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Portland, Oregon

RIP RAPP ARCHAEOLOGICAL GEOLOGY AWARD

Presented to Richard I. Macphail

Richard I. Macphail
University College London

Citation by Paul Goldberg

Someone came up to me at Micromorphology Working Group meeting in London in 1981 wanting to show me some thin sections about ancient agriculture in the UK, and I said, "sure." That was the beginning of a friendship that has lasted almost 30 years. Since that time, Rich has had a lengthy and productive career as a geoarchaeologist, contributing his knowledge of soils and landscapes in order to obtain a better, more complete and accurate understanding of past human occupations and activities.

Rich has been one of the principal promoters of soil microchemical (e.g., microprobe, magnetic susceptibility) and micromorphological techniques applied to archaeological issues and topics. The spectrum of topics is broad and include: palaeoagriculture and early pastoralism in Europe and the Middle East, Palaeolithic sites and their environmental settings (Boxgrove; Gorham's Cave), experimental archaeology (e.g., Butser Farm, Overton Down, and Wareham), human-induced landscape changes, urban archaeology (e.g., Dark Earth and early Medieval occupation and floor deposits), and the analysis of human materials (e.g., lime plaster, mortar, and other building materials). He has published numerous articles on soils, soil micromorphology, and archaeological sediments, and has co-authored texts in micromorphology and geoarchaeology; he also served as author and editor of a collection of papers that focuses on archaeological soils and sediments.

Rich has also served the academic community as an active member of the editorial board of the journal, *Geoarchaeology*, and has done more than his share of vetting manuscripts, always a team player. In addition, he has given numerous intensive short courses in Archaeological Soil Micromorphology for international students and researchers, and is an active participant in Soil Micromorphology Workshops, such as the one held this past summer in Italy. He has been a visiting scholar in France, Belgium, and Italy, where he taught geoarchaeology courses that emphasized the significance of soils in archaeological research. Lastly, Rich's field areas span the globe, where he has carried out research on sites in the UK, the United States, Gibraltar, Korea, Djibouti, Sweden, Germany, Hungary, Israel, Italy, and China; the sites are too numerous to list.

In sum, Richard is intensely dedicated to the field of Geoarchaeology. He has not only produced research of his own but has been a beacon of information and help for students and colleagues from all over the globe who have sought out his expertise and knowledge. He has contributed immensely to the field of geoarchaeology, and has raised the bar about how we go about interpreting archaeological sites. He is well deserving of the Rip Rapp Award, and I am honored to be able to be his citationist.

Response by Richard I. Macphail

It was a complete, but most welcome surprise to become the recipient of the 2009 Geological Society of America's Rip Rapp Award for Archaeological Geology. As a Brit I feel even more gratified by this honour, and hopefully this reflects well on the standard of geoarchaeology both in the UK and Europe as a whole. Nevertheless, I imagine that part of this recognition results from my close collaboration with Paul Goldberg, the journal *Geoarchaeology* (at which he was an editor for so long), and Boston University where I am an Associate Research Fellow in the Department of Archaeology. In fact over the last decade, Boston has become something of a second home and laboratory!

Over the years, Paul and I have worked together on a number of North American sites, and these has given me an extra dimension to my understanding of geoarchaeology especially in hunter and gather site investigations. Importantly, I think that I have successfully transferred some of this improved understanding to Europe.

I am also indebted to my other chief co-worker, Marie-Agnès Courty of the French CNRS, and all those experts who helped train me from my earliest studies in the 1970s (including the late Peter Bullock and John CC Romans). Equally, I also wish to acknowledge the contribution of all members of the Archaeological Soil Micromorphology Working Group who have helped develop and broaden this field within geoarchaeology since 1990. Just as importantly, I thank the many academic bodies (British Academy, English Heritage, The Leverhulme Trust) and commercial companies (Geo-Marine Inc, Museum of London Archaeology, Oxford Archaeology, Statistical Research Inc, Wessex Archaeology — to name but a few) for funding. It is clear that they truly value the contribution of microstratigraphic investigations to archaeology. It is also important to note that soil micromorphological results have been greatly enhanced by the contributions of archaeological colleagues (too numerous to list), palaeoenvironmentalists (Mike Allen, Jill Cruise and Pat Wiltshire) and soil chemists (John Crowther and Johan Linderholm). Lastly, none of these studies would have been possible without the scientific base provided by the Institute of Archaeology, University College London since 1978. Over the last decade for example, amazing support has been received from the following (again to name but a few!): Sandra Bond, Barbara Brown, Kevin Reeves, Thilo Rehren, Arlene Rosen, Stephen Shennan (director of the IoA) and the late Peter Ucko (retired director of the IoA).

Once again, I'd like to thank Paul Goldberg for being my citationist for this award, and I am extremely grateful to the Geological Society of America and committee members such as Ralph Mandel, for honouring me and my discipline in this way.

GILBERT H. CADY AWARD

Presented to R. Marc Bustin

R. Marc Bustin
University of British Columbia

Citation by Maria Mastalerz

It is a great honor to recognize R. Marc Bustin for his outstanding contributions to the field of coal geology. A graduate of University of Calgary and the University of British Columbia (UBC) in Canada, R. Marc Bustin has been a Professor of Geology at the UBC in Vancouver since 1979. My association with Marc started 19 years ago, when he offered me a postdoctoral position at UBC, but his diversified scientific research has been a major resource throughout all my professional career.

Bustin's contribution to coal geology is immense. His early papers on the Fraser River Delta peat deposits are still important references on modern peat-forming environments. Those early papers already established him as an outstanding sedimentologist/coal geologist. His research on the role of stress and strain in the maturation of organic matter has been a major contribution in understanding graphite formation and is widely cited in the literature. His innovative research on the application of micro-techniques to study coal—microprobe and micro-FTIR—contributed new knowledge of maceral chemistry. Perhaps his greatest contribution to the science of coal geology is his pioneering work on coalbed methane, and gas, including carbon dioxide, sorption. With his graduate students and postdoctoral fellows, Marc addressed many key issues, combining field observations, laboratory experiments, and modeling. His research in this field brought him a wide recognition not only in the scientific world but also in the industry, reflected in countless invitations to present short courses and give invited talks in North America and internationally. In my opinion, his outstanding recognition of the key research problems and providing creative solutions remain unparalleled in the field.

In addition to his outstanding contribution to coal research, Marc is a dedicated teacher and mentor. Since 1982 he has advised more than 40 students and several postdoctoral fellows. Many of these individuals hold important academic and industrial positions, a testimony to his abilities as a teacher as well as to the importance and timeliness of his research. He exhibits a finely honed intuition and a keen scientific imagination, and he masterfully instills these traits in his students and co-workers. We all continue to be inspired by his depth of knowledge, professionalism, and scientific intuition, and often seek his advice.

Bustin has also shown his commitment to coal geology by serving as Associate Editor of the International Journal of Coal Geology; reviewing countless papers for other scientific journals; working in various capacities in such organizations as CSCOP, ICCP, and GSA; and participating in the organization of scientific conferences, short courses, workshops, and other scientific events. He has received a number of national and international awards, including the Thiessen Award, the highest award presented by the International Committee for Coal and Organic Petrology.

R. Marc Bustin is a distinguished coal geologist, one the best of our time, and for his research, dedication to teaching, and service to coal-related professional organizations, it is an honor to recognize him with the Gilbert H. Cady Award of the Geological Society of America Coal Geology Division.

Response by R. Marc Bustin

It is great pleasure that I acknowledge and thank the GSA for the Cady Award. Past recipients of the award include the most respected coal scientists and engineers and I am truly honored to be considered in such esteemed company. My interests in coal geology goes back to the early 1970s when I was a naive student in the Canadian Arctic Islands with the Geological Survey of Canada under the tutelage of Drs. Hugh Balkwill, Ken Roy and Steve Hopkins. Their patience and encouragement are to a great extent responsible for my career choice and career values, and I here acknowledge and thank them. As a teacher I have had the good fortune to have had some remarkable graduate students, post doctoral fellows, and research associates and what success I have had as a researcher must at minimum be equally shared by them. Through the last 30 years I have had the remarkable good fortune to have had the best job, that of a professor at one of the great universities situated in one of the most beautiful cities in the world with access to adequate funds to pursue my curiosities. Such a great job and work environment was made possible by the tax payers of Canada and I hope that the Cady Award in some small way helps validate their investment in my research program over the last three decades.

E.B. BURWELL, JR., AWARD

Presented to Matthias Jakob and Oldrich Hungr

for

"Debris-flow Hazards and Related Phenomena"

Matthias Jakob
BGC Engineering

Oldrich Hungr
University of British Columbia

Citation by Susan H. Cannon and William H. Schulz

It is with great pleasure that we present the 2009 E.B. Burwell, Jr. Award to Matthias Jakob and Oldrich Hungr for their book *Debris-flow Hazards and Related Phenomena*.

Landslides are among the most deadly and damaging of geological processes, and most losses from landslides are from debris flows and the related phenomena, hyperconcentrated flows and lahars. These phenomena can be dangerous because of their great mobility, high impact forces, and large inundation areas, as well as the difficulties associated with predicting their location, size, and time of occurrence. Recognition of hazards posed by debris flows increases with each deadly event, and thus study of debris flows has flourished in recent decades. However, results from important work have remained scattered throughout various journal publications, conference proceedings, and consulting reports. Fortunately for all of us in the field, Drs. Jakob and Hungr recognized the necessity for a concise presentation of the state-of-the-science knowledge of debris-flow hazards and expended considerable effort to compile, partly write, and edit such a volume. The result is *Debris-flow Hazards and Related Phenomena*.

As experts in debris-flow science, Drs. Jakob and Hungr were keenly aware of the varied subject matter most vital for understanding and mitigating debris-flow hazards. They identified the leaders from the global community of scientists and engineers who study debris flows and solicited from them wonderfully written chapters that describe the most up-to-date knowledge of the phenomena. Drs. Jakob and Hungr themselves made outstanding contributions to the book, including a thorough introduction to debris-flow hazards, an explanation of the relations between various classification systems and terminologies that are used worldwide, and discussions of two critically important topics, enlargement of debris flows by entrainment and analysis of hazards posed by debris-flow movement. The resulting book is a well-rounded compendium on the subject including analytical and empirical modeling of debris-flow and related processes, description of tools for their study, and case histories, all of which focus on practical, predictive tools that may directly reduce debris-flow hazards.

The outstanding value of the book is evident not only in the authorship of the 27 chapters, but in the subject matter that is covered and the organization by which it is presented. The book begins with an overview of the debris-flow problem, a synthesis of terminology and definitions used worldwide, and a presentation of the historical significance of debris flows and their understanding. These introductory chapters provide the reader with a strong foundation for what is to come and are aptly followed by chapters describing the most advanced knowledge on slope failures that may result in debris flows, mechanisms resulting in debris-flow mobility, and debris-flow growth by entrainment. As the reader has then developed an understanding of debris-flow initiation and movement, the book presents chapters describing the related phenomena of hyperconcentrated flow, subaqueous debris flows, and volcanic debris flows (lahars). The following chapters describe tools for identifying and studying debris-flow-prone areas and debris-flow processes and related conditions. To provide understanding of factors contributing to debris-flows, the next chapters discuss how external forcing, such as climatic change, wildfire, and timber harvesting control temporal and spatial patterns of debris-flow occurrence. The wealth of knowledge just presented culminates in chapters on debris-flow hazard analysis and mitigation. The volume concludes with nine exceptional case histories describing well-understood debris-flow events, hazard assessments, and mitigation activities from around the world.

