

GEOGRAM

LETTER FROM THE CHAIR

**“THE LINE IT IS DRAWN
THE CURSE IT IS CAST
THE SLOW ONE NOW
WILL LATER BE FAST
AS THE PRESENT NOW
WILL LATER BE PAST
THE ORDER IS
RAPIDLY FADIN’.
AND THE FIRST ONE NOW
WILL LATER BE LAST
FOR THE TIMES THEY ARE A-
CHANGIN’.”**

(From: Bob Dylan, The Times They Are a-Changin’, 1964, Columbia Records; Copyright ©1963, renewed 1991 Special Rider Music)

Much has been written about Bob Dylan’s most famous song, but whatever Dylan intended, much of what he wrote reflects the cyclic nature of life in academia.

I came to the University of Maryland from Kingston University (England) in late February 1990. During the following academic year, the University faced severe cuts to its State appropriation and the Department was threatened with possible closure. We weathered that storm. Over the past two decades, together we have built a department equal to the best on Campus with a national and international reputation, particularly in Geochemistry for which US News & World Report ranked us 10th in 2006. As we ride out another storm, I will finish the last of my four terms as Chair (on June 30th, 2010), so this is my final “Letter from the Chair” for the GeoGram. From a budgetary perspective ‘plus ça change, plus c’est la même chose’!

Change means opportunity

The economy has been on the decline for a couple of years and now we face even deeper cuts to our State appropriation than we faced in the early 1990s. However, our situation is much different now than then. The Department’s existence is not threatened; on the contrary, we contributed significantly to the national and international reputation of the University, which has pushed its ranking to 37th in the world (<http://www.arwu.org/ARWU2009.jsp>). In addition, Earth and the environment, particularly climate change, are significant areas of focus at all levels of government and society, and will be significant areas of focus for the University in the future. President Mote concluded his State of the Campus speech in mid-September as follows:

“Accommodating the extraordinary budget stringency this year stresses all of us. Despite this, we will implement continuing and new initiatives. We must never let up.”

We must follow President Mote’s lead; we must continue our climb to be among the best departments in the world. A time of change is a time of opportunity!

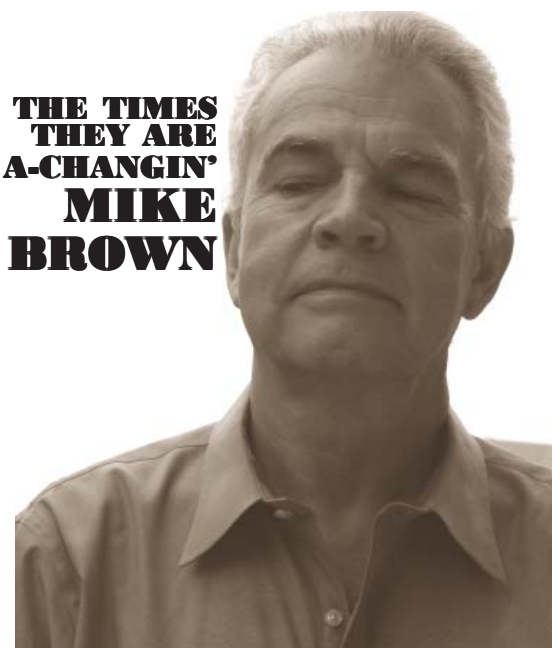
A little history

Many of you are familiar with the history of the Department, but let me just summarize how we have reached where we are today before I speculate on where the next decade or two may lead us. After a

slow increase in faculty and classes offered during the 1960s, the B.S. in Geology enrolled its first students in 1971. Changes in the faculty during the 1970s included the arrival *Ann Wylie*, now Vice President for Administrative Affairs; the 1980s began with the arrival of *Luke Chang* in 1981, the first Professor of Geology and Chair of the newly established Department. Luke passed away last summer (see Memorial article on p. 3), but it is important to remember that the present success we enjoy as a department is built on the foundation that Luke put in place in the 1980s. The Graduate Program began in 1982, and in common with every decade, the 1980s was a period of faculty change; *Phil Candela* remains with us from that period.

