MIT were role models. Gerald Wasserburg took me on as a post-doct and taught me how to think. At Rice, I had the opportunity to pick Bill Leeman's mind, interact with Lenardic, Niu, Levander, Gordon, Morgan, J. Anderson, Don Anderson, Albarede, Blichert-Toft, and finally our two newest faculty, Dasgupta and Gonnermann. I also had the chance to re-connect scientifically with Doug Morton, develop collaborations with Terry Plank, Dante Canil, and many others. Most importantly, I have been lucky enough to work with many students and post-docts, Mark Little (who is now a GSA Congressioal Science Fellow), Li, Horodyskyj, Turner, Thiagarajan, Harbert, Agranier, Young and presently Dyer, Luffi, Höink, Shen, Le Roux, Dalton, and Chin. Last but not least, the one who really made all this happen is my wife, Yu-Ye.

# GSA PUBLIC SERVICE AWARD

**Presented to Bruce F. Molnia**


Bruce F. Molnia
*U.S. Geological Survey–Reston*

***Citation by John F. Shroder Jr.***

Bruce Molnia began his career way back in the 1960s when he first majored in geology at Harpur College at the State University of New York in Binghamton. He was one of Don Coates' advisees and early students in geomorphology, which was that most seminal time when Don and later Marie Morisawa were first implementing what is now the preeminent Binghamton Geomorphology Symposia in North America. Some of that early enthusiasm for sedimentologic geomorphology seems to have rubbed off on Bruce, because he went from SUNY – Binghamton to Duke for a Masters Degree in marine geology in 1969, and a Ph.D. in marine geology from the University of South Carolina in 1972 where he did a dissertation on marine geology and Pleistocene ice rafting in the eastern North Atlantic. This training led Dr. Molnia eventually to conduct more work on glacial, marine, and coastal environments in equatorial, temperate, sub-polar, and polar regions for the next 37 years. As a research geologist at the US Geological Survey (USGS), for much of this time, Bruce Molnia has been keenly interested in glacial processes, impacts of changing climates, shallow marine geology, glacial-marine sedimentation, and the use of remote sensing to investigate these phenomena.

Dr. Molnia's first job out of the doctoral gate was as a Visiting Professor of Geology at Amherst College and Mt. Holyoke, which must have given him a taste for educating students before he joined the US Geological Survey in 1974, because he has held several adjunct professorships, with Cal State – Northridge, the University of Idaho, and most recently, Duke University, on his list of adjunct academic postings ever since. The USGS meanwhile has been his home through thick and RIFing thin, with many interesting projects to occupy his energies over the past decades.

For example, Bruce started off as a marine geologist at Menlo Park where he was the Chief of Projects on Environmental Studies of the eastern Gulf of Alaska and North Aleutian Shelf. This work involved planning, management, participation in, and analysis of results from marine geological and geophysical research projects and cruises to the Gulf of Alaska, Bering Sea, and Alaskan coastal zone environments. The research topics included analysis of the geology of the Alaskan continental margin, interpretation of coastal and offshore processes, remote sensing, assessment of offshore U.S. marine mineral resources, definition and indication of marine geohazards, sea-floor mapping, production of side-scan sonar mosaics, and investigation of glacial–marine sedimentary processes.

Then in 1983-1985 Dr. Molnia moved into the heartland where he became the Supervisory Physical Scientist and Deputy Chief for Data Production and Distribution of the USGS Earth Resources Observation Systems (EROS) Data Center in Sioux Falls, SD. There he managed the activities of 100 employees involved in digital mapping, as well as the processing and distribution of satellite imagery and aerial photographs. In addition he was responsible for the acquisition and management of large digital geochemical and geophysical data bases (RASS and NURE), evaluation of new remote sensing technologies and instrumentation such as Side looking Airborne Radar (SLAR), the Large Format Camera (LFC), video data storage, etc.), and in marketing and public awareness of USGS remote sensing programs and products.

From South Dakota in 1985, Dr. Molnia moved east to Reston, VA, where the USGS first loaned him to the National Research Council (NRC) of the National Academy of Sciences in Washington, DC. Here he managed and directed activities of the NRC's national advisory group on polar research where he was responsible for initiating, planning, organizing, and conducting studies utilized by federal agencies, Antarctic treaty nations, the Scientific Committee on Antarctic Research (SCAR) and private foundations. In addition he was also responsible for the activities of the NRC Committee on Permafrost, Committee on Glaciology, Committee on Remote Sensing of Ice and Snow, Committee on Polar Ocean Research Platforms, and Committee on Arctic Solid-Earth Geosciences. At the USGS meantime, he was also Special Assistant to the Chief.

This work led in 1987 to Dr. Molnia's appointment to the International Programs Office of the Chief Geologist in Reston where he coordinated international activities; supervised a staff of 15 international program personnel; organized three international workshops on ocean pollution and Arctic contamination; developed new programs and implemented agreements; represented the USGS and Department of the Interior (DOI) on interagency committees on environment, Arctic policy, global change, Antarctic environmental protection, international data management, and federal government response to Hurricane Mitch; and directed a climate-change-oriented Alaskan glacier research project. His research interests at this time were climate change, coastal and shallow marine processes, fiord and glacial-marine sedimentation, temperate glaciers, remote sensing, synthetic aperture radar (SAR), and use of multi-media for outreach and information distribution. While in this office, he worked his way through as Acting Chief, Deputy Chief, Chief of International Environmental Studies, and finally as Chief of International Polar Programs.

Then in 1999-2003, Dr. Molnia was detailed by DOI to the 107th Congress in the office of Congressman Curt Weldon as a Senior Legislative Fellow to organize and operate a caucus focused on ocean policy issues. The caucus was co-chaired by Represntatives Tom Allen (D-ME), Sam Farr (D-CA), Jim Greenwood (R-PA), and Curt Weldon (R-PA). In this capacity Molnia organized numerous workshops, *International Ocean Sciences Day, House Ocean Policy Development Day*, and *Capitol Hill Oceans Week* to raise the visibility of ocean issues.