As we hope is evident from the description above, the book *Debris-flow Hazards and Related Phenomena* presents a unique and outstanding synthesis of the state-of-the-science knowledge of some of the most damaging and deadly of geological phenomena. We believe, as the editors had hoped, that the book will help reduce the loss of lives and property from future debris flows and related phenomena. For these reasons, the book is a very worthy recipient of the 2009 E.B. Burwell, Jr. Award.

Response by Matthias Jakob

It is with great pleasure that we learned about this award. Clearly, these types of books are not compiled for commercial benefit nor for personal glory. A science Harry Potter is yet to be written. Rather they evolve out of the feeling of necessity to extract advances in a science for the benefit of those scientists and practitioners who do not have the opportunity to sift through hundreds of articles on the subject published in a variety of journals and conference proceedings. Most importantly, they give us the chance to condense a subject to a common scientific denominator on which we can orient our own academic efforts and consulting practice. While the publication of a book ought to be enough satisfaction to warrant the countless hours that have gone into it, receiving an award in recognition of the effort is a deeply gratifying experience that we would like to extend to all the authors who have made this publication possible, and who have put up with our nagging, friendly and unfriendly reminders over the course of two years. Thanks are also due to the publishers, especially to Philip Blondel and Clive Horwood who have kept this book on course.

We thank our nominators for their citation and the award committee for their choice that will certainly motivate us to continue our publication record and maybe, one day, provide an update to this book!

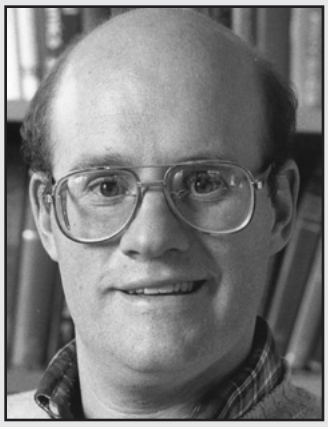
Response by Oldrich Hungr

I am very grateful to the GSA and to the nominators, Drs. Cannon and Schulz for this prestigious award that relates to the book "Debris-flow Hazards and Related Phenomena". It is encouraging to see one's daily work recognized by colleagues. However, I cannot claim this honour as my own. A large part of it, of course, belongs to Dr. Matthias Jakob who, with his characteristic unbounded energy, enthusiasm and skill, was the driving engine for the project. An even larger part of the recognition is due to the 44 chapter authors who represent leading experts on debris flows from five continents.

Once again, thank you, all.

GEORGE P. WOOLLARD AWARD

Presented to Seth Stein



Seth A. Stein
Northwestern University

Citation by Donna M. Jurdy

Each year the Geophysics Division of the GSA gives the George P. Woollard award to a distinguished scientist for "outstanding contributions to geology through the application of the principles and techniques of geophysics." It is a pleasure — and honor — to deliver the citation for the Woollard Award's 2009 recipient, Seth Stein.

Seth Stein, the William Deering Professor of Earth & Planetary Sciences at Northwestern University, investigates plate boundary processes and deformation within the lithosphere by using a range of techniques including space-based geodesy, seismology, and marine geophysics.

Stein specializes in the integration of diverse techniques for tectonic studies. His graduate work at Caltech used earthquakes to prove that the 90 East Ridge was tectonically active, as opposed to the "aseismic" feature it was assumed to be. This laid the foundation for his later reanalysis of plate motions in the Indian Ocean. He also developed techniques for normal mode studies that many years later gave the first full insight into the Great 2004 Sumatra earthquake. Early in his career at Northwestern, he spearheaded a team of graduate students along with another faculty member in a project that reexamined the burgeoning relative plate motion dataset. From this work they developed NUVEL-1, a model that provided new insights into plate motions around the world over the past 3 Myr. This accounted for "missing" motion on the San Andreas fault and demonstrated that India and Australia are distinct plates. The NUVEL model is routinely compared with results from space-based systems to identify temporal changes in plate motion. It is the standard to describe plate motions and allows testing of the rigid plate hypothesis and measurements of intra-plate deformation. Seth developed widely-used models for the role of microplates in changing the geometry of plate boundaries. He also examined aspects of thermal evolution of the ocean floor including the dependence of earthquake depths and topography on lithospheric age, and the magnitude and distribution of hydrothermal water flux forming a primary interaction between the solid earth and ocean/atmosphere. Also, he combined GPS satellite, geology, and earthquake data for a view of temporal and spatial variation of Andean mountain building. This showed the deformation extends from the trench to the continental interior.

More recently in his career Seth Stein has shifted attention to seismological problems with relevance to society. With a GPS field survey, he demonstrated that little or no present-day deformation is occurring at the New Madrid seismic zone, triggering a major reassessment of the processes and hazards there. A productive debate has ensued about the appropriate hazard mitigation policy. Most recently, he has been a leader in studying the great 2004 Sumatra earthquake, showing how the giant tsunami was generated and identifying which other subduction zones can generate such events. The rupture area was determined to be 1200 km in length, considerably longer than thought, which established that similar events should not be expected in 500 years. He undertook the first comprehensive view of postglacial rebound across North America, constraining glaciation history and mantle viscosity. This GPS study provided the first full mapping of present vertical and horizontal glacial rebound and subsidence which showed detail not visible from shoreline observations alone. Data led to improved mantle viscosity models and revealed that another major ice lobe existed, west of Hudson's Bay.

Beyond his ground-breaking scientific research, he has also had a major impact in formulating public policy to mitigate earthquake hazards. He has worked extensively with news media to improve public understanding of earthquake hazards and policy, as well as made contributions in earth science education. Seth Stein served as Scientific Director of the UNAVCO GPS Consortium, and was one of the founders of the Earthscope program. He has written a widely-used seismology textbook, and edited 5 books about plate boundary zones, intraplate earthquakes, and the Mesozoic Pacific. He has recently completed a popular book about earthquakes in the midwest and is in the process of developing a new textbook for geophysics at a sophomore level. He has been an IRIS-SSA Distinguished Lecturer and speaks widely on seismology and tectonics.

Especially active in service outside for professional organizations and universities, he selflessly offers his expertise and considerable energy. Truly a model advisor, he has a long history of mentoring successful graduate students, many now faculty advisors themselves, and others in industry or government laboratories. Out of the numerous past students who have worked with him, four were recognized by AGU Outstanding Student Paper awards.

The diversity and productivity of Seth Stein's research throughout his career, as well as his efforts in education, outreach, and public policy, make him deserving of the George P. Woollard Award.

Response by Seth Stein

Thank you very much, Donna for that generous citation.

I very much appreciate this award and am deeply grateful to the Geophysics Division, to GSA, and to the geological community that we're all part of.

Getting up here reminds me of the story of the medical school dean who tells new students "Half of what we will teach you in the next five years is wrong. The problem is that we don't know which half."

I think that's a good description of earth science. We're all working on trying to understand more about how our complicated planet works. We do make progress, but it's a messy process.

We've all probably tried to explain how science really works compared to the ideal "scientific method" people learn in elementary school. The ideal scientist is like a lone explorer who examines the possible paths to a clearly visible mountain, chooses the best, and heads on. Real scientists are like a mob of hikers trying to find the way to an unseen lake through dense woods full of swamps, mosquitoes and poison ivy. We argue about which routes look best, try different ones, follow them when they seem to be working, and try others when they

aren't. It's exciting and fun but also confusing and frustrating. Eventually, mostly through luck, we reach the lake, often by different routes that get there about the same time. Once we're at the lake, we argue whether it's the right lake.

The moral is that while searching for the lake we were all confused and going in the wrong directions about half the time. Eventually, we got there as a group by combining many people's efforts. It's hard to say who contributed what, since we're all sure that we played the key role. It's also not that important, because after relaxing in satisfaction for a while, we realize that this lake is just a small pond. We've made progress, but the big lake is somewhere higher up on the mountain, and it's time to get to work looking for it. Almost all the projects we do, big or small, are a lot like hunting for the lake. We got there with lots of help — from the people we worked with, from other people working on that problem or related problems, and from the broad community whose knowledge we drew on. Moreover, the results are just part of a much bigger picture.

In that spirit, I'd like to thank many people.

The first is my wife, Carol. We've been a two-geologist family for 28 years, with all the fun and complications that poses. When we go to the same meetings, there's the issue of leaving children. Since we live where "Ferris Beuhler's Day Off", "Home Alone", and "Risky Business" were filmed you get the idea. There's the problem of long absences. When Carol was gone twice for a month doing heat flow work off Costa Rica, I did the Mr. Mom stuff. I remember talking to a mother who said her family couldn't function if she were gone overnight. There are the issues of talking to children. When we explained to our 3-year old son that the average old ocean basins were about a kilometer shallower than previously thought, he worried whether there was enough room for whales. On the other hand, our daughter is an avid rock climber, but doesn't care where they came from.

Next are my colleagues. In particular, over many years Donna Jurdy and Brad Sageman made our department a comfortable place. Emile Okal does the opposite — he makes life uncomfortable by coming up with several neat scientific problems a day that he wants to solve immediately. Since that's more than even he can solve working 12-hour days, I get dragged into a few and fun results often emerge.

A lot of one's closest colleagues are students. I've been lucky to work — as an advisor or a coauthor — with great students: Doug Wiens, Joe Engeln, Paul Stoddard, Gary Acton, Charles DeMets, Don Argus, Paul Lundgren, George Helffrich, John Brodholt, Michael Wysession, John Weber, Thomas Shoberg, Lisa Leffler, John DeLaughter, Fred Marton, Phil Richardson, Andy Newman, Eryn Klosko, Alberto Lopez, Kim Schramm, James Hebden, Laura Swafford, and Carl Ebeling. They were fun, thought for themselves, and didn't worry about conventional wisdom they heard from me or elsewhere. When they didn't agree with me, I got responses like "I can't believe you missed that" or "that's stupid." They were often right, of course.

Then there are coauthors: a great part of science is working with and learning from so many smart people. As you get older the numbers grow — my records show 167 coauthors. I'd use up my time listing everyone, but thanks in particular to Bob Geller, Richard Gordon, Tetsuzo Seno, Sierd Cloetingh, Rinus Wortel, Tim Dixon, Steve Kirby, John Schneider, Giovanni Sella, Anke Friedrich, Mian Liu, and Eric Calais.

I'd like to finish up with some thoughts about an issue many us have been mulling over. We do exciting science, but ofen don't do as well communicating it to the public. There's broad if diffuse interest in issues of the earth, energy and environment. For example, we had a window of public interest for almost two weeks between December 26, 2004, when the Indian ocean tsunami that killed more than 200,000 people dominated the news, until January 7 when Brad Pitt and Jennifer Aniston announced that they were splitting up.

