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RIP RAPP ARCHAEOLOGICAL GEOLOGY AWARD

Presented to
Don G. Wyckoff

Don G. Wyckoff
Oklahoma Museum of Natural History

Citation by Jesse A.M. Ballenger and Stance Hurst

The 2011 recipient of the Rip Rapp Award in archaeological geology is Don G. Wyckoff. Don completed his Ph.D. in Quaternary Studies at Washington State University in 1980 under the direction of Peter Mehringer. His distinguished career spans 50 years of research concentrated on the Southern Plains and Osage Prairie, where he has discovered, collected, and interpreted critically important pieces of the late Quaternary environmental and archaeological records, and where his emphasis on geoarchaeology will guide the interests of future archaeologists and Quaternary scientists alike.

One of Don's most significant contributions to the late Quaternary prehistory of the Southern Plains unfolded at the Burnham site in 1986, where stone tool debris was found in stratigraphic association with a 33,000-year-old Bison alleni skull. The resulting multi-year, inter-disciplinary project led by Don aimed to reconcile the association of extinct faunas and artifacts 20,000 years before the appearance of Clovis, no small task in light of the complex stratigraphic situation at the site. Relying on information from geomorphology, geochronology, pollens, snail ecology, and mammalian faunas, Don and his team were able to bring multiple lines of evidence to bear upon the problem. The resulting report, published in 2004, describes evidence that the bones and artifacts were together in a secondary deposit, leaving the antiquity of the artifacts unresolved. At the same time, the Burnham project provided an important record of Oklahoma's Ice-Age past, and it is a benchmark as the first concentrated effort to break the so-called "Clovis barrier" in Oklahoma. In 2007, Don led another interdisciplinary team in investigations at central Oklahoma's Powell Farm site, another mid-Wisconsinan pond deposit with complex late Pleistocene and Holocene deposits overlying it.

One of the epiphanies to come out of Don's experiences at Burnham and other late-Quaternary fossil sites was the need to better understand the modern distribution of terrestrial gastropods. The resulting Southern Plains Gastropod Survey conducted by Don represents a quantified baseline survey of terrestrial gastropod assemblages along a 700 km transect spanning three physiographic provinces and four biotic districts. During 1995 and 1996, more than 35,000 shells assignable to 26 taxa of terrestrial gastropods were sampled by Don and his colleagues. The results of this study revealed an east-to-west shift in the composition of land snail taxa, and it provides an important reference for studying Quaternary fossil assemblages. From 1997 to 2005 this research team collected land snails from Oklahoma to the Canadian border, from the Ozarks to the Southern Plains, and south into central Texas. A book compiling all these findings is currently underway.

One of Don's most significant contributions to Plains archaeology began in 1962 when he led excavations at the deeply stratified Packard site in northeastern Oklahoma. The site included an assemblage of lanceolate-shaped projectile points (now known as the Packard Complex) beneath Dalton tools. With the advent of AMS dating, Don went back to the Packard site collections and was able to show that Plains-oriented groups were visiting eastern Oklahoma by approximately 9,800 B.P., immediately before or during the widespread expansion of Dalton populations in the region.

However, if we were to measure Don's contributions based on how he allocated his time and resources, his greatest accomplishment would have to be his recruitment and training of students. As an instructor, Don stressed the development of skills acquired first-hand in the field. In his graduate-level courses in geoarchaeology, he dedicated his weekends to escorting students to various stratigraphic sections throughout the state in order to instruct them in the proper documentation of soils and sediments within but also apart from the complexities introduced by human occupation. In 2009 Don went a step further by publishing several student papers in Geoarchaeology of the Cross Timbers, Memoir 13 of the Oklahoma Anthropological Society. His lithic technology course required two semesters, the first to learn the vast literature dedicated to the topics of geology, fracture mechanics, and human tool using behavior, and the second to learn how to apply that knowledge to a nodule of rock.

Don's passion for prehistory has taken him down many roads, and in each case he arrived with an eye on the fundamentals of archaeological geology, scholarship, and mentoring. We believe his efforts reflect the spirit and the standards of the award he is receiving, and that both the Geological Society of America and past award recipients should be proud to recognize him in this way. It is therefore with great pleasure that I introduce Don G. Wyckoff as the 29th recipient of the Rip Rapp Award.

Response by Don G. Wyckoff

Having former students and colleagues nominate me for this award is deeply appreciated. To actually receive this award is even more gratifying, yet very humbling given the list of previous recipients. I certainly don't consider myself in their league. So in accepting this award, I express my thanks to the geoarchaeological decision makers and especially to three colleagues who, since 1985, have played key roles in our combined efforts to understand what was going on in Oklahoma since mid-Wisconsinan times. Brian Carter, at Oklahoma State University, has been a constant source of knowledge and questions as we opened up stratified deposits tucked away in slopes in the central and northwestern parts of the Rolling Red Plains. Likewise, archaeologist-rancher Pete Thurmond consistently proved to be an astute observer and synthesizer as we recorded profiles and collected cores from Pleistocene and Holocene dunes and alluvial deposits in the Washita River watershed of western Oklahoma. Finally, Jim Theler, University of Wisconsin-LaCrosse, has enlightened all of us with his knowledge of gastropods and its application to paleosols and sediments dating back to over 150,000 years ago.

My interests in geology, pedology, and past environments were initiated and sustained by Robert E. Bell, Peter Mehringer, and Henry Smith. Dr. Bell gave me a chance to run archaeological salvage projects in Oklahoma, and the first two sites dug revealed multiple occupations buried in diverse terrace settings. In addition to forcing me to become concerned with alluviation and taphonomic issues, the recovered artifacts were primarily of chipped stone. Given Dr. Bell's early study (1941 M.A. thesis, University of Chicago) of the prehistoric use of particular kinds of knappable stone for certain kinds of chipped stone tools, his insights spurred me to continually seek better information on the bedrock sources of such materials. Such research is ongoing as now I am analyzing 8000 to 9000 year old artifacts from a southern Oklahoma site where quartzite formed and exotic chert clasts were deposited in middle Cretaceous beach sands. Frank Leonhardy supported my application to the Ph.D. program in Quaternary Studies at Washington State University, and there Pete Mehringer introduced me to palynology and raised my awareness of "secrets of the past" while Henry Smith taught pedology with a strong emphasis on tephra, other eolian, and alluvial processes in soil formation and landscape development. I am indebted to these scholars and teachers. I thank my Oklahoma University anthropology colleagues for allowing me to develop and teach courses in past environments and human society, geoarchaeology, and lithic technology. The students proved worthy and demanding, and it was a pleasure to try to keep up with their expectations. To have my efforts recognized in the kind words and thoughts expressed by Stance and Jesse is most touching. I thank you all for this very special recognition.

GILBERT H. CADY AWARD

Presented to
William A. Dimichele

William A. Dimichele
Smithsonian Institute

Citation by W. John Nelson and Howard Falcon-Lang

This year's recipient of the Gilbert H. Cady Award is Bill DiMichele of the Smithsonian Institution, one of the world's leading paleobiologists. In the course of his prolific thirty-year career, Bill has made huge contributions to our understanding of the Carboniferous peat-forming ecosystems and hence the origin of coal. Indeed, his name is so synonymous with the 'Coal Forests' that it is almost impossible to write a paper on that topic without citing half a dozen of his 110+ publications. A brilliant researcher, Bill is also a warm, collegial and humble person, who nurtures the careers of young scientists and fosters open, collaborative networks through which science flourishes.

Bill began his research career as a doctoral student at the University of Illinois, Champaign-Urbana, in the late 1970s, working in the lab of Prof. Tom Phillips (himself a recipient of the Cady Award in 1992). Together they developed new whole-plant reconstructions for Carboniferous lycopods that emphasized the weird biology of these extinct plants. Bill teamed up with Phillips again while a professor at the University of Washington, Seattle, from 1979-1985, to pioneer studies of coal-swamp ecology. Their work caused a fundamental shift in the field, integrating neo-ecological concepts into paleobotany for the first time and prompting museums around the world to remodel their dioramas. Twenty-five years later, one of Bill's students still remembers his "magnetic appeal" while explaining these new ideas to his graduate class.

Moving to the Smithsonian in 1985, Bill continued work on Coal Forest dynamics. Drawing on his exceptionally broad readings in theoretical biology, he explored how species distribution in time and space could be explained in terms of reproductive biology, biomass costs, and resource partitioning. However, he also became keenly aware of the "inherent strangeness of coal plants" (as one of his colleagues put it) and how the present is not always a reliable key to the past. In response, Bill explored coal mines and natural exposures across the United States (from Texas to Illinois and the Appalachians) to learn what geology could contribute to paleoecology at a time when few paleobotanists were engaged in field studies.

Through that field program, Bill became an advocate of climate change as the major controlling influence on Carboniferous peat accumulation and stratal cyclicity. In this work, Bill was again a pioneer. As one colleague has commented, "Bill did not jump aboard the climate change bandwagon; rather his vision allowed him to help set it in motion, way in advance of its present popularity". Without doubt, paleoclimate research has really played to Bill's great strength as a "renaissance man", being so adept at collaborating with experts from a wide range of disciplines including stratigraphers, sedimentologists, geochemists, soil scientists, and micropalaeontologists. We are therefore delighted that the GSA has chosen to honor someone who has done so much to advance coal geology in so many ways.

Response by William A. Dimichele

Officers and Members of the Coal Division, friends and colleagues,

I would like to thank the Coal Division of the GSA for this award, named for one of the great coal geologists, who served a great geological survey, that of Illinois, with which I have been associated since graduate school. I am grateful to many people of that organization, and of my alma mater, the University of Illinois, for teaching me the basics of geology and botany, and for modeling scientific curiosity, before sending me out to join them on a path through, and all around, coal and the late Paleozoic tropical world.

The first coal I ever saw was weathering around my grandmother's disused coal chute. From that moment on, I was fascinated by black rocks. Later travelling through the Appalachians, I saw red rocks for the first time, equally fascinating. These two, the red and the black, have dominated my research for the past 35 years.

