2014

GSA Medals & Awards

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of the

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Vancouver, British Columbia, Canada

RIP RAPP AWARD FOR ARCHAEOLOGICAL GEOLOGY

Presented to
William R. Dickinson

William R. Dickinson
University of Arizona, Tucson

Citation by David Killick

This is the third time that William (Bill) Dickinson has been honored by the Geological Society of America. He was awarded the Penrose Medal in 1991, and the Laurence L. Sloss Award for Sedimentary Geology in 1999. He was also elected to the National Academy of Sciences in 1992 for his extraordinary volume of research combining sedimentary petrology with tectonics, applied particularly to reconstructing the geological evolution of the Pacific and of North America. Yet very few of those who know Bill as a towering figure in these fields realize that he has also had a parallel career in archaeological geology that began in 1965 and has so far produced 121 publications.

Bill Dickinson's contributions to archaeological geology have had two foci. The first has been to track the earliest migrations of humans into the Pacific between 1200 and 750 BCE. He has done this by quantitative optical petrography of the Lapita pottery that the migrants took with them. By comparing the frequency of mineral and lithic temper grains in these sherds to those of temper sands that he and his collaborating archaeologists have systematically collected on Pacific islands, Bill has been able to identify the starting points for most of these voyages. These data have been enormously important in reconstructing the earliest settlement of western Polynesia.

His second major contribution to archaeology has been on the geomorphology of Pacific islands, whose present shorelines differ from those encountered by the earliest Lapita voyagers because of mid- Holocene sea-level changes and subsequent isostatic uplift. These studies have been immensely helpful in prospecting for archaeological sites of Lapita age.

The many letters received in support of this nomination testify to the reverence of many Pacific archaeologists for Bill Dickinson as a person, and for their very high regard for his work. There can be no more deserving recipient of the Rip Rapp Award for Archaeological Geology.

Response by William R. Dickinson

When I first put my standard specialties of sedimentary geology and tectonics to work in the service of geoarchaeology a half century ago, I had no inkling that effort would gain me such a signal and unexpected honor. I stand here infused with a mixture of humility, pride, and unalloyed joy.

I took my first step into geoarchaeology in 1965 as a sidelight to mapping the Wainimala orogen and its cover rocks on Viti Levu in Fiji with a Guggenheim Fellowship during my first sabbatical from Stanford. Laurence and Helen Birks were at the same time excavating the famed Lapita ceramic site beneath the Sigatoka sand dunes on the south coast. At the time, it was unclear whether Lapita ware was fabricated at some central entrepot in Melanesia, to be carried from there across some 4000 km of the South Pacific, or whether it was made locally on the multiple islands where it is now found. To approach that issue, I undertook a study of the sedimentology and sedimentary petrography of the Sigatoka dune sands in parallel with a study of the temper sands embedded in Sigatoka pottery. Without a doubt, the pottery was tempered with local sand.

On my way home from Fiji, I stopped by the Bishop Museum in Honolulu where Richard Shutler, Jr. (deceased 2007) was serendipitously in residence for a year. Richard knew the value of geology to archaeology, having been the first scientist in charge of the radiocarbon laboratory at the University of Arizona. We hatched the scheme of applying sedimentary petrography to the study of temper sands in Lapita and other ceramic traditions throughout the South Pacific arena. Our co-conspirator from the outset was Roger Green (deceased 2009), the acknowledged doyen of South Pacific archaeology at the University of Auckland.

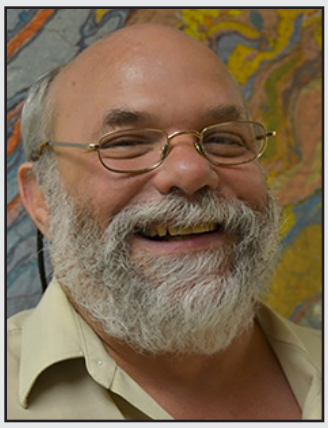
As my research unfolded over the years, potsherds were gratefully received from around 100 archaeological collaborators working on at least 150 islands, and have produced perhaps 2850 thin sections as grist for interpretations. It is by now abundantly clear that it was by and large the pot makers who migrated through the islands of Pacific Oceania over the centuries plying their ancestral skills, and not the pots that moved. Still and all, the same investigative technique has also documented ceramic transfer in limited volume between more than 75 pairs of islands, thereby revealing specific and otherwise undemonstrable cultural ties.

After my retirement from teaching in 1991, able to spend two to four months a year in the islands, I turned my attention to the influence of hydro-isostasy and lithospheric flexure on the evolution of Holocene paleoshorelines where so much archaeology is focused within Pacific Oceania. Since my pursuit of that topic coincided with an era of easy air access to 60 airstrips on multiple far-flung islands, it seems likely that my wife Jackie and I have walked more miles of island shorelines than anyone who ever lived.

I could literally run on for hours but my allotted time is up. Peace be with you all!

GILBERT H. CADY AWARD

Presented to Jack Pashin



Jack Pashin
Oklahoma State University

Citation by Jingle Ruppert

Jack C. Pashin's level of technical expertise is vast and covers sedimentary geology from soup to nuts (petroleum and coal, CO_2 sequestration, sedimentary and structural geology, basin analysis, hydrology, and geochemistry). He received his Ph.D. degree from the University of Kentucky in 1990 and began his professional career at the Geological Survey of Alabama in 1988. He is currently employed as Professor and Devon Energy Chair of Basin Research, Boone Pickens School of Geology, Oklahoma State University, where he develops advanced geoscience curriculum, seeks grant opportunities for students, and runs competitive, multi-institutional research programs.

Jack has produced more than 300 publications in venues ranging from peer-reviewed books and journal articles to abstracts and field trip guidebooks, and he is not slowing down. He is a powerful and clear speaker and communicator as evidenced by his invitation to be an American Association of Petroleum Geologists Distinguished Lecturer: in total he has given more than 185 invited talks.

Jack's research is innovative and award-winning and focuses on the geological aspects of exploration, development, and environmental management of unconventional and conventional hydrocarbon reservoirs and geologic carbon sinks. He is an excellent teacher who immerses himself in his students, mentoring them, and providing sponsorship and guidance. He has served on more than 50 thesis and dissertation committees at nine major U.S. and Australian universities and supported over 30 B.S., M.S., and Ph.D. students on research grants.

And he doesn't stop there. He chairs and participates in research, program, and outreach committees of AAPG, GSA, USGS, and other organizations. He is an Associate Editor for the AAPG Bulletin and is a member of the editorial board of the International Journal of Coal Geology. He has served in leadership positions in the Energy Minerals Division of AAPG, GSA Coal Geology Division, and the Alabama Geological Society.

Jack C. Pashin has received numerous awards from AAPG and other organizations. He was elected a GSA Fellow in 2011 and was the Chair of the Coal Geology Division from 2009-2010. It is time that Jack C. Pashin receive the highest honor of our organization – the Gilbert H. Cady Award.

Response by Jack Pashin

It is a great honor to be considered for the Gilbert Cady Award, and I am grateful and humbled to be this year's recipient. My interest in geology was kindled as a youth while hunting fossils in Ohio. My career path began crystallizing at Bradley University in Illinois, where I was educated by Merrill Foster, Don Gorman, and Henry Helenek. There I studied the Desmoinesian section at the Wolf Covered Bridge, which includes the Colchester coal. This is my earliest link to coal geology and the legacy of Gilbert Cady.

I whiled away the break before graduate school trudging the deep gorges and waterfalls around my birthplace near Cleveland, Ohio. Tom Lewis of Cleveland State University informed me that some great, unsolved geologic mysteries were lurking right under my nose near the Devonian-Mississippian boundary. And so I had my research topic well in hand by the time I arrived at the University of Kentucky under Frank Ettensohn's tutelage. Frank is as great an advisor as a student could have because he teaches how to tackle diverse geologic problems. And with teachers like Jim Cobb, John Ferm, and Sue Rimmer, I couldn't help but get a great background in coal geology.

Ernie Mancini passed through the geology department at Kentucky looking for somebody who could interpret paleoenvironments in coal-bearing strata. Thus began my employment at the Geological Survey of Alabama, where I found myself on the ground floor of the coalbed methane boom and, incidentally, met my wife, Janyth. My background was insufficient for solving the puzzle of coalbed methane reservoir geology. If I wanted to have any impact, I needed to explore the finer points of structural geology and basin hydrology; and I thank Walt Ayers, Rick Groshong, Bill Kaiser, and Steve Laubach for bringing me up to speed. I was fortunate to serve under three state geologists during my tenure at the survey (Ernie Mancini, Don Oltz, and Nick Tew), and all three afforded me the freedom to pursue any opportunity that emerged—from offshore petroleum systems to fractured reservoir characterization and clean coal technology. Clean coal technology has dominated my career since 1998, and I am pleased to have been involved in several CO_2 injection projects. Thanks to Richard Esposito at Southern Company, we are hooking coal-fired power plants to wells, thereby pointing the way toward commercial CO_2 storage and expanding opportunities for enhanced hydrocarbon recovery. I will always fondly remember my colleagues at the Geological Survey of Alabama, whose ideas and efforts were essential to the success of each research project we took on.

In 2013 I joined the Boone Pickens School of Geology at Oklahoma State University, where I find mentoring students highly gratifying and am discovering a range of new research possibilities. In accepting the Cady Award, I would like to thank all of my mentors, colleagues, and collaborators who, alas, are too numerous to name here. In the modern world, after all, the most meaningful scientific contributions are achieved by teams.

E.B. BURWELL, JR. AWARD

Presented to
A. Keith Turner and Robert L. Schuster

Keith Turner
Colorado School Mines

Robert L. Schuster
Retired

Citation by James P. McCalpin

The E.B. Burwell award is made to author/editors of "*a published paper of distinction that advances knowledge concerning principles or practice of engineering geology...*" **Rockfall** (2012, Transportation Research Board, 658 p.) was selected for the 2014 Burwell Award because of its comprehensive nature and high technical level in analyzing a geohazard often encountered in engineering geology.

The book's editors, Keith A. Turner and Robert L. Schuster, between them have more than 100 years of experience in slope stability studies. Their previous TRB monograph "Landslides: Investigation and Mitigation" (1996, 673 p.) won the 1997 Burwell Award. In early 2013 when I first saw notice of Rockfall's publication, I was skeptical that its 658 pages could all be related to rockfall, since that narrow subject took up only a small portion of their previous monograph on landslides. But after looking at the Table of Contents online, I ordered the book. Once I started reading it, I soon realized that it was not only exclusively about rockfall, but that the field had greatly advanced since I had done my last rockfall project. With continued reading I began to understand (and you will too) how out of date one's rockfall knowledge can become in only 10 years.