Thereafter to the present time at the USGS, Bruce Molnia has continued as a Research Geologist of the Earth Surface Processes Team, where he maintained his interests in climate change, coastal and shallow marine processes, fiord and glacial marine sedimentation, temperate glaciers, remote sensing, synthetic aperture radar (SAR), and use of multi-media for outreach and information distribution.

In his service to the Geological Society of America over the years, Bruce Molnia served as the Forum Editor of *GSA Today*, where he wrote more than 100 science policy articles as monthly columns over the ten years from 1990 to 2000. He has also served as a Councilor to GSA for a time.

Finally, Dr. Bruce Molnia has authored, coauthored, or edited more than 200 articles, abstracts, maps, and books, as well as several CD-ROMS. Books that he has authored include: *Glaciers of Alaska, Glacial-Marine Sedimentation, Alaska's Glaciers*, and the Alaska chapter of the *Satellite Image Atlas of the Glaciers of the World*.

In sum, Dr. Molnia's mix of work on environmental issues on oceans and glaciers reflects his consuming interests in serving the public with the best of information from our geoscience world. Dr. Bruce Franklin Molnia much deserves the recognition given him in the GSA Public Service Award.

### *Response by Bruce F. Molnia*

Thank you all! I am both pleased and humbled to receive GSA's Public Service Award, an award created to honor the Shoemakers.

Gene Shoemaker significantly influenced the path my career has taken and the methods I use. As a young graduate student, I saw Gene shoemaker's rephotography of Grand Canyon sites originally photographed by John Wesley Powell's 1868 expedition. The sheer power contained in each pair of his 'before and after' images fueled the development of my thinking about landscape evolution, especially glacier change. They helped me understand how dynamic Earth can be and the rapidity of Earth processes. More than 250,000 photographs later, I am still awe struck by the power that a pair of sequential images contributes to the visual documentation of our changing planet.

To quote Robert Frost, "Two roads diverged in a wood, and I — I took the one less traveled by, And that has made all the difference."

I am standing here tonight because my career has taken frequent detours down Frost's "road less traveled by." Many of these career detours placed me in situations where I was able to materially enhance the public's understanding of the Earth sciences and serve decision-makers in applying science and technology to public affairs and public policy. Combining science and policy, along with outreach and education, is a career path that I highly recommend to all of you.

My first significant career detour occurred in 1973 when I left my neophyte academic career to become the Bureau of Land Management's (BLM) first west coast oceanographer. My role at BLM was to gather information about sea floor geology, petroleum potential, and marine environmental hazards, that could be synthesized to provide an information baseline for Federal decision makers who would then decide when, where, and what Outer Continental Shelf (OCS) areas would be leased. This was my first experience combining science and policy and it made me understand that a significant audience existed for Earth science information beyond the world of refereed journals.

Later, I moved to the USGS where I conducted marine geological and geophysical site surveys and environmental assessments in Gulf of Alaska and Bristol Bay OCS lease areas. In these surveys, the results of our investigations were the information on which the decisions to lease were made.

These investigations also permitted me to perform up-close and personal investigations of glacier and fiord process and glacial marine sedimentation in one of Earth's highest sedimentation rate areas. Published in 1983, Glacial Marine Sedimentation, an 844-page synthesis of the glacial-marine environment, is one significant result of these investigations.

In 1985, the USGS loaned me to the National Research Council to temporarily replace the Executive Director of the Polar Research Board. During my 2½ year detail, Board committee's produced reports on the future of Arctic marine geophysics, the need for new US icebreakers, and US Antarctic research in the 21st century. In 1986, my Arctic geophysics committee made the first US scientific delegation visit to the Soviet Union in more than a decade.

Later, I represented USGS and Department of the Interior (DOI) interests in a broad array of issues ranging from regulating mining activities in Antarctica to understanding the extent of contaminants in the Arctic. I organized three international workshops, held in 1993, 1995 and 1997, that focused on Arctic contamination and produced many new insights into radioactive waste dumping and contamination in the Arctic marginal seas.

During the 1990s, I served as the U.S. representative to the International Arctic Environmental Data Working Group and as web master for the State Department, when the US hosted the Arctic Council. Both efforts resulted in increased international cooperation and the development of successful multi-national projects.

Many of you first encountered me as the result of discussions that I had with former GSA Director Mike Wahl in the late 1980s. These discussions focused on making our Society more relevant and on how to elevate the Society's newsletter into a more information-rich publication. The result was the birth of *GSA Today* and my agreement to serve as its Forum Editor. I held this position for nearly a decade and authored more that 120 *GSA Today* articles that focused on key Earth sciences and public policy issues.

In 1994, I testified before the U.S. House of Representative Merchant Marine and Fisheries Subcommittee on Russian dumping of nuclear waste in the Arctic marginal seas. There, I met Congressman Curt Weldon, a Republican from Pennsylvania, who had a strong interest in and an excellent working knowledge of ocean pollution issues. In 1998, DOI detailed me to the Congressman staff, where as a Senior Legislative Fellow, I organized and operated the bipartisan House Oceans Caucus.

Since then, my focus has been on understanding the response of temperate glaciers in Alaska and Afghanistan to changing climate. *Glaciers of Alaska*, published in 2008, synthesized not only my research, but also information collected by more than 250 other investigators concerning the post-Little Ice Age behavior of more than 1,000 Alaskan glaciers. At more than 500 pages and a weight of more than 2 kilograms, it is not only an excellent reference, but also a very effective door stop.

To come full circle, my current research involves rephotography of Alaskan glacier landscapes, using historical images from the 19th and early 20th century. The goal is to provide unequivocal, unambiguous, visual documentation of the effects of changing climate and to share this information as broadly as possible. One pair of these images has been reproduced more than 500 times and even appears on refrigerator magnets and postcards. Another dozen are the basis of a National Center for Atmospheric Research (NCAR) game designed to raise public awareness about climate change.