As John Donne once, famously, wrote "No man is an island, entire of itself; every man is a piece of the continent." We rarely hear the latter part of that quotation, which, in its entirety, encapsulates modern science. My "island", shared with my collaborators, is part of the greater "continent" of science, so much of which we accept, with due caution, so that we can progress in our own small fight against ignorance. I can take full credit for little—my whole career has been collaborative, learning from others, sharing and evaluating ideas, all of us asking, to the best of our abilities, "what's this all about?" Some colleagues have played special roles. My thesis advisor, Tom Phillips, with whom I still work, taught me to love this life and work. My friend, John Nelson; no one has taught me more about how to study the earth, about personal integrity, about dirt-track racing. Blaine Cecil, friend and mentor, introduced me to the principle of total evidence and to geology as richly conceptual. Hermann Pfefferkorn, a visionary gentleman whose precocious insights helped guide much of my work. Add some hard-driving, ever-questioning, mostly younger, colleagues, Richard Bateman, John Calder, Cortland Eble, Scott Elrick, Howard Falcon-Lang, Bob Gastaldo, Bob Hook, Hans Kerp, Cindy Looy, Spencer Lucas, Isabel Montañez, Neil Tabor, who have given me their time, insights, and infusions of their great energy. I am especially indebted to my Smithsonian associate, Dan Chaney. Finally, I owe immeasurable thanks to my family, who have given me strength through trials, tested the depths of my wisdom, and continue to teach me much.

Long ago, at the University of Washington, one of my colleagues hoped that 50 years hence he would be cited without attribution in every introductory text book in his field. To do work worth remembering, that had become a truism seems a worthy goal. I should be so fortunate, but that judgment lies outside of my lifetime. In this lifetime, I would like to thank John Nelson and Howard-Falcon Lang for their generous remarks, and the Coal Division for their kind consideration.

E.B. BURWELL, JR., AWARD

Presented to
Lynn Highland and Peter Bobrowsky

for
"The Landslide Handbook: A guide to understanding landslides."
(2008); USGS Circular 1325.

Lynn Highland
USGS Denver

Peter T. Bobrowsky
Geological Survey of Canada

Citation by David H. Huntley

The 2011 E.B. Burwell Jr. Award winning publication by Lynn Highland of the U.S. Geological Survey and Peter Bobrowsky of the Geological Survey of Canada ("The Landslide Handbook: A Guide to Understanding Landslides, 2008, U.S. Geological Survey Circular 1325, 129 p. Available online at: http://pubs.usgs.gov/circ/1325/) is an innovative volume targeted at the non-technical community charged with emergency management, landslide mitigation and public education in both developed and developing countries, including lay persons interested in a comprehensive introduction to landslide hazards. The Handbook features detailed graphics, illustrations and photos from all over the world to emphasize the global nature of landslide hazards and threats to life and property; and so that the user can more easily visualize landslide processes and impacts, along with methods of mapping, monitoring and mitigation.

The Landslide Handbook is a globally relevant text. The volume was first released in English as a publication under the USGS Circular Series and posted online through the USGS website in a downloadable format, and an additional 1,000 hard copies were printed and distributed free of charge. Since 2008, the Handbook has been translated, with minor additions to suit specific audiences, into Mandarin Chinese, Japanese, Spanish and Portuguese editions. The Chinese version was translated by Dr. Fawu Wang, Shimane University, Japan; and with the assistance of Dr. Yueping Yin is available in print and online through the China Geological Survey. A Japanese version, translated by Dr. Tamotsu Nozaki is available online through the Japan Landslide Society's website. The Spanish version, translated by the World Bank's Disaster Global Facility for Disaster Reduction and Recovery, Washington D.C., is accessible online at the World Bank website, and in print from the World Bank. The Portuguese version was translated by Dr. Paulo Rogerio, from Pomerode, Brazil, and was edited and printed by the World Bank. A second English edition targeting a Canadian audience is now in development for release by the Geological Survey of Canada.

It gives me great pleasure to have nominated this unique effort for the prestigious E.B. Burwell Jr. Award within the Engineering Geology Division of the Geological Society of America. The support and endorsement provided during the nomination process by an extraordinary list of international specialists ensured that the peer recognition and acknowledgement that this publication warranted was duly received through accreditation of the engineering geology community. The authors and this volume will continue to serve the best interests of the landslide community for years to come by educating future populations and reducing the risks associated with landslide hazards.

Brief biographies of the co-authors

Lynn Highland is a Geographer with the U.S. Geological Survey Landslide Program, Geologic Hazards Science Center, located in Golden, Colorado. She began her career as an Anthropologist for the USGS Earthquake Program and after obtaining a Masters degree in Geography from the University of Colorado, Boulder, became Coordinator of the National Landslide Information Center and provides outreach support for the USGS Landslide Program and resources for landslide education and information.

Peter Bobrowsky is a Senior Research Scientist with the Geological Survey of Canada and has published widely on a variety of topics including surficial mapping, aggregate resources, till geochemistry, paleoseismology and landslides. He has served on several organizations and societies including Secretary General of International Union of Geological Sciences, International Director of the Canadian Federation of Earth Sciences and Vice President of the Geological Association of Canada. Dr. Bobrowsky also works and lectures in numerous countries around the world and often collaborates with USGS colleagues.

Response by Lynn Highland and Peter Bobrowsky

Landslides occur throughout the world, under all climatic conditions and terrains, cost billions in monetary losses, and are responsible for thousands of deaths and injuries each year. Often, they cause long-term economic disruption, population displacement, and negative effects on the natural environment.

Although considerable literature and research on landslides is generally available, little of this information is accessible in a format that can assist lay audiences. Moreover nothing comprehensive at an *introductory* level has been published since the 1980's. There are a number of excellent texts available that are directed towards a technical audience that have been published by government agencies, academic institutes and the consulting community. Additionally, many other specific publications deal with topical landslide information such as landslide mapping, engineering, mitigation, monitoring and safety. However, no one textbook addresses all the topics collectively under a single cover in a public-friendly format.

To fill this outreach gap, the International Consortium on Landslides endorsed a project proposal entitled "A Best Practices Handbook for Landslide Mitigation" in 2002. As the project evolved, the aim became more comprehensive and targeted at the non-technical community that is normally charged with emergency management, landslide mitigation, and public education in both developed and developing countries, including those lay persons interested in landslide hazards. The Handbook aims to help the general public, home-owners, communities, emergency managers and decision makers by taking the positive step of encouraging awareness of available options and recourse in regard to potential landslide hazard and threat to life and property around the world.

We are both fortunate and thankful that our respective employers, the US Geological Survey and the Geological Survey of Canada, provided support for the past few years for this project to see completion.

We are extremely grateful to David Huntley and the professional—technical supporters (Jerry DeGraff, Keith Turner, Laurance Donnelly, John Clague and Owen White) who provided a positive endorsement of our work as part of the nomination process. We are also very grateful to the EGD evaluation committee for bestowing this award on our work. We are positive that their decision was not easy when comparing our work to other worthy candidate nominations. Within the geotechnical community, the E.B. Burwell Jr. Award of the GSA Engineering Geology Division carries with it considerable prestige and recognition. We cannot imagine a greater and more professional satisfying nod of approval from our peer community. Many thanks to our fellow engineering geologists from around the world who find this volume of use in their daily work.

GEORGE P. WOOLLARD AWARD

Presented to
Leigh H. Royden

Leigh H. Royden
Massachusetts Institute Technology

Citation by Walter D. Mooney

Prof. Leigh (Wiki) H. Royden of MIT has been selected as the 2011 Woollard Awardee by the Geophysics Division. Wiki has made major contributions to the study of geologic processes through quantitative geophysical modeling. A native of Palo Alto, California, her father, Halsey Royden, was a math professor at Stanford University. Wiki's interest in a quantitative approach to science may have been inspired by him. She completed her A.B. degree (physics) at Harvard and received her Ph.D. at MIT in 1982. She is the recipient of numerous awards, including a Presidential Young Investigator Award in 1985, the Donath Medal (Young Scientist Award) from the GSA in 1990, and election to Fellowship of the AGU in 2004. This Geophysical Division award recognizes Wiki's impressive scientific achievements and I highlight just a few these. Certainly one of Wiki's first big scientific contributions was her paper on the thermal subsidence of the rifted continental margin of NE North America. Today we view the process of thermal subsidence as so familiar that it is sometimes forgotten that this two-stage process was developed and quantified in this now-classic paper. A second landmark paper is entitled "Evolution of retreating subduction boundaries formed during continental collision" (Royden, 1993). Wiki applied her analysis to the Mediterranean region, easily one of the most complex tectonic environments on Earth. Wiki was the first to recognize the critical role played by advancing and retreating plate boundaries during collisional events. Wiki is also well recognized for her work on the channelized flow of a weak crustal layer (Royden, JGR, 1996; Clark and Royden, Geology, 2000). Wiki's contribution was to provide the mathematical background for basally driven three-dimensional flow within an idealized crust with a laterally invariant, depth-dependent Newtonian viscosity. One impressive outcome of her calculations was the demonstration that a steep-sided, flat-topped plateau is expected in the case of a crust with a low-viscosity zone, exactly as is observed in Tibet and the Altiplano. Entire conferences have been devoted to a discussion of crustal channel flow, and the Geological Society of London published a multi-author book on the topic. Wiki has been a frequent speaker at GSA meetings and has been a highly successful mentor. As a final note, I have observed that Wiki is frequently selected as a keynote speaker at the conferences she attends. After her talk, the scientific discussion inevitably ends up centered on the ideas she has introduced. She's a person who captures an audience's scientific imagination. For all of these reasons it is a great pleasure to present Wiki Royden of MIT with the 2011 Woollard Award from the Geophysics Division of the GSA.

Response by Leigh H. Royden

It is a great honor to receive the George P. Woollard Award for Geophysics, and I thank you all very much. I especially want to thank Tom Jordan and Walter Mooney for their efforts to compose and deliver a most flattering citation. I have been extremely fortunate to have had many excellent colleagues, collaborators and students, who are far too numerous to mention here, but I must single out just a few.