Still, on many important issues — natural hazards, global warming, natural resources, etc. — much of the public doesn't appreciate concepts that we learned as undergraduates and teach our undergraduates. They certainly don't appreciate that these are areas about which we still have lots to learn. For example, I read a piece in the *Sierra Club Bulletin* advising students about "green careers" and was amused that none of them involved science. I wrote a letter — which to be fair, they printed — pointing out that addressing environmental issues without science was like hiking without a map — it's easy to get lost.

The good news is that we're trying hard to communicate our science in lots of ways. It's different from talking among ourselves, as I've learned while doing things like IRIS/SSA lectures and now writing a general audience book. Still, it's fun and I encourage anyone interested to try. We know how exciting and fun it is to work on problems that are both challenging and relevant to people's lives, but the trick is to convey this to everyone else.

2008 BIGGS AWARD FOR EXCELLENCE IN EARTH SCIENCE TEACHING

Presented to Laura Guertin

Laura A. Guertin
Penn State–Brandywine

Citation by Heather Macdonald

Today we honor Laura Guertin, the 2009 recipient of the Biggs Award for Excellence in Earth Science Education, for her outstanding teaching, service, and community leadership. Dr. Guertin, an Associate Professor of Earth Science at Penn State Brandywine, received a B.A. from Bucknell University and a Ph.D. from the University of Miami. Tim Bralower, Head of the Department of Geosciences at Pennsylvania State University writes that "Professor Guertin is a truly brilliant educator at the undergraduate level."

At Penn State Brandywine, Laura has taught an impressive array of courses: *Planet Earth, The Sea Around Us, Biodiversity and Earth History, Dinosaur Extinctions and Other Controversies, Environment Earth, Environments of Africa, Natural Disasters: Hollywood vs. Reality, Earth System Science for Teachers, World Food Problems, The Role of Knowledge in Society, Critical Issues in Science, Technology, & Society, Civic and Community Engagement, and various First Year Seminars (Careers in Science; Diamonds, Man-Eating Lions of Tsavo, and Environmental Sustainability* and *Community Service)*. In the classroom, she uses a variety of teaching strategies including collaborative learning approaches, field work utilizing shopping malls and cemetaries, Just-in-Time Teaching (JiTT), and incorporating technology in the classroom (from Google Earth to handheld technology to online videos and audio files). She has been invited to lead workshops and give presentations on her work with JiTT and wrote a chapter in a new book, *Just-in-Time Teaching (JiTT) Across Disciplines*. In her scholarly endeavors with students, she also uses Twitter and Flickr! Her students write about "her passion for science, enthusiasm for teaching, and her innovative teaching style", "her willingness to work with [students] outside her classes", and "her ability to encourage her students to go great things". In writing about students who transfer to the Penn State University Park campus, Tanya Furman writes that "They all remain in touch with their beloved "Dr. G."

Laura incorporates creative approaches to service learning such as involving her students in working with Girl Scouts on merit badges, having students make dinosaur-themed educational/toy boxes for children in hospitals, and taking her students to lead science-based activities for Brownie troops. Although she is the only earth science faculty member on her campus, she quickly became a campus leader in part because of her involvement in service learning in her classes and various campus volunteer efforts. She is currently the coordinator of the Jane E. Cooper and Schreyer Honors Programs at Penn State Brandywine and co-chair of an intercollege minor on civic and community engagement for Penn State University. In 2008, she received a Congressional Citation for her efforts in engaging a community of volunteers.

She has a passion for mentoring undergraduate students in their first two years on inquiry-based projects and independent research. She has mentored 28 Penn State undergraduate students on research and honors projects and was instrumental in initiating a campus undergraduate research exposition (EURECA). She is the Chair of the Geosciences Division of the Council on Undergraduate research (the first faculty member from a primarily two-year college to hold this position) and co-leads workshops on various aspects of undergraduate research program. She is currently working on an NSF-funded project, Developing Undergraduate Research at Community Colleges: Tapping the Potential of All Students, with Brent Cejda, University of Nebraska-Lincoln and others.

Laura has developed web resources for *Starting Point*, developed a workshop for teachers in Earth System Science with Tanya Furman, and so much more. She is a Councilor-at-Large in the National Association of Geoscience Teachers and a member of Project Kaleidoscope's Faculty for the 21st Century Network (PKAL-F21). She has received many awards. From Penn State Brandywine, these include the Student Government Association Outstanding Service Award, the Student Government Association Most Involved on Campus Award, Club Advisor of the Year, and the Undergraduate Research Mentor Award. In addition, she has received a college-wide Award for Teaching Excellence and the George W. Atherton Award for Excellence in Teaching, Pennsylvania State University (a university-wide teaching award). Today we are delighted to recognize her outstanding contributions with the Biggs Earth Science Teaching Award.

Response by Laura Guertin

I am deeply humbled to be selected as this year's Biggs Earth Science Teaching Award recipient. It is overwhelming when I think about the significance of this honor. I feel as if the seal has just been broken on an envelope at the Academy Awards, and my name has been announced as the winner. So, in the spirit of the Academy Awards, I have a few people I would like to thank in my acceptance speech. I must begin by thanking Miss Somerfelt, my fifth grade teacher at Wheeler Elementary School in Plainville, Connecticut. It is in her class I recall engaging in my first science experiment. The class took some radish seeds. The seeds were placed on dry and wet paper towels in Ziplock bags, with some of the bags covered with aluminum foil and some in placed in natural light. I will never forget the amazement I felt when Miss Sommerfelt unwrapped foil-covered Ziplock bag with the radish seeds on the wet paper towels – wow, did those seeds grow! Thank you, Miss Sommerfelt. In eighth grade physical science, Mr. Laskarzewski had us design our own experiments, and a fellow student and I looked at one type of plant and how it grew with various fertilizers in different amounts of light. Thank you, Mr. Laskarzewski, for my first memory of a group project modeled as an independent study. Plainville High School was filled with some dynamite teachers, inspiring me with hands-on experiences and discipline-based fieldtrips. Mrs. DeThomas, thank you for your excitement and passion for chemistry and allowing our class to do creative projects with the periodic table of elements. Miss Ludwig, who would have known that the cemetery explorations we did in your anthropology course would lay the foundation for the

cemetery work I continue to do with my students today. I thank you for getting me outdoors for my first field project.

I completed my undergraduate education at Bucknell University in Lewisburg, Pennsylvania. Jack Allen, Ed Cotter, and Richard Nickelsen — no one could have asked for a more dynamic group of faculty committed to getting all students in the Valley and Ridge Province for some intense fieldwork. Dr. Cotter, thank you for letting me serve as your teaching assistant in my senior year — another great experience that laid the foundation for where I am today. Dr. Nick, I am honored to have had you in your last semester of teaching at Bucknell before retiring — I'll never forget your passion for explaining structural geology, including the time you stood up on the chair in front of the room and proceeded to act out the motion that occurs at a subduction zone.

When I was accepted to graduate school at the University of Miami's Rosenstiel School of Marine & Atmospheric Science, I was offered a teaching assistantship with the undergraduate geology program. I will now admit publicly that at that time, teaching was the last career path on my mind. I was terrified of getting up in front of people to speak. I seem to have come over that fear, and I thank UM for offering me the opportunity to develop my teaching skills — which, by the way, were enhanced significantly by the wonderful geosciences education workshops held at GSA meetings over the years and the current On the Cutting Edge workshop series. I don't know where I would be without such fantastic mentors and role models such as Heather Macdonald, Tanya Furman, Cathy Manduca, Barb Tewksbury, Jill Singer, Dave Mogk, and so many others to name. And I have learned so much from the wonderful organizations that support engaged teachers and researchers, such as the Geological Society of America, National Association of Geoscience Teachers, and the Council on Undergraduate Research. But I think I hear the music begin to play and I see the giant hook coming out to drag me off the stage.

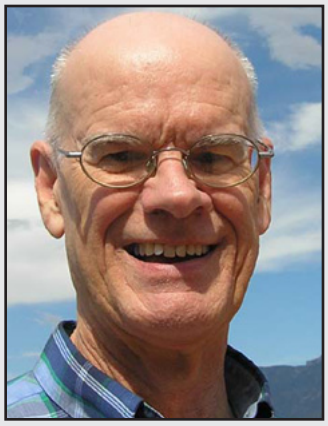
There are two additional groups I will quickly thank — first, my students at Penn State Brandywine. Although the administration, staff, and fellow faculty members have been an amazing support network, I am a lone ranger at my campus, faced with many challenges and polite nods when I describe the latest geologic events to colleagues. To the students in my general education courses for non-science majors, thank you for your desire to learn and see how and why geoscience knowledge is important for you to become a scientifically-literate citizen. And to Alyce, Teron, Lindley, Sara, Emily, Paola, Jen, Gina, Shana, Stacey, Leigh Ann, and the many other students that have engaged in undergraduate research projects with me in the geosciences — even though none of you are geology majors, your passion for engaging in research and presenting and publishing your work is an inspiration to me.

Finally, where would I be without my family. Thank you Mom and Dad for supporting me, even when you were so totally confused when I said I was going to be a geology major in college. Thank you to my brother and sister, thank you to my many personal and professional friends. And most importantly, thank you to my wonderful husband, Dan King, for being as solid as a rock for me during my entire career. Dan is also a pedagogical researcher in chemistry, and it is so nice to have someone to talk to about topics such as the muddiest point, and he knows I'm not talking about the geologic definition of "mud."

So from the Plainville Blue Devils to the Bucknell Bison, to the Miami Hurricanes to the Nittany Lions, thank you to all my teachers and colleagues that have inspired me with their outstanding teaching philosophies and passion for student learning. I only hope that I can and provide the valuable and memorable experiences for my students as you have all done for me. Thank you to all geology faculty with a passion for geoscience education, and thank you Geological Society of America for this great honor.

MARY C. RABBITT HISTORY OF GEOLOGY AWARD

Presented to Davis A. Young



Davis A. Young
Calvin College (emeritus)

Citation by Sally Newcomb

Dave Young has had a most interesting trajectory in his career. Along the way he has written and published extensively for general and specialized readers in a number of areas. He has been, and is, an effective spokesman and liaison for the science of geology as well as having a long and varied teaching career. He has published cutting edge technical works and highly regarded history of geology, but has also published a number of books, reviews, and papers that speak to a community that many of us frequently are not able to address, and is an intelligent and thoughtful communicator between the two worlds.

Dave was educated in the public schools of Abington Township, Pennsylvania, the son of a professor of the Old Testament. He earned a B.S. in engineering with honors in geological engineering from Princeton University in 1962. He earned his M.S. in mineralogy and geochemisstry from Pennsylvania State University in 1965, and his doctorate in geological sciences from Brown University in 1969. He has since been assistant professor of geology at New York University, associate professor at the University of North Carolina at Wilmington, and associate, full professor, and department chair of the Dept. of Geology, Geography, and Environmental Studies at Calvin College in Grand Rapids, Michigan. He has been emeritus since 2004. During his time at Calvin he was for a year a Fellow at the Calvin Center for Christian Scholarship. He is a member of GSA, the Mineralogical Society of America, the American Scientific Affiliation, the Affiliation of Christian Geologists, of which he has been president, and the International Commission on the History of the Geological Sciences.