The 1990s was also a period of much change, but we finished the decade as we began, with 11 tenure faculty members, although we also had one full-time Lecturer and several research faculty, and we had begun our expansion into additional space in the Chemistry Building. At the millennium, the Department was bringing in approximately one million dollars in grant and contract income to support its research activities, particularly through stipends for graduate students and summer support for undergraduate

**THE TIMES
THEY ARE
A-CHANGIN’
MIKE
BROWN**



research. The last decade has seen a modest expansion to 16 tenure faculty members (14.1 full-time equivalent positions, including two joint appointments with the Earth System Science Interdisciplinary Center and one with the Department of Physics), 2 Senior Lecturers, 6 research faculty, and 7 post-doctoral Fellows. This growth is reflected in an extraordinary growth in the level of external support for our research, which now exceeds four million dollars per year in awards received.

Our successes during the past year

At this point let me report some of the achievements of our faculty, staff, students and alums during the past year—for this is the foundation of our success. Our faculty accomplishments include: the election of **Rich Walker** as a Fellow of the American Geophysical Union and a Geochemical Fellow of the Geochemical Society and the European Association for Geochemistry; the choice of **Bill McDonough** to receive the 2009 College of Computer, Mathematical and Physical Sciences Distinguished Faculty Award; and, the award of a Guggenheim Fellowship to **James Farquhar**, who spent the 2008–2009 academic year as a Visiting Professor in the Biology Institute at the University of Southern Denmark.

Among our staff, **Sandy Romeo** won the 2009 CMPS Dean's Non-exempt Employee Award at the Spring Academic Festival. Congratulations Sandy, I know the folks in Geochemistry are unable to get through the day without you!

A Physics undergraduate student, **Carolyn Harbitz**, who completed her senior thesis research with **Andy Campbell**, won the Monroe Martin Prize for Undergraduate Research—awarded by the Institute of Physical Science and Technology to Physics Majors—for her experiments on melting silicate perovskite. **Madara Jayatilake**, a high-school intern working with **Richard Ash**

and **Bill McDonough**, received awards from the Washington, D.C. Area Chapter of the American Chemical Society (for excellence in Chemistry) and the American Nuclear Society (for efforts and accomplishments in Nuclear Science and related fields), including the 2nd Place Prize in the Montgomery County Science Fair, for his research “Preparation and Analysis of Uranium Isotope Standards for Laser Ablation.” **Rebecca Fischer**, who was a Summer Intern with **Andy Campbell** in 2008, has come back to the Department as a graduate student in 2009, supported by a National Science Foundation Graduate Fellowship and a Flagship Fellowship from the University.



Mike Brown at the Geological Society of London with William Smith and his map that changed the geological world

Our graduate students continue to publish peer-reviewed papers en route to completing their theses and dissertations (see <http://www.geol.umd.edu/pages/graduates/gradpubs.htm>).

From among our many alums, the Department selected **Bill Smith**, who graduated with a B.S. in Geology in 1981, as the Department of Geology Distinguished Alumnus for 2009 (see

related article on p. 4). Bill completed a senior thesis entitled “Morphologic Distinction of Formations Using Fourier Analysis” under the direction of **Galt Siegrist**, one of the founders of the Department.

The College and our future—will they remain linked?

The formation of our department and its development has occurred within the College of Computer, Mathematical and Physical Sciences, which celebrates its 25th anniversary in Academic Year 2010–2011. However, the times they are a-changin’. We are all aware of the possible causes and consequences of global climate change: the loss of ice mass at the Poles and in Alpine glaciers is well documented; and, sea-level rise is a threat to large tracts of land along the East Coast of North America. In principle, the Campus is well positioned to contribute to both understanding the causes of these issues and proposing strategies to ameliorate the consequences. However, in practice, the Campus’ resources are distributed among a number of small units across several colleges and the Campus lacks a clear high-profile focus on Earth and the environment. This may change. The next 25 years of our development might be tied to a new College-level unit focused on these issues. But, whatever the future has in store for us, we must welcome the opportunities it provides, and if called take a leading role in the establishment and development of new initiatives, to continue advancing the reputation of the University.