First and foremost, I would like to thank John Sclater for luring me into the general field of geophysics, persuading me to apply to the PhD program at MIT, and as my PhD advisor leaving to go on sabbatical for my first year of graduate school so that I was left on my own to discover that geology was at least as interesting as geophysics. I must also thank Bill Brace who hired me as an assistant professor at MIT, and Tom Jordan who sheparded my tenure case through the perils of the MIT Science Council. Finally, I thank Clark Burchfiel, who taught me most of what I know about geology, and even more about geology that I have forgotten.

When I was young, I was frequently asked whether I considered myself to be a geologist or a geophysicist, but I never could decide which I was. Now that I am farther down the road of aging geoscientist, I am no longer asked this question very often. Instead, geologists assume that I am a geophysicist and geophysicists assume that I am a geologist. I am not at all sure that this is particularly flattering but I hope that receipt of the Woollard Award will clarify this point—I am officially a geophysicist/ …. or maybe still not?

Lastly, on this auspicious anniversary of the Geophysics Division of the GSA, I would like bear in mind the sage advice of George Thompson, the first-ever recipient of the GSA's Woollard Award. George was the first to write and congratulate me, and as we exchanged emails reminded me that the best way to give a five minute acceptance speech is to stop after four minutes. And with that sound advice in mind, I shall end by thanking you all once again for this very great honor.

BIGGS AWARD FOR EXCELLENCE IN EARTH SCIENCE TEACHING

Presented to Natalie Bursztyn

Natalie Bursztyn
Bakersfield College

Citation by Eric Hiatt

It is a privilege to nominate Natalie Bursztyn for the Biggs Earth Science Teaching Award. I have known Natalie for about 12 years; she was an undergraduate student in my Sedimentology and Stratigraphy course at Queen's University, Canada. She received her B.Sc. and M.Sc. degrees from Queen's. As a student, Natalie had an infectious enthusiasm and positive attitude that was evident to the faculty then–characteristics that she continues to display today.

Natalie taught at Bakersfield College beginning in 2005, and has always employed an interactive teaching style; she has a reputation for being able to keep students highly engaged and interested. Natalie is known for making connections with students and for her ability to make complex concepts understandable, which speaks to her effectiveness as a skilled teacher. She loves teaching geology in the field and regularly organizes field trips for her students. Based on these field experiences, students note that Natalie's courses have been "the best thing that has happened to them…" during their college experience.

Natalie is a force of nature. During her time at Bakersfield College she wrote three lab manuals, authored a book "Geology of Kern County", she wrote many of the new Geology curriculum standards for the state of California, spearheaded development of a cooperative agreement and effective transfer of credits between Bakersfield College and the nearby California State University branch, and she developed many new courses. She organized the campus Geology Club, leads two field trips per semester, assigns and corrects written assignments, quizzes, and exams every semester. This degree of hard work and dedication would be commendable if she taught at a private college with virtually unlimited resources; however, what makes these accomplishments truly amazing is that she has excelled at a state college under extreme budget constraints, and while teaching classes with enrollments of 100+! She is a source of inspiration and she always takes time to listen to students' concerns, and as a result, has received the campus-wide Advisor of the Year Award twice.

One theme that comes through repeatedly in the numerous nomination letters submitted is that Natalie has made an enormous impact in the lives of many students—from giving them confidence in themselves to strive for more than they ever thought they could achieve, for making geology field experiences accessible to students with physical disabilities, to inspiring them to become geologists. Her nominators use terms such as: dedicated, respected, gifted teacher, tenacious, and amazing individual. She has a reputation for accomplishing anything she puts her mind to, and--always--for truly loving teaching. One of her nominators noted that she has made a bigger impact on campus than any other professor.

A great teacher first and foremost is an exemplary role model. Natalie is, at her core, an amazing role model for students. Her enthusiasm, energy, and drive are readily apparent to her students. In their nomination letters, Natalie's peers stress that she is respected and admired on campus and is an inspiring teacher. Natalie never stands still—and recently has begun a new chapter in her career; she has just begun a Ph.D. in Geology at Utah State University.

Congratulations, Natalie—it is frustrating to try to describe in a few words such an exemplary life dedicated to others, but I have never met anyone more deserving of the Biggs Earth Science Teaching Award.

Response by Natalie Bursztyn

I am truly honored to be the recipient of this award—though every rationale listed in my nomination I did because I enjoyed doing it, I wanted to do it, or because I felt it was of great value to the students, the school, or the education system in general. Anyone who stepped forward wanting to learn, no matter their circumstance, I'd help. Together we can make it happen, we just need to figure out how.

I love geology, I love making geology jokes, integrating geology and/or geology jokes into non-geological conversations, explaining the geology of regions I am familiar with, and trying to puzzle out the geological history of places I'm unfamiliar with… when I hike up a mountain, I conjure up images of the depositional environment the rocks I'm walking across formed in rather than staying aware of wherever I actually happen to be.

I think that when I teach I try to project or share this excitement and the thought process involved with the students. I want them to see in a rock, not the mineral crystals or clasts (although that is important), but the deep time and history in it.

I also love to explore the interconnected nature, repeating patterns, evolution and history of geology itself. To think of how recently plate tectonics was accepted as a theory and how long ago deep time and evolution were understood by the scientific community, and to see the latter become perceived as more and more controversial amongst the general population is disappointing. I believe that teaching critical thinking is our strongest defense.

Critical thinking comes naturally in teaching geology—as long as we don't have a time machine at our disposal, the open-ended aspect of resolving the evolution of landscapes requires careful and critical analysis of all the evidence and possible interpretations. From this standpoint, I see geology as a fundamental course for all students to take, and teach it not as though they will become geologists, but so they develop skills necessary for success in all their college classes and the real world beyond. So they appreciate the awesome planet they live on and understand that every component of their iPhone was mined, refined and transported somewhere to be assembled, packed and transported somewhere else before they bought it. So that they rubberneck as they drive by a road-cut and ask themselves how the outcrop formed and maybe even come to a screeching halt on the side of the road to ask the person examining it with a hand lens if they are a geologist and then tell this startled geologist all about that super fun geology class they took in college… true story.

And so, with this passion for teaching in mind, and geology, and stewardship for our only habitable planet, I thank you for this amazing recognition. I am embarking on a new journey in pursuit of this passion of mine, and am now two months into a PhD in geology and geoscience education … being advised by a former recipient of this very award.

MARY C. RABBITT HISTORY AND PHILOSOPHY OF GEOLOGY AWARD

Presented to Sally Newcomb

Sally Newcomb
Silver Springs, Maryland

Citation by Sandra Herbert

Sally Newcomb has been one of the individuals whose efforts over the last thirty years have led to the currently vibrant state within our field of the history and philosophy of geology. Partly Sally's contribution has been from her publications; partly her contribution has been from her presence. As for all of us, her contributions sprang from her life. In my remarks I will try to show how her life and her contributions fit together.

Born in Williamsport Pennsylvania in 1932, Sally Fritz majored in chemistry at Purdue University, where she received her B.S. in 1954. Her chemistry major is important for it was through that door that Sally would eventually enter geology. Also in 1954 Sally married Robert Newcomb, an electrical engineering student at Purdue. Their children Gail and Rob were born in 1955 and 1956. Robert Newcomb took his Ph.D. in Electrical Engineering at the University of California, Berkeley in 1960. His teaching career has spanned continents, allowing Sally to travel as well. She reports that her travels left her with the feeling that "the world is often a friendly place." Sally's later work as an American member of INHIGEO has no doubt reflected that experience. Sally and Bob have been frequent participants in INHIGEO conferences abroad.

Sally first encountered geology at San Jose State University where she was a student from 1964-1967. Her goal was earning a California teaching credential. This required a more diverse major in physical science than chemistry alone. While at San Jose State she took a number of geology courses, in addition to those in physical chemistry. She reports that, "I was 'hooked' when, on a week's field trip to Death Valley, the geologist gathered us at the top of Golden Canyon and 'read' it like a textbook."

With her teaching certificate in hand, Sally began teaching both chemistry and geology, in a variety of settings beginning with the Palo Alto, California public schools and culminating in an eighteen-year career at Prince George's Community College in Maryland. Deepening her knowledge of chemistry in its relation to geology was a master's degree in Geochemistry and Education, earned in 1980 from the University of Maryland, College Park.

Sally Newcomb's first publication in the history of the earth sciences was an article in *Ambix* in 1986 entitled "Laboratory evidence of silica solution supporting Wernerian theory." In 1987 she earned her second master's degree, this time in the history and philosophy of science. Her thesis, done under the direction of Stephen Brush, was entitled "Contributions of British Experimentalists to the Discipline of Geology: 1780-1920." Twenty two years later, in 2009, she published *The World in a Crucible: Laboratory Practice and Geological Theory at the Beginning of Geology*. It appeared as Special Paper 449 from the press of the Geological Society of America. The book explores what Newcomb termed the paradox that so many geologists initially rejected: the Huttonian theory of the igneous origin for nearly all rocks, preferring instead to find the origin of many rocks from solution. The book describes the patient work by geological investigators seeking to resolve that paradox. In the book one recognizes Sally Newcomb's initial training as a chemist as well her later adoption of the science of geology. In the clarity of the book's treatment of such topics as geological instruments or chemical reactions one also sees her broad and diverse experiences as a teacher. She does not obfuscate. While every inch the scholar, she communicates at a level that everyone can understand. To mention just a small point, original sources are cited in the original language in the book, but translations are provided in footnotes. *World in a Crucible* will prove to be a standard work on the subject, nearly as valuable to historians of chemistry as to historians of geology.

In addition to her scholarly work, Sally Newcomb has been noteworthy for her presence in the discipline. For example, in 2001 at the GSA meeting in Boston, she was the co-convener of a Pardee Symposium and two topical sessions on "Ophiolites as Problem and Solution in the Evolution of Geological Thought." In 2006 at the GSA meeting in Philadelphia she co-led a field trip to sites in the city displaying research collections in the history of geology and paleontology. She has also served this division as its chair in 2001. Similarly she was a councilor for the History of Earth Sciences Society in 2004-2006. More informally, as I can attest, she has also provided ready assistance to those who ask her questions about laboratory procedures in the geological sciences.

To do all this of course has required some sacrifice. As she was becoming more active in exploring the history of geology, she gave up performing as a musician, the cello and the lute being her instruments. I can only feel some satisfaction that our field has provided her equal pleasures to those of music. I'm pleased to introduce to you Sally Newcomb, the recipient of the Mary Rabbitt award for 2011.