In his long teaching career, I'm sure Dave has steered many a young person to geology, and his department has just instituted a student Summer Research Fellowship in his name. He co-led a course on Hawaiian geology in the best of places, Hawaii itself. Reading the program for that, I envy the students who were able to take part in it. With student help, he has also assisted with the curating of Calvin College's rock and mineral collection.

Dave's publication record is remarkable. I first became aware of his work in the MSA publication of 1998 titled *N.L. Bowen and Crystallization-Differentiation: The Evolution of a Theory*. This is a thorough and lucid history of Bowen's pioneering work in the diversification of igneous rocks via magma development, one of the true milestones in geology. The book was informed by the close cooperation and advice of our late colleague, Hatten Yoder. Dave has also published technical articles in the *GSA Bulletin*, *the Journal of Petrology, the Proceedings of the Fourth Lunar Scientific Conference, the Encyclopedia of Mineralogy, Earth Sciences History, Northeastern Geology, Lithos, Canadian Mineralogist*, and a GSA Special Paper, as well as two major papers in two Geological Society of London Special Publications. A real landmark was his publication in 2003 of *Mind over Magma: The Story of Igneous Petrology*. This was a part of the history of geology that had had no coherent explication to that point, and his careful and fascinating story is a valuable reference as well as being a treat to read. He is currently working on the fourth and final article for ESH about the inception of the CIPW system for quantitative classification of igneous rocks originated by four American petrologists, a system first reviled and later appreciated by budding petrologists. It is a true intellectual history, and has all the elements of a gripping story, friendships, travel, difficulties, and even death, as well as insight into the thoughts of excellent minds grappling with an almost insurmountable problem. Dave's expertise has also been brought to bear in numerous book reviews.

But there is more. As he is credited to be in several web sites, he is a noted conservative evangelical Christian who is also a geologist—and is a fine example of both. As such, he has access to venues that few of us can address, and is a spokesman for our science with a unique authority. His reviews of important books in the history of geology speak to a wider audience than many of us can reach. Dave will tell us more of his journey. The Rabbitt Award is most fitting recognition of Davis Young.

Response by Davis A. Young

My profoundest gratitude to the History of Geology Division for bestowing this honor on me. To have my name on a list with previous Rabbitt award honorees, such as Rudwick, Oldroyd, Marvin, Albritton, Bork, and Torrens, leads me to believe that I accidentally awoke in a parallel universe this morning.

At the age of twelve, I was introduced to a modest collection of apophyllite, prehnite, and zeolite specimens from the lava flows of northern New Jersey at a friend's home. The beauty of the crystals produced in me the determination to spend my life working with minerals. My newfound passion was further stimulated by collecting staurolite, almandine, and kyanite crystals from nearby outcrops of Wissahickon Schist in Philadelphia. In college and graduate school my interests matured to include petrology and geochemistry, which I learned from Dick Holland, Arthur Buddington, Dick Jahns, Peter Wyllie, Don Eckelmann, and Dick Yund. My doctoral dissertation focused on the granulite facies orthogneisses and paragneisses in the New Jersey Highlands. In 1968 my teaching career began at New York University and the University of North Carolina at Wilmington where I taught hard rock geology.

Concurrent with my enthusiasm for geology was another passion. My father was a professor of Old Testament. One of his professional interests was the Genesis creation story. I became ever more curious about the relationship of geology and the biblical creation account. Realizing in graduate school that young-Earth creationism was spreading throughout the Christian community, I set out to explain the fallacies of young-Earth creationism and flood geology to church and college audiences in articles, books, and talks. I spent the final 26 years of my 36-year teaching career in Grand Rapids at Calvin College, a Christian

liberal arts college operated by the Christian Reformed Church. Calvin takes it for granted that its faculty members will integrate history, philosophy, and theology into their specific disciplines. That was the ideal environment for me.

In writing on the relationship between Christianity and geology, the important role of religion in the historical development of our science was driven home to me. I also learned that young-Earth creationists often made inaccurate comments about the history of geology. My writing increasingly incorporated historical aspects of the relation between Christianity and geology. Because of my uncompromising stance against a 6000-year-old Earth and against flood geology, my books became controversial in some Christian circles. During the late 1980s, I and two other colleagues at Calvin College became the targets of vocal constituents within our denomination. Calvin strongly defended the three of us, but that didn't make me any more popular with the advocates of young-Earth creationism.

In 1995, I published *The Biblical Flood*, a book on the history of ecclesiastical interpretation of the flood story. There was plenty of history of geology in that book. Around that time, I needed a breather from the controversy that often swirled about my writing. Increasingly intrigued by the history of geology, and aware that the only history of igneous petrology, by then woefully out-of-date and a scant 85 pages, was originally written in Russian by Loewinson-Lessing in 1936 and translated into English in 1954, I decided, just for fun and no doubt naively, to write a history of igneous petrology. Along the way, I received much encouragement and insight from numerous petrologists and geochemists. Hatten Yoder, Julian Goldsmith, Peter Wyllie, Tony Morse, Alexander McBirney, and many others were enormously helpful. Given the critical role of N. L. Bowen (of reaction series fame) in the development of experimental petrology, I planned to devote an entire chapter to his achievements. That chapter quickly evolved into a separate book, *N. L. Bowen and Crystallization-Differentiation: the Evolution of a Theory*. In 2003, the more extensive history, *Mind over Magma*, my magma opus, as my colleagues at Calvin liked to call it, was published. The appreciative response was incredibly gratifying. No controversy, no one overly annoyed with me. Just thanks expressed for undertaking and accomplishing the task. Writing that book, however, made me conscious that so much work remains for historians of igneous petrology. We need critical biographies of igneous petrologists as well as investigations of the history of ideas about specific rock types, classification schemes, magmatic emplacement, the generation of magmas, and solar system petrology.

More recently Joseph P. Iddings, arguably America's greatest igneous petrologist prior to Bowen, has occupied my attention. I am currently writing a series of articles on the origin of the remarkable quantitative igneous rock classification system devised by Cross, Iddings, Pirsson, and Washington and published in 1902.

Martin Rudwick, David Oldroyd, Ronald Numbers, and David Livingstone have served as my role models in writing history of geology and history of science. Carl-Henry Geschwind and John Servos wisely counseled me to tone down my excessive adulation for some of the petrologists about whom I wrote, particularly Bowen. After all, I am a petrologist who took up writing about the history of geology as a hobby. As an internalist, my admiration for the externalists knows no bounds. I possess neither the knowledge nor skill to evaluate in a meaningful way the social factors that influenced the development of scientific theory and practice. I will leave that to others.

Since retiring from Calvin College in 2004, I have resumed writing for Christian audiences, because various forms of pseudo-science doggedly persist within large segments of the church. My most recent book, *The Bible, Rocks and Time*, co-authored with my paleontologist colleague at Calvin College, Ralph Stearley, was specifically targeted at the "geology" of young-Earth creationism. We determined to root it out once and for all, but, of course, that is an unrealistic dream. Still, we have received many responses from individuals indicating that their eyes have been opened. The first five chapters of this book summarize in popular form the development of ideas, mostly geological, about the age of the earth. Although I have returned to addressing science-religion issues, history of geology has irrevocably become an important component of my intellectual life.

I am humbled, delighted, and most grateful for the award. My profound thanks to GSA's History of Geology Division for bestowing this incredible honor on me.

O.E. MEINZER AWARD

Presented to W. Mike Edmunds

W. Mike Edmunds
Oxford Centre for Water Research

Citation by Alan E. Fryar

I am honored to introduce Mike Edmunds as the recipient of the 2009 O.E. Meinzer Award. During a career of more than four decades, Prof. Edmunds has made seminal contributions to multiple topics in groundwater chemistry. These include controls on water quality in regional aquifers, recharge over a variety of time and space scales, and the origin of mineral and thermal waters. His research exemplifies how combining scientific insight with technical innovation can yield an improved understanding of groundwater quality and availability.

Mike earned an Honours BSc in Geology (1964) and his PhD in geochemistry (1968), focusing on the genesis of garnet in polymetamorphic rocks, at the University of Liverpool. In 1966, he began a 35-year career at the British Geological Survey, where, to quote Willy Burgess of University College London, Mike became "the father of hydrogeochemistry in the UK". His research initially encompassed chemical processes in aquifers in Great Britain, the impacts of acid rain on shallow groundwater quality, and, as noted by Yousif Kharaka of USGS, "some of the earliest investigations of geothermal resources," particularly the chemistry of hot, dry-rock reservoirs. Subsequent studies in the Sahara and Sahel sparked Mike's sustained interest in groundwater recharge and paleohydrology in semi-arid regions. Since the mid-1990s, he has coordinated several major projects sponsored by the European Commission, including baseline groundwater quality and paleohydrology of aquifers across Europe. He retired from an Individual Merit position at the BGS in 2001 but retains an appointment there as Honorary Research Associate. In 2002, Mike became Research Director of the Oxford Centre for Water Research. He holds the title of Visiting Professor of Hydrogeology in the Oxford University Centre for the Environment, where he coordinates the MSc program in Water Science, Policy, and Management.

Mike has been a remarkably prolific and influential researcher in hydrogeology. He has more than 140 externally peer-reviewed publications; according to Science Citation Index, at least nine of his papers have been cited more than 30 times each. He was a founder of the International Association of Geochemistry and Cosmochemistry's Water-Rock Interaction Group, which he chaired from 1986 to 1997. His contributions have been recognized with the Ineson Lectureship (1998) and Whitaker Medal (1999) of the Geological Society of London, the Ingerson Lectureship (2004) of the IAGC, and lectureships at Trinity College Dublin, Oxford, and Waterloo. He has received the Meinzer Award for four publications that represent the depth, breadth, and sustained productivity of his research:

Edmunds, W.M., Bath, A.H., and Miles, D.L., 1982, Hydrochemical evolution of the East Midlands Triassic sandstone aquifer, England: *Geochimica et Cosmochimica Acta*, 46, 2069-2081;

Edmunds, W.M., and Walton, N.R.G., 1983, The Lincolnshire Limestone—Hydrogeochemical evolution over a ten-year period: *Journal of Hydrology*, 61, 201-211;

Cook, P.G., **Edmunds, W.M.**, and Gaye, C.B., 1992, Estimating paleorecharge and paleoclimate from unsaturated zone profiles: *Water Resources Research*, 28(10), 2721-2731;

Edmunds, W.M., and Milne, C.J. (eds.), 2001, Palaeowaters in Coastal Europe: evolution of groundwater since the late Pleistocene: Special Publication 189, Geological Society, London, 332 p.

Edmunds and others (1982) was among the first studies that integrated a broad suite of analyses (major and minor solutes, stable isotopes, ^{14}C, and aquifer mineralogy) with geochemical modeling to delineate regional-scale processes of hydrochemical evolution in a clastic aquifer. **Edmunds and Walton** (1983) complemented the 1982 paper by highlighting hydrochemical evolution in a regional carbonate aquifer and documenting how water quality changed in the upgradient part of the system as a result of agrichemical inputs. This paper may have been the first to identify the potential significance of natural attenuation of contaminants (in this case, nitrate reduction) at the regional scale. As noted by Bridget Scanlon (University of Texas), Mike's "use of major and trace element concentrations as indicators of redox sequence in an aquifer … with age indicators and palaeo-recharge temperature proxies provided a sophisticated look at the relationships between water/rock interaction, climate and abstraction."