Future challenges—a call for action

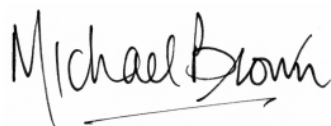
There is no doubt we face severe challenges, but they will be met with determination by faculty and staff, forbearance by our students in the face of reduced resources, and support from our alumni and friends as we continue to push forward.

This is a call for action. Today—right now—we have an opportunity as a community to contribute to issues

related to climate change, national security and sustainable resources, and to provide solutions for the betterment of society.

“We” means all of “us”—faculty, staff, students, alumni and friends—for we must all be involved in a partnership if we are to continue our development to be the best we can be and to provide the best education and opportunities to future generations of young geoscientists who will contribute solutions to global issues relevant to society. The challenges we face can be met through collaborations between Government agencies and the University, and with the support of those of us who have achieved our goals on the foundation of our education. If you are reading this GeoGram, you know what we are trying to accomplish and you can make connections between what is important to you and our work, and help us achieve our goals (see page 12).

I thank everyone for their support over the past twenty years, and I look forward to your continuing involvement and support as we move forward under new leadership in 2010.



10-22-2009

Call to Alumni

We would like to provide more alumni information in this annual newsletter, but we need to hear from you. Please update us by visiting our alumni webpage where you can provide contact information, news and download images for future GeoGrams.

<http://www.geol.umd.edu/pages/alumreg.htm>

MEMENTO MORI

Dr. Luke L.Y. Chang passed away on August 3, 2009 at the age of 74. Dr. Chang served as Professor of Geology from 1989 to 2004 when he retired as Professor Emeritus. He was the first Chair of the Geology Department holding that seat from 1981 through 1989. According to *Ann Wylie*, there were a surprising number of external candidates for the job, but few that were interested in building a department. “Luke was the most important hire we made at the time,” she said. He had experience in building the Geology Department at Miami of Ohio and transferred that knowledge to Maryland. Wylie said, “Chang took a gamble to advance our agenda by moving the department into CMPS.”



“Luke’s dream,” said *Phil Candela* “was to compete with the best programs in the country.” On meeting Phil at the 1981 GSA meeting, the pragmatic Chang said, “We are going to create a great graduate program from the ground up, and grow this department day-to-day.” Luke oversaw the move of the Geology Department from the attic of H.J. Patterson Hall to the newly renovated Geology Building. Chang set an important example for the expanding department by continuing his own active research agenda, and insisting on teaching mineralogy and other courses each year. He was a supportive and collegial Chair interested in leading the faculty into the world of competitive research at the highest level. For nine years he put his heart, soul, and mind into the developing graduate program.

Chang was an interdisciplinary scientist before that term became so commonly used. He was a classical experimental geologist out of the same mold as Bowen, Tuttle, and Goldsmith moving effortlessly between geology and material engineering. “He recognized no boundaries,” Candela said. “Chang ran his lab on wit, creativity, and his fundamental knowledge of materials and engineering.” In addition to his many peer-reviewed journal articles in the fields of materials science, ceramics, mineralogy, geochemistry and metallurgy, Luke wrote two books, “Rock-forming Minerals: Sulfates, Carbonates, Phosphates, Halides”, published by Longman in 1996, and “Industrial Mineralogy: Materials, Processes, and Uses” published by Prentice Hall in 2002. In 1997, a new mineral discovered at Mont Saint-Hilaire, Quebec, was described and named after Luke for “His contributions to the study of carbonate group minerals”; the mineral is Lukechangite-(Ce), [ideally $\text{Na}_3\text{Ce}_2(\text{CO}_3)_4\text{F}$].