Like many of my previous journeys down the "road less taken" this one has also been successful in materially enhancing the public's understanding of the Earth sciences and significantly serving decision-makers in the application of scientific and technical information in formulating public policy.

I thank GSA for recognizing the fruits of my unconventional career journey.

# GSA PRESIDENT'S MEDAL

**Presented to**
**JUDGE JOHN E. JONES III**

Judge John E. Jones III
*Federal Judge, U.S. District Court for the Middle District of Pennsylvania*

### *Citation by Judith Totman Parrish*

The theory of evolution is one of the foundations of geosciences. Through the study of fossils and living organisms and the changes they have undergone through time in morphology and ecology, paleontologists and biologists are revealing not only the history of life, but the history of the Earth itself and both the scale and tempo of that history. The theory of evolution was established by careful, diverse, and revealing tests carried out by scientists in a wide array of disciplines, from geology to computer science, ecology to mathematics. Its application ranges from medicine to the exploration for economic resources. Yet despite the strength of the evidence for evolution and its practical importance to society, it is unique among the great scientific theories in being under nearly constant attack.

The GSA President's Medal was established by President Steve Wells to recognize and be conferred upon individuals whose impact has profoundly enhanced the geosciences profession by, among other things, advancing geosciences in the service of humankind. Our recipient's work qualifies as such an enhancement. By following the law separating religion and public education he, by extension, defended the study of evolution as science and of the teaching of evolution.

The 2009 GSA President's Medalist, Judge John E. Jones III, unquestionably fits these criteria for the medal. Judge Jones had served for four years on the U.S. District Court for the Middle District of Pennsylvania when he was assigned a case for bench trial, to be formally known as *Kitzmiller v. Dover Area School District* or, more informally to evolutionary scientists, "the Dover trial". The case challenged a decision by the school district to have a statement read before ninth-grade biology classes indicating that there are alternatives to the theory of evolution. When Judge Jones was assigned the case, the defendents took heart; Judge Jones was known to be politically conservative, and they reckoned that he was likely to rule in their favor. What they did not anticipate was thorough analysis of the law, in-depth analysis of the history and origin of intelligent design theory, and acute powers of reasoning. Judge Jones' opinion decisively laid to rest the notion that intelligent design should be taught in science classes, alongside evolution, as an alternative theory to the evolution of life.

Judge Jones' opinion is 139 pages long, and thus approached by those not in the legal profession with some caution, in anticipation of legalese barely understandable to the lay person. But it is nothing of the sort. The decision is written in plain and unmistakable English, clearly argued, scholarly, and complete. Indeed, it is an exciting document to read, and should be approached with relish.

It is particularly fitting that Judge Jones receive this medal in 2009, the bicentenary of the birth of Charles Darwin. Darwin would, I think, have approved of the clear and scholarly reasoning of Judge Jones' opinion.

### *Response by Judge John E. Jones III*

I am humbled and delighted to accept this most impressive medal from the Geological Society of America. I suspect that it is fairly unprecedented to give it to someone outside of your world, let alone a federal judge. That simply makes it all the more special to me.

When I sat in Professor Noel Potter's geology class at my wonderful undergraduate school, Dickinson College, some thirty-six years ago, neither Professor Potter nor I could have ever imagined this day would come. And I will be very truthful — when I was hanging on a rock face outside Carlisle, Pennsylvania during that freshman year digging for trilobites, I was not thinking about the fact that they dated back to the Early Cambrian period some five hundred forty years ago, or that they were marine arthropods, or even that they were important in estimating the rate of speculation during the Cambrian Explosion, so much as I was intent on chatting up that pretty co-ed digging away next to me. But something in professor Potter's class obviously stayed with me. In 2004 when the monestrous case of *Kitzmiller v. Dover* landed on my desk, throughout the trial the following year, I needed all the tools my good liberal arts education at Dickinson gave to me. Significant among those were the bedrock skills in geology that I learned from Professor Potter so long ago.

The Kitzmiller case represented a great confluence of not only my liberal arts education, but also my legal training and experience as a lawyer and judge. Margaret Talbot, writing in *The New Yorker* magazine, termed the trial the biology class that you wish you'd taken. So it was for me, as I sat through weeks of stunning and impressive testimony from scientific and other experts in the fields of biology, paleontology, geology, theology and pedagogy. Although as noted my own educational background was useful, it was these experts who made me a temporary expert in each of their areas. If I got the science right, it is in large measure due to their presentations.

And so for part of 2004 and all of 2005 entered your world. It was terrifically interesting, if at times daunting and complex. Indeed, one of the authors who rendered a book about the trial stated that he perceived after days of abstruse scientific testimony, including more about bacterial flagellum than I ever thought I'd learn in my lifetime, that I would be hanging on to my Starbucks coffee cup on the bench like a lifeline! Clearly, I am a living exemplar of what you can do with superb liberal arts education, since that is certainly what I obtained at Dickinson College. In the spirit of that liberal arts education, and since I entered a part of your world for a time, I hope you'll indulge me for a moment and invite you into mine. The Kitzmiller case resulted in many enduring lessons. Some hyperbolic commentators said that I saved science through my decision. I think that is pretty over the top. But I do know this — my work has served to highlight the concept of judicial independence in the United States. It has also permitted me to enhance the public's understanding of the judiciary, which is the most misunderstood of out three branches of government. The Framers, in their almost infinite wisdom, created a system of branches that exercised checks and balances. The president and the Congress are responsive to the public will via popular elections. But my branch is different, and intentionally so. It was expressly designated as a bulwark against

the tyranny of the majority. The judiciary, as set forth in Article III of the Constitution, is not responsive to the public will, but rather to the laws of the land, the Constitution, and the Bill of Rights.