Using numerical modeling, **Cook and others** (1992) demonstrated how chloride and stable-isotope profiles in the unsaturated zone can preserve sub-decadal to century-scale fluctuations in recharge. Yousif Kharaka commented that Mike "was the first to show how (vadose-zone) tracer based approaches may be used to resolve recharge rates and … history. The results have had profound implications to recognizing the limits of renewable groundwater, especially in semi-arid regions." Bridget Scanlon added, "Mike's vadose zone chloride investigations introduced the hydrogeological community to one of its most valuable approaches to recharge estimation…. The approach has become an indispensible tool for recharge and palaeo-recharge studies worldwide and makes recharge assessment broadly accessible to developing countries and remote locations."

Edmunds and Milne (2001) drew together studies demonstrating the emplacement of paleowaters in coastal aquifers across northern and western Europe. In addition to being the book's senior editor, Mike authored or co-authored seven of its 17 papers. Yousif Kharaka highlighted Mike's work as "instrumental in the recognition of off-shore palaeowaters as an important new water resource". This volume is cited in a paper just published on-line in *Ground Water* by Cohen and others, "Origin and extent of fresh paleowaters on the Atlantic Continental Shelf, USA".

Mike Edmunds' output has been not only meticulous and prolific, but of great practical relevance. Perhaps more than any other hydrogeologic researcher of our era, he has worked in multiple regions, developed and developing, humid to arid, including Europe, north Africa, the Middle East, China, Siberia, and Mexico. In its diversity statement, GSA describes itself as "a global

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* *Citation publications noted in bold*.

professional society". It is thus fitting that the Hydrogeology Division recognizes Prof. Mike Edmunds with the 2009 Meinzer Award.

Response by W. Mike Edmunds

First let me thank you, the GSA Hydrogeology Division and especially the Awards Committee in this Golden Jubilee year for your generosity in having nominated me for the prestigious O.E. Meinzer Award.

Secondly I owe special thanks to Alan for his eloquent citation and hard work involved for putting all this together and for the others who have been involved in the process.

Thirdly I would like to acknowledge the inspiration of many British hydrogeologists and working colleagues who have been part of my scientific career. I feel specially honoured as the first British recipient of this award and as a Fellow of your sister society — the Geological Society of London

Like many hydrogeologists I entered the subject from a hard rock background and was fired up wanting to work further on my electron probe studies of garnet in metamorphic rocks. Even as a hydrogeologist I continue to owe my scientific approach and discipline to the remarkable University of Liverpool where I studied in the "swinging sixties" inspired especially by Robert Shackleton, Wally Pitcher and Mike Atherton.

Hydrogeology was a Cinderella subject in UK in the 1960s and I am indebted to Stevenson Buchan and David Gray who offered me a job in the newly-formed Water Department at the British Geological Survey and who had faith in me to apply my geochemistry at lower temperatures. I joined on the same day as the new Director, Sir Kingsley Dunham. It was Sir Kingsley from his work on ore forming fluids,who was inspirational in getting me up to speed in this new subject.

I think it was his strong friendship with Don White and an early meeting with Don that introduced me to what was going on across the Atlantic. Armed with two books — the classic by John Hem and probably the best book on hydrogeochemistry ever written - Solutions, Minerals and Equilibria — by Bob Garrels and Charles Christ, I never looked back.

The first task was to set up new hydrogeochemical laboratories and take a fresh look at British aquifers and the geochemical processes controlling their water quality. The **first two citations** represent two of the papers from this period and exemplify the teamwork and productivity with colleagues of our small group (Adrian Bath, Doug Miles and Nick Walton) that enabled us to apply the growing range of chemical and isotopic tools to build our understanding of the British aquifers.

I would like to make special acknowledgement at this point of the encouragement offered by Bill Back (USGS) in my early career on carbonate aquifers. If I had accepted his offer to join him working on the Edwards Limestone my career might have taken a different course.

Sir Kingsley Dunham supported my application to attend the IAGC Symposium on Hydrogeochemistry and Biogeochemistry in Tokyo (1970) where I first presented the Lincolnshire work. In Tokyo I was present at the birth of the IAGC Working Group on Water-Rock Interaction. This coincidence had a strong influence on my career. I have kept the WRI faith for almost 40 years through the Water-Rock Interaction Symposia and have had the privilege of meeting and working with numerous inspirational hydrogeochemists — Tom Paces, Brian Hitchon, Yousif Kharaka — to mention just three.

One of my early assignments (1967–1974) was to be part of the BGS team exploring for groundwater in Libya. Apart from successfully defining the boundaries for the subsequent "Great Man Made River" this introduced me to a lifelong fascination with water in semi-arid regions and the amazing resilience of its peoples. Following our initial work in Cyprus, I had the opportunity to work in Sudan and then in other Arab countries and in the countries of the African Sahel investigating groundwater recharge and recharge history.

Here I would like to pay tribute to the inspiration of the late Jean-Charles Fontes, with whose collaboration I was able to join up the loose ends of our research in West Africa. The **third citation** comes from this period of my career where Peter Cook, this year's Darcy lecturer, and I were able to consolidate some of the geochemical recharge studies which owe much of their success to Australian connections.

It has proved exciting and challenging in the past two decades to discover Europe, working with colleagues in many European countries (including Russia!), discovering new scientific and multidisciplinary avenues and enabling me to follow a less-insular approach. Working with large teams in Europe on geothermal energy, hydrogeochemical exploration, palaeohydrology, and baseline geochemistry has led to some highly rewarding research, lasting friendships, and not least an improvement in my linguistic skills - and an appreciation of good wine. The **fourth citation** exemplifies this work which provided an opportunity to apply a wide range of isotopic, geochemical knowledge working with Quaternary geoscientists to understand palaeo-groundwater evolution at a continental scale.

There have been many privileges and learning experiences in working with peoples in rural and often remote areas, hearing water stories first hand and appreciating the hardships still faced by the some of the world's poorest people. These experiences have inspired me and helped me to focus scientifically in key areas of water scarcity and stress on water quality. As hydrogeologists I think we are well placed to transfer good science to the needs of society. Working now with colleagues across a wide field in Oxford University has opened new opportunities for teaching and for integrating our science into areas of water policy and better management of our valuable groundwater resources.

It remains to propose one further special vote of thanks. I could not have sustained such a career were it not for the patience, love and support of my wife Kathy and the "family support team" (Katharine, David, Victoria and Paul), who have often joined me in the field.

It is with deep gratitude to the GSA and the Hydrogeology Division and a degree of humility that I am pleased to accept the 2009 OE Meinzer award. I wish the Division well for the next 50 years!

INTERNATIONAL DIVISION DISTINGUISHED CAREER AWARD

Presented to Yildirim Dilek

Yildirim Dilek
The Miami University

Citation by Paul T. Robinson

It gives me great pleasure to present the 2009 GSA International Division Distinguished Career Award to Professor Yildirim Dilek of Miami University. This award is meant to recognize individuals who have made numerous, significant contributions to the advancement of Earth Sciences and who have provided extraordinary service to the GSA and to the international community at large.

Professor Dilek has succeeded admirably in both areas. He has had a long career as a distinguished scientist whose speciality is the origin and tectonic significance of ophiolites and oceanic crust. He has published more than 100 major papers directly related to ophiolite genesis and is considered one of the leading ophiolite specialists in the world. Just a few of his major contributions include a new classification of ophiolites, elucidation of the role played by arc-trench rollback in ophiolite formation, recognition of Archean oceanic crust in greenstone belts and the role of ophiolites in the geodynamic development of the Alpine-Himalayan, Cordilleran, and Caledonian orogenic belts. In addition, he has contributed significantly to our understanding of mantle dynamics and crustal evolution in both collisional and extensional tectonic environments through his original research, particularly in the Aegean and Mediterranean regions. The breadth and significance of Professor Dilek's scientific contributions are quite remarkable.

In addition to his many scientific contributions, Professor Dilek has an unmatched record of service to the national and international geoscience communities. He has served as Editor or Associate Editor of many world-class journals, including the GSA Bulletin and Geology. In his editorial capacity Yildirim provided opportunities for international scientists, particularly those from developing countries, to publish their science in the mainstream international literature. In addition, he has convened many excellent symposia and special sessions on contemporary topics at numerous international meetings, and has organized the contributions from these meetings into important thematic volumes and edited books. These publications have received excellent reviews, and are widely read and cited. Yildirim has made the annual meetings of the Geological Society of America truly diverse and international by inviting many top scientists and young researchers from around the world to his sessions and symposia, and by obtaining funds and travel grants allowing them to participate.

Yildirim's contributions to GSA include serving as President of the International Division and the History of Geology Division, as a member of the Publications Committee, Chair of the Penrose Committee, and many others. He is currently the USA representative on the UNESCO Scientific Board and the International Geological Correlation Program (IGCP), and is a member of the US Science Advisory Committee (USAC) on Scientific Ocean Drilling.

Yildirim's many scientific and service contributions have already been widely recognized. For example, in 2002 he was elected a Fellow of the GSA, in 2007 he was awarded the GSA Distinguished Service Award for *"outstanding scientific and editorial contributions to the international earth sciences community,"* and in 2008 he received the Neil Minor award of the National Association of Geoscientists (NAGT) for *"exceptional contributions to the stimulation of interest in the earth sciences."* He is a Distinguished Professor of Geology at Miami University.

For his many scientific and service contributions, Yildirim is a most worthy recipient of the 2009 International Division Distinguished Career Award of the Geological Society of America.

Citation by John Wakabayashi

Paul, it is a great pleasure for me to be able to help honor Yildirim's enormous contributions in science and service which you have detailed so well. I wish to give a personal perspective that illustrates just how deserving Yildirim is of this award. From when I first met Yildirim as a fellow graduate student at UC Davis, it was clear that Yildirim had the talent and drive to accomplish exceptional things. As our friendship continued over the years I hoped, perhaps daydreamed, that I might someday be in a position to honor him as a citationist for a major award such as this.

In many ways I see this not only as a chance to give recognition to Yildirim's great achievements, but also, to say "thank you", and I believe that when I say "thank you" I am speaking on behalf of so many geoscientists around the world and in this room. There a huge part of Yildirim's contributions that is not so much part of the written record. He has helped so many geoscientists around the world get their research publicized and published that might otherwise have languished. I am one of those individuals. Whether by direct collaboration, invitations to conferences and symposia, invitations to submit papers to special volumes that he edited, or just plain encouragement, Yildirim has provided opportunities for us.

As many of you (and me) have experienced, he has also helped get many involved in service, and my own involvement with the International Division/Section, and with GSA in general, is a result of Yildirim's efforts. In all of his endeavors, Yildirim has had a strong international flair to his networking, for it is hard to find a country that Yildirim has not connected with researchers. A part of his bringing together researchers from other countries is that he has always reminded North Americans about the work of those in the international community that they might overlook.

Finally, I think it is safe to say that much of Yildirim's building of international bridges has been aided by his vibrant personality, sense of humor, and the friendship he has extended to so many. His company at conferences and in the field has certainly made those experiences more enjoyable and memorable for me and for so many of us. So I think I speak on behalf of many of you when I say to Yildirim: "Congratulations for a honor well deserved" and follow it with an emphatic "Thank you Yildirim, for all that you've done for and given to us".