Jeanne Martin fondly remembers Luke, who hired her in 1982. She wrote, “I can remember his two children, Julian and Audrey stopping in to see him and he would take them to lunch. He was very proud of them, telling me of their successes after graduation, and of his grandchildren. Whenever I think of Dr. Chang, it’s always with a smile. It was my pleasure and honor to work with/for him.”

Luke was a dedicated family man devoted to his wife and was a great father to his two children, and four grandchildren. Upon his retirement, he and his wife went on a number of cruises around the world sharing new adventures with family and friends. He also spent a lot of time reading, following the stock market, watching his beloved Boston Celtics, and spending time with his grandchildren. Chang is survived by his wife Margaret, daughter Audrey, son Julian and daughter-in-law Catherine, and two sisters Natalie and Irene. He also leaves behind four grandchildren: Nicolette, Courtney, Luke, and Calvin.



DISTINGUISHED ALUMNUS

Bill Smith 1981

The 2009 Geology Distinguished Alumnus is Bill Smith. This is the 9th year of this award, and Bill represents the 4th Distinguished Alumnus whose career has been as a professional geologist in industry, complementing three who work as scientists for the Federal Government and two from the professoriate. This range illustrates the broad reach and utility of an education in Geology.

Bill graduated from the University of Maryland with a B.S. in Geology in 1981, having completed a Senior Thesis entitled "Morphologic Distinction of Formations Using Fourier Analysis", under the direction of Galt Siegrist, one of the founders of the department. He has also earned an M.B.A., with a concentration in Environmental Management, from Widener University in 1999. In talking with

undergraduates Bill emphasized, as others have done before him, the importance of the Senior Thesis in training him for the work environment.



Bill Smith with Galt Siegrist before the CMPS Academic Festival

Bill is the President and Principal Hydrogeologist of Environmental Alliance, Inc., an engineering and environmental consulting firm headquartered in Delaware that he started in 1992. His company works primarily for other industrial companies, utilities and law firms, supplying consulting services in the areas of environmental site

assessment and remediation, permitting, air-quality services, and expert testimony/litigation support services.

Prior to starting his own firm, Bill served as Chief Operating Officer and Senior Vice President of Technology for Groundwater Technology, a publicly-held consultancy company that grew from 2 in 1981—Bill was the second employee—to about 1900 employees and close to \$200M turnover by the time he left a decade later. Early in his career he managed several technology groups concerned with research and development, remediation—particularly bioremediation, engineering design and regulatory compliance. These activities led to opportunities to make key presentations at national environmental conferences and to write papers on diverse topics from complex, large-scale pump-and-treat projects to integrated sequenced biodegradation projects utilizing aerobic and/or anaerobic degradation pathways.

RECOGNITION AND AWARDS

2009 was an exceptional year for Department of Geology faculty, staff, and student recognition and awards. Among the faculty important recognition was bestowed on three of our geochemists. **Rich Walker** was elected



left to right, in chromatographic order: geochemistry Professors Rich Walker, James Farquhar, and Bill McDonough

to be a Fellow of AGU, the Geochemical Society, and the European Association of Geochemistry. **James Farquhar** was awarded a mid career Guggenheim Fellowship, which is intended for men and women who have already demonstrated exceptional capacity for productive scholarship or exceptional creative ability. The purpose of the Guggenheim Fellowship program is to help provide Fellows with blocks of time in which they can work with as much

creative freedom as possible. Finally, **Bill McDonough** received the 2009 CMPS Distinguished Faculty Award selected by the Board of Visitors. The Award, established by the College's Board of Visitors, recognizes outstanding accomplishments over the previous five years that have had a major impact, and thereby contributed significantly to raising the profile and visibility of the College.