The importance of having an independent judiciary becomes patently evident in cases like Kitzmiller. Remarkably, in 2009, in the great industrialized democracy that is the United States, nearly half of all of our fellow citizens reject evolution. I know you're doing all that you can to fix that problem. For my part, I am proud to be a part of a judiciary that does not bend to the popular will but rather, as I hope was evident in the Kitzmiller case, carefully finds facts and appropriately and deliberately applies the law to those facts in reaching its decision. That is does so without the interference of politics, emotion, fear or favor, is a tribute to those wise men assembled in Philadelphia over two-hundred twenty years ago.

In May of 2006 I was called back to Dickinson College to give the commencement address. It was one of the greatest honors of my life. There I was reunited with professor Potter, who I'd not seen in years. Noel approached me with tears in his eyes and said: "I knew you could do it." That was great, but candidly I can't say that I had as much confidence in myself as he did! But those of you who teach, please remember this — even that political science major buried in the midst of one of your classes may end up some day vindicating your inspirational teaching skills! Noel Potter taught me that history of our planet and its rocks, water, and atmosphere, and the history of life, are inextricably intertwined. It is a lesson I never forgot.

We are over eighty years past the Great Tennessee Monkey Trial, an event that we'll see re-enacted in a couple days. But the controversy surrounding Kitzmiller informs us that there is still an astonishing amount of work to do. That my trial was labeled "Scopes II" tells you everything you need to know, doesn't it? Please keep up your spectacular work in making our world a better, smarter, and more ecologically sound place. I promised I will continue doing my part as well. I shall treasure this honor forever.

# BROMERY AWARD FOR THE MINORITIES

**Presented to John T. Leftwich**

John T. Leftwich
*Halliburton Company*

### *Citation by Terry Engelder*

The Bromery Award recognizes minority professionals "who have made significant contributions to research in the geological sciences, or those who have been instrumental in opening the geoscience field to other minorities."

John Thomas Leftwich, Jr. received his B.S. from Virginia State University, his M.S. at the University of Massachusetts, and his Ph.D. from Pennsylvania State University.

He has been Professor of Geology at Old Dominion University where he was awarded a "Chair of Excellence" by the US Department of Energy, and has worked at corporations including Exxon, Meridian, Shell, and Halliburton. John is an expert petroleum geologist with many years experience in both the onshore and offshore Gulf of Mexico. John has managed as many as seven exploration and production fields simultaneously. His research investigations have focused on abnormal pressures and undercompaction in sedimentary basins. Most notably, he documented the relationship between undercompaction and smectite-illite transformation in the Texas Gulf Coast.

John is a member of eight professional societies and is a certified petroleum geologist. He has been honored by universities, professional societies, corporations, and federal agencies for his research and teaching, but perhaps his greatest honors come from organizations not as well known in our professional ranks. John has been a 20-year volunteer at elementary schools up through community colleges and has adopted 18 schools nationwide.

John was a founding member of the National Association of Black Geologists and Geophysicists (NABGG), serving as president for six terms: 1984–90. In 1986–89, thousands of jobs were lost in the oil sector and many NABGG members left the society, but John carried NABGG almost single-handedly through the difficult years of reduced membership and little money. NABGG now has over four hundred members and is a GSA associated society, a testament to John's singular effort. His illustrious career is so varied not only because he has so many interests but also because he has applied these interests in meeting the needs in the greater community.

### *Response by John T. Leftwich, Jr.*

Thank you Terry, Terry was my Ph.D. advisor at Penn State and I thank him for being a lifelong mentor and a friend. Ladies and gentlemen, I feel very honored to be this year's recipient of the Bromery Award. I would like to extend a very special thanks to the Bromery Family for establishing this award. Thanks also to the National Association of Black Geologists and Geophysicists (NABGG) for the nomination and I express my sincere thanks to the Geological Society of America (GSA) for selecting me as this year's recipient of the award. I of course share this award with my wife, Jackie who is here with me tonight and who has constantly supported me through out my career and many endeavors. She has been a constant source of inspiration and encouragement. Behind every success there is a line of support. Time does not permit me to thank each and every one of you individually but I would like to take this opportunity to thank all of you.

I was truly blessed as an undergraduate at Virginia State University for it was there that I met the late Dr. Mack Gipson who had recently established a geology department at Virginia State. As fate would have it I took an Earth Science course as an elective where I met Professor Gipson who encouraged me to seek a career in Geology. In my sophomore year I changed my major from Biology to Geology and in the summer of 1969 became the first graduate of the department and the seventh African American to graduate in the United States with a degree in Geology. It was during the summer of 1968 that several students and myself were fortunate to get summer internships with the U.S. Geological Survey. Dr. Gipson was acquainted with Dr. Bromery at the University of Massachusetts who in turn was affiliated with the United States Geological Survey (USGS). Bromery enabled us to get summer internships and we had great summer experiences. Eventually I chose the University of Massachusetts for graduate school and started my graduate education with a full fellowship.

So, in a manner of speaking I have enjoyed a series Bromery Awards. First, he assisted me in finding a path to my dream of continuing my education. In addition to all of the wonderful things Bromery taught us that you could achieve if you were so inclined as to attach a magnetometer to the rear of an aircraft and fly it over a terrene full of Oliverian gneiss domes. He gave me a second award in the form of a message and that is, in addition to your technical excellence you must also remember that there is nothing more valuable than your integrity and your developing good values, such as appreciation and respect for others. It is more important and a much higher ideal to be concerned about the welfare of others than about yourself.

So I would like to ask each of you to continue mentoring young people, help them find internships and involve them in your research, put them on your teams, teach them to make observations and design the right experiments. Provide opportunities for them to learn and become good scientists. But above all, help them to expect, understand and respect the character, differences, and diversity in science and in life.