The book is divided into 4 parts: (1) Recognition of rockfall hazard, 20%; (2) Rockfall analysis and investigation, 45%; (3) Rockfall mitigation, 20%, and (4) Rockfall maintenance and management programs, 5%. This mix of science, engineering, and hazard management makes the book a comprehensive reference book, which was also a hallmark of their previous monograph.

Applied sciences like engineering geology advance not continuously, but in small to large leaps spurred by bombshell publications such as this one. Such books can only be written by researchers who have spent decades in the forefront of their field, as Drs. Turner and Schuster have. And so today we honor their latest "monster" monograph with the 2014 Burwell Award.

Response by Alan Keith Turner and Robert L. Schuster

Receiving the 2014 Burwell Award is really a special honor and greatly appreciated by both of us. It is somehow fitting that this Burwell is awarded in Vancouver for a book devoted to rockfall.

Turner was faced for the first time with rockfall-hazard-mitigation issues on the Trans-Canada Highway at Hells Gate in the Fraser Canyon in 1965. At that time he held the position of Engineering Geologist for the Department of Public Works in Ottawa. The Trans-Canada Highway involved federal funding, so an enquiry by provincial authorities led to his first visit to the west coast – a several-day field trip to see the recent Hope Landslide and the slope instabilities along the Fraser and Thompson Canyons. Hells Gate had already been extensively rock bolted, so only continued monitoring of an obviously dangerous slope was recommended.

The story does not end there, however. In the summer of 1969, Turner and his wife traveled on the Trans-Canada from Vancouver to Toronto while on vacation. As they rounded the corner approaching Hells Gate they faced a large rock in free-fall! It missed the car, landing on the shoulder, and there was no collision with other traffic. His wife's strong opinions about limitations of the existing efforts on rockfall mitigation led Turner to participate in the deliberations on rockfall that began at about this time at the Transportation Research Board (TRB) Annual Meetings.

TRB is a division of the National Research Council. Our rockfall book is the fourth of a series of Highway Research Board/ Transportation Research Board texts on slope failure. Schuster has been co-editor on three of these, and Turner and Schuster have been co-editors on the last two. The 1996 TRB landslide book that we co-edited was a great success, and was the reason we received the 1997 Burwell Award. So this second Burwell Award is really an unexpected honor.

We are long-time members of GSA: Schuster since 1959; Turner since 1964. We are also long-time friends and professional collaborators. We first met at an annual TRB meeting in Washington, D.C., in about 1970. In the early 1970s Turner joined the faculty of the Colorado School of Mines (CSM) and Schuster joined the Engineering Geology Branch of the U.S. Geological Survey in Denver. For 40 years we and our families have lived within a mile of each other in Golden, Colorado. During those years, we have spent a considerable amount of time working together either in Turner's CSM office or over the kitchen table at the Schuster home. The high points of our professional collaboration have been our two TRB landslide volumes.

We are deeply appreciative of all who assisted with the writing and production of the rockfall book. Over the years, we had the unfailing support of our families, including our wives who were very happy to see the book completed, and numerous colleagues at the Colorado School of Mines, the U.S. Geological Survey, and the Transportation Research Board.

OUTSTANDING CONTRIBUTIONS IN GEOINFORMATICS

Presented to Ian Jackson

Ian Jackson
formerly British Geological Survey

Citation by Lee Allison

The GSA Geoinformatics Division brings together professionals in our field to advance discussion of our issues and ideas, to facilitate teamwork by earth scientists and computer scientists, to promote publication of our progress, and to advance education in our crucially important discipline.

To pursue goals such as these, it is customary for groups such as ours to present major awards to those who have demonstrated the most admirable commitment to and leadership in our field, thus providing a model to which we all may aspire.

The Division therefore has established the 'Outstanding Contributions in Geoinformatics Award', to be presented annually to a highly worthy nominee for outstanding contributions to geology through application of the principles of geoinformatics.

Today, it gives me great pleasure to present the 2014 GSA Geoinformatics Division 'Outstanding Contributions in Geoinformatics Award' to Ian Jackson, who is widely known for his long and superb service to advance the field of geoinformatics through his pioneering work at the British Geological Survey, to the establishment and unprecedented success of the OneGeology initiative, and to many important international activities such as CGI – the Commission for the Management and Application of Geoscience Information.

Ian graduated from the University of Newcastle upon Tyne in 1972. He began his career with BGS in 1973, working on mineral resource assessments in the UK and overseas.

In 1983, he became a field geologist in the coalfields of North-East England, where he applied early computing systems to large borehole and mine plan databases. Subsequently, he was appointed manager of a corporate project to introduce digital map production across BGS in 1990.

Ian then became BGS Director of Information from 2000 to 2007, and he was appointed Chief of Operations prior to his recent retirement from BGS. Concurrently, he fulfilled roles such as member of the European Commission team that drafted regulations for INSPIRE – the Infrastructure for Spatial Information in the European Community.

A dominant theme throughout Ian's career has been the wide application of geoscience data for societal benefit, a goal he continues to promote as a consultant on the international stage. Ian has been one of the first in geological survey organizations worldwide to understand, and more importantly, to change the organization of the survey to fulfill its role of "information agency."

Ian understood the importance of standards to achieve the opening of geoscientific data for diverse uses, and took a decisive part to the recreation of the IUGS/CGI.

Among his many accomplishments, Ian is perhaps best known as the primary instigator of OneGeology - a global initiative to make digital geological map data accessible throughout the world.

OneGeology began at the General Assembly of the Commission for the Geological Map of the World in February 2006 as a vision among a small international group of geologists involved with the management and publication of geological data who faced the daily challenge of sharing and exchanging data. Although many in the group were enthusiastic about the concept, it was Ian who ran with the idea and became the champion and leader of the initiative.

Ian's colleagues uniformly refer to his ability to inspire others on the OneGeology concept and build a strong team with the skills to create OneGeology, his keen awareness of how to get things done, and his ability to find constructive ways around obstacles as key to the success of the initiative.

The project gained momentum under the International Year of Planet Earth, and reached full speed at the stupendously successful Brighton workshop in early 2007, where the Brighton Accord was unanimously adopted by delegates from 54 countries.

Ian knew that OneGeology could only be successful if it was promoted as a geology initiative rather than a purely technological project. The Brighton Workshop has been described as a masterful approach to launching OneGeology that showed how the news media could be harnessed to help promote a geoscience initiative. Knowing that international endorsement was a critical first step to OneGeology, Brighton publicity established OneGeology internationally with a degree of success that has rarely been seen before or since.

It is widely accepted that without Ian, OneGeology would not have become the success it is.

Ian's strong leadership is balanced with a diplomacy that managed to coordinate most of the European geological surveys (and the project delivered the first prototype implementation of INSPIRE. This positioned our community as the most advanced and organized community involved in INSPIRE.

Those who have been intimately involved in OneGeology know very well of the immense commitment, passion, and meticulous effort that Ian has contributed to these activities – much of it behind the scenes.

For these tremendous contributions to our field, the GSA Geoinformatics Division therefore is immensely pleased to present the 2014 'Outstanding Contributions in Geoinformatics Award', to Ian Jackson.

Response by Ian Jackson

I would like to thank members of the Geoinformatics Division and the GSA for this award; it is very much appreciated. If I may I would like to accept it on behalf of the OneGeology and British Geological Survey teams. In particular I would like to acknowledge the enormous effort and contribution of friends and colleagues in the less well developed countries of the world; it is they who have advanced the furthest and added most value.

Those who know me know well that I have maintained a strong belief throughout my career that the prime responsibility of geological surveys, and the geoscientists who work within them, is to apply their science for the benefit of society. While some of those in the academic sector have a legitimate reason to pursue knowledge for knowledge sake that, in my view, is not the role of geological surveys. Their mission is, or should be, to seek to maximise the value of their work for their stakeholders.

In the context of geoscience information this means that geological surveys must ask themselves: *Given the new technologies available to us, are we fully adding value to and disseminating the data, information and knowledge we already hold before we embark on new surveys and data acquisition programmes?* I do not believe that this is a question that is asked often enough. The result is that good science and data produced by our predecessors, that has been funded by society and can improve health and welfare, lies hidden and inaccessible.

I am of course making the case for surely the most deserving Cinderellas in the geological domain - data management and delivery. It often seems to me that, as a science, geology's desire to build plush washrooms far outstrips its ability to complete the essential sewage and water supply infrastructure.

The relevance to this award? Well I very much hope that the work done by OneGeology and BGS has in some small way adjusted the balance and demonstrated the value of managing and disseminating geological data. I would also hope that it has made those of us in the so-called developed world realise how much we can help those who are less fortunate than us and how much our colleagues appreciate that help.

Thank you.

GEORGE P. WOOLLARD AWARD

Presented to
Joe Kirschvink

Joe Kirschvink
California Institute of Technology

Citation by Benjamin Weiss and Francis Macdonald

We are delighted to present the 2014 Woollard Award to Joseph L. Kirschvink. Throughout his career, Joe has inspired students and has pushed the fields of paleomagnetism and geobiology with creative and provocative hypotheses.

Immediately upon finishing college, Joe generated some of the first magnetostratigraphic and chemostratigraphic records tied to radiometric ages that culminated in the construction of a *geomagnetic polarity time scale and global paleogeography through the Cambrian Explosion*. With this work, Joe identified large and rapid shifts in pole positions and proposed that the Earth experienced episodes of *inertial interchange true polar wander*, in which the outer solid Earth rotated tens of degrees over periods of just millions of years. This should have had profound implications sea level, the carbon cycle, and the evolution of life.

Using a paleomagnetic fold test, Joe confirmed that Neoproterozoic glacial deposits were deposited at equatorial latitudes and proposed the *Snowball Earth hypothesis*. Previous energy balance models suggested global glaciation was implausible because the ice albedo effect left no way out of a terminally glaciated state. Joe had the insight that a diminished hydrological cycle in combination with the release of volcanic CO_2 would result in a super-greenhouse and catastrophic deglaciation. The Snowball Earth hypothesis has since been spectacularly confirmed with chemical evidence of extreme CO_2 concentrations in globally synchronous cap carbonate sequences.

Joe also played a *foundational role in biomagnetism*. His work, led to the discovery of the magnetic sensory organelles used by animals to detect the geomagnetic field. This is the first new sensory organ discovered in higher animals since bat sonar was identified more than 70 years ago. *With these and other discoveries, Joe became one of the original "geobiologists" who built this interdisciplinary field.*

Joe's contributions to *paleomagnetic instrumentation and analysis* are too numerous to mention but have profoundly changed the field.