Response by Yildirim Dilek

Thank you, Paul and John, for your warm and generous citation. It is a great honour to receive the Distinguished Career Award of the GSA International Division, and I thank my nominators, colleagues and the Society for this tribute. Receiving this award is especially meaningful to me as an international scientist, in the company of those geological giants that were past recipients of this recognition.

I was fortunate to encounter great teachers and mentors, such as Yücel Yilmaz, who introduced me to the ophiolite concept in my undergraduate years; Eldridge Moores, whose extraordinary intellect and exuberant personality inspired me in graduate school and remains an inspiration today; Paul Robinson, who has always reminded me that ophiolite research and life in itself without tantalizing geochemical work would be not so complete; Harald Furnes, who has shown me how stimulating and exciting fieldwork would be in the cold Nordic fjords; and Yujiro Ogawa, who introduced me to the fascinating geology of the Japanese islands and the Nankai Trough. I met John Wakabayashi and Peter Thy while in graduate school at the University of California (Davis), who provided much animated discussions and exciting ideas on a variety of topics that eventually made into our joint publications, as well as good times and fun in the field. I have been privileged to have the opportunity to work with all these colleagues over the years, and it is a real pleasure to me that most of them are here this evening.

I have enjoyed incredible freedom to explore a wide range of subjects, all driven by curiosity, love for being outdoors, and international connections. I am extremely lucky to have the unique experience of working in many countries and continents, and to develop most productive collaborations and deep friendships with many people from around the world. My involvement with the Geological Society of America has brought wonderful professional opportunities and more international experience. Throughout my tenure as the *GSA Bulletin* Editor and as the Divisional officer I have made every effort to ensure that GSA reach out to the international community to promote international science and endeavors, and to become an international leader in our profession well beyond the confines of North America. I am proud to say that GSA is more global nowadays than ever, and this is in part due to the collective and effective efforts of those colleagues, who have been actively engaged in the International Division governance and activities. But, we still have a long way to go in order to make the GSA the foremost, global society of Earth scientists in the world.

I am here today to receive this award because of the fruitful collaborations of so many international colleagues, the ample support of Miami University and my students there, and the unconditional support and encouragement of my family throughout my education and career. My family's love and support have always been the pillars underlying my scientific and professional accomplishments. I extend my sincere thanks and gratitude to all of them in accepting this award.

I thank the Geological Society of America again for this great recognition and my colleagues for their support, and I gratefully accept the Distinguished Career Award of the International Division.

G.K. GILBERT AWARD

Presented to Robert G. Strom

Robert G. Strom
Lunar and Planetary Laboratory, University of Arizona (emeritus)

Citation by H. Jay Melosh

I am delighted to celebrate Bob Strom's receipt of the Gilbert Award. Spanning more than four decades of research, Bob has contributed in myriad important ways to our understanding of the geology of the Moon, the inner planets, and the satellites of the outer solar system.

As a member of the imaging team for Mariner 10, Strom led the initial investigation of volcanic and tectonic processes on Mercury. He marshaled the arguments for a volcanic origin for plains deposits on that planet, and he documented the principal types of tectonic features and their implications for patterns of stress and strain. In particular, Strom deduced that lobate scarps on Mercury record a period of global contraction, and from the distribution, lengths, and throws on such features he determined the timing and magnitude of that contraction. His fundamental finding has provided a key constraint on models for the thermal evolution of Mercury for 30 years. More generally, Strom has integrated what is known about Mercury in a series of review articles and in two books. He helped to make a compelling case to send further spacecraft to Mercury, a phase of exploration of the innermost planet that is only now fully underway. Bob continues to play an active role in the exploration of Mercury as a member of the MESSENGER mission team.

Following the Magellan radar mapping of Venus, Strom teamed with Jerry Schaber to address the implications of the population of impact craters and their states of preservation to constrain the resurfacing history of Venus. Strom carefully and thoroughly assembled the geological and statistical arguments for catastrophism — the view that most of Venus had been resurfaced within a geologically short time interval. This hypothesis was strongly resisted at the time by a planetary geophysics community who favored more gradualistic resurfacing scenarios, but Strom and his colleagues — most persuasively in their 1994 paper — won the community over. We still do not understand the interior mechanism for global resurfacing, but no one now argues that Venus is not the product of such a history.

With Vic Baker and Jeff Kargel, Strom overturned the static, post-Viking view of Mars. Their analysis of the surface of Mars suggested the possibility of extensive sheets of ice or water and active volcanism. Although highly controversial at the time, much of this work has been vindicated by the discovery of widespread and indubitable glacial features on the planet and evidence of a much more important role for flowing water than previously thought.

Strom's most recent work builds on the crater studies that he made throughout his career. Compilation of the impact crater size frequency distributions in the inner solar system, on the most ancient terrains of Mercury, Mars and the Moon, coupled with crater distributions from Voyager's images of the satellites of the outer planets convinced him many years ago that the inner solar system underwent a unique episode of heavy meteoritic bombardment. Most recently he recognized that this population bears the distinctive signature of bombardment from the main asteroid belt, while the more recent lightly cratered plains in the inner solar system bear the traces of the size-filtered present NEO population. This finding dovetails neatly with the dynamically inspired "Nice" model of planetary migration and orbital destabilization in the asteroid belt and has led us at last to a better understanding of the Late Heavy Bombardment.

G. K. Gilbert, in whose honor the award is named, had a deep interest in impact craters, lunar geology, volcanism and even glaciation. Gilbert would have taken immense pleasure in knowing of Bob Strom's many contributions to Planetary Science. It is thus most fitting that Bob should be the 2009 recipient of the Gilbert Award of the Geological Society of America.

Response by Robert G. Strom

I want to thank the award committee for this great honor. I will always cherish the Gilbert Award and try to live up to the ideals it represents.

I began my career as a planetary geologist in 1961 at the Space Sciences Laboratory of the University of California, Berkeley before I moved to the Lunar and Planetary Laboratory at the University of Arizona in 1963. At that time there was hardly any data amenable to geologic studies of the Moon and planets. The best data were Earth-based telescopic images of the Moon with a resolution of about 1 km. There was no geologically pertinent information for the planets or outer planet satellites other than some rather crude measurements of their composition and blurry images of the surfaces of Mars and Mercury. All geologic studies were confined to the Moon. Also at that time there were plans to send spacecraft to the Moon, and eventually its human exploration announced of John Kennedy in 1961. This gave planetary geology an enormous boost.

I have been extremely fortunate to have been involved in space exploration from its inception when there was very little lunar and planetary geological information to the present when there is an abundance of geological information that is pouring in even as I speak. We have now seen details of the surfaces of the Moon and all the terrestrial planets, plus incredible details of all the major outer planet satellites. We have also seen details of the surfaces of asteroids and comets. All of these data have been accompanied by a plethora of other geologically pertinent information such as the composition and quantitative topography of many Solar System objects. Today the planetary geology community has grown tremendously and has specialists in tectonics, impact cratering, geochemistry, and many other areas. We are also beginning to decipher the geology of icy bodies; some with exotic compositions like Titan's methane ices and liquids. As a result we are beginning to understand the origin, evolution and geologic history of our Solar System in ways that would have been impossible only a short time ago. It is now possible for a planetary geologist to spend his/her entire career working on one specialty such as the tectonics or stratigraphy of Mars. This would have been unthinkable only 20 years ago.

I am extremely fortunate to have seen and participated in the beginnings and the maturation of planetary geology. I am also

fortunate to be currently participating in the MESSENGER mission to Mercury. I was on the Mariner 10 mission that flew by Mercury three times in 1974-75. Until the MESSENGER mission was approved in 1998, I was convinced I would never live long enough to see another mission to Mercury much less participate in it. Although I am officially retired, I plan to continue studying and writing papers on various aspects of planetary geology, particularly the impact cratering record. Before I leave this planet, I hope to see the return to the Moon by humans, and other exciting planetary missions. Again, thank you so much for the presenting me with the G.K. Gilbert award.

KIRK BRYAN AWARD FOR RESEARCH EXCELLENCE

Presented to Ellen E. Wohl

Ellen E. Wohl
Colorado State University

Citation by Martha Cary "Missy" Eppes

Members and friends of the Quaternary Geology and Geomorphology Division of GSA, it pleases me to no end to introduce Dr. Ellen Wohl as the 2009 recipient of our division's most distinguished honor, the Kirk Bryan award. Ellen receives this award for her paper 'Limits of Downstream Hydraulic Geometry' which was published in the journal *Geology*, Volume 32, in 2004. To quote one letter of support received for her nomination packet, "Ellen Wohl is clearly one of geomorphology's premier scientists. This work truly honors the field of geomorphology and the spirit of the Kirk Bryan Award."

Over 50 years ago Luna Leopold and Thomas Maddock described how an alluvial river's discharge, its channel morphology and its hydraulics are intricately linked in a delicate balance of form and process. The elegant numerical relationships that Leopold and Maddock developed are not only valid today, after decades of testing and refinement, but are widely employed by geomorphologists and engineers alike to address both academic and applied geomorphic problems in alluvial streams. It is notable in fact, that their 1953 classic paper 'The Hydraulic Geometry of Stream Channels and Some Physiographic Implications', went on to receive the very first Kirk Bryan Award in 1958 from this same Society.

A logical progression of the Leopold and Maddock body of work is to apply the same relationships and hypotheses to non-alluvial channels in mountainous settings, and numerous workers have attempted to do so. Be that as it may, however, when the same power functions have been tested for bedrock channels and mountainous rivers, the data have been equivocal. Nevertheless with rapidly increasing efforts to numerically model surficial processes, and with the ever expanding efforts of the consulting world to (quote) "restore streams to their natural state," it is becoming increasingly essential and relevant to understand the key variables which dictate a mountainous river's morphology and behavior.

In her creative and insightful paper, Dr. Wohl seeks to identify the conditions that must be met for a stream to *stop* behaving in the manner essentially predicted by Leopold and Maddock's seminal work. The results of Dr. Wohl's study thus move us beyond the question of *whether or not* bedrock and coarse-grained channels behave in a manner similar to alluvial ones, towards the more instructive questions of *when* do they stop behaving this way and *why*.

Using field data collected primarily by Wohl and her students from more than 350 individual stream reaches in ten different rivers around the globe, Dr. Wohl first determines which of these rivers exhibit 'well-developed downstream hydraulic geometry', i.e. a statistically significant relationship between channel morphology, hydraulics and discharge. Wohl then applies to these streams various versions of commonly employed, bedrock channel stream power and shear stress relationships in order to determine which of them might predict those streams that have well-developed or poorly developed downstream hydraulic geometry. Wohl's results suggest that well-developed downstream hydraulic geometry is closely linked not only to discharge but also to bedload grain size. Wohl then goes on to identify a specific threshold in the ratio of stream power to grain size below which the concept of downstream hydraulic geometry does not apply.