I thank each and every one of you as you have enriched my life beyond measure. With your discussions of blueschists problems, out of sequence thrusts, ignimbrites, pigeonites, deviatoric stress , how thrust sheets move, life in hostile environments, panspermia, mantle ichor, Archean atmospheres, dislocation glide etc. you have shown me things beyond my wildest dreams.

I would like to commend GSA for their continuing to support underrepresented groups and programs to educate all of our young people so that they can grow intellectually, appreciate the world of science, and help shape the destiny of humankind.

In a Universe so vast that there are as many stars as there are grains of sand on all the beaches of the world looms one of the biggest questions of all. Is there intelligent life elsewhere in the Universe? What will these intelligent beings be like? Well Earthlings developed science and technology, at some point in their evolution they listen in on the hydrogen ion frequency. They care about other members of their society and about something greater than themselves and as they have done for thousands of years they continue to bury their dead with flowers. Thank you.

# 2009 GSA DISTINGUISHED SERVICE AWARD

## Presented to Karl E. Karlstrom

Karl E. Karlstrom
*University of New Mexico*

### *Citation by Brendan Murphy*

It is a pleasure to nominate Karl Karlstrom for the GSA Distinguished Service Award.

Karl is a Professor in the Department of Earth and Planetary Sciences at the University of New Mexico (Albuquerque). He obtained a B.S. in 1973 at Northern Arizona University in Flagstaff, an M.S. in 1977 and a Ph.D in 1981, both at the University of Wyoming, Laramie. He moved to the University of New Brunswick, Canada for a two year post-doctoral fellowship with Paul Williams, a renowned structural geologist. Karl had various academic appointments between 1982 and 1994, when he joined the University of New Mexico as a Professor. His main research interests involve structural geology and tectonics, including evolution of tectonic styles in the Precambrian, processes of continental accretion, assembly, and stabilization, and tectonic evolution of the southwestern U.S. from the Precambrian to the Quaternary. At the last count, he has authored or co-authored nearly 140 refereed publications, 24 geological maps, 36 reports and guidebooks. He has supervised or co-supervised nearly 45 graduate students, and judging by their track record since graduation, he has been an excellent mentor. This body of work has tackled fundamental geologic processes that have shaped the evolution of our crust from the earliest Paleoproterozoic to the Cenozoic. Although trained as a structural geologist, his recent research on tectonic geomorphology in the American south-west is testament to the breadth and depth of his expertise. These contributions are but a small sub-set of his total academic achievements.

Karl has been involved in many of the core activities of GSA publications, as an editor, reviewer, and author. He served the society as editor of *GSA Today* (GSAT, 2000-2003), and of *GSA Bulletin* (GSAB, 2005-2008). He served on the Publications Committee as an articulate and passionate advocate for those journals, and on the editorial board of *Geology* (1988-1991). He has also contributed enormously to the society as a researcher. At last count, his vita documents authorship or co-authorship of 51 GSA publications (14 in GSAB, 18 in *Geology*, 3 in *Geosphere*, 4 in *GSA Today*, 3 in GSA Special Papers). He has also have presented 159 GSA abstracts since 1983—many co-authored by his students. He has chaired numerous topical sessions, instigated and organized Pardee keynote symposia and has led several GSA field trips.

As *GSA Today* (GSAT) editor, he followed in the great footsteps of Eldridge Moores and Sue Kay. He built on their legacy by soliciting ground-breaking articles that represented the breadth and depth of our rapidly expanding science. Typically, these articles dealt with hot topics or controversies, had outstanding graphics, and reached out to the broad readership of *GSA Today*. Each article was carefully and tenderly guided by Karl through the many iterations required to shape the article for the GSAT readership. Many professors have volunteered that they assign many of these articles to their graduate and undergraduate students. During Karl's tenure, the GSAT monthly science article routinely became the paper with the most hits on the GSA webpage.

As *GSA Bulletin* (GSAB) editor, I can attest that Karl was a delight to work with, a view shared by Yildirim Dilek, my predecessor and GSAB editor from 2003–2006. Sound advice was always just a phone call away. Throughout his stewardship, he worked tirelessly to maintain the international stature of the Bulletin, and helped shape its niche and as a prime outlet for high impact data-rich, archival papers. He constantly reminded me (in a good-natured way) of the importance of maintaining the highest of standards. The success of this philosophy is borne out by citation statistics. During his tenure, the impact factor of GSAB has risen steadily, and the on-line publication facility (see "Ahead of Print" on the GSAB website) has reduced the publication lag-time. In short, the journal flourished during his stewardship, and has enhanced its stature at the forefront of geoscience publications. He has followed in the footsteps of many excellent editors and has helped the journal to evolve, paving the way for new GSA journals such as *Geosphere* and *Lithosphere*.

After each of his terms GSAT and GSAB editor, he was replaced by two editors, a sure testament to the workload he carried and to the success of his tenures!!

Karl is also an exemplary geocitizen, and has participated in several science outreach programs to the general public, most notably in explaining the spectacular geology in the vicinity of the Grand Canyon.

For his service and dedication to the geoscience community in general, and the Geological Society of America in particular, he is a most deserving recipient of the GSA Distinguished Service Award.

### *Response by Karl E. Karlstrom*

I appreciate receiving GSA's Distinguished Service Award. Following in the footsteps of Eldridge Moores and Sue Kay, I was *GSA Today's* science editor from 2000 to 2003, and the sole editor for much of 2001-2003. The process of soliciting top science articles, working with authors to make the papers understandable to broad audiences, and always fearful we might not make the next month's issue are palpable memories. I still feel that these science papers have the potential to be the Science and Nature papers for our discipline and (somehow simultaneously), a way to convey cutting-edge ideas to specialists, students, and the public. These articles have a special niche in our science, and subsequent science editors are carrying forward this tradition grandly. As an essential and overdue step, I look forward to seeing the *GSA Today* science article in the Science Citation Index and in Geoscience World.