Response by Sally Newcomb

If I said I stood on the shoulders of giants in the history of geology, a number of them might object. It could be uncomfortable for them, because many of them are actually in this room. But of course, I do. Geology is known for its mentor relationships. Perhaps the necessity of being outside together in heat, rain, snow, and sleet has something to do with it. However, I've found "library" to be sometimes just as strenuous, which my colleagues here will well understand. Our field of the history and philosophy of geology must be even more notable for those relationships. There often seems to be little recognition of the field, and the number of practitioners world wide is only in the low hundreds. The good news, however, is that recognition is increasing, and we can all point with pride to a series of excellent books and collections of papers published in the last two decades, often by the Geological Society of America and the Geological Society of London, as well as by commercial publishers. Relative newcomers to the field such as China, Japan, South and Latin American countries, and the Arab world, are being recognized, joining the European countries and North America.

My checkered career, anything but a straight line, can best be described as "sequential, not simultaneous." Unlike the admirable young women of today, I first worked as a biochemist, then had children, traveled as a family to my husband's Fulbright and other overseas positions, then went to graduate school and continued teaching when our children were grown. I taught science in primary grades in a museum setting in Palo Alto, substituted in 7th through 12th grade science in those schools, then taught physical science, biology, and anatomy and physiology at the Academy of the Washington Ballet, where the students were all preprofessional dancers. It has been a rich life. During my time at graduate school, I joined the physical science faculty at Prince George's Community College in Maryland and taught physical geology and inorganic chemistry. It is a large institution, just outside Washington D.C., with students from well over a hundred countries. Those positions were scarce, but a determining factor was that I had lived overseas and had hosted Bob's graduate students from literally around the world in our home. We joke that we can land at any airport anywhere in the world and one of Bob's Ph.D. students will be there to greet us.

Having written a paper on the history of chromite mining in Maryland for the final paper for my first Master's degree, I became interested in the history of geology, and how geology impacted present land and water use, economics, and the transport networks of a region. This led to study with the Committee on the History and Philosophy of Science at the University of Maryland, with one of those aforementioned giants, and Division award winner, Stephen Brush, as my major advisor. I quickly became aware that I was in a different ballgame, entirely unlike my previous technical studies and courses. That first course in historiography was more daunting than X-ray fluorescence analysis or petrology. The first paper I gave at a national GSA meeting was in Indianapolis. It was greeted with great tolerance, but I fear it must have been pretty bad, because I recall wrestling with primary sources and still writing the night before it was presented. I also recall how welcome I was made to feel, and how friendly people were at the division lunch, particularly Ellen Drake and Bill Sarjeant. Studies at the University continued to widen my horizons. I often felt schizophrenic because in the college setting I was supposed to be an expert, but was anything but in the history of geology.

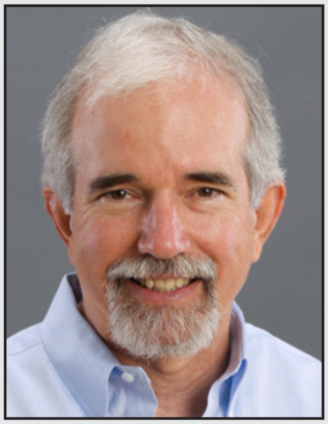
The anomaly that ultimately resulted in The World in a Crucible occurred to me during this time. It seemed that the geology literature of the 18th century veered between theory and field work, and Hutton was sometimes called "the father of geology" in our textbooks and elsewhere. A theory would be proposed, and the natural philosophers of the time would go to the field to test it. But reading the literature, it was clear that theories were not supported by field evidence at least as often as they were. In another puzzle, it was hard to understand why, if Hutton's theory of igneous origin was correct, it took such a long time for the counter-possibility, deposition from water solution, to be falsified. As I started reading the experimental literature I appreciated the significance of the fact that rocks and minerals could be and were put into solution, and components of the solution including silicates, precipitated out sequentially. This was much more immediate evidence of an "aqueous" origin of crystalline rocks than a so-far hypothetical source of heat sufficient to melt them. And, being something of a contrarian, I rather enjoyed being a Neptunist, as well as becoming familiar with the excellent and ingenious chemical research of such people as Kirwan, Bergman, Klaproth, Spallanzani, Saussure, and etc. It became obvious that there was a "third leg" to geological knowledge, namely experiment, and that it was far more ubiquitous and influential than the cursory notice it received in the standard history of geology works. It has been my pleasure to continue to seek to untangle that tale, and to give an account of the many excellent natural philosophers who insisted on "interfering with nature" to the extent of experimenting on earth materials, in the 18th and early 19th centuries.

This quest has led to many happy hours discussing and exchanging ideas with colleagues.

The most rewarding part of taking part in HaPG activity has been the collegial relationships throughout the world that I have acquired, as well as discovering the excellent and often rigorous science employed by our 18th-century predecessors. This division of the Geological Society of America has provided a much-appreciated forum for the exchange of ideas and the introduction of new ones. I am most grateful that my work has been recognized. Thank you.

O.E. MEINZER AWARD

Presented to Graham E. Fogg



Graham E. Fogg
University of California, Davis

Citation by Christopher T. Green and Edward A. Sudicky

We present the 2011 O.E. Meinzer Award to Graham E. Fogg in recognition of his pioneering work on solute transport in complex geologic media. Graham has more than 30 years of experience researching and teaching about topics that include, among others, regional physical hydrogeology, contaminant hydrogeology, geostatistics and stratigraphic modeling, and groundwater/surface water interactions. Graham has produced a large body of impactful papers, from which the award committee recognized three seminal papers as having significantly advanced the science.

Graham's career has been devoted to developing fundamental theory and widely applied methods related to the role of complex geology in hydrogeology. While at the Bureau of Economic Geology from 1978–1989, he identified continuity and interconnectedness of high conductivity zones as critical factors affecting fluid and solute transport in complex aquifers, and he recognized the need for geostatistical and stochastic methods to study these factors (Fogg, 1986, *Water Resources Research*, v. 22, p. 679–694). In 1989, Graham began teaching and mentoring graduate students at University of California, Davis. His research group made important advances toward developing the tools needed to better simulate transport processes in complex aquifers, including methods to simulate complex geological features from readily available sources such as core logs (Carl and Fogg, 1996, *Mathematical Geology*, v. 28, p. 453–476) and random walk particle tracking methods to avoid numerical dispersion in simulations of solute transport in complex media with sharp interfaces (LaBolle, Fogg, and Tompson, 1996, *Water Resources Research*, v. 32, p. 583–593). These key advances led to a cascade of publications that have shined light on transport processes such as diffusion limitations to contaminant recovery, convolution of groundwater ages and age-tracer concentrations, anomalous dispersion and tailing of concentrations, and stable isotope fractionation. Graham's broad knowledge and substantial contributions to hydrogeology have gained him a very strong international reputation and the respect of fellow scientists. Above all, he is a dedicated, sharing colleague with the highest level of integrity.

Response by Graham E. Fogg

Thank you Lenny Konikow, Chris Green and Ed Sudicky for those kind words. It is quite overwhelming to join the list of illustrious O.E. Meinzer Awardees. I would like to thank the Geological Society of America, the Hydrogeology Division, and those who wrote letters of support for bestowing on me the honor. When the phone call came from Ed Harvey notifying me of the good news, I literally almost fell off my chair! It was a total surprise, which made it all the sweeter.

No one gets to this point without a lot of help, and in my case I feel extraordinarily lucky to have been supported by an incredible collection of people, especially family, mentors and students. First and foremost I owe thanks to my family, which has supported me through thick and thin, and pulled more patience and wisdom out of me than I knew I had. From the bottom of my heart, thank you Karen Burow, and Paul, Dana and Carson.

Four extraordinary, mind-bogglingly different mentors taught and influenced me profoundly. While I was a wayward Junior at the University of New Hampshire, Francis Hall first lit up my interest in hydrogeology and helped put me on a path to graduate school. At University of Arizona I had the amazing fortune to be put through the paces both by both Shlomo Neuman and John Harshbarger. Shlomo has the unusual quality of being both a brilliant theoretician and gifted teacher. My modeling foundations and appreciation for the role of basic research in hydrogeology came largely from him. John Harshbarger, 'big John', was the opposite of Shlomo—a nuts and bolts hydrogeologist with emphasis on the 'geo'—and with an intimidating, demanding style that both scared the hell out of us students and motivated us to pursue practical, imaginative solutions to problems when the equations did not quite work.

Then it was on to the Bureau of Economic Geology at The University of Texas at Austin and into a totally different school of thought. It was there, while brainstorming about transport of radionuclides that Charlie Kreitler kept dropping pearls of wisdom about the absence of modern geology in hydrogeology and especially about the unrealized potential of depositional systems science. This led to my early attempts at incorporating geology more realistically into 3D models in the early 80's. It was then that I realized the importance of connectivity as a means of simplifying the seemingly intractable heterogeneity problem.

That research, and related efforts helped me accumulate quite a list of research ideas that set me up for my next job as a Professor at UC Davis. I knew I had a bag full of ideas for dissertations and theses when I arrived at Davis in 1989, but had no idea whether I would get students who were interested in doing the work. And my goodness, did that ever work out! The later work cited in this award is predominantly due to two remarkable Ph.D. students, Steve Carle and Eric LaBolle; and in truth, their creativity remolded my earlier ideas into something far greater and unanticipated. In the early 1990's in my lab while Steve Carle was rewriting the 'book' on geostatistics for facies modeling, Eric LaBolle was developing the first transport modeling algorithm capable of doing justice to actual 3D geologic heterogeneity, and then in walked Gary Weissmann to close the loop regarding geologic processes and groundwater quality sustainability. I really owe so much to Steve and Eric as well as to Gary and an outstanding lineup of other gifted students.

Lastly, a word of advice to our younger brethren. I think the late Steve Jobs said it well, and this has worked well for me even though it did not really kick in until later in my career: "Don't let the noise of others' opinions drown out your own inner voice. And most important, have the courage to follow your heart and intuition." In other words, decide in your head and gut what you think or what you think is the right path, and never give up; and of course, never stop listening. Thank you very much!