On top of all of these research achievements, Joe has been an extraordinary mentor and teacher with a large and loyal following of former students that are active in science. Congratulations, Joe!

Response by Joe Kirschvink

Francis, Ben – thank you for your overly generous citation. I don't know where to begin my response. Although I have been a member of the Geological Society of America for nearly 40 years, I never thought in my wildest dreams that the Geophysics Division would consider a gadfly like me for the George P. Woollard award, particularly as I am a card-carrying Geobiologist (whatever that means). On the other hand, physics was my first intellectual love. I have been very fortunate in not really having to choose between physics, biology, and the earth sciences ever since I was an undergraduate at Caltech. Everything fascinated me from the beginning, and my faculty mentors never worried about what I was doing, as long as it was interesting. Many of them put deep fingerprints in my brain, including (at Caltech) Gene Shoemaker, Heinz Lowenstam, Lee Silver, James Bonner, and Dick Feynman, and (at Princeton) Al Fischer, Jason Morgan, Rob Hargraves, and Jim Gould. Many friends and colleagues elsewhere have been critically important too, including Paul Hoffman and Jim Kasting, in particular!

After joining the faculty at Caltech in 1981, I've had the enormous satisfaction of working with a group of hyper-stimulating students who have taken those old fingerprints on the brain and stretched them in numerous unexpected directions. In addition to Francis Macdonald and Ben Weiss, I'm particularly indebted to Dawn Sumner, Paul Filmer, Robin Chang, Rob Ripperdan, Linda Maepa, Rob Ferber, David Evans, Chris Pluhar, Jack Holt, José Hurtado, Kevin Boyce, Adam Maloof, Tim Raub, Isaac Hilburn, Cody Nash, Bob Kopp, Sonia Tikoo, Sarah Slotznick, and many others. Also, I would really like to thank my wife, Atsuko, for being extraordinarily patient with me, and our boys, Jiseki and Kōseki, for tolerating their geological names ('Magnetite' and 'Gemstone' in Japanese).

I suppose that there is a unifying theme in much of my work, namely magnetism. Magnets fascinate me. I was delighted when I realized that a frozen bit of animal tissue was essentially a rock, and then one could do rock magnetism on it. Heinz Lowenstam and I started this on chitons (a type of marine mollusk), whose teeth are capped with a hardening layer of biological magnetite. I was curious about how much magnetite these little animals could produce, which led to comparisons with the magnetotactic bacteria and the eventual discovery of magnetofossils. It also opened a new door of biophysics concerning how a magnetite-based receptor cell could act as a magnetic sense organ for migrating and homing animals. That has been a fun pursuit. We actually have a major project funded by the Human Frontiers Science Program, trying to train humans to consciously perceive the geomagnetic field. Perhaps someday field geologists won't need their Brunton compasses any more!

Bringing this back to George P. Woollard, it is fitting to note that he was a pioneer in the construction and interpretation of large-scale gravity and magnetic anomaly maps, including some for the east coast of the United States. Having those maps, and later the digital data, were critical for helping us understand the magnetic navigation of birds and bees, and even crazy things like whale strandings. I'm not sure if this is "multidisciplinary", "interdisciplinary", or what – but I certainly know it has been fun! And in my Woollard lecture I would like to upset paleontologists by suggesting that the Cambrian explosion might have been partially an artifact of true polar wander! Again, many thanks.

BIGGS AWARD FOR EXCELLENCE IN EARTH SCIENCE TEACHING

Presented to
Callan Bentley

Callan Bentley
Northern Virginia Community College

Citation by Heather Macdonald and Robert Blodgett

Callan Bentley, recipient of the 2014 Biggs Award, is an outstanding educator held in high regard by his students and colleagues. His instruction, work with students, outreach, and writing have been extraordinary. After only six years as a full-time professor at Northern Virginia Community College (NOVA), he received the Chancellor's Award for Teaching Excellence, the highest honor for Virginia community college faculty. His interactive, and challenging courses all have field experiences. One that he developed, Regional Field Geology of the Northern Rocky Mountains, has had a profound, life-changing effect on the students. This year he joined Joshua Villalobos from El Paso Community College (EPCC) in a course which brought NOVA students to West Texas and EPCC students to Virginia for collaborative field work. His richly-illustrated *Mountain Beltway* blog, one of the first in the "AGU Blogosphere" reaches thousands of readers around the world. His pioneering macro GigaPan photography has created a "virtual Virginia" for online geology. Callan was the founding editor of *Foundations*, the NAGT Geo2YC Two-year Colleges Division e-newsletter. His public outreach has included more than 85 public-interest geology talks, tours, and hikes in the past 8 years. Few faculty, at any level, inspire and engage as many people in the Earth sciences by integrating field work with cutting-edge visualizations. As Steve Whitmeyer recently wrote, Callan's success is a model for all of us to emulate.

Response by Callan Bentley

It's wonderful to be here today with you, here on Earth. You and I are fortunate to live on a very interesting planet. It's big enough to have differentiated. This allows a magnetic field that protects our atmosphere from erosion by the solar wind. Differentiation also provides for mantle convection, the power source driving plate tectonics. The eruption of volcanoes and gravitational acquisition of comets both yield water, and this water is critical for life. Every critter and microbe needs liquid water, and for 4.5 billion years, our planet's surface has had the right blend of solar heating and greenhouse gas insulation to keep the water flowing. *What fortune!* Every move we make, every breathe we take, we rely on geology.

In my job, it is a delight to be surrounded by clever people who are largely unaware of the dynamic geomachinations that sustain them. You and I teach them to read the world. In every process, Earth generates a little clue or two. The cumulative record of these clues is a fantastic saga: from magma ocean to stromatolitic 'slimeworld' to Snowball Earth to Cambrian explosion and eventually human intelligence, we've come a long way! And we have the rocks to prove it.

You and I are the ones who get the honor of opening the world's eyes to geoscience. We reintroduce our students to the planet, what it's made of, how it works, how it sustains them, and how it can kill them. We provide a vital service, a job that is extraordinarily gratifying fun. For each new student, we slip a pair of geology-colored glasses onto their face, and lean back with satisfaction as they stare about in newfound wonder. Their appreciation is the greatest reward.

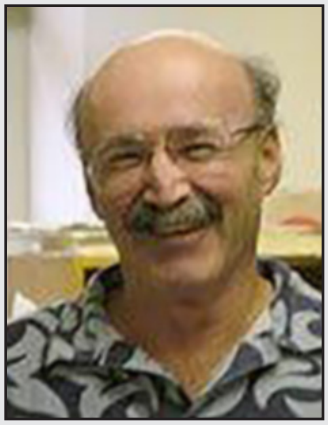
I'm honored to be recognized with the Biggs Award. I thank Heather MacDonald and Bob Blodgett for making the effort to nominate me. Heather and the faculty at William & Mary nurtured a familial atmosphere that drew me into geology as a very young man. They inspired me, as did many talented writers and artists. I'm grateful to my colleagues at NOVA, Geo2YC, Pearson, and every institution I've been lucky enough to be affiliated with. I'm most grateful to my hardworking students, too many to list now, but some of the best are here at this meeting. My wife Lily is a stalwart supporter of my many projects, but she rightfully reminds me that life is short, and work is but one facet of a full life. Sharing an appreciation of nature with our son Baxter is now the project I want to spend all my time on.

Every person in this room is interested in geoscience education. Future students are lucky to have you to learn from. I hope you are as honored as I am to be doing this job. It is essential work for the sake of our species' future, and for the sake of feeling at home here on the most fascinating planet in the neighborhood.

Thank you.

MARY C. RABBITT HISTORY AND PHILOSOPHY OF GEOLOGY AWARD

Presented to
Henry Robert Frankel



Henry Robert Frankel
University of Missouri - Kansas City

Citation by Alan Leviton and Michele Aldrich

Henry Frankel received the Mary Rabbitt Award in recognition of his lifetime achievement in researching and writing about the controversy over continental drift and its evolution into plate tectonics. He is the first philosopher of science to win it.

Hank received a BA in zoology from Oberlin College and a PhD from Ohio State University in Philosophy, where he learned to appreciate the history of philosophy from Robert Turnbull and was introduced to philosophy of science by Peter Machamer, himself a philosopher and historian of science. In 1971, Hank began teaching in the Philosophy Department of the University of Missouri at Kansas City. The University strongly supported his research projects with numerous grants. He also won support from the National Science Foundation, American Philosophical Society, and the National Endowment for the Humanities.

For three decades, Hank presented papers on the history of continental drift at scholarly meetings, including the AGU, GSA, History of Science Society, Philosophy of Science Association, AAAS, and INHIGEO.

Hank's papers document the growth and change of Frankel's methods and conclusions across time. Initially, some of the papers followed traditional philosophy format, framing of a model followed by use of drift as a test. Early on, Hank argued that Thomas Kuhn's account of scientific change failed to explain the plate tectonics revolution. He argued that Irme Lakatos' account fared better while Larry Laudan's offered the best fit.

Gradually, Hank found himself creating as well as gathering evidence he needed to write the history of drift. This led to detailed studies of marine geology and arguments over seafloor spreading, paleomagnetism and their role in drift controversy, and the development of plate tectonics itself. He consulted archival collections and read their published papers. But he went beyond that to do extensive interviews with many of the characters in the story and to correspond over many years with central figures to analyze and clarify what happened at crucial junctures. And he continually mulled over what to do with this huge body of material to make it available to future scholars.

The project culminated in Hank's magisterial 4-volume history of drift published in 2012 by Cambridge University Press. The books have already won awards including the journal *Choice*'s designation as an outstanding academic title, the Friedman award of the Geological Society of London, and the Geoscience Information Society's 2013 Best Reference Book Award for his first volume.

Hanks' books have been reviewed in several places. All reviews are strongly positive. We mention four here, Anthony Hallam's in Isis, David Miller's in *Contemporary Physics*, Robert Mayhew's in *Progress in Physical Geography*, and Paul Hoffman's in *EOS*. Hoffman's is the most thorough and informative; he summarizes what Hank covers, and identifies Frankel's most important findings. Hallam chose to emphasize the contrast between American and British reception of drift. Hank builds much of his story on regional differences in geological research and thinking, but not as a way to say one is better than the other, as Hallam does. Mayhew hopes that Frankel and Cambridge University Press produce a single-volume work on the controversy that is affordable to students. We concur. Miller and Hallam imply that Hank thinks the plate tectonics revolution fits Kuhn's view of scientific growth and change.