My editorship for *GSA Bulletin* (2004-2008) was differently rewarding. The niche of *GSA Bulletin* articles is as the data-rich and archival record of our science. These papers are cited for decades—they have depth and staying power. With co-editors, Yildirm Dilik, then Brendan Murphy, we were successful in helping increase international participation and recognition for GSAB. I am proud that every one of the hundreds of manuscripts we handled (accepted or not, and many with several revisions) was improved by the peer review process. This process is filled with frustrations: a sometimes slow review process, some impatient and irate authors, and

inevitably some unevenness in treatment of manuscripts. But, the GSAB review process is the best we have; it represents the Society's best efforts at identifying, improving, and publishing the best geoscience. The success of *GSA Bulletin* is at the core of the success of the Society. Both happen because we have a committed team: Associate Editors do an amazing job; reviewers are diligent, authors provide the work in the first place, my editorial assistant Eileen Embid kept it all keep moving, and the dedicated GSA staff help papers reach completion. Thanks especially to Jon Olsen and Jeanette Hammann for their efforts and help to me over the years. In a tangible way, I view this whole team as the essential ingredients needed to work towards a better understanding of the Earth.

In some respects, though, I think my strongest sustained service to GSA has been my participation with my students in presenting talks and abstracts, leading field trips, chairing and organizing topical sessions, and otherwise being a supporter of the GSA National and Section meetings. Since 1979, I have been coauthor of 180 GSA abstracts, most with my graduate and undergraduate students as first authors and coauthors. GSA meetings are where these students meet each other and future professors, and where many present and defend their first research projects.

It continues to be a pleasure to be part of both the scientific meetings and publishing aspects of GSA — a scientific society that emphasizes its membership and the science first.

# SUBARU OUTSTANDING WOMAN IN SCIENCE AWARD

**Presented to Jaime D. Barnes**

Jaime D. Barnes
*University of Texas at Austin*

***Citation by Zachary D. Sharp and Jane Selverstone***

Jaime Barnes finished her Ph.D. in the spring of 2006, and the contributions resulting from her thesis have already had a significant impact within the geological community. Her thesis work led to seven publications, with an additional four manuscripts published since that time. Her papers have been cited in print more than 80 times, which is remarkable considering that her first paper was only published in 2004. Her chlorine isotope work is novel and exciting, and has made her a very visible presence at national and international meetings.

Jaime carried out her M.S. and Ph.D. under the supervision of Jane Selverstone and Zachary Sharp. Her original interest centered on petrology, but she soon fell in love with geochemistry as well. After completing her Master's degree on fluids in Alpine shear zones (*Journal of Metamorphic Geology*, 2004), she decided to enrich her geochemical arsenal with chlorine isotope geochemistry. This was not a simple endeavor, and took close to two years to perfect. She needed to work out the extraction method, develop a purification procedure for methyl chloride, and modify the mass spectrometer, adding new collectors and resistors. Through trial and error, finding some published procedures acceptable and others unworkable, she developed a method that allowed her to analyze trace amounts of Cl in rocks and minerals with high precision and accuracy. She was off to the races.

Chlorine isotope ratios of geological samples were first measured in 1960. Other than a few publications in the 1990s, virtually no other chlorine isotope analyses of rocks had been made until Jaime's work. After recognizing serpentinites as a major carrier of Cl into the mantle (*Earth Planet. Sci. Lett*, 2004), she measured the chlorine isotope composition ($\delta^{37}$Cl values) of Ocean Drilling Project (ODP) serpentinites. She identified a bimodal isotopic distribution of samples depending on whether they had been hydrated directly by seawater or by porewaters from a thick overlying sequence of sediments. This work provided significant insights into the mechanisms of seafloor serpentinization (*Chem. Geol*. 2006). Having characterized the distinct isotopic signatures of serpentinites formed under different tectonic conditions, she turned to an obducted oceanic sequence in Elba, Italy, and demonstrated that information on the seafloor history of each serpentinite-bearing nappe was preserved throughout the subsequent metamorphic and obduction history (*Geochem. Geophys. Geosyst*., 2006). At the same time, she was part of a team that worked out the chlorine isotope composition of the mantle, primitive meteorites and the crustal variations through Earth's history. This work places new constraints on the formation of our planet and the global chlorine cycle (*Nature*, 2007).

Jaime continued at UNM as a Postdoctoral fellow working with Tobias Fischer and Sharp studying chlorine isotope distribution over subduction zones. She worked on the Izu-Bonin-Mariana arc and Central American arc, with two sampling campaigns under her belt. In a paper in *Geology*, she identified variations perpendicular to the IBM arc, assigning fluid sources to different types of volcanic materials at the surface. Looking at along-arc variations in the Central American arc, she was able to constrain potential sources related to specific 'forcing functions'. This work is in press in *Geochemistry, Geophysics, and Geosystems*.

Jaime knew that there was a water-soluble chloride phase in her serpentinite samples, but she could not identify it at the SEM or electron microprobe scale. Undeterred, she realized that she needed to take another approach. Using the transmission electron microscope, she and Adrian Brearley found high concentrations of Cl in the center of chrysotile tubes using the transmission electron microscope. The implications of this finding are the topic of a manuscript that is currently in preparation.

Jaime's chlorine isotope work has generated a great deal of international interest, leading to several collaborative studies. Axel Liebscher (Potsdam, Germany) and Jaime determined the chlorine isotope fractionation between aqueous fluid and vapor up to the critical point (*Chem. Geol*. 2006). She worked with Huiming Bao (Louisiana State University) on identifying sources of aerosols in the McMurdo Dry Valleys, Antarctica (*J. Geophys. Res*., 2008) and most recently with Bruce Watson (RPI), in a project to determine Cl diffusion rates in silicate melts.