ISRAEL C. RUSSELL AWARD

Presented to
W. Berry Lyons

W. Berry Lyons
Ohio State University—Columbus

Citation by Scott W. Tyler

It is an honor and a tremendous pleasure for me to present the citation for the Israel Cook Russell award for major contributions to the field of limnogeology to my dear friend and colleague, Berry Lyons.

Berry has been a leader in the broad field of environmental geochemistry, and is recognized internationally as an expert in wide range of areas, including trace element transport in the environment, geochemical evolution of lakes and lacustrine sediments and global climate change in the Polar Regions. His diversity of interests and expertise is phenomenal; he has conducted seminal work on the geochemical evolution of saline lakes and in the same year, published groundbreaking work in the sediment fluxes to the oceans. Berry has published over 180 research papers covering some of the broadest topical areas I have ever seen. He has collaborated with a tremendous group of colleagues from around the world, including his accomplished wife and colleague at the Ohio State University, Dr. Anne Carey. Berry has also served tirelessly on editorial boards of journals ranging from Applied Geochemistry to Water Resources Research, National Academy panels, all while serving as PI and Chief Scientist for a decade, of the National Science Foundation's Long Term Ecological Research Site at the McMurdo Dry Valleys in Antarctica. He has been widely recognized by his peers including Fellow of the American Geophysical Union, the Geological Society of America, the AAAS and the Explorers Club.

I have had the pleasure to know and work with Berry for almost the same amount of time, and every meeting is joy and exciting. My emotions are shared by all of Berry's colleagues, and I would like to read to you a few of their words and their appreciation for Berry's contributions, collaboration and friendship.

"Berry is a gung-ho scientist who finds great joy in discovery and collaboration. He is as much of a people person as he is a scientist. This combination makes working with him a wonderful experience both from a professional perspective and for just having fun"

"He combines the people-skills with a rigor for organization and setting reasonable goals. As such he has a wonderful ability to create a team out of a group of self-directed and focused scientists.

Berry is able to take in the big picture and motivate group goals such that everyone has a buy-in"

"Berry, your generosity, humility and friendship has been enduring and valued in more than 20 years of collaboration"

"Berry Lyons is a true friend to many and a wonderful scientist who epitomizes the term interdisciplinary in every way."

"Hurray for Berry!"

Berry's accomplishments could fill this lunch hour easily, but as you heard from his colleagues and students, his spirit of discovery, camaraderie and energy are those of a truly a great scientist, educator and colleague. I cherish the collaborations and friendship that I have been fortunate to have with Berry Lyons, and ask that you join me in recognizing and congratulating the Limnogeology Division's 2011 Israel Cook Russell Awardee, Dr. William Berry Lyons.

Response by W. Berry Lyons

Thank you Scott for your gracious and very generous words. I would like to begin by thanking the Limnogeology Division of GSA for this wonderful honor. It is particularly gratifying to me to follow my long-time colleague Bill Last as the second awardee, as Bill and I collaborated on the investigation of Canadian Prairie lakes in the late 1980's. It is extremely humbling to be honored by your peers and I found it difficult to reflect on my linmogeological career in just a few words.

Bill mentioned last year in his response that having grown up within meters of Lake Michigan that he had always been fascinated by lakes. I grew up within a few kms of the ocean and as I grew into adulthood knew that I wanted to be an ocean scientist. My oceanographic career ended abruptly in the early 1980s as I became more interested in terrestrial aquatic systems, especially salt lakes. Also as I taught aquatic geochemistry for the first few times, I became intrigued by the seminal work by Hardie and Eugster on closed-basin lake chemical evolution, and soon began to think about how elemental variation in lake systems was reflected by both watershed and in-lake biogeochemical processes. Two other career changing influences occurred soon after that increased my desire to refocus my research interests on lacustrine geochemistry—both of these connected my oceanographic past to my limnological future. The first was the reading of a paper by Karen van Damm and John Edmond that essentially asked the question- What would the chemistry of the oceans look like without mid-ocean spreading centers? The answer in their minds was to look to alkaline, saline lakes in Africa. The second epiphany came from the work of Bill Green and his students who approached the understanding of Antarctic saline lake evolution by applying an oceanographic perspective on solute mass balance. About this same time Mark Hines, Andy Herczeg, John McArthur and Dave Long and I were working on acid lake systems in Australia and Bob Wharton asked me to become part of the McMurdo Dry Valleys LTER project, where I had the great opportunity to conduct research on these fascinating and unusual closed-basin lakes at 78°S.

So from the late 1980's one of my major research and teaching interests has been the study of the geochemical behavior of lakes. Along the way, I have literally been blessed to have been associated with many hard-working, inspiring, and life-sharing colleagues, collaborators, post-docs and students. I am proud to say that I have never had a single authored publication- the life's work that you have honored for today has really been the work of many. Although I do not have nearly the space or time to acknowledge them all, I will note a few! These include the Australian work with Mark, Andy, John and Dave noted above, my brief, but greatly rewarding work in Lake Naivaska, Kenya with Bwire Ojiambo and Bob Poreda, my interest in Great Basin lakes I owe to individuals such as Karen Johannesson, Larry Benson and Scott, and my two decades of Antarctic work I have shared with many wonderful colleagues and students including, to name just a few, Kathy Welch, Peter Doran, Klaus Neumann, Becki Witherow, Sarah Fortner and a major source of knowledge and dedication—John Priscu. I am also grateful to my wife and colleague of over 25 years, Anne Carey, for her support, understanding and collaboration.

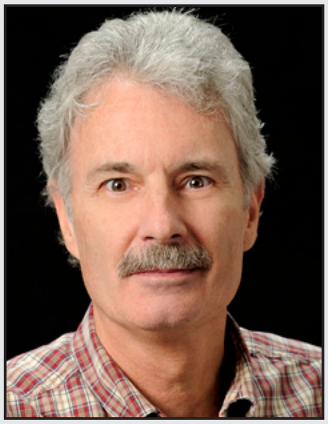
Let me finish by adding my astonishment to be associated with the 'likes of Israel C. Russell. In the introduction to 1895 book on lakes he summarized what processes and linkages a scientist had to understand to discern a lake's history.

"The history of a lake begins with the origin of its basin and considers among other subjects the movement of its waters, the changes it produces in the topography of its shore, its relations to climate, its geological functions, and its connections with plant and animal life." He was clearly a man ahead of his time, with a truly interdisciplinary perspective on lacustrine environments. We can only hope to uphold this tradition.

I am greatly appreciative and grateful to the Limnogeology Division for receiving the IC Russell award. Thank you all very much.

DISTINGUISHED GEOLOGIC CAREER AWARD (MGPV DIVISION)

Presented to John M. Ferry



John M. Ferry
Johns Hopkins University

Citation by Sarah C. Penniston-Dorland

John Ferry is a man of extraordinary intellect who has made significant contributions to the understanding of the role of fluids during metamorphism. Because of his work, metamorphic petrology now operates in an intellectual environment that links metamorphism to global change, volcanism, ore genesis and plate deformation. John recognized and characterized infiltration-driven reactions and the associated alteration of the chemical and isotopic compositions of rocks to quantitatively assess the amount and chemistry of fluid involved in metamorphic reactions. More than two decades ago, John recognized that the paradigm of static thermodynamic phase equilibria used in understanding metamorphism had been "squeezed dry" of new insights. He sought to transcend the limitations imposed by the time-invariant aspect of equilibrium models, and, throughout his career, has led metamorphic petrologists from a static towards a dynamic view of metamorphism.

From his earliest contributions John's work has made significant impacts on the field of metamorphic petrology. His most-cited work is an experimental calibration of Fe-Mg partitioning between biotite and garnet (Ferry and Spear, 1978), which is still a widely used geothermometer (1,206 citations as of this writing!). John has coauthored ten other papers that have over 100 citations, most of which quantify the composition and amount of fluid required for the progress of metamorphic reactions.

John's work has always been field-based, and includes all types of metamorphic environments—from his studies of regional metamorphism in Maine and Vermont, to studies of hydrothermal alteration on the Isle of Skye and in the Dolomites, to numerous studies of contact metamorphism including Notch Peak, Bergell, Monzoni, Predazzo, Onawa, Ballachulish, Beinn an Dubhaich, Ritter Range, and Mt. Morrison.

John uses a multidisciplinary approach to his research. He integrates field-based studies, quantitative modeling of heat and mass transfer during fluid-rock interactions, application of thermodynamic analysis and experimental determinations of mineral-mineral and mineral-fluid equilibria. His analytical techniques include detailed three-dimensional field mapping of fluid flow pathways, petrology and thermobarometry, major and trace element analysis by electron microprobe and LA-ICP-MS, calculations of reaction progress, and measurement of stable isotopic compositions (both in bulk and in individual minerals) through both traditional and clumped isotope thermometry.

What is it that makes John's work so compelling? John has a deep commitment to understand the rocks as they are. His is the sort of integrity that looks to the rocks to suggest working hypotheses for testing with measured data. Throughout his career, John's meticulous analytical protocols have solidly undergirded the once-extremely controversial conclusions he has drawn about the flux of fluids through metamorphic rocks and the time-scales for fluid-rock interactions in both pluton-related and regional metamorphic settings. No modern petrologist can ignore the implications of fluid fluxes during metamorphic processes, and this view can be traced to John's elegant work.

We are pleased that the Division of Mineralogy, Geochemistry, Petrology and Volcanology has recognized John for his decades of leading metamorphic petrologists towards active consideration of the flow of fluids, matter and heat during metamorphism through the awarding of its Distinguished Geologic Career Award. Congratulations, John!

Response by John M. Ferry

Thank you, Sarah, for your generous citation and my other students who wrote letters of support.

I'm proud to receive this award for two reasons. First, GSA has been my most important meeting of the year because it has a focus on continental crust petrology. The greatest honor is to be recognized by the group whose work means the most to me.