However, we and Hank think that Kuhn's model does not work. Drift and classical geology coexisted as "paradigms" or mega-theories for over fifty years. The only way the history of geology fits Kuhn is if you view everything before plate tectonics as preparadigmatic and make plate tectonics the first real paradigm. But Kuhn himself viewed uniformitarianism as offering a previous paradigm. The history of geology is not the only bad fit for Kuhn. Historians of biology have trouble with it, and so do historians of economic thought, who have to cope with Marxism coexisting with classical theory and then Keynesian economics. If Hank writes a short book on the drift controversy, we think he should return directly to philosophical issues about scientific change and the plate tectonics revolution.

Hallam and Hoffman proclaim that Hank's books are the definitive work on the subject. It is true that other scholars are unlikely to redo all the interviews and undertake correspondence with the same characters, many of whom are now deceased. But we see the books as a starting point. After all, even Darwin's *Origin of Species* was a starting point, and like Darwin, Hank will be remembered for a long time to come for his extraordinary accomplishment.

Here are some topics we think warrant investigation, mostly inspired by his fourth volume, *Evolution into Plate Tectonics*:

1. The application of plates to continents. This is an exciting story. Hank ends his story with the development of plate tectonics and its initial application to ocean floors. We need regional studies of the reception and modification of plate tectonics to the continents.
2. More detailed studies are needed on the regional (i.e., Europe, South America, etc.) reception of drift from the 1920s through the '50s.
3. Permian glaciation. The story actually begins in the mid-1860s. Hank has some materials on later works that need to be pulled together and analyzed as a topic in itself to respond to such questions as How did pre-drift geologists handle it? What use did drifters make of it? How did anti-drifters deal with it?
4. Petroleum geologists' reaction to plate tectonics. We've heard anecdotes that they were slow, but that may have been a projection from the rejection in the 1930s.
5. Drift and plate tectonics in college textbooks. What did they say about drift? Were some specialties more receptive than others? Are there differences among nationalities?
6. Drift and plate tectonics in college classrooms. When, where, and how?

Response by Henry Frankel

I am greatly honored to receive the 2014 Mary C. Rabbit History and Philosophy Geology Award from the History of Geology Division of the Geological Society of America, especially because my own work has been in philosophy and history of science, and concentrated almost entirely on geology and geophysics. Nonetheless, I've been an outsider to the community of historians of geology; your honoring me with this award is a tribute to your broad-mindedness. An undergraduate zoology/chemistry major at Oberlin College, I studied philosophy of science at Ohio State where I worked with Peter Machamer. Five years after taking a position in the philosophy department at the University of Missouri – Kansas City (UMKC), I learned of the plate tectonics revolution. I'm a slow learner! What a grand opportunity for a philosopher of science to test philosophical accounts of scientific change. It took no imagination to see that here was a post-Kuhnian revolution ripe for philosophical and historical analysis. After finding that Kuhn's model did not fit, while I. Lakatos', and L. Laudan's fared better, I discovered to my surprise that I wanted to know what happened during the controversy quite independently of testing various accounts of science change. I wanted to find out why various participants claimed what they did when they did. Epistemology was still central to my task, but by 1985 I had become more a historian than a philosopher of science. For the next thirty years, longer than the span between the rise of paleomagnetism and acceptance of plate tectonics, I tried to figure out what happened during the drift controversy. I could not have done so without the generous input from major and minor participants in the revolution. A few not only wanted to help me get their contributions right, but wanted me to get the entire story right. Here I have in mind especially Edward Irving, Dan McKenzie, Robert Fisher, and Fred Vine. I also thank Nanette Biersmith, former Administrative Assistant of the Philosophy Department at UMKC. She edited all my works; her judicious suggestions greatly improved them. Finally, I've been so lucky that Paula, my spouse of 45 years, who has had only slight interest in the plate tectonics revolution, has put up with me, often telling me to quit complaining and get back to work.

O.E. MEINZER AWARD

Presented to
Charles F. Harvey

Charles F. Harvey
Massachusetts Institute of Technology

Citation by Roger Daniel Beckie

It is my pleasure to present Charles (Charlie) Harvey as the recipient of the 2014 O.E. Meinzer Award. Through his career Charlie has identified important problems, attacked them with a remarkable range of original tools and approaches, and achieved many profound insights. His investigations of arsenic in South Asian groundwater are particularly noteworthy and the basis of this Meinzer Award.

Charlie's early contributions with his collaborators were directed at understanding solute transport in heterogeneous aquifers and are all notable for their ingenuity and novelty. He developed temporal moment equations which provide a simpler and analytically advantageous description of solute transport. These equations have subsequently been applied in many contexts, particularly inverse modeling, rate-limited mass transfer, mixing, groundwater age and effects of heterogeneity. At a time when the dominant model was macrodispersive, Charlie showed that simple mass-transfer well explained solute transport at the MADE site and is a useful alternative conceptualization for strongly heterogeneous systems. When it was thought that pulsed pumping may provide for a more efficient remediation of mass-transfer-limited solutes, he showed that it made no difference. He showed a fundamental weakness of second-order geostatistical descriptions, which are the basis of many stochastic approaches. These contributions shared some common threads: the elegant application and clear exposition of analytical methods to gain insights into the problem. At the end of the nineties he did not appear to have a strong background in groundwater geochemistry, let alone using field and laboratory methods of investigations.

At that time, few of us in the hydrogeology community were aware of the tragedy of arsenic in groundwater that was unfolding in South Asia. In a well - intended attempt to reduce sickness and disease caused by the consumption of surface water, villagers were installing millions of "tube wells" that regrettably produced drinking water containing dangerous concentrations of arsenic. The work of local authorities in Bangladesh and India, and the British Geological Survey, revealed what to this day remains as probably the most extensive groundwater contamination problem in the world.

In 2000 it was clear that fundamental empirical science – gathering field and laboratory data – was necessary to make progress on the arsenic problem. It was understood through superb antecedent studies that the arsenic was naturally occurring, but there was no agreement on the mechanism by which arsenic was released from sediments into solution. One hypothesis assumed oxidation of arsenical sulfides was responsible, another that phosphate from fertilizer released sorbed arsenic, and a third that arsenic was released when iron oxides were reduced by bacteria during the anaerobic respiration of organic carbon.

I don't know exactly how Charlie became aware of the arsenic problem and decided as a young assistant professor to abandon the comfortable world of Cambridge and Laplace transforms and plunge into geochemistry. It was certainly a bold move.

Charlie proceeded to lead and implement a stunning set of field and laboratory investigations that are the basis of his ground-breaking contributions including his 2002 Science paper, his 2004 Geochimica paper and the 2006 Chemical Geology paper. It is hard to understate the organizational skill and acumen, as well as the risk that he undertook to abandon his familiar research areas and establish a field program on the other side of the globe, in an underdeveloped country, essentially on his own while still an assistant professor.

Typical of Charlie, he took a novel approach to his investigations. In particular, he established a single heavily instrumented field site where he characterized the hydrology and geochemistry in great detail. This was a key innovation, distinct from a regional survey approach, and provided the basis for profound insights into arsenic dynamics.

The 2002 Science paper established unequivocally for the first time that reduction hypothesis is a viable mechanism for arsenic release. In a so-called "push-pull" experiment he injected molasses and tracer into the aquifer at his field site and showed that arsenic concentrations increased as iron oxides were reduced to soluble ferrous iron and the sorbed arsenic was released into solution.

In many ways to me the most remarkable publication is the 2004 Geochimica paper. It is a tour – de – force of geochemical analysis and established Charlie as a bonafide geochemist. In a painstaking field and laboratory program, including sequential extraction analyses, he and his team quantified the arsenic solid and aqueous concentrations and general groundwater geochemistry with depth. They characterized the distribution of arsenic with depth and showed that there existed a "hump" or peak in arsenic concentration at approximately 30 m depth, something suggested by the mass surveys of villager wells. This paper is still to my mind one of the most comprehensive, thorough and informative geochemistry papers on the arsenic problem.

The 2006 Chemical Geology paper is an integrated assessment of the hydrology and geochemistry of arsenic dynamics. It employed a simple zero-dimensional conceptualization of the aquifer system to quantify the fluxes of water and mass through the system. The paper's brilliance is the clarity of the model: the system is distilled to the essential components allowing for a transparent examination of cause and effect. This was one of the first papers to interrogate two absolutely fundamental issues: 1) the role of irrigation pumping on arsenic dynamics and 2) the possible sources of the organic carbon that is driving the reduction of iron oxides. The paper quantified the water cycle, established that natural and dug-out ponds could be sources of the organic matter and that irrigation pumping severely disrupted the natural hydrologic cycle.

In the four years between 2002 and 2006, Charlie had established himself as a world leader in arsenic research. The influence he has had on the field is evident not only in publication metrics, but also in the numerous colleagues who have sought out Charlie for collaborations and advice since that time. Indeed, almost every session on arsenic in groundwater at an international conference will have at least one Charlie

collaborator. And he has made us all better for it. I certainly count my sabbatical year with Charlie at MIT in 2000 – 2001 as one of the most enjoyable and fruitful of my career. I know many of you in the audience today will agree that we have all been enriched by our encounters with Charlie.

Indeed, Charlie is not only a brilliant and creative scientist, but also wonderful person. He is generous with his ideas, patient, open to new approaches and opinions and with his impish humor and easy – going nature, extremely fun to be around. One of the simplest ways to find Charlie is to listen for peals of laughter erupting from a corridor scrum.

Charlie and his collaborators' work on arsenic is remarkable for attacking so many dimensions of the problem, with such an astonishing array of scientific tools, achieving so many significant results. The impact of his work is irrefutable, and his esteem well deserved. I take great joy in being here in my hometown to recognize Charlie with the O.E. Meinzer Award. Please join me in congratulating the 2014 O.E. Meinzer Award recipient, Charles Harvey.

Response by Charles Harvey

Thank you Roger. It's particular nice to hear the citation from you because you have been a model for me of intellectual depth and broad scientific curiosity. I thank the GSA and the hydrogeology division. I am truly grateful for this award, but also suffer a bit from the imposter syndrome that undergrads at prestigious universities supposedly feel. Perhaps there was a mistake. Twenty years ago Roy Haggerty, Alicia Wilson, Carl Renshaw, David Hyndman, Fred Day-Lewis, Claire Tiediman and I were all Steve Gorelick's students. When looking for a job I was once interviewed by someone who conflated at least three of us, those with names starting with H, as one person -- the prolific young hydrologist named something like Harvaggerman. Of course, I let the misunderstanding stand, and here I am. Working with Steve Gorelick and the group at Stanford and Menlo Park was a tremendous opportunity to learn to be a successful scientist and hydrogeologist. Steve's mentoring developed the skills I needed for what came after Stanford. Before Stanford, I had an entry-level job at the Richmond USGS office, where I was inspired by the work of USGS hydrologists to pursue a career in hydrogeology.