Jaime has compiled a long list of honors in her short career. She was an NSF graduate student fellow, was awarded the "Excellence in Graduate Research" Award from the University of New Mexico Sigma Xi chapter, and won the V.C. Kelly Outstanding Doctoral Candidate scholarship and the Best PhD award from our department. In 2007, she was awarded one of five L'Oréal Women in Science Awards in the United States. This was the first time that the award, which is judged by the AAAS, was given to a geoscientist. Clearly, Jaime's achievements have been

recognized at all levels. She was active as a teaching assistant (even though she was fully funded by research monies) because she wanted to gain valuable teaching experience for the future. She also mentored several high school students as part of the NASA SHARP minority mentorship program.

Overall, Jaime is an exceptional young scientist. This was apparent to the faculty at the Jackson School of Geosciences at University of Texas, where she was recently appointed Assistant Professor. She is eager to tackle difficult problems, and quickly gets the results of her work into print. She also made time to marry fellow geoscientist Dan Breecker, and last year gave birth to their first child. Jaime works hard, but is always cheerful and generous with her time, helping both graduate and undergraduate students in the laboratory or in any other way she can. We were always aware when Jaime was around because we could hear her infectious laughter down the hall. Jaime will no doubt be an inspiration to other young women in the Geosciences and a mentor to many aspiring geoscientists in general. She is very deserving of the Subaru Outstanding Woman in Science Award from the Geological Society of America.

### *Response by Jaime D. Barnes*

It is truly a great honor to receive the Subaru Outstanding Woman in Science Award in memory of Doris Curtis. I would like to thank GSA for this award and Subaru for their sponsorship.

My path to academia began as an undergraduate when I entered UT-Austin as a declared geology major. It was there that I took Bill Carlson's petrology class. I would to like thank Bill for pulling a shy undergraduate aside and asking her to do an undergraduate honors thesis with him. Bill first introduced me to scientific research- teaching me what questions to ask and how to answer them. It was also Bill who encouraged me to look outside the state for graduate school- a hard task for a native Texan.

I decided to head just slightly west to attend the University of New Mexico and work with Jane Selverstone. Jane and I instantly bonded. She is an amazing scientist, teacher, and role model. Jane taught me the basics of how to do field work, write a paper, and give a talk- and how to do them well. She remains my voice of reason, a source of excellent advice and my very dear friend. I quickly got pulled into the world of stable isotopes through the contagious enthusiasm of Zachary Sharp. It was Zach who showed me that science is first and foremost fun. At first I was a bit apprehensive about this man who ran into my office almost daily yelling "I just had this idea- let me show you, now" or "grab a wrench and come quickly" and then would disappear as quickly as he appeared. Little did I know that my tidy, meticulously neat and orderly world needed Zach. Zach taught me to be creative, try new things, and how to multitask. With time, my initial tentativeness began to disappear. I broke many things, many expensive things, but Zach always shrugged it off. "We can fix it" and he always did. I would not be standing before you, accepting this award, if it were not for these two amazing people. They share in this award as much as I do. Jane and Zach were the perfect complement as mentors. Jane taught me my field skills- while Zach muttered that ∫D was the same in every direction so why did I have to take a strike and dip- and Zach taught me my laboratory skills- while Jane poked her head into the stable isotope lab but would never cross the threshold. I hope that in the future, I can provide my students with a fraction of the support that Jane and Zach did for me.

And finally I would like to thank my family and friends for their support, especially my husband, Dan Breecker. Dan takes everything in stride with a constant grin upon his face, helping me keep things in perspective and providing a balance in my life. He and I are incredibly lucky to be able to navigate this journey into academia together as we chase our already quite fast one year old son.

I am exceptionally grateful to be a member of a community so supportive of its young members and am humbled to accept this honor.

# AGI MEDAL IN MEMORY OF IAN CAMPBELL

**Presented to Jonathan G. Price**

Jonathan G. Price
*Nevada Bureau of Mines and Geology*

### *Citation by James M. Robertson*

It is my special privilege to be the citationist for Dr. Jonathan G. Price, the American Geological Institute's 2009 Ian Campbell Medalist.

I have known Jon since the mid-1980s, when he was serving as Director of the Texas Mining and Mineral Resources Research Institute at the Texas Bureau of Economic Geology. Since that time we have become friends and Association of American State Geologists (AASG) colleagues, communicating and interacting regularly on a wide variety of state, regional, and national geoscience and public policy issues. In the late 1990s, Jon and I served together on the AASG Executive Committee.

Jon's resumé is a compelling testimony to his very active and tremendously varied career in the geosciences. He has, since completing his graduate degrees at the University of California-Berkeley, devoted the ensuing thirty-two years to almost every aspect of the profession. Although he began his career with relatively brief stints in academia (Bucknell University) and the private sector (U.S. Steel Corporation), Jon has spent the remainder of his time working in the public sector, first with the Texas Bureau of Economic Geology and, since 1988, as the Director of the Nevada Bureau of Mines and Geology. In the early 1990s, Jon took a two-year leave of absence from the Nevada Bureau to serve as Staff Director for the Board on Earth Sciences and Resources at the National Research Council in Washington, DC. Over the past twenty years, Jon somehow found time to actively participate in a prodigious number of national and international professional organizations and societies, serving as president of three (American Institute of Professional Geologists, Society of Economic Geologists, Association of American State Geologists) and as an executive committee member or councilor for several others.

Jon is a prolific writer. He has, over the past 30-plus years, authored or co-authored hundreds of peer-reviewed technical publications, abstracts, symposium proceedings, guidebooks, newsletters, popular articles, state legislative and Congressional testimony, and e-mails. Especially e-mails …

I am most familiar with Jon's work in the AASG, for which he has had numerous leadership roles. Jon has been especially active on the AASG Federal Liaison Committee and regularly participates in that committee's biannual visits to Washington, DC. He also supplied much energy and commitment to the AASG efforts to successfully develop, enact, fund, and reauthorize the National Geologic Mapping Act. Jon served four years on the Federal Advisory Committee that oversees this well-regarded and productive program. At present, Jon is the longest-serving sitting state geologist. If AASG had an academic procession, he would lead it.