Among our staff, **Sandy Romeo** won the 2009 CMPS Dean's Non-exempt Employee Award at the Spring Academic Festival. Sandy joined our administrative staff in 2001 to provide much-needed support to the growing number of Geology students, post-docs



Administrative Assistant II Sandy Romeo: 2009 CMPS non-exempt faculty award

and faculty who reside in the Chemistry Building. "She has done a phenomenal job over these years," said **Roberta Rudnick**. In addition to her routine tasks Sandy also handles all travel related activities for Geology researchers in the Chemistry Building. **Jay Kaufman** said, "Sandy provides full-time productivity on a part-time salary. She is punctual, organized, and friendly to all who enter her doorway, and furthermore she acts as the cement that holds the various faculty along the Geochemistry corridor together as a unified team." According to **Bill McDonough**, "dependability, commitment, calmness, timeliness and a wonderfully positive attitude are Sandy Romeo's hallmark attributes." **Rich Walker** put it simply, "Life as we know it would not be possible without Sandy."

Many of our graduate and undergraduate students, as well as our high school interns, have also been acknowledged this year for their outstanding academic efforts and contributions to the University of Maryland (see following page). Congratulations to everyone for a banner year of awards and recognitions.



Graduate students Miriam Galenas (right) and John-Luke Henriquez (left): American Federation of Mineralogical Societies Scholarship Foundation grants



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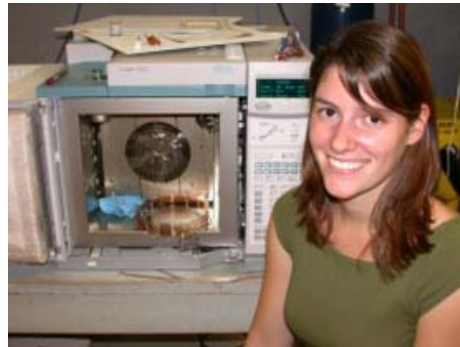
Eleanor Roosevelt High School student Jessica Marbourgh with Roberta Rudnick: Geology Department prize for Best Earth Science related project at the Prince George's County Science fair

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Undergraduates Jodi Gaeman (top) and Garrett Mitchell (bottom) with CMPS Dean Steve Halperin and Chair Mike Brown: Dean's Award for Academic Achievement

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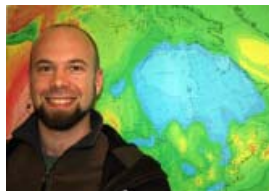
Graduate student Kristen Miller: Center for Teaching Excellence 2008-2009 Distinguished Teaching Assistant Award

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Graduate student Rebecca Fischer: NSF Graduate Student and UMCP Flagship fellowships

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Undergraduate Brodie Marrow: Green Scholarship in Environmental Science and Policy ESP



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Walt Whitman High School intern Madara Jayatilake: American Chemical Society of Washington and American Nuclear Society awards



Undergraduate Carolyn Harbitz: Monroe Martin Undergraduate Prize from the Institute of Physical Science and Technology

Graduate student Xiaoming Liu: AWG Sand Student Research Presentation Travel Award



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Undergraduate students (l-r) Achyut Dangol, Jill Gribbin, and T. J. Deane: Fernow Field Camp Scholarships



Undergraduate Natalie Sievers: American Chemical Society SUMR Fellowship

Ann Wylie Dissertation Fellowships for 2008-2009

Rick Arevalo, Jr., Kateryna Klochko, Barry Reno, and Kate Scheiderich



SCIENCE & GLOBAL CHANGE: A NEW COLLEGE PARK SCHOLARS PROGRAM IN THE GEOSCIENCES

THOMAS R. HOLTZ, JR.



College Park Scholars (<http://www.scholars.umd.edu>) is a residential honors (living-learning) program for academically-talented freshmen and sophomores. Students invited to College Park Scholars participate in one of a dozen different programs that focus on some large interdisciplinary field of study. Students in any given Scholars program take many of the same classes, live in the same dorms, and attend the same extracurricular activities.