I am obviously very lucky to be at MIT with exceptional colleagues such as Harry Hemond, who knows more about the environment than I ever will. But, any of you who know the details of my research also know that my graduate students and post-docs really did it. It's an open secret. What you might not realize is that I haven't had that many – they've just all been really good.

Let me first mention several current members of my group who just might be available for employment. Alex Cobb is the research scientist living in Borneo who did the work I talked about at 8:00 Sunday morning, which a couple of you showed up for. The scope of Alex's work is hard to believe – he designed and built our eddy flux systems, constructing the towers by helicopter deep in the inaccessible Bornean tropical peat swamp forests. He speaks Iban, Malay and Mandarin. He wrote the code that simulates the hydrology and ecological dynamics of the forest over millennia and is now conducting the analysis of gene flow through the forest. Mason Stahl, a PhD student, has led our work in Bangladesh for the last years. To test hypotheses about the cause of arsenic contamination, he directed construction of a lake above an extensive network of wells and sampling devises. I only hear about this from Mason, but I know it must not be easy. Mason has found geochemical and hydrological surprises: terrestrial crabs control the flow through the lakebed and mobilization of old labile organic carbon from beneath the lake. Mason is driving the research to answer questions we have been seeking for a decade.

Our work in Bangladesh began with the interests of Winston Yu back in 1996, who first analyzed the severity of the public health project. It's worth emphasizing that the problem remains bad – very recent epidemiology shows that in parts of Bangladesh twenty percent of mortality can be attributed to arsenic in groundwater. To launch the project in Bangladesh, I first visited Dhaka with Shafiq Islam, now at Tufts, who introduced me to Borhan Badruzzman at the Bangladesh University of Engineering and Technology (BUET). Borhan has guided our project from the beginning and remains, fifteen years later, a most trusted collaborator and colleague. The initial science was directed by Chris Swartz, a recent PhD from MIT. Chris had the broad geochemical insights to understand the system and the field acumen to choose the right measurements. Again, it was really Chris who did the work. Two excellent students followed Chris. Ashfaque Khadakar developed the first numerical models of groundwater flow at the 10-m scale of arsenic variations that we still use to guide our work. Becca Neumann mustered a stunningly broad range of data and models to characterize the reactive flow system that controls arsenic concentrations. At her faculty position at University of Washington, Becca has continued to expand her work to include detailed understanding of root dynamics and redox processes in the subsurface.

That leaves just seven other former student and post-docs. Kaeo Duarte, Holly Michael, Brendan Zinn, Kurt House, Hanan Karam, Elena Abarca and Pete Oates. Pete was the student too smart to take an academic job. Although Pete will never tell you this, he did the most theoretically deep work I have been involved in. Pete has seen his work to fruition, if not in the groundwater literature, then in his remarkable stochastic models of the stock markets and better beer brewing through reactive transport. Kaeo Duarte is an inspiration in the field of environmental management. He combined mathematical aptitude and thoughtful analysis of how people and cultures value present and future water quantity and quality. I am pleased that he is stewarding the future of Native Hawaiian lands. Brendan Zinn produced a piece of work that changed my thinking about whether simple stochastic models are useful in the real world. Kurt House has been an education for me. Through Kurt I learned everything I know about two apparently desperate subjects: thermodynamics and business. It has been a thrill to work with Kurt as he successfully navigated the world of venture capital and land rights to build the first successful carbon sequestration company. Hanan Karam and Elena Abarca have done groundbreaking empirical work on coastal groundwater and achieved new theoretical insights – let's publish it and share it with the world! That leaves Holly Michael. Holly, first, thank you for the nomination. At a young age, Holly has produced a remarkable number of important contributions to the field. I remember Holly as the new graduate student who I suggested might run out to buy fifty 55-gallon steel barrels to manufacture a fleet of seepage meters. She did it, not realizing that I had no idea what I was talking about. Now, I worry that, as I learn more and more from my students, I might start to give future students real guidance, and thereby diminish their development as independent scientists. And, incredibly, I now have the best group of new graduate students I have ever had: Alison Hoyt, Brittany Huhman and Neha Mehta. You will be hearing from them.

Whatever the set of anomalous circumstances that got me here, I'm now on a platform to say something about the field of hydrogeology. Mary Anderson recently

published a fantastic paper describing how Meinzer winners have build the foundations of groundwater hydrology. Where can I go from there? I'll be brief. I'd like to suggest that the future of hydrogeology is in interdisciplinary field-based research. I don't mean the collaboration of a hydrologist with a microbiologist, geochemist or economist. Rather, I mean that the P.I., and hence the students, need to grasp the problem in its entirety. It's not about combining a hydrologic study with a geochemical or ecological study. It's about finding well-posed questions about the complete system from the get go, the system of water and chemistry and biology. Yes, this approach requires a daunting quantity of background knowledge. It's about knowing the limits of ecological understanding, targeting the hydrologic interactions themselves, and designing new field measurements and experimental methods that directly test these interactions. And, ultimately it must be done in the field. After all we aren't studying the equations themselves, or idealized lab models, rather we are only employing them to understand the natural world.

ISRAEL C. RUSSELL AWARD

Presented to
Robin W. Renaut

Robin W. Renaut
University of Saskatchewan

Citation by Gail M. Ashley

I am honored to present to the Division Dr. Robin W. Renaut for the Israel C. Russell Award for excellence in limnogeology through research, teaching, and service. Robin has been at the University of Saskatchewan (in Saskatoon) since receiving his PhD at the University of London. His PhD research in the Lake Bogoria region of East Africa was under the supervision of the illustrious W.W. (Bill) Bishop. At that time, Bishop had number of doctoral students to whom he gave free rein (i.e. let loose) on the Plio-Pleistocene in Africa. Robin thrived in this land of scientific freedom and opportunity. The East African Rift Valley was full of lakes about which very little was known. Robin and colleagues put an end to that. Using field based studies, he has made major contributions to the understanding of sedimentation, tectonics and hydrochemistry of lakes and springs in the Kenyan Rift deposits of the Turkana, Baringo-Bogoria and Magadi-Natron basins. With colleagues, he determined the role of groundwater in lake chemistry and resolved the mystery of why the East African lakes range from highly alkaline (i.e., soda lakes) to fresh. During his career he has published nearly 90 papers in referred journals and another 40 as chapters in edited volumes. He is one of the scientific field team for the Lake Magadi Basin drilling area for the HSPDP (Hominin Sites and Paleolakes Drilling Project), in this international effort to obtain long-term records near hominin sites. Drilling of Lake Magadi occurred just this summer.

He is a collaborator extraordinaire, being both stimulating and easy to work with. He has had a long-standing collaboration with Brian Jones (University of Alberta) and they have published over 40 papers on springs (both hot and cool) and composed of both silica- and carbonate-rich sediment. These papers starting in 1994 (20 years ago) are the gold standard for sedimentary geochemistry and high-resolution SEM imagery.

Robin has had a long collaboration with R. Bernhart Owen (Bernie); they served as each other's field assistants during their doctoral research and worked together since. They are often referred to as the Terrible Two by colleagues working with them. They have been friends and colleagues for over 30 years and have published sixteen papers together, so far.

Robin is an outstanding and dedicated teacher, as well, and has supervised a total of 22 BS, MS and PhD students. He is a man who sees through the confusing natural world of sedimentary geochemistry and depositional environments, and provides clarity of thought in his presentations. The excellent teaching ability carries over to his research. Robin's papers are always clearly written, full of details and have well-conceived illustrations that tie things together. He is also an artist. His chapter on "Lakes" that he co-authored with Elizabeth Gierlowski Kordesch in Facies Models (4th edition) is a "must have" for limnogeologists for both teaching and research.

Robin has also been very generous with his time for the profession. He has served as Associate Editor of a number of international journals, faithfully served on grant selection committees and as grant director for Research Council of Canada (NSERC), He was one of the founding fathers of IAL (International Association Limnogeology) and currently on the Board of Directors.

In summary, this nomination recognizes the major contributions in research, teaching and service that Robin W. Renaut has made to the relatively new, but rapidly growing discipline of limnogeology. He was one of the first researchers to approach the study of rift lakes holistically from the large-scale perspective of rift tectonics down to the microbes responsible for hot spring deposits. He has set a very high standard of accomplishment and is most deserving of the Israel C. Russell award. I am honored to be able to give Robin recognition for his achievements.

Response by Robin W. Renaut

Thank you Gail for those kind words. I am honoured to have received this award from the GSA Limnogeology Division. It is very nice to receive recognition from your peers for doing what you enjoy.

My interest in lakes began very early. I grew up in London near some ponds, where as a child I spent a lot of time throwing stale bread to ducks. My interest in the East African rift lakes began when I was an undergraduate student at the University of London, where I took a course on Cenozoic geology by the late Bill Bishop, who gave me the opportunity to do a PhD in Kenya. Bill was a sedimentologist and stratigrapher who specialised in providing the geological context for hominin sites in East Africa. During my first field season in 1976 I visited Lake Bogoria and its hot springs, and immediately fell in love with the place. There began my interest in saline lakes, geothermal sediments, and continental rift sedimentology.

For me, one of the main attractions of lakes is that they can be studied almost holistically. We can trace sediments from source to sink, and follow the chemical evolution and behaviour of waters from the most dilute to the most saline brine. The scale of modern lakes provides an opportunity to try to tackle the whole depositional system rather than just one small part. One day you can be studying gravel beaches, another day microbial carbonates, and another day turbidites. These depositional systems have huge diversity and are never boring.

Thirty years ago the limnogeological community was very small and seems to have grown almost exponentially since then. We can all thank Kerry Kelts and Beth Gierlowski-Kordesch for bringing together scattered groups of researchers and graduate students from around the world. Their initial efforts provided the roots for what we have today – both the Limnogeology Division of GSA and the International Association of Limnogeologists. Our informal conferences back then were small (perhaps only 30 to 40 people), great fun, and often field-based in remote locations. From them evolved the International Limnogeological Congresses, with hundreds of participants – Michael Rosen is organising the sixth one in Reno next June. They are always great events.

I have been very fortunate to work with many talented lake geology researchers who have taught me so much and frequently corrected some of my wilder ideas. Among them are Jean-Jacques Tiercelin, Beth Gierlowski-Kordesch, Gail Ashley, Tim

Lowenstein, Jenni Scott, Andy Cohen, Dan Deocampo, Michael Rosen, and Michael Stamatakis. In particular, I must thank my close friend and colleague, Bernie Owen. Bernie and I met as grad students in 1975 and have worked on modern and ancient lake sediments in many countries. We have just finished a field season drilling the floor of Lake Magadi, and are now planning a new project, making almost 40 years of collaboration and research. I consider part of this award to be shared with Bernie.