Much like Ian Campbell, Jon Price has actively participated in and contributed to many different facets of the geosciences. He has served as a research scientist, teacher, administrator, president of several national professional societies, and in the public policy arena at the state and federal levels. He is a vigorous and articulate advocate for the geosciences and, more importantly, for the timely transfer of unbiased geoscience information to political decision makers at all levels of government. He is not afraid to make candid assessments of people and organizations that, in his opinion, could be serving the geosciences more appropriately and effectively. But he is never without thoughtful suggestions about how changes and improvements can be achieved. His dedication and energy are truly remarkable. And he race-walks for relaxation!

On behalf of the American Geological Institute and its Member Societies, I am pleased to present to you the 2009 Ian Campbell medalist Jonathan Price.

### *Response by Jonathan G. Price*

I thank Jamie for his citation and the AGI nomination committee and Member Society Council for selecting me. It is a great honor to be recognized for contributions to the profession, because the medal demonstrates, at least for me, that geology is tremendously fun.

I started having fun with geology at about the age of five, while collecting brachiopods and crinoids in Devonian siltstones on our farm in Pennsylvania. My parents gave me plenty of support (for example, by getting my best fossils identified by the Smithsonian, which, by the way, never returned them; and by working hard to save enough money to send me to a college with a strong geology program). Connections at Lehigh University led to meeting Beth, who has been my spouse, scientific advisor (particularly in chemistry, physics, and biology), bridge partner, exercise coach, co-volunteer with the Red Cross and USA Track and Field, and best friend for 37 years. While I was having fun with field work, Beth handled raising our two children. I'm not disappointed that neither child became a geologist (despite giving them many minerals for holiday presents and taking them underground in a mercury mine at the ages of two and four); Alexander is an engineer, and Argenta is a biochemist.

My professional career developed as a series of coincidences. Had my public high school not offered two years of Latin and four years of German, and had Lehigh not had a third-year language requirement for geology majors, I probably wouldn't have double majored in geology and German or spent a post-graduation year at the University of Heidelberg. Had that university not had such a strong program in economic geology (where I learned from professors Ramdohr, Amstutz, and Harvard visiting professor Petersen), I would have probably focused on igneous petrology and geochemistry at Berkeley (where professors Carmichael, Helgeson, Wenk, Verhoogen, and Bolt nonetheless influenced my approaches to geology). Had Chuck Meyer not suggested that I pursue a dissertation on a Nevada mine, and had he not pushed me to work in industry upon graduation, I would probably not have gone to work for U.S. Steel Corporation. Had ARCO not acquired Anaconda, causing the federal government to worry about a monopoly of the domestic uranium-mining industry, U.S. Steel probably would not have transferred me to South Texas. Had work there not led to a research job at the Texas Bureau of Economic Geology, where Ian Campbell Medalist Bill Fisher was an outstanding mentor, I probably

would not have been qualified to return to Nevada to become the State Geologist, truly an ideal job for me. Had Bill not urged me to accept a two-year assignment with the National Research Council, I probably would not have gained the necessary insight to better serve a state in which 87% of the land is managed by the federal government.

Working with a thoroughly professional and competent support staff and an excellent scientific crew at the Nevada Bureau of Mines and Geology has been fun. Terri Garside has been our executive assistant during much of my service as State Geologist; her attention to details, knowledge, and work ethic have helped on many fronts. Nevada's geology has given me many opportunities to learn, and it has been fun to see our scientific staff make significant strides in understanding the origin of world-class gold deposits; unraveling the tectonic history of the Cordillera; reducing risks from earthquakes through a combination of geological research, interaction with emergency managers, and outreach to the public; applying space geodesy to issues of earthquake, volcano, and tsunami hazards and climate change; expanding geothermal production through applied research and outreach to industry; and educating the public about geology. Even Yucca Mountain and Area 51 have had their fun aspects.

It has been great fun serving scientific and professional organizations, including several member societies of AGI. My supervisors at the University of Nevada, Reno have supported my helping AIPG, SEG, AASG, GSA, SME, AEG, and others. Some of the most fun has been with organizations such as the Western States Seismic Policy Council and the Nevada Earthquake Safety Council, which bring scientists, engineers, emergency managers, insurance experts, social scientists, and others together for the public good.

One of the attractions of moving to Reno was the fact that the Geological Society of Nevada holds monthly dinners with technical talks, two major field trips per year, and a symposium once every five years. As do most successful volunteer organizations, GSN recognizes that you volunteer because you enjoy the work. It has been great working in a state in which so many geologists volunteer their time and skills to documenting the local geology — a function that otherwise falls on the shoulders of the state geological survey. I was particularly pleased to demonstrate the value of GSN's (and the Nevada Petroleum Society's) contributions to the geology of Nevada by giving them office and storage space in our new building, which was an outgrowth of concerted efforts of AGI, the National Research Council, AASG, and others to focus national attention on the need for geoscience sample and data preservation.

I have had the pleasure of working with 21 Ian Campbell Medalists, mostly as volunteers for various geoscience organizations, and it is a true honor to be part of this group. Several of us, led by Charlie Mankin, the 1987 recipient, helped promote geologic mapping — one of the most fun and rewarding endeavors any field geologist can pursue. Sam Adams, the 2005 Medalist, was the recipient with whom I had the longest and most fun experiences — starting with his leading a tour for Berkeley grad students at a mine in New Mexico, hatching the ideas for Earth Science Week with Susan Landon and other volunteers for AGI, stimulating debates about mining on federal lands and support for the USGS during National Research Council studies, and welcoming our family to be part of his and Nancy's extended family in New England and Nevada. Throughout his career Sam demonstrated, as did Ian Campbell, that geology is tremendously fun. I know that message will endure. Thank you.