As one citationist noted in a letter of support for this award "One of the great strengths of this paper is that none of the results are over-interpreted or overextended. Ellen is both circumspect and forthright in discussing limitations of the analysis … The discussions of local complicating factors (such as bedrock outcrops or debris-flow processes), and the overall limitations of the study show admirable insight and integrity."

Needless to say, a long list of testable hypotheses stem from this well-designed and innovative analysis of a classic suite of field data collected by Dr. Wohl, her students and her colleagues. Despite the four page limit of *Geology* manuscripts, the paper moves us beyond recounting that mountainous fluvial systems are complicated, to identifying the specific conditions under which there are predictable relationships between discharge, bedload grain size and channel hydraulic geometry. Thus, now, as in 1953, we have the decades ahead of us in which to build upon Dr.Wohl's results and to test the hypotheses that develop from her study. I and many others certainly look forward to seeing where we stand in 2065.

Response by Ellen E. Wohl

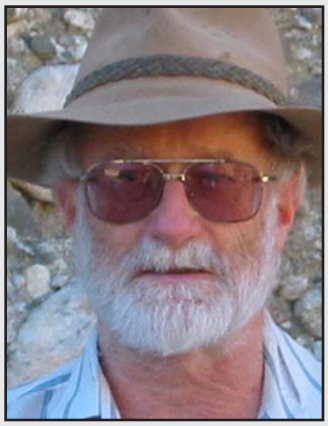
It is a great honor to receive the Kirk Bryan Award from the QG&G Division, and I am particularly pleased by the symmetry of receiving this award today, 51 years after Leopold and Maddock's foundational paper on hydraulic geometry received the first Kirk Bryan Award. I would like to thank Missy Eppes and other colleagues who wrote letters of nomination for this award, as well as those on the division panel who served as evaluators. It is particularly gratifying when people who are always busy go out of their way to recognize the work of others.

I would also like to thank those who have made particular contributions to my development as a scientist. I must start with my parents, who encouraged my curiosity and an early passion for science, even encouraging a four-year-old's declared intention to be a "bacteriologist." I have been exceptionally fortunate in my mentors within academia. While an undergraduate at Arizona State University, I could watch Mike Malin and Troy Péwé move easily back and forth between teaching and research. During graduate school at the University of Arizona, Vic Baker and Bill Bull provided excellent role models of how to have fun while doing good science. Once I joined the faculty at Colorado State University, Stan Schumm made me welcome and helped me figure out how to succeed in a new environment. And, perhaps most importantly, my graduate students over the years have kept the job fun and intellectually challenging, providing a much-needed counter-balance to the university's logistical and budgetary challenges.

I am also pleased that the paper recognized by this award deals with mountain rivers. During the past decade, in particular, the geomorphic community has been revitalized by the need to expand the foundational fluvial work of the 1950s-60s to diverse fluvial environments, including bedrock and mountain rivers. One of the themes of any field-based science is exploring and quantifying consistency versus diversity in natural systems: Water always flows downhill, but what characteristics of that flow differ among rivers with readily erodible boundaries and rivers with greater erosional thresholds, for example? To paraphrase a contemporary social slogan, I like to think that my research celebrates fluvial diversity.

LAURENCE L. SLOSS AWARD

Presented to Raymond V. Ingersoll



Raymond V. Ingersoll
University of California at Los Angeles

Citation by Kathleen Marsaglia

The Laurence L. Sloss Award for Sedimentary Geology acknowledges those who emulate its namesake through achievement in the field of sedimentary geology and service to the Geological Society of America. This years' deserving recipient is Raymond V. Ingersoll.

Born in Mountain View, CA, Larry Sloss started his geological career as an undergraduate student at nearby Stanford, and then planned to attend Harvard but, according to Sloss, he fortuitously ended up at the University of Chicago for his doctoral work. Ray Ingersoll, a New York native, had an almost mirror-image educational career, starting as an undergraduate at Harvard, then moving west to attend Stanford for his MS and PhD. Both scientists focused on sedimentation and tectonics, Sloss from a cratonic perspective, Ingersoll with a focus on the active western margin of the North American plate. Their research interests overlapped in the Rocky Mountains. Here, the Paleozoic rocks that Sloss loved and honed his stratigraphic concepts on provided the backdrop for the Indiana University field camp in southwestern Montana, where Ray was both student and instructor for several seasons, including the summer when Ray co-organized with Steve Graham, Lee Suttner and last-year's Sloss awardee Pete DeCelles a study of the Laramide thrust-generated Sphinx Conglomerate.

At Stanford, Ray was profoundly influenced by his advisor and mentor, Bill Dickinson. Ray's graduate research on the Cretaceous Great Valley Group combined stratigraphic, sedimentologic, and petrofacies analyses to provide a now classic picture of the Mesozoic margin of western North America. According to Ray, the thick, upturned forearc-basin strata of the Great Valley were most easily measured by driving through them in his favorite field vehicle, a tangerine Porsche. His later work in the region focused on the Paleozoic to Mesozoic tectonic evolution of the forearc basement terranes. Ray also was part of a successful collaborative team with his fellow graduate students at Stanford, particularly Steve Graham and Chris Suczek. Together, they helped define the sedimentary signatures, particularly lithic proportions, of collisional orogens, creating several co-authored publications.

Ray started his academic career at the University of New Mexico, where the magnificently exposed geology of the Rio Grande rift focused his interest. With students and colleagues from New Mexico, he examined the Holocene to Paleozoic history of the region. This experience expanded his expertise to include rift sedimentation, which ultimately led him to the Baikal rift in Russia. When family interests dictated that he migrate back west, he joined the faculty at UCLA and plunged into the complex history of extensional basins associated with the Basin and Range and Transverse Ranges, conscripting, I mean inspiring, numerous willing MS and PhD students to tackle significant stratigraphic and tectonic problems from Nevada to the Los Angeles basin.

Ray is a prolific scientist, with over 120 publications, many with student co-authors. Through these publications he has established himself as an authority in the study of the tectonics of sedimentary basins, writing a key review paper for the GSA centennial bulletin in 1988, and later co-editing with Cathy Busby and coauthoring chapters in a leading text on the subject in 1995. His research at Stanford established one of his research themes: the sedimentological, compositional, and geochemical fingerprints of magmatic arc evolution, in California and across the circum-Pacific. His 1982 paper in Geology on the instability of triple junctions and ramifications for the Cenozoic evolution of the western North American margin is one of my favorites.

Ray is a passionate debater. He has always been a stickler for "the rules" and following protocol, championing the petrofacies approach and rigorously defining guidelines for its application in modern and ancient settings, as well as in diverse tectonic provinces. His later publications have more closely examined the statistical evaluation and significance of large petrologic data sets and aspects of scale in provenance studies.

A Fellow of the Geological Society of America (GSA), Ray has been an ardent supporter of the GSA Sedimentary Geology Division from its inception; he first served on the division's nominating committee (1986), and later on the executive committee (1998-2002), starting as Second Vice Chair and finishing as Past Chair. He was the citationist for 1999 Sloss Award winner, Bill Dickinson. As an Associate Editor of the GSA Bulletin (1984-1992), he promoted the quality of sedimentary science published in the journal. He has been a member of the committees for research grants (1992-1994; member and chair) and the Donath Medal (2005-2008) of the GSA and served as a member of the Technical Program Committee (1998, 2000, 2001) and Nominating Committee (1993) of the Cordilleran Section. Examples of his significant contributions to other affiliated societies include service as Associate Editor for the Journal of Sedimentary Petrology (1984-1988) and International Geology Review (1997-present) and two terms as President of the Pacific Section of SEPM.

Ray loves pomp and circumstance, proudly wearing his Stanford Cardinal robes at every student graduation. He is a loyal supporter of his mentors, peer colleagues, and his student mentees. At UCLA he created a family of 30 students including me that have in turn begat students or "grandchildren" as he calls them. As with all good fathers, Ray gives his students the lessons that they need for success, then the freedom to develop into independent scientists. He has proudly watched them go on to influential careers in industry, academia and government.

However, Ray's real family (mother, father, sister, wife and daughter) has been the inspiration and center of his life. Ray's proudest creation and his deepest joy is his daughter, Jenny, who is the image of his dear, departed wife, Mary. Mary, along with his also-departed father and sister, would have been very proud of his receiving this award.

Response by Raymond V. Ingersoll

It is a wonderful honor and pleasure to receive the Sloss Award. I thank GSA, the Sedimentary Geology Division, its officers

and the Sloss Award Committee. I especially thank Kathie for her flattering words, and Tim Lawton for nominating me.

I met Larry Sloss briefly on two occasions; never did I imagine that I would receive an award in his honor. My being here results from a combination of hard work, inspirational mentors and colleagues, talented students and good fortune; I have been in the right place at the right time.

I am privileged to have attended outstanding institutions. At the Putney School, first as student, then as faculty, I learned fundamental physics, how to think as a scientist and how to teach, all under the mentorship of Ed Shore, probably the best science teacher I have known. At Harvard, I learned now-outmoded concepts of geosynclines and how revolution of the downtrodden stratigraphic masses led to a paroxysm of orogeny! I also absorbed abundant mineralogy, petrology and geochemistry. Interestingly, I never had a course in stratigraphy, sedimentology or paleontology! I spent 3 summers as a student and Associate Instructor at the Indiana University Geologic Field Station; this kept my geologic juices flowing while I taught physics and math at Putney. I then headed west to Stanford, where the Revolution in the Earth Sciences had occurred. No more geosynclines! Subduction leads to orogeny! An actualistic Earth model was being developed; at the forefront was Bill Dickinson.

I would not be here today if Steve Graham had not been a fellow first-year graduate student in an adjoining office at Stanford. He had come specifically to work with Cowboy Bill, whereas I had environmental leanings, and knew nothing about sedimentary geology or plate tectonics. Within a couple of months, I was a Dickinson advisee. I was planning to take Bill's undergraduate sedimentary-geology course when the TAship for the course opened up, and Bill said "You be the TA!" I know there is no better way to learn a subject than to teach it; I learned a lot fast! I still have never taken a course for credit in sedimentary geology or paleontology. I did take stratigraphy, paleoecology and marine geology from Jim Ingle, who became my other mentor.

My years at Stanford (1972-1976) were seminal years for sedimentary tectonics. The definitive publications on interpreting graywacke and arkose (Dickinson, 1970) and sandstone petrofacies (Dickinson and Rich, 1972) had just appeared, as had the definitive paper on submarine-fan facies (Mutti and Ricci-Lucchi, 1972). Dickinson's papers on plate tectonics and sedimentation, and sedimentation related to arc-trench systems both appeared in 1974. Bill suggested I investigate the Great Valley forearc basin, and away I went. Petrofacies, submarine-fan facies, petrostratigraphy, paleobathymetry, arc-trench dynamics: it all came together in a magical way. I couldn't have been dealt a better hand, and I played it for all it was worth.

But to backtrack a bit, a magical moment occurred before I knew anything about forearc basins during the winter of 1973. I was the TA for Dickinson's sedimentary-geology class, which Graham was auditing. He knew most of this stuff from Indiana University, so he was sometimes bored as we sat in the back of the classroom. One day, Bill distributed Curray and Moore's rendering of the Bengal Fan and its relation to the Himalayas and Indonesia. Steve was idly rotating the figure, when his eyes lit up and he exclaimed "The Ouachitas!" Thus, the concept of remnant ocean basins was born. After class, Steve excitedly explained the modern and ancient analogy, and I watched in ignorant amusement. Again, what total luck for me to be there at that Great Moment in Science as Bill and Steve patiently brought me up to speed. The three of us have revised and updated the concept since.