Second, the award specifically recognizes field studies. Members of the MGPV Division need little persuasion of the importance of fieldwork. One reason is that you go out in the field expecting to find one thing and make an unimaginable discovery of something else even more significant. A favorite example is Louis Alvarez's suggesting that iridium concentration might record sedimentation rate in a stratigraphic sequence Walter was studying at Gubbio, Italy. A similar, although less momentous, surprise brought me here. When I began graduate school in 1971, one of the hottest research subjects in mineralogy and petrology was subsolidus phase relations among plagioclase feldspars. Five years before, the peristerite gap was determined from feldspar compositions in metamorphic rocks. My first summer of fieldwork was to look for analogous miscibility gaps in more calcic plagioclases in metacarbonate rocks along a gradient from chlorite to sillimanite zones in Maine. Plagioclase compositions in the rocks proved bafflingly complicated, so I switched my attention to the petrology of the carbonate rocks themselves. This led to my first ideas about infiltration of rocks during metamorphism.

Even more importantly, however, fieldwork is the enterprise of mapping spatial patterns of countless different features in nature. It's these patterns, obtainable by no other means, that tell us how the Earth works. In my case, mapping the spatial distributions of mineral assemblages in metamorphic terrains at a range of scales revealed the existence, size, and fundamental properties of fossil fluid flow systems.

My field studies have been possible only in areas where stratigraphy, structure, and age relations are already worked out. Accordingly, my heroes among field geologists are those who do this. Many have shared their time and knowledge both in and out of the field getting me started at new locations, including Phil Osberg and Doug Rumble in New England; George Dunne, Cal Stevens, Rich Schweickert, and especially Sorena Sorensen in the Sierra Nevada; Dave Pattison and Ben Harte in Scotland; Bernard Evans and the late Volkmar Trommsdorff in Switzerland; and Lawrie Hardie and Nereo Preto in Italy. Three people made pivotal contributions to my intellectual development. My Ph.D. advisor, Jim Thompson, grounded me in thermodynamics and phase equilibria. When I was 46, my postdoc advisor, Doug Rumble, took me on in his laboratory as an apprentice stable isotope geochemist. Lukas Baumgartner first tuned me into transport theory. My students have expanded my horizons by involving me in field problems I would not have explored otherwise, by developing theory and numerical simulations beyond my abilities, and by pointing out my earlier ideas that needed revision. Many people thus share in this award, and I thank them all.

G.K. GILBERT AWARD

**Presented to
Steven W. Squyres**

Steven W. Squyres
Cornell University

Citation by Laurence A. Soderblom

Steve Squyres' career is rich in contributions to planetary science with fundamental research into the chemistry, physics, and geology of bodies ranging from Venus to Mars, from comets to asteroids, and across the myriad of outer-planet satellites. Threaded through his career has been a keen interest in searching for evidence of liquid water and potential habitats, coupled to the possible emergence of life beyond Earth. Europa and Mars became the early foci of his passion. Steve has enormously advanced our understanding of the role of water in the geological and climatic history of Mars—probably more than any other planetary scientist. Pursuit of these fundamental Mars science goals became a personal, career-long crusade. In the end he has laid down a new scientific foundation for the exploration of Mars; that crusade I chronicle here.

His early career focused on geomorphic evidence for liquid water and ice in Mars' geologic past, arguing that many features signaled presence of ice; such ice is now confirmed by Mars Odyssey gamma ray and neutron measurements and by Mars Reconnaissance Orbiter's subsurface radar observations. He later hypothesized that ancient valley networks formed in the Noachian evidenced abundant ice-covered lakes. From modeling efforts to understand the physics and chemistry and stability of lakes and springs against freezing, he concluded that a warmer and wetter period in Mars' early history was required to explain the lakes. Squyres presented a lecture entitled "Water on Mars" in accepting the 1989 Urey Prize from the American Astronomical Society.

In the 1990s Steve became a strong spokesman for *in situ* chemical and mineralogical measurements feeling our insight into Mars' early history was weakly based on geomorphology. He began promoting both *in situ* and remote methods that could definitively ascertain the chemistry and mineralogy of the Martian surface, including gamma ray, x-ray, alpha particle, Raman, and infrared spectroscopy that could be used on landers, rovers, and orbiters. He became a science team member on gamma ray and x-ray fluorescence experiments on several Mars and asteroid missions. Forging alliances with the scientific leaders in these fields, he assembled a scientific team and a suite of instruments that grew into the Athena payload, ultimately the tools of two robotic field geologists, the Mars Exploration Rovers.

Squyres was now poised to lead a mission to Mars to peer directly into its ancient geologic past to answer the key scientific questions that had so long driven him. The MER results have dramatically enriched our view of the enormous complexity of Martian geological history and transformed our understanding of how Mars has evolved. At Gusev crater Spirit uncovered a complex variety of aqueous alteration products; in Meridiani Opportunity discovered sedimentary rocks deposited in open shallow lakes. There is little doubt that warmer, wetter periods had to exist on ancient Mars. Squyres' career-long quest to reveal Mars' early environments has been a monumental and singular personal feat with a scientific impact that has indelibly reshaped the future exploration of Mars—both by robots and by humans.

Response by Steven W. Squyres

This award is given very generously, and received very gratefully. It's especially gratifying to receive it in the presence of so many of the friends and colleagues that I've worked with over the years.

I started down this road a long time ago, and I've had the good fortune to be guided by many people along the way. Joe Veverka was my advisor in grad school, and he taught me both how to do science and, by his example, how to be a generous mentor and colleague. Carl Sagan taught me physics, and also taught me the importance of communicating science in a way that anyone can understand. I also had the great good fortune to work with Gene Shoemaker when I was in grad school; Gene's enthusiasm for science has been an inspiration to me ever since. And my postdoctoral advisor at Ames was Ray Reynolds. Much of my early work in planetary science began with ideas that came from him.

I've also gotten to work with some of the best in the business on a number of NASA flight projects. A long time ago, as a brand-new grad student working on the Voyager project, I decided that Larry Soderblom was the guy I wanted to be like when I grew up. I'm still working on that one. Ray Arvidson has been my partner and friend through all the years that we've worked on Spirit and Opportunity, from the very beginning right up to yestersol. And of course the rover science is the product of the whole Athena science team, more than a hundred scientists that I'm very proud to be one of.

Too often in this business, we scientists have a tendency to forget about the people who make what we do possible—the engineers who build our instruments and our spacecraft. All the science done by the MER rovers was made possible by people like Pete Theisinger, Richard Cook, Matt Wallace, my good friend Barry Goldstein, and literally thousands of others. I am deeply in their debt, as are we all.

Another thing I think maybe we forget sometimes is how lucky we are to do what we do. We're living in an extraordinary time, when we're taking the first steps off our home planet. It's a time that I think in the hindsight of history will be seen as one of humanity's great bursts of exploration and discovery. And we not only get to witness it, we get to be part of it. I'm deeply grateful for that opportunity, and even more grateful to be able to have shared the adventure with so many of my colleagues and friends. Thank you.

KIRK BRYAN AWARD

Presented to
Robert C.Walter And Dorothy J. Merritts

for
Natural Streams and the Legacy of Water-Powered Mills
Science, v. 319, p. 299-304.


Robert C.Walter **Dorothy J. Merritts**
Franklin and Marshall University

Citation by Ellen E. Wohl

The 2011 Kirk Bryan award goes to Robert Walter and Dorothy Merritts for the 2008 Science paper "Natural Streams and the Legacy of Water-Powered Mills." This paper generated national and international attention because of its thorough and timely examination of some long-held assumptions about river form and river restoration. The scientific community has come to regard gravel-bed streams as having a characteristic meandering planform bordered by fine-grained overbank deposits. This conceptualization is based at least in part on mid-Atlantic streams initially described in some of the classic fluvial geomorphic studies of the 1960s. Stream restoration projects commonly seek to re-create this river form under the assumption that it represents the most stable, widespread, and natural configuration for mid-sized rivers. The Walter and Merritts paper calls this conceptualization into question by presenting careful documentation that, prior to European settlement of the eastern United States, many of the streams were small, multi-thread channels in valleys with extensive wetlands that accumulated relatively little sediment. These streams and valley bottoms were subsequently buried by thicknesses of up to 5 m of sediment that was trapped upstream from tens of thousands of mill dams constructed along the streams to create water power for diverse uses during the 17th to 19th centuries. As these mills were abandoned, the filled millponds were forgotten, vegetation grew over the pond sediments, and the streams incised into the sediments and assumed a new, stable planform that was subsequently interpreted to reflect 'natural' stream configuration in the absence of human manipulation of watersheds and valley bottoms. By demonstrating that the floodplains are actually historical fill terraces and that the streams are not natural archetypes for gravel-bed, meandering streams, Walter and Merritts have provided an opportunity for members of the stream-science community to re-evaluate long-held assumptions about stream process and form, the historical influence of humans on streams, and appropriate models for stream restoration.

A strength of the work presented in this paper is the careful, detailed interpretation of past environments based on stratigraphic and historical records. Walter and Merritts use diverse sources of prehistoric and historical information to reconstruct the environment of valley bottoms prior to, during, and following the period of initial European settlement. As stream science becomes increasingly quantitative and based on numerical simulations, this paper provides a strong reminder that conceptual and numerical models must be firmly grounded in the reality of records from the field. The expectation of what streams 'should' look like is fundamental to our understanding of geomorphic process and form and the application of this understanding to stream management, including restoration. Expectations based on inappropriate assumptions can have direct and widespread consequences. The work of Walter and Merritts exemplifies the application of stratigraphic, paleoenvironmental, and historical records to understanding past and present landforms and to contemporary resource management. Because this work represents fundamental scientific research, as well as the application of scientific understanding to issues of concern to contemporary society, the paper is worthy of the high honor of the Kirk Bryan Award.

Response by Robert C. Walter

There are few things more gratifying than being recognized by ones peers, especially when this honor began with a recommendation from a colleague as accomplished as Ellen Wohl. I am deeply grateful to Ellen for her recommendation, and to the Kirk Bryan Award committee for selecting our 2008 paper for this citation. I am privileged and humbled.

When I was as a graduate student, I read a short article about the great Boston Red Sox slugger Ted Williams. He was attempting to describe what he visualized in the batters box that made him such an outstanding hitter. He said: "When I step into the box, time slows down for me. When the pitch is delivered the ball looks to be the size of a beach ball. That's when I know I'm in the zone." I carried that article for years as inspiration of what it must feel like to be so in tune with your profession that time slows down.