Our discipline is in a healthy state. The paleoclimate records preserved in lake sediments are unparalleled, and the future of limnogeology looks very bright.

To conclude, I am very grateful for this award and sincerely thank the Limnogeology Division, and many friends, colleagues and graduate students who enjoy working on lakes. I especially thank my wife, Lin, for her continuing support and for always accepting my absences to do fieldwork, often for extended periods. Thank you all.

DISTINGUISHED GEOLOGIC CAREER AWARD (MGPV DIVISION)

Presented to
Frederick A. Frey

Frederick A. Frey
Massachusetts Institute of Technology

Citation by J Michael Rhodes

I have known, and admired the work of, Fred Frey, the 2014 recipient of the Geological Society of America's Distinguished Career Award in Petrology, Mineralogy and Geochemistry for over 40 years.

Formally trained in chemistry, Fred rapidly established a reputation as a leading geochemist, making some of the earliest contributions to our understanding of trace element geochemistry of the rare-earth elements in a wide variety of rocks. This new approach to geochemistry used Radiochemical Neutron Activation Analysis (RNAA), an extremely painstaking technique that undoubtedly honed his uncompromising insistence on the importance of the highest quality geochemical data.

Later, Fred, among others, introduced Instrumental Neutron Activation Analysis to geochemistry, contributing to the instrumental revolution that, including X-Ray Fluorescence Analysis and Isotope Dilution Analysis, that improved data quality for both major and trace element analyses. Fred was a pioneer in this revolution, making possible quantitative trace element modeling of magmatic processes.

Early in his career, Fred realized that to understand the dynamics of the earth's mantle and melting processes within it, he needed, first, to study mantle rocks and mantle-derived magmas in different tectonic environments and, second, to integrate trace element geochemistry with field and volcanological studies, and with petrology, mineralogy, and isotopic analyses. His extensive, and highly cited, publication list (211 to date) shows that he has been extremely successful in both these goals, and his collaborators include a veritable "Who's Who" in geology, petrology, volcanology and geochemistry.

Significant contributions to the Geoscience Community have included working on numerous committees, co-convening several Geological Society of America Penrose Conferences and AGU Chapman Conferences and yeoman service as Associate Editor of Geochemica Cosmochemica Acta for over twenty years. In 1998 he became President-Elect of the Volcanology, Geochemistry and Petrology Section of the American Geophysical Union, and President between 2000 and 2002. At MIT, Fred has trained 32 students. Almost all have gone on to successful careers in the Geosciences.

In summary, Fred Frey has had an outstanding, highly productive and sustained career over 48 years. His publications cover an exceedingly wide range of topics, almost all in highly rated journals. Many are "classics" that have been highly influential in modern geochemistry. In recognition of his outstanding research contributions he received the prestigious AGU Bowen Award in 1986, was elected a Fellow of the American Geophysical Union (AGU) in 1996, and was elected Fellow of the Geochemical Society and the European Association of Geochemistry in 2000. In my opinion Fred belongs amongst the greats of modern geochemisty and the Geological Society of America's Distinguished Career Award in Petrology, Mineralogy and Geochemistry is a fitting tribute to his remarkable career.

Response by Frederick A. Frey

"Thank You" to MGPV, Mike and most importantly to my students; there is no doubt that without their research skills and motivation to succeed, I would not be here.

A Distinguished Career Award leads me to reflect on forks in the road. Undergraduate School: MIT or Wisconsin? In 1956 MIT students chanted "$1500 tuition is Too Damn Much." The Wisconsin $50 tuition made the choice easy. Why Chemical Engineering? A difficult major, but a BS Chem Eng led to job opportunities At Hercules Chemical Company, I supervised a technician who knew more than I did; an uncomfortable situation. Graduate School: Harvard Business School or Chemistry at Wisconsin? I chose the latter. Assistant Professor Larry Haskin had developed a radiochemical technique for determining the abundance of rare-earth elements (REE). Larry asked me "Would you be interested in determining the REE content of deep-seated rocks"? I had no clue what "deep- seated rocks" meant, but replied "sure". I analyzed peridotites (deep-seated rocks). While discussing my results, Larry said, "one of us must learn **geology**." Next semester a course in Igneous Petrology initiated my association with the Department of Geosciences.

After a thesis defense in 1966, I was surprised that two universities were interested in hiring a geochemist. Frank Press, recently appointed Chair of the Geology and Geophysics at MIT, was building a new department. A superb opportunity, but I recall that Frank said "I was a full professor by age 31; no reason you cannot do the same." Did he realize that I was already 28?

What research paths to follow? Trace Element Geochemistry was not a well-established field, and I was often asked "how can you ignore 99% of the rock". I sent letters to igneous petrologists who might be interested in collaborative research. A positive reply came from Dave Green, who had mineral separates from the Lizard peridotite; I was eager to analyze them for REE. Our jointly authored papers are my most cited publications. We continued to study peridotite massifs. Stimulated by John Dickey's thesis research on the Ronda Peridotite, students M. Obata and J. Suen identified systematics to the layering and compositional variation. Then study of the layered Horoman Peridotite showed us that to understand mantle processes our km-scale sampling had to be supplemented by cm-scale sampling using a portable rock drill followed by ion-probe analyses of clinopyroxene in the facility supervised by Nobu Shimizu.

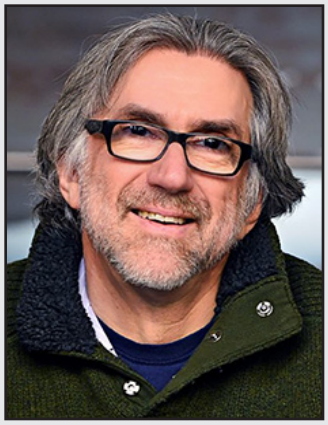
I realized that accurate compositional data are not useful if the sample analyzed was inappropriate for solving the problem being addressed. In our studies of mantle xenoliths we found that the absence of field constraints hindered our understanding. As part of my thesis I determined REE abundances in MORB. The results, depletion in the most incompatible elements, were surprising. Bill Bryan and Geoff Thompson at WHOI and I used MORB obtained by DSDP to understand the geochemical characteristics of the igneous

oceanic crust. Studies of drill core from Hawaiian volcanoes were stimulated by M. Garcia and a long term collaboration with Dave Clague has led to 15 papers focused on Hawaiian lavas. Discussions with Mike Rhodes, and use of his XRF facility, have been stimulating to many aspects of our research. Our studies of Andean volcanoes in Chile resulted from Lopez-Escobar, my only student with 3 MIT degrees. Our efforts on basalt forming the Eastern Indian Ocean seafloor began with a 1988 ODP cruise to the Ninetyeast Ridge, when as shipboard scientists Dominique Weis and I realized that we had complementary geochemical skills. My experience in major and trace element geochemistry combined with her expertise in radiogenic isotopic ratios has led to 30 papers.

In closing I have enjoyed my career because understanding evolution of the earth requires people with diverse expertise working together towards a common goal. It is fun and my career continues.

G. K. GILBERT AWARD

Presented to
W. B. McKinnon



Bill McKinnon
Washington University in St Louis

Citation by Jay Melosh

It is a great pleasure to see the Gilbert Award presented to William B. McKinnon. G. K. Gilbert excelled in applying quantitative reasoning to geologic and planetary processes, a talent evident in Bill's own research. Bill's distinguished career in Planetary Science began in 1981 at Caltech, where his PhD dissertation focused on the mechanics of complex crater formation. This work shortly developed into the ring tectonic theory of multiringed basin formation, a theory that has received spectacular verification from the GRAIL gravity investigation of the Orientale basin on the Moon. Bill's true love, however, always lay in the outer part of our solar system, where the icy moons of the giant planets captured most of his later attention.

Bill was one of the first to recognize that the bright lanes arcing across Galileo Regio on Ganymede form a ring system similar to (but larger than) the Valhalla system on Callisto. He has been a leading investigator of convection in Europa's icy shell in collaboration with a long list of students and postdocs. He proposed an impact origin for Charon, the major satellite of the dwarf planet Pluto and is participating in the upcoming flyby of that object. Most recently he played an important role in defining the nature and origin of Iapetus' (and Enceladus') equatorial ridge. Bill has been an active advocate for planetary science and exploration. He has a talent for clearly summarizing complex information and his many review papers and edited books are, for many aspiring young scientists, their first source of information about the bizarre denizens of the outer solar system.

For all of these reasons, and many more that there is no space to list here, I think that Bill McKinnon is a most fitting recipient for the 2014 Gilbert Award.

Response by W. B. McKinnon

I thank Jay for his gracious remarks. I also thank my luck to be born in the middle of the 20th century. I was able to see the Moon and planets revealed one by one as the real places they are. As a boy I was utterly captivated by the far off worlds of our solar system, but had to be contented with low-resolution telescopic images or illustrations from the imagination. I went to college (MIT) to study science in some form, but it only became clear with time that the path to the planets, for me, lay through geology. I remain forever grateful for my undergraduate grounding, in both physics and geology, and for such inspirational teachers as Irwin Shapiro and John Lewis.

Heading out west for the first time, I landed at Caltech, and began my graduate work with Jay Melosh, someone who needs no introduction given his immense contributions to planetary science. Our initial theoretical (and a bit of experimental) work in impact cratering was fascinating enough, but what valorized my graduate years were the launch and arrival of the twin Voyagers at Jupiter. Entirely new worlds to explore and understand (by which I mean the satellites)! I have never looked back (or at least not much). The one-score-and-two midsize and large satellites of the giant planets illustrate splendidly the variation possible in geological and geophysical evolution, and the uncountable number of dwarf planets in deep solar space provide a boundless scientific frontier.

It was also in graduate school that I discovered G.K. Gilbert, whose papers can still be read with profit — for their insights, prescience, and methodology. Indeed, I continue to assign his 1896 *Science* paper on "a topographic problem" (Meteor Crater) in my planetary geology class, as an example of coming to the wrong conclusion for all the right reasons. Nature can be subtle, and it is so important to question one's assumptions. Gilbert's expert consideration of the impact problem and the surface of the Moon make him, in my view, the first true planetary geologist. I am deeply honored to receive this award named for him.