My next great fortune was being hired at the University of New Mexico, where I found myself in the Rio Grande rift, the Laramide orogenic belt and the Ancestral Rocky Mountains, entirely new environments for me. It also was my great fortune to arrive in Albuquerque the same summer as Steve Wells (another IU product, a recurring theme in my life). Steve and I grew up together as Assistant Professors, with all the uncertainties and excitement that entails. Even though I left UNM after 6 years, Steve and I remain very close friends.

Because my wife Mary had moved to Los Angeles, I resigned my UNM position and accepted an adjunct position at UCLA. I thank Gary Ernst for championing my cause at UCLA and helping convince the faculty and administration to regularize my position, which happened in 1985. As Kathie describes, this led to a wonderful time of joint investigations with many great students, too numerous to name. UCLA has been a wonderful home for me, especially as I now pursue my final major project: a detailed palinspastic reconstruction of southern California back to the Cretaceous.

I am thankful for the recognition this award conveys on my research. As with all of us, however, I feel that some important concepts I have proposed or championed have been "underutilized." Therefore, in the hope of encouraging rereading of old publications, here is my list of
Underutilized Important Concepts in Sedimentary Tectonics:

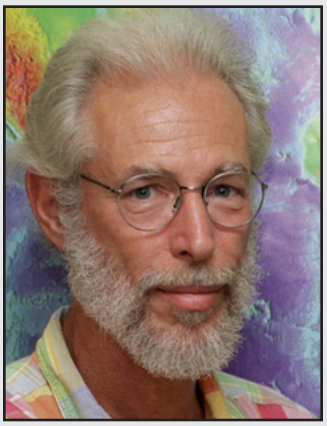
1. Pseudomatrix
2. Sampling scale in actualistic sand(stone) petrofacies
3. Continental embankment
4. Remnant ocean basin
5. Dormant ocean basin
6. Transpressional basin
7. Preservation potential

Finally, in addition to the wonderful folks I have mentioned, I thank Peter Bird, Cathy Busby, William Cavazza, Salvatore Critelli, Pete DeCelles, Clarence Hall, Rich Schweickert, Chris Suczek, Lee Suttner, An Yin and all my former students for years of fruitful interactions. Science progresses through social interactions, and I am grateful for wonderful collegial relations over the years. I am one of the lucky ones. And of course, my grandparents, parents, sister, late wife Mary and wonderful daughter Jenny have been central to my success and life itself.

Thank you for this great honor of the Sloss Award.

STRUCTURAL GEOLOGY & TECTONICS DIVISION CAREER CONTRIBUTION AWARD

Presented to Paul F. Hoffman



Paul F. Hoffman
Harvard University

Citation by Samuel A. Bowring

Paul Hoffman has profoundly changed our understanding of earth history by integrating and synthesizing geological observations, tectonics, geochemistry, and climate science. Many here may be most familiar with Paul's most recent work on Neoproterozoic climate history, often simplified as "Snowball Earth" and not his first twenty-five years of work on the origin and development of continental lithosphere. However, what may appear at first glance to be a two-part history is rather a continuum in which Paul's natural curiosity and strongly integrative approach melded to provide a better understanding of how our planet operates.

Paul Hoffman is without doubt one of the most influential and creative geologists of the past 100 years and it is an honor to present him for the 2009 Structural Geology and Tectonics Division Career Contribution Award. It is no coincidence that seventeen years ago Paul received the Division's Best Paper Award for his paper entitled "United Plates of America, the birth of a craton: early Proterozoic assembly and growth of Laurentia."

This contribution, known to most as the "United Plates" paper is probably the most influential paper for the study of Precambrian continental lithospheric evolution in the past two decades and was borne of more than twenty field seasons in the Canadian Arctic followed by five years of intense office work examining maps and reports and drafting maps and figures. During his Ph.D. studies and early years at the Geological Survey of Canada, Paul recognized that the plate tectonic models being applied to the Appalachians could easily be adapted to Proterozoic rocks of the Canadian Shield. He built upon the careful, measurement-intensive work in the east arm of Great Slave Lake to develop plate tectonic models for basin development, from subsidence to deformation. Central to Paul's approach when trying to understand plate tectonics was the recognition that huge reservoirs of information — from paleocurrents to infer changing topography and provenance in a tectonically controlled basin to recognizing the role of precipitation in driving uplift — are contained in sedimentary rocks.

This was followed by a now legendary effort at understanding the history of Wopmay orogen. The team of students, co-workers, and colleagues that Paul led during the mapping of Wopmay orogen was independent, diverse, and expert in a broad cross section of disciplines. At the core of compilation maps for this part of the Canadian Shield are many years of 1:50,000-scale mapping. Paul has a voracious appetite for knowledge and made sure that he and his team had a deep understanding of plate tectonics on the present day earth from the development of passive margins, thrust and fold belts, foreland basins, and magmatic arcs to the chemistry of arc magmas and the utility of geochronology and isotope geochemistry so that they could apply it to their rocks. Wopmay orogen is now one of many, but probably the best studied, Paleoproterozoic orogenic belts that provide evidence that plate tectonics operated at least 2.0 billion years ago. The lessons learned in Wopmay orogen and the recognition of the power of synthesis led Paul to expand his approach to the entire Canadian Shield, Laurentia, and the history of supercontinents. It is impossible to overstate the influence that Paul has had as his approach has served as a template for analysis of other continents and for intercratonic correlations.

Following his Laurentian synthesis, Paul began the second phase of his career, applying the tools of field mapping, structural geology, section measuring,isotope geochemistry, geochronology, and plate reconstructions to understand Neoproterozoic earth history. Paul first went to Namibia to develop a tectonic story of Pan African orogens and the amalgamation of Gondwana, but what piqued his interest was the juxtaposition of glacial deposits with platformal carbonates. Most geologists would not be broad or creative or even interested enough to notice such a juxtaposition, let alone want to completely change their research agenda and study it in detail. However, this is a perfect example of Paul's breadth and creativity. Within two years, and based on detailed observation rather than conjecture, he was to develop the Snowball earth hypothesis to a level of detail way beyond Kirschvink's original hypothesis. He immersed himself in the literature of low-temperature stable isotopes, paleooceanography, and glaciology, and built a comprehensive, multidisciplinary hypothesis that helped lead to a series of landmark papers and perhaps more importantly, a new generation of scientists who can integrate tectonics, climate science, biology, and geology. One has to wonder how many classically trained geologists 10-15 years from retirement could "switch gears"and have such an impact?

Many of us in the room have argued with Paul on topics that range from a sedimentary structure in a rock to politics, track and field, jazz, and baseball and know that such discussions are not for the faint of heart or the unprepared. His encyclopedic knowledge and photographic memory have left many stuttering and speechless and/or infuriated. On the other hand, Paul has been a generous mentor for students and colleagues and in any endeavor, whether physical or intellectual, leads by example.

Paul Hoffman has had a profound influence on our understanding of the importance of plate tectonics in earth history, from the construction of continental lithosphere and supercontinents to the chemistry of Neoproterozoic oceans and atmospheres and richly deserves the GSA Career Contribution Award.

Response by Paul F. Hoffman

Thank you, Sam, for the generous citation. Recognition by one's peers is second only to the kick one gets from the work itself.

When I look back, I see that many of my interpretations were failures. Most of those that didn't fail, weren't original. My first paper appeared in *Science* over 40 years

ago. It showed that stromatolite shape and orientation give the direction and facing of ancient shorelines. I subsequently found that the eminent paleontologist Winifred Goldring of the New York State Museum had reached the same conclusion three decades earlier.

I was first known in tectonics circles for the concept of *aulacogens*, the failed arms of rift systems that opened to make ocean basins. I knew and acknowledged their recognition by Nikolai Shatsky in Russia in the 1940s, and their interpretation based on studies in Africa by Hans Cloos and Kevin Burke. The problem was, my own example in the east arm of Great Slave Lake wasn't an aulacogen at all, it was a collision zone between the Slave and Rae cratons.

In the Wopmay orogen of northern Canada, I had recognized a rifted continental margin 1500 km inland from the present Pacific margin: either the continent had grown by accretion of juvenile crust, or continental rafts had been added by collisional orogeny. At the time, 1970-71 and years before Cordilleran suspect terranes, I thought a Precambrian continental margin was news. I didn't know that 20 years earlier, long before plate tectonics, the first pre-Mesozoic continental margin had been recognized in the Adelaidean (Neoproterozoic) of South Australia. Its discoverer was the far-sighted geologist, entrepreneur and conservationist, Reg Sprigg.

The age of initial rifting in Wopmay orogen and the location of the collisional geosuture between the deformed passive-margin and accreted terrane were high on my research agenda. Sam Bowring later showed that rifting occurred 115 Myr earlier and the passive-margin stage lasted seven times longer than we initially inferred. Robert Hildebrand forced the geosuture to retreat tens of kilometers toward the craton, cutting anchor from the intervening terrane. Message to Cordilleran geologists about Hildebrand: do not be too quick to dismiss GSA Special Paper 457!

My thoughts on supercontinents, sea-level and climate were anticipated by Tom Worsley and my reconstruction of paleo-northern Rodinia was derived from Charlie Jefferson. Where we had placed Australia-Antarctica, Jim Sears elbowed in Siberia and Zheng-Xiang Li inserted South China. Around this time I gave a talk at Queen's University in Ontario on, "The value of making BIG mistakes". Afterwards, an earnest undergraduate asked, "If you acknowledge making mistakes, won't people stop believing you?" Evidently my talk had failed as badly as my geology.

Which brings us to Snowball Earth. I used to be labelled a "doctrinaire uniformitarian" for saying that plate tectonics has changed little since the Mesoarchean, 3.5 billion years ago. That criticism, at least, has ceased! Some people think I've gone the way of Sam Carey, the great Tasmanian structural geologist, glacial sedimentologist, global tectonicist and academic administrator, who is sadly remembered most for his unshakeable adherence late in life to the expanding Earth hypothesis. There is nothing more pathetic than a scientist who clings to a false theory too long, but there is nothing worse for science than one who gives up on a good idea too soon. This is the tight-rope I chose to walk. As of now, I'm sticking with the snowball hypothesis. Of course, the concept has changed some over the years. Tropical marine platforms like the one I study in Namibia were not just enveloped by sea ice, as I originally envisioned, they had their own dynamic ice sheets, complete with ice streams. But the core idea of an ocean-wide dynamic ice-shelf still best explains the ocurrence of iron-formations, cap carbonates and extraordinary CO_2 levels inferred from boron, carbon, oxygen and calcium isotopes.

Finally, it is customary for Career Awardees to proffer some "sage" advice. With the recent history of large lending institutions and my own failures in mind, I give you this. Beware of science projects that are "too big to fail." Paraphrasing the philosopher Karl Popper, What can't fail, isn't science.

Thank you, and let us vow to keep the makers of field boots in business.

2009 MEDALS & AWARDS