In the summer of 2003, and I found myself standing in ankle deep water of a small second-order stream in Lancaster County, Pennsylvania. I was with my colleague Dorothy Merritts and her student Lauren Manion. Lauren was showing us a perplexing site she had found a few days earlier. What was perplexing was that this ankle-deep, 3-m-wide stream had a vertical cut bank nearly 5 m high. The bank was composed entirely of silts and clays, which were horizontally bedded and finely laminated. They looked like pond sediments, and not at all what one expects to see in the bank of a small, meandering stream: no lateral accretion surfaces, no fining-upward sequences, no sand or gravel...just 5 m of massive, finely laminated silty-clay. Dorothy said: "There must have been a dam. These have to be pond sediments". We walked less than 100 m downstream where we found large, rough hewn blocks of limestone in the stream, some the size of this podium, and we traced them into both banks. The boulders on the left bank were neatly stacked like large bricks, representing the remains of a 5-m-high stone dam. The boulders on the right bank merged into an equally well-crafted stone wall that braced one side a long ditch dug into the base of a colluvial hill slope. We followed the ditch about a kilometer, where it lead to an old, long defunct, water-powered mill. As we took in this sequence of events—the high banks, the stone dam exactly the same height as the banks, a kilometer-long millrace—we began to piece the puzzle together.

I grew up in Lancaster County, I fished these creeks as a boy and rode my bike around the countryside. “There were hundreds of mills in Lancaster County…” I said, letting the thought trail off. Silently, as if blinders were lifted, we began to see the cumulative impact of hundreds of dams. Time slowed, and for a fleeting moment I felt like Ted Williams in the batters box… nature was tossing us a huge, juicy fastball right down the center of the plate.

I am grateful to many colleagues and mentors who instilled in me a love for the Quaternary, and I would like to acknowledge a few here: John Moss (F&M), John Hollin (INSTAAR), John Andrews (INSTAAR), John Westgate (University of Toronto), and my graduate advisor Jim Aronson (CWRU, now Dartmouth). The late Derek York (University of Toronto) shared with me his passion for deep (and not so deep) time, and his ability to recognize important research problems. He is sorely missed.

Response by Dorothy J. Merritts

Thank you, Ellen, and members of the Quaternary Geology and Geomorphology Division for honoring our work on mid-Atlantic streams. Our work builds on the legacies of the great geomorphologists Luna Leopold (first Kirk Bryan award winner, 1958) and Reds (M. Gordon) Wolman, who for years worked on the same small to mid-sized Piedmont streams in Maryland and Pennsylvania upon which we now spend much of our time. We were fortunate to discuss this work with Reds on multiple occasions, and even to share two days with him in the field before he passed away. We also were fortunate to work with Milan Pavich (USGS), 33rd winner of the Kirk Bryan award. Throughout this research, I benefited from early training by Bill Bull (35th winner of the Kirk Bryan award). Mid-Atlantic Piedmont streams are far different than those of the Pacific Rim that I traipsed with Bill, but his influence enabled me to see the signal of rapid base-level change in a landscape where we didn’t expect to find it.

Nearly 40 years ago, Luna Leopold delivered the outgoing president’s address to the Geological Society of America at its 1972 meeting, the last time it was held here in Minneapolis. The title of his address was “River Channel Change with Time” (GSA Bulletin v. 84, no. 6, p. 1845-1860). The channel was Watts Branch, a small (10-km^2 drainage area) tributary to the Potomac River. Luna had monitored channel change since 1972, and concluded it was occurring “far more rapidly than [he] expected”. Urbanization had just begun, and he attributed change and its rapidity to this phenomenon.

Luna’s observations and astute insights remain sound, but he didn’t realize that the channel he studied was the remnants of a race, a ditch dug by some 19th c. miller to bring water through an older sediment-filled millpond to his mill just downstream. Luna’s channel sections were located within the incised channel of this filled pond. We now know that the milldam breached sometime between 1910 and 1955, and this breaching led to rapid incision, channel migration, and erosion. Also, we now know that the valley was a stable wet meadow with groundwater springs, thick nutrient-rich organic mat, and small channels throughout the Holocene. This Holocene wetland formed on a coarse Pleistocene periglacial colluvial substrate.

What lessons can we learn from nearly 60 years of research on the same streams? Causality is not necessarily the most obvious or even concurrent phenomenon. Base-level change from breaching of old dams, not (just) urbanization, has led to widespread channel incision throughout the mid-Atlantic region. Stratigraphy and mapping are fundamentally important. Boulders and cobbles in the bed of a small stream might be exhumed from a Pleistocene gelifluction sheet, not necessarily evidence of transport during modern storms. Millpond sedimentation was equivalent to a Pompeii effect, blanketing and preserving the Holocene landscape. Finally, when we look back at the classic early work of Reds and Luna we find that they made many of the same discoveries that continue to surprise us. One of the most important is the role of freeze-thaw in bank erosion. Luna referred to it in his 1972 GSA address as the “main mechanism of bank retreat”. Our *detailed*, ongoing studies support this finding, yet modern policies for reducing sediment load to the Chesapeake Bay, an impaired water body, do not account for bank retreat or freeze-thaw.

In closing, we thank our many colleagues (especially Mike Rahnis, Noel Potter, Frank Pazzaglia, and Allen Gellis) and the Department of Earth and Environment at Franklin and Marshall College for their continued support and collaboration.

LAURENCE L. SLOSS AWARD

Presented to
John P. Grotzinger

John P. Grotzinger
California Institute of Technology

Citation by Andrew H. Knoll

John Grotzinger has made original and lasting contributions to three areas of sedimentary geology, any one of which would qualify him for the Sloss Award.

To begin, John's meticulous field studies of Neoproterozoic successions in Siberia, Oman, and Namibia have collectively transformed our understanding of the timing and environmental context of early animal diversification. With Sam Bowring, Grotzinger established the temporal framework of early animal evolution, collecting ash beds from all three successions that sharply constrain the ages of the oldest known animal fossils, the Proterozoic-Cambrian boundary, and the isotopic excursions that permit inter-basinal correlation of Ediacaran rocks. Grotzinger documented the stratigraphic and environmental distribution of the earliest known skeleton-forming animals. Moreover, through detailed stratigraphic research in Oman, he showed that these early skeletal organisms suffered abrupt extinction at a horizon near the Proterozoic-Cambrian boundary marked by major perturbation of the carbon cycle. Also, Grotzinger and his students have provided a highly resolved picture of variation through latest Proterozoic time in the carbon and sulfur isotopic compositions of seawater, supporting hypotheses of major changes in marine redox chemistry just as large and motile animals entered the geologic record.

More generally, Grotzinger has led his generation's efforts to understand the tectonic, environmental, and biological controls on carbonate deposition in Precambrian oceans. His work shows that three-dimensional geometries of carbonate platform accretion have changed little in more than two billion years, demonstrating strong overall control on shelf carbonate deposition by tectonics and seawater chemistry. Especially important, John has made key observations of Precambrian stromatolites and developed mathematical models for their accretion, providing (among other things) an abiotic null model against which hypotheses of biological accretion must be tested. Grotzinger was also the first to document the precipitation of aragonite from Precambrian seawater, and the first to show the long term pattern of decreasing seafloor carbonate precipitation through time. This stands as the most significant change identified in carbonate rocks through the first 85 percent of recorded Earth history, and it provides critical context for interpretating the stromatolite record.

Beyond all this, Grotzinger has become the undisputed leader in efforts to characterize the sedimentary geology of the oldest known well preserved sedimentary rocks—on Mars. He led the effort by NASA's MER science team to produce the first stratigraphic section measured on another planet and provided the key insights that underpin interpretations of depositional and diagenetic processes recorded by sedimentary rocks at Meridiani Planum. Indeed, in continuing research John is establishing a genuine discipline of planetary sedimentary geology. As the principal scientist on the Mars Science Lander mission, to be launched during the coming year, John will have new and unique opportunities to elucidate depositional patterns and processes on our planetary neighbor.

I have worked closely with John for many years and cannot imagine a better colleague—or a better friend. As he has done for more than two decades, John Grotzinger continues to lead sedimentary geology in new directions. Larry Sloss would be proud.

Response by John P. Grotzinger

Thank you Andy for your kind words about my love for sedimentary geology, and thanks to the Geological Society of America for this recognition. Receiving the Sloss Award is a tremendous honor, as Larry was a great inspiration to me in many ways as a graduate student.

No one arrives at a moment like this without the help of many people, and I am grateful for the opportunity to acknowledge at least a few of them. At the University of Montana Don Winston first influenced me to work on the little-known Belt basin in northwestern Montana. Paul Hoffman exposed me to a series of field campaigns in Wopmay Orogen that still remain as the most intense of my life. After 20-30 kilometer traverses he would spend hours in the summer twilight of northern Canada educating me in almost every aspect of geology. Sam Bowring shared this adventure, but on the other side of the most mosquito-infested map area on the planet. At Virginia Tech, Fred Read illuminated everything about carbonate sedimentology and we shared the thrill of running the first numerical simulations of carbonate platform development. Ken Eriksson schooled me in clastic sedimentology and along with Hoffman and Winston further instilled in me the drive to explore Precambrian Earth history. Later on, at Lamont Doherty, Nick Christie-Blick and Gerard Bond challenged me to undertake basin modeling studies that I subsequently carried to MIT in collaboration with Wiki Royden.

I have benefitted from many collaborations over the years and to mention just a few, I must begin with Andy Knoll who taught me pretty much everything I know about evolutionary biology. Sam Bowring, Roger Summons, and Dan Rothman have all drawn me into very different corners of Geobiology. Steve Squyres provided me with a career-changing Opportunity to join a remarkable team of scientists and engineers that motivate me to this day. Those first images of cross-stratified rocks in Eagle crater will be burned in my mind forever.