Space does not allow me to thank everyone to whom I owe so much, but I will try: Jay Melosh, of course, who initiated me into the mysteries of impact cratering and tectonics, and who provided the template for a scientific life; the other faculty and students at Caltech back in the day, including Andy Ingersoll, Dewey Muhleman, Gene Shoemaker, and Peter Goldreich; Bob Strom of the University of Arizona, who needed a postdoc to study icy satellites right when I needed a job; Larry Haskin and the department at Washington University in St. Louis, who took a chance offering a faculty position to a greenhorn; my parents, grandparents, siblings, and uncles; my most excellent former students, many of whom made the trek to Vancouver; numerous colleagues and bffs (many of whom are the same); and of course my lovely and talented wife Kate and our children.

In closing, I will simply say that it is wonderful to reconvene, as we periodically do, this tribe of like-minded planet and (especially) icy satellite enthusiasts. Planetary science, and especially planetary geology, is never, ever boring. New discoveries roll in endlessly, enriching and ennobling the common heritage of humankind.

KIRK BRYAN AWARD

Presented to John C. Ridge

with John C. Ridge, Greg Balco, Robert L. Bayless, Catherine C. Beck, Laura B. Carter, Jody L. Dean, Emily B. Voytek, Jeremy H. Wei

For
"**The new North American varve chronology: a precise record of southeastern Laurentide Ice Sheet deglaciation and climate, 18.2–12.5 kyr BP, and correlations with Greenland ice core records**" 2012, American Journal of Science 312: 685-722.

John C. Ridge
Tufts University

Citation by Gail M. Ashley

This is a truly an outstanding paper that represents major advancements in the fields of both Quaternary geology and geomorphology (the corner stones of the Division).

The paper is concise, well written and the concepts and results summarized clearly. It represents over two decades of meticulous field and laboratory work and yet the data are synthesized and presented in just a few diagrams. The paper summarizes nearly 6000 years represented by the North American Varve Chronology (NAVC). I highlight below what I think are the 6 major contributions of this landmark publication:

(1) *An interdisciplinary approach to collection and integration of data.* The paper was based on the knowledge of local and regional field relations of glacial deposits in a vast area from southern Connecticut to Quebec. It required the integration of geomorphology, sedimentology, stratigraphy and glacial geology on a range of temporal and spatial scales.

(2) *Best practices in sedimentology.* The basis of the chronology is ultimately the varved sediments, annual deposits accumulated in lakes from glacial meltwater. The paper presents beautiful, high-resolution photos of the sediments. The close-ups of the laminae show the inter-annular variability at different locations. No two varves are alike, but the rhythmic beat of the annual cycle is clearly depicted and reflects the sedimentation processes that formed them. The detailed logs of the varves are the paper's key data source.

(3) *Best practices in stratigraphy.* The varves in New England were recorded and compiled by Ernst Antevs (1922). But, his record was "floating" and there were gaps, some minor errors, and there was a general lack of confidence in his findings because of the paucity of independent dating. Ridge and co-authors revised the NAVC, established a credible record by using cores combined with outcrop data and radiocarbon dates. They corrected the errors in Antev's record, closed a major gap and extended the record by ~1000 years. Using detailed logs of varves and basic principles of stratigraphy, the record now reaches 5,659 continuous years spanning most of the last deglaciation.

(4) *Interpretation of Laurentide Ice Sheet dynamics.* The precise chronology (within ~ a decade) represented by the NAVC has opened doors to interpreting both the environment in which the varves formed (dynamics of the northeastern portion of Laurentide Ice Sheet), as well as other records associated with deglaciation, such as local climate changes, sea level rise, moraine belts, re-vegetation of the landscape, migration of animals, and arrival of humans.

(5) *Potential for determining the response of Northern Hemisphere ice sheets to climate change.* One of the extraordinary outcomes of the American Journal of Science paper is the potential for correlation of the NAVC to the Greenland Ice Core record. Comparison of varve thickness records with Greenland ice-core climate records show that after 15,000 yr BP, climate changes of sub-century and longer scales recorded in both records appear identical and synchronous indicating there was a link between North Atlantic climate and marginal processes of the southeastern sector of the Laurentide Ice Sheet. Prior to 15,000 yr BP the correlation is not as strong suggesting dominance by local factors.

(6) *The varve record is a yard stick against which future climate change can be compared.* With the planet warming, modern ice sheets will likely contribute to eustatic sea level rise, but how much and at what rate is debated. The NAVC record and its tight correlation to the Greenland Ice Core record makes it a valuable tool to guide predictions of future sea level rise.

In summary, the Ridge et al. 2012 publication in AJS is a paper of great distinction advancing the sciences of geomorphology and Quaternary geology. Built on over 2 decades of research and presented in a clear readable document, this publication will have impact on our science for years to come. It is most deserving of the QG&G Kirk Bryan Award.

Response by John C. Ridge

Thank you, Gail for your very kind words. It is both a great honor and a humbling experience to receive the Kirk Bryan Award and we thank the Quaternary Geology and Geomorphology Division for making this award possible. Our gratitude goes to the people and organizations that made our work possible. We would like to thank the National Science Foundation and the drillers of the U.S. Geological Survey, especially Glen Berwick, Eugene Cobbs, and Jeff Grey. Also, Carl Koteff of the USGS and former New Hampshire State Geologist Gene Boudette both supported field mapping in southwestern New Hampshire that would prove to be invaluable in finding critical drilling sites. Our paper was the culmination many smaller studies over the last 25 years, mostly by undergraduate students at Tufts. They put the pieces in place that would be critical to turning the original New England Varve Chronology into a continuous, calibrated sequence.

I am thankful for the recognition our paper has received, but not just for the scientific merit that it may have. The *American Journal of Science* and its editors allowed us to pursue other objectives as well. First, it is our hope that the paper will provoke interest in varve chronology in North America, which has been under-utilized for too long. There are many untapped reservoirs of varves that would lend themselves to glacial stratigraphy. Varves are more than just a time scale because they can dovetail with many other types of investigations, including: radiocarbon chronology, precise ages and rates of deglaciation, variations in weather and climate, correlation with ice core records, paleomagnetic stratigraphy, cosmogenic nuclide dating of deglaciation, and the chronology of trace and microfossils. We have only scratched the surface in these endeavors, even in New England where glacial lakes and long varve sequences are abundant and well studied.

Another objective was to write a paper that would be a widely-read educational publication. As much as possible, we hope the paper will inspire budding "varve-ologists" and inform the Quaternary community of the relevance of varve studies.

A final objective was to provide an historical perspective on glacial varve chronology in North America. After the formulation of the New England Varve Chronology in the 1920s by Ernst Antevs, and before the full value of the chronology could be appreciated, it was mostly rejected in the U.S. as an accurate time scale. In fact, mention and references to the New England Varve Chronology were not included in the later two editions of Richard Foster Flint's textbooks on glacial geology. It was a time when varve chronology seemed to be incompatible with the first radiocarbon ages from New England.

There were several scientists whose work advocated for acceptance of the varve chronology, but they were largely ignored by the Quaternary community. Beginning in 1938, geophysicists used the varve chronology to assemble paleomagnetic records. Most noteworthy is the work of Alvin McNish, Ellis Johnson, Oscar Torreson, and Thomas Murphy that was later refined by Ken Verosub. In the 1970s Gail Ashley also published what is still the definitive paper on the sedimentology of varves in the Connecticut Valley and at a time when skepticism regarding varves was high and there were few women in the field.

When I started my career at Tufts, although I had heard about the New England Varve Chronology and was intrigued by it, I didn't arrive with the idea of studying varve chronology. However, I had the good fortune of being a friend of Fred Larsen (now emeritus) at Norwich University in Vermont. Fred contacted me in 1988 saying, "Jack, I found the Rosetta Stone!" The Rosetta Stone turned out to be a 20-meter excavation for tennis court material in a clay pit with over 600 varves along Canoe Brook in Dummerston, Vermont. With Fred's encouragement we measured the section and matched it exactly to Ernst Antevs' chronology. We published the record along with the first radiocarbon ages from New England varves in the *GSA Bulletin*. Shortly afterward I received a letter from Dick Goldthwait, praising us for our work and also making it known that he had fond memories as a teenager of helping Ernst Antevs assemble his varve records in the attic of his parents' home in Hanover, New Hampshire.

I have also been lucky in another respect. I had colleagues in the Geology Department at Tufts, especially Charlie Stearns and Bert Reuss, who encouraged me to pursue varves as an avenue of research despite negative attitudes about varves in New England. The science seemed solid and as Charlie Stearns once told me: His PhD advisor at Harvard, Kirk Bryan, always thought varves were a great idea and that Antevs' varve chronology should not be dismissed.

We often admire some past geologist's work as being brilliant, but frequently qualify our accolades in light of past academic training and older technology. For me this person is Ernst Antevs, but I do not have to qualify my admiration. He arrived in America from Sweden in 1920 with his mentor Gerard De Geer. By 1922 Antevs published 90% of the New England Varve Chronology with field measurement of 101 varve sections in New England and New York. By 1931 he had formulated almost all the other glacial varve sequences that we have today across the United States and Canada. In his free time Antevs published a book on the alpine vegetation zones of the White Mountains in New Hampshire and wrote articles on the Pleistocene of the Great Basin, dendrochronology, and the pattern of glacial isostasy in New England. All of these investigations have been improved since Antevs' time but his work on varves still stands. In the 1930s Ernst Antevs moved to a ranch in Arizona where he and Kirk Bryan shared an interest in the climate change chronology of the Southwest as it related to postglacial archaeology. It seems fitting that Ernst Antevs receive recognition and our paper is dedicated to him and his work on varves.

Again, the Kirk Bryan Award is a tremendous honor and on behalf of my co-authors I thank all those who nominated our paper and the Quaternary Geology and Geomorphology Division for recognizing our work.

LAURENCE L. SLOSS AWARD

Presented to
Chris Paola

Chris Paola
University of Minnesota

No citation/response provided

STRUCTURAL GEOLOGY & TECTONICS CAREER CONTRIBUTION AWARD

Presented to
Darrel Cowan

Darrel Cowan
University of Washington

Citation by Terry Pavlis

It is a great pleasure to present tonight's recipient of the SG&T Career Contribution Award, Darrel Cowan. I am honored to present this citation because Darrel is a unique individual whose work has influenced so many of us. One of Darrel's nomination letters said it best:

" Darrel's distinctive voice and rigorous attention to logic and detail has produced a body of work that has influenced decades of progress in structural geology and tectonics. Darrel is extremely clear and forthright in judging his own and other's interpretations, and has used his significant influence to return the community time and again to fundamental field/observational tests on new ideas".

That is a very compact summary of why Darrel is here tonight. His career contributions span a broad spectrum and all across that spectrum his works are highly regarded. I always knew that but I was impressed by how obvious this was in his letters of support for this nomination (and it was a long list—we spammed the committee). They supported my opinion because each emphasized different things in their letters. To me that was an indication that Darrel isn't the geo equivalent of a one-hit-wonder artist. Some of his letter writers emphasized his work on melanges, others Baja BC, others fault zone studies, others Cordilleran strike-slip issues or Cordilleran tectonics in general. To me that shows his work is highly respected across the board, the perfect record for a recipient of this award.

Many of you also know that Darrel is an exemplary "good citizen" to our profession. We could as easily be here talking about a GSA distinguished service award. He has tirelessly worked for our division, often behind the scenes, on things from science plans to GSA business. In his own institution he has served as department chair while maintaining a stellar research record. Some of you also know him as the point man for SHEAR—a geo hostel in California. Perhaps most notably, however, is in what NSF would call Broader Impacts. His list of PhD graduates reads like a who's who in this division—most of them are sitting out there tonight. Clearly anyone could take mentoring lessons from Darrel!

Finally on a more personal note, I am sure everyone who knows Darrel cheered when they heard he was receiving this award. We could spent a few moments roasting Darrel, but I think we can save that until later where we can talk about karaoke or the contrast in the mechanical skills of brothers (Darrel has a brother who is a construction contractor), or maybe talk about being desert trailer trash.

Congratulations Darrel from all of us here!

Response by Darrel Cowan

A few years ago our class of graduating seniors asked their classmate, Harrison, to make a few remarks at our departmental commencement celebration. He said he had checked a couple of websites for guidance about what to say. One advised: "Don't talk about yourself but keep it personal. Tonight I will speak personally, and I'll talk about myself: How did I become a field geologist, and how did I arrive at working on diverse projects, some of which might have led to this award?"

The first question is easy to answer. During my undergraduate days at Stanford, almost all my teachers—Dr. Compton, Dr. Dickinson, Dr. Page, and Dr. Muller…we used the honorific then—were actively working in the field. But the singular experience was the 1965 summer field course—the "Stanford Geological Survey"—when Dr. Compton took his first group to the Raft River Mountains in NW Utah. We pilgrims dutifully and carefully mapped gently dipping and horizontal thrust faults that had the curious property of having emplaced younger unmetamorphosed units above medium-grade, deformed metamorphic rocks. Of course, the Raft Rivers have since become a poster child for extensional core complexes, and I have had fun wondering: what if I had approached the prof in my typically shy way and said, "Excuse me, Dr. Compton, but I don't think these are thrusts, I think they re an important new type of normal fault, and in my report I'll call them "low-angle normal faults." Why he and I might have received this award decades earlier.

My research projects? I think I worked on them partly by design, but also by serendipity or coincidence. I'd like to give a couple of examples that may be of interest to the junior scholars and students here. You have to remember that my generation of graduate students was very privileged because we were present at the creation—when plate tectonics, promulgated and quantified by geophysicists largely in the marine realm, was brought into continental geology. I happened to be working for my Ph.D. research in the Franciscan assemblage, as it was called then, but not because we knew it is a subduction complex. I don't think that word had been invented. I was trying to gain some insights into unusual chaotic rocks that Ken Hsu called mélange. But seemingly overnight, we recognized that the Franciscan is part of the great triad of late Mesozoic California convergent-margin geology: the Franciscan the subduction complex, the Great Valley sequence the fore-arc basin, and the Sierra Nevada the magmatic arc.

I have long favored the idea that tectonic elements have been displaced northwards along the western margin of North America by a thousand kilometers or much more. Once again I think the seed was planted because my Masters student Lee Fairchild was working in the Leech River schist on southern Vancouver Island, and her found that the unit recorded an unusual Buchan-type metamorphism and two syn-metamorphic deformations. I've always liked to read about the western Cordillera, and somehow while Lee was working I happened on a USGS professional paper by Loney, Brew and others on Baranof Island in SE Alaska that described what I thought—never having been there—are rocks so similar that they were once contiguous but had been displaced 1200 km northwards, after 50 million years ago. I'm pretty sure that this seed is what flowered into my support for the Baja British Columbia hypothesis, about which I won't say anything further tonight.

Death Valley and fault rocks: around 1990, Marli Miller was working for her Ph.D. on the Badwater turtleback detachment fault in Death Valley. On a few trips with Marli and Terry Pavlis, I was struck by the excellent exposures of fault rocks, so I began a detailed study with my two postdocs, Juli Morgan and Trenton Cladouhos, not to learn more about detachment faulting, but rather to learn how the fabrics and textures of diverse fault rocks formed in an absolutely certain setting compared with what we observe in mélanges, where there was and is still debate about how much they owe their character to submarine mass movements. But as our work progressed, and we were joined by grad students Eliza Nemser and Nick Hayman, and our Fullerton colleague Jeff Knott, we found the geologic evidence overwhelming that the faults had accrued slip while gently dipping in the late Quaternary.

Still intrigued by the idea that perhaps the Death Valley detachments are active, I happened to be chatting with Dr. Lauro Chiaroluce from INGV in Rome, on the steps of Moscone Center at an AGU meeting around 2003. He told me about new and remarkable results form the Alto Tiberina low-angle normal fault in the central Apennines. His group had put out a temporary array of 40-odd seismometers for a couple of years and found that the fault, which is clearly visible on seismic reflection profiles, is decorated with micro-earthquakes: it is active and seismogenic. I probably would have discovered the paper on my own, but that chance conversation led, almost a decade later, to my current research with my UW colleague Paul Bodin. We were able to put out a temporary array of 12 seismometers looking for micro-earthquakes on the detachment faults which we propose dip westward beneath Death Valley. And we have recorded them.

So if I may, I'd like to contribute a few words of wisdom from a veteran to the students and junior scholars here, and emphasize again how chance and serendipity can influence a career. If you have an empirically based idea, a hypothesis, however it originates, that you feel has legs, run with it to see where it leads. Don't be intimidated by authorities who may not like it, or because it conflicts with received wisdom. Read widely and frequently. And if you are field-oriented, go look at a lot of rocks and structures.

So to GSA and this division, Terry and my nominators, the graduate students, post docs, undergrads, and colleagues who have accompanied me on this journey, I want you to know that you have been my cynosure, my North Star, and for this I am deeply grateful.

Thank you.

INTERNATIONAL SECTION DISTINGUISHED CAREER AWARD

Presented to
Farouk El-Baz

Farouk El-Baz
Boston University

Citation by Nazrul Khandaker

GSA International Section is proud to share the excitement along with numerous earth scientists about Dr. Farouk El-Baz being the recipient of the 2014 Distinguished Career Award. From our point of view it was an easy yet quite compelling task to recognize Farouk's long standing affiliation with the GSA and affiliated societies particularly GSA International Section (GSA IS). Farouk's contribution to advance desert research and utilize remote sensing data to uncover geologic mysteries under Sahara Desert in the seventies kept him fully engaged and enabled him to reach out so many individuals from sub-Saharan countries which certainly brought science and society together. Farouk is truly a geoscientist without border and his academic excellence and humanitarian contribution is second to none. His professional career began by teaching geology at Asyut University, Egypt (1958-1960) and Heidelberg University, Germany (1964-1965). In 1966, he joined the Pan American – U.A.R. Oil Company, where he participated in the discovery of El-Morgan, the first offshore oil field in the Gulf of Suez. As a Research Professor and Director, Center for Remote Sensing, Boston University, he wore many hats and quite amazingly dealt with a wide variety of geoscience and socio-political issues and often brought to a successful completion. Farouk believes in international collaboration and always emphasizes on mutual respect and cultural tolerance. We haven't seen too many individuals like him who relentlessly continued to leave lasting impression on humanity through his thoughtful and caring work. GSA IS was fortunate to have his presence and wisdom with respect to its restructuring and launching of the GSA International and on behalf of the entire management board and overseas participants, let us celebrate this wonderful occasion and echo with Apollo mission 15, Command Module Pilot Alfred Worden's comment, "After the King's [Farouk's nickname] training, I feel like I've been here before."

Response by Farouk El-Baz

I came to the U.S. in 1960 on a graduate scholarship at the Missouri School of Mines and Metallurgy in Rolla, MO. That year, I saved enough money to attend the GSA Annual Meeting. The unforgettable experience of enjoying lectures by, and rubbing shoulders with, eminent geologists encouraged my remaining a member ever since.

With a Ph.D. on the Missouri Lead Belt, I taught mineralogy at Heidelberg University in Germany, then worked in offshore oil exploration in the Gulf of Suez. Upon immigration to the U.S. in 1967, my first job was to interpret lunar photographs in preparation for the Apollo missions to the Moon. Soon, I became Secretary of the Lunar Landing Site Selection Committee, and Chairman of Astronaut Training in Orbital Observation and Photography.

In 1973, I joined the Smithsonian Institution to establish the Center for Earth and Planetary Studies at the National Air and Space Museum. Joint work with Soviet counterparts included discussing joint production of lunar maps. In addition, I was asked to plan the Earth Observations and Photography Experiment on the Apollo-Soyuz earth-orbital mission – the first joint American-Soviet project of 1975.

President Anwar Sadat of Egypt invited me in 1974 to conduct research in Egypt and I began studying its Western Desert with Egyptian colleagues. Utilizing satellite images revealed potential areas for economic development. Four years later, President Sadat appointed me Science Adviser. He continued to show interest in research results to the extent that he once spent two weeks with us in the field - using a helicopter. Many of the agricultural projects initiated then continue to serve the people of Egypt today.

This encouraged investigations of landforms in major deserts including the Rajasthan of India, northwestern China, the Arabian Peninsula, in addition to the African Sahara. Emphasis was placed on groundwater potential in these deserts. The work in Darfur, in particular, was highly apprized by the United Nations and used to satisfy urgent needs of refugees from the political unrest.

Much of that work was conducted at the Boston University Center for Remote Sensing, which was established in 1986. This allowed me to interact with the international geologic community at large. Thus, I served as Chair of the U.S. National Committee on Geological Sciences of the National Academies, with emphasis on strengthening UNESCO programs.

Because of my belief in international geologic cooperation, It was gratifying that the GSA established the "Farouk El-Baz Desert Research Award" to yearly reward a distinguished researcher in the field. In addition, because students greatly contribute to generating new ideas and approaches, GSA also established the "Farouk El-Baz Student Research Award" to be given yearly to two students (one male and one female) to support field research on arid landforms anywhere in the world.

Because I firmly believe in the significance of joint research with international colleagues, I accept with great humility and pleasure the "Distinguished Career Award" of the GSA International Section. I look forward to increased activity in this regard by the new initiative of GSA International.