Finally, I have been very lucky to have a superb group of students and postdocs. David McCormick, Julio Freidmann, and Brad Ritts mapped foreland and strike-slip basins; Beverly Saylor, Shane Pelechaty, Odin Smith, Steve DiBenedetto, David Fike, and Justin Ries explored Ediacaran chronostratigraphy and paleoceanography; Linda Kah, Stefan Schroeder, Erwin Adams, Mike Tice, Abby Allwood and Woody Ficher studied microbial processes and their rock record; Roy Adams, Dawn Sumner, and Mike Pope examined Archean to Cambrian carbonates and evaporites; Jennifer Carlson, Jeff Parsons, and Bill Lyons took on analysis of turbidites and bed thickness distributions; Wes Watters reconstructed *Namacalathus* and Endurance crater; Adam Maloof worked on Holocene parasequence development at Andros Island; Alex Hayes, Joannah Metz and Ralph Milliken helped pioneer the study of the sedimentary record of Mars. And finally, Lauren Edgar, Maggie Osborn, Katie Stack, Kristen Bergman, and Daniel Stolper form my group of current students. Many are becoming scientific leaders in their own right, and I am immensely proud of all their accomplishments.

STRUCTURAL GEOLOGY & TECTONICS CAREER CONTRIBUTION AWARD

Presented to
Richard H. Sibson

Richard H. Sibson
University of Otago, New Zealand

Citation by Barbara E. John

It is my pleasure to introduce Professor Richard (Rick) H. Sibson the 2011 recipient of the Career Contribution Award. This award is given to an individual who throughout their career has made numerous distinguished contributions that have clearly advanced the science of structural geology or tectonics, and ‘distinguished contributions’ is a very apt description of Rick’s career studying earthquakes in the field as a geologist. In fact, I know each of us has been influenced by his contributions toward understanding the structure and mechanics of crustal fault zones, but some may not know the man—for those a brief history.

Rick was born and raised in Auckland, New Zealand the son of R.B. Sibson (classics master at King’s College, life-long birder, and inveterate island-hopper), and J.W. Fleming, sister of Sir Charles Fleming, Chief Paleontologist with the New Zealand Geological Survey. This auspicious birth led to his love of the outdoors, a career choice likely prejudiced by his uncle, and an ability to recite literature at any time and place. At the University of Auckland, he was strongly influenced by an inspirational class in structural geology taught by Professor Arnold Lillie. At the same time he took up caving and exploring old gold-silver mines east of Auckland, which likely led to his later diversification from pure structural geology into the structural controls on ore deposits, and processes of mineralization.

In the 1970s, Rick was a post-graduate at Imperial College London, where his PhD supervisor, Janet Watson, had the wisdom to let her students run by themselves and ‘follow their noses’. And so he did, selecting his field area on the basis of a New Scientist article by Peter Francis entitled ‘The Geology of Whiskey Galore’. Rick’s investigation of the deep-seated ‘guts’ of the ancient fault zone exposed adjoining the peat bogs of the Outer Hebrides (Scotland) convinced him of the relationship between structural geology and earthquake rupturing. His thesis recognized that systematic changes with depth in fault rocks could be used to define a mechanical transition in the crust between brittle near-surface faulting and deeper, more ductile shear zones. This work defined the basic architecture of fault zones, and presented the terminology for fault rocks that remains widely used today. It emphasized the important point that ‘earthquake geology’ extends below the dirt levels beloved of paleoseismologists well into the ‘underburden’.

In the early 1980’s Rick was invited to the Office of Earthquake Studies at the USGS in Menlo Park. This ‘intoxicating’ environment led to him recognizing the correlation between the depth distribution of crustal earthquakes, and his earlier fault zone models, transforming our understanding of faulting processes and earthquakes. In 1982 he moved to U.C. Santa Barbara where Rick mentored me. There I was called into service to aid him in his newfound passion of ‘launching’ from remote mountaintops strapped into nothing more than a pair of dacron wings, hoping to fly—something he called hang gliding. I felt the need for him to remain alive to sign my dissertation so decided monitoring his activity was reasonable. At the time I worked on well-exposed low-angle normal faults whose existence Rick reluctantly admitted though he considered them mechanically unfeasible. Over the same period he was developing comprehensive models highlighting the interrelationships between fluid flow, faulting, and earthquakes in the crust. This led to his fault-valve model tying the earthquake cycle to the flow of overpressured fluids and mineralization. By applying simple mechanical principles, Rick demonstrated that transient permeability generated by earthquake rupture can lead to fault-hosted hydrothermal mineralization; a concept that is now widely utilized in gold exploration.

In 1990 he returned to New Zealand as Professor and Head of the Department at the University of Otago. Since his return ‘home’, Rick has continued studying natural examples of deformed rocks from denuded fault zones and hydrothermal mineral deposits. He quietly/calmly but repeatedly reminds our (structural geology) community that rock structures we consider as developing slowly and steadily in the upper half of the crust are likely accomplished by earthquake faulting. Integral to this mission has been raising public awareness of earthquake hazards surrounding the New Zealand plate boundary, and Pacific Rim in general. However, this did not stop him and his geologist wife Francesca Ghisetti from acquiring property near Christchurch City! He helped define the scientific rationale and objectives for the NSF/USGS San Andreas Fault Observatory at Depth (SAFOD), and continues to contribute to the drilling program on New Zealand’s Alpine fault.

Rick, you have had a profound influence on both pure and applied geosciences over more than 35 years, and are truly a distinguished international scientist. It is therefore my great honor to present to you the 2011 Career Contribution Award from the Structure and Tectonics Division of the Geological Society of America.

Response by Richard H. Sibson

Thank you Barbara John for your very kind remarks. Once, during a break from field-camp Bobbie drove my truck while I was desperately trying to avoid getting sucked up into a thunderhead in Owen’s Valley—an early near-death experience—so it is entirely right that she should be here giving this citation. More properly, one should note that graduate students like Bobbie always teach you a lot more than you teach them—*“I don’t care what your mechanics tell you, Rick—look at the rocks—you just cannot deny the physical existence of low-angle normal faults!”*

The biologist Jacques Monod tells us that ***life as a whole evolves through chance and necessity***—a pretty fair description of my own career adapting to changing circumstances. Back in pre- plate tectonic days, my grounding in structural geology and tectonics at the University of Auckland came from Arnold Lillie who had mapped the high Southern Alps around Mt Cook with the help of a field assistant called Ed Hillary. My transition to Imperial College in London in 1969 was due largely to Arnold's coercion in forcing me to sign a series of scholarship applications.

Some will recall 1968 as the magic year when many of the fundamental papers of plate tectonics were being published in the *Journal of Geophysical Research*—intoxicating reading for someone growing up in an island arc. One that particularly impressed was '*Seismology and the New Global Tectonics*' by Bryan Isacks, Jack Oliver, and Lynn Sykes—earthquakes, apparently, had something to do with displacement along plate boundaries. I thus arrived at Imperial College to study quantitative structural geology with a head full of the new-fangled notions of plate tectonics. With this in mind I sat through John Ramsay's cohesive and wonderfully flowing lectures on the earth as a ductilely deforming continuum, occasionally wondering whether anything fast and violent ever occurred in structural geology. But Neville Price's 'think of a number' approach combined with Ernie Rutter's materials science set me off along another track! Around that time earthquakes appeared as 'flyspots' on maps and were the property of seismologists—they were not generally considered part of structural geology. However, over in Civil Engineering, John Tchalenko and Nick Ambraseys were preparing wonderfully detailed maps of the 1968 M 7.2 Dasht-e-Bayaz rupture in central Iran where c. 4 m of left-lateral strike-slip had occurred in just a few seconds.

Then came the problem of selecting a PhD topic. Daunted by the vast literature on the Alps, I decided to have a crack at the peculiar 'flinty crush phenomenon' associated with the Outer Hebrides Thrust and somehow persuaded Janet Watson that 'those awful rocks' were worth studying. Structural geologists have a bad tendency of being distracted by beauty but 'rock uglification' also turns out to be important. Demonstrating that the pseudotachylytes so widespread in the Lewisian Gneisses of the Outer Hebrides were 'fossil earthquakes' and reconstructing the rheological structure of an ancient thrust zone was enormous fun but I soon realized I needed to know a lot more about modern earthquake processes.

In 1981 I had the great fortune to be a Visiting Scientist in the Office of Earthquake Studies at USGS in Menlo Park where I encountered the generous hospitality of the Californian earthquake science community—Tom Hanks, Dave Hill, Art McGarr, Bill Ellsworth, and many others including the great Bob Wallace who began as a mining geologist but was surely the pioneer of modern Earthquake Geology. Then came the move to UC Santa Barbara working alongside John Crowell and Art Sylvester. NSF was surprisingly supportive though I do recall one review that noted: "Sibson's idea of field work seems to consist mostly of touring". Quite right—if you see the same field relations in a variety of locations you may be looking at something important! A growing interest in fluid activity in the ductile roots of fault zones then led me to the Archean shield of Canada where I was introduced to the wonderland of mesothermal lode gold systems by Howard Poulsen and Francois Robert of GSC.

My return to New Zealand to the University of Otago in 1990 allowed me to continue work in these three overlapping fields—structural geology of fault zones, the mechanics of shallow crustal earthquakes, and the role of faults and fractures as fluid conduits for mineralization. Sadly, I had to let go of the hang-gliding. Many of our students first find employment in the Archean craton of Western Australia but I like to think that growing up on the active Pacific Rim contributed to their education.

To a student of active Earth processes, the South Island of New Zealand is a geological paradise. But as you all know, much of geologic process resembles warfare—long periods of boredom punctuated by short periods of unusual interest (and terror!)—so you have to be careful what you wish for. The ongoing earthquake sequence around our newly adopted city of Christchurch in fact turns out to be a classic example of conjugate 'Andersonian' wrench faulting. But the fascination of 'living over the shop' certainly fades after a year of rich and violent aftershock activity!

A structural geologist is soon lost without a compass. The America I knew, lived in for 10 years, enjoyed hugely and benefited from immensely, was the land of boundless possibility, of "let's make it happen", of science as "the never-ending frontier", of "the only thing we have to fear is fear itself". It was not the America that condones torture, abandons habeas corpus, and conducts drone assassinations. This seeming 'loss of moral compass' is of enormous concern to friends of America around the world.

That said, I am grateful beyond words to the Geological Society of America for this award, to my parents who let me fly free, to all my colleagues and students, and most importantly to my wife Francesca Ghisetti—best of companions.

Thank you all very much indeed.