In the Fall of 1999 I and Dr. John Merck premiered the Earth, Life & Time program (<http://www.geol.umd.edu/~jmerck/eltsite>), a Scholars program focusing on the natural historical sciences: geology (of course), but also evolutionary biology, archaeology, anthropology, climatology, and more. Our motto was “The Science of Nature, and the Nature of Science”, reflecting our interest not only on the discoveries made by the scientific community but also the process, methods, and ethos of the scientific enterprise and its role in our society. Through the Earth, Life & Time program we led several expeditions to Arizona and to the Galápagos Archipelago, as well as geological and other natural sites much closer to College Park. We guided students of all major through the writings of researchers and science writers on topics such as pseudoscience, climate change, evolution, and extinction.



In the Spring of 2009 at the request of the top officials of the college and university, we reorganized the geoscience Scholars program to have a greater focus specifically on issues concerning climate change research. This new program—Science & Global Change (<http://www.geol.umd.edu/sgc>)—recruited its first cohort for the incoming class of Fall 2009. While retaining our interest and examination of critical thinking, the scientific method, and the societal aspects of the geosciences and related disciplines, the new program finds greater concentration on issues of global change science: climatology and its historic and ancient record of changes; computer modeling of complex systems; the impact of climate changes on biological systems, including

agriculture and disease distribution; and the future of energy resources and production.

We have already had considerable interest by the new students in our changed focus. We are planning a new field program in Iceland (with possible side trip to Greenland) as part of the Science & Global Change experience. We look forward to seeing how our new curriculum develops and especially to incorporation of the research of scientists from within our department, from the Earth System Science Interdisciplinary Center, and from other units on campus in these exciting, changing times.



NEW FIELD METHODS COURSE

AARON J. MARTIN

On January 5, 2009, Assistant Professor *Aaron Martin* flew with four students to Tucson, Arizona to teach a new winter-term course for the Geology Department titled **Advanced Field Methods**. Over the next three weeks, these students learned the ins and outs of detailed structural mapping, measuring stratigraphic sections, and collection of oriented samples while working in the fantastic exposures of the American Southwest. This outdoor education transformed students' understanding of one main way in which geologists collect data as well as how many different sub-disciplines of geology fit together.



2009 field party near the top of the Catalina Mountains. From left to right: Nina Wernecke, Jill Gribbin, Sarah Regen, Lisa Walsh, Aaron Martin.

The course is a joint graduate-undergraduate offering, with more responsibilities for graduate students. Seventy-five percent of the requirements were met in the field, and the remaining twenty-five percent were completed during the semester following the field work, Spring 2009. Development of the course was supported by a grant from UMD's Center for Teaching Excellence.

The first week in the field was spent making a very detailed structural map of a small part of a canyon on the west

side of the Tucson Mountains. Here, the students studied brittle structures in sedimentary rocks deformed during Late Cretaceous-Early Cenozoic shortening. Dr. Martin also taught the students methods for collecting an oriented sample – one of the only field methods courses that provides such instruction. The students completed this module by analyzing and interpreting the field data and writing a report using computers at the University of Arizona library.

After resupplying, the group moved to the Galiuro Mountains of southeastern Arizona for four days. Here, the students measured a stratigraphic section through a mixed clastic and carbonate succession that filled a half-graben during late Oligocene extension related to metamorphic core complex formation. The students also had the opportunity to inspect a preserved trackway made by an Oligocene rhinoceros-like mammal called a *Brontothere*. The students completed this part of the course by interpreting the field data and writing a report.

Next, the participants left southeastern Arizona and headed east into southern New Mexico to search for mantle xenoliths at Kilbourne Hole, a famous locality for chunks of the mantle. This crater formed about 80,000 years ago as part of volcanism related to the Rio Grande rift.

Loaded down with dense mantle rocks, the group returned to Tucson for the last field module. The final days of field work were spent making a detailed structural map of the ductilely-deformed granites of the Catalina-Rincon metamorphic core complex and collecting oriented samples

of foliated and lineated rocks. The expedition concluded with a trip to the top of the Catalina Mountains for spectacular views of the surrounds and discussion of regional tectonics.

After returning to the University of Maryland, the students completed the remaining twenty-five percent of the course by cutting billets to make oriented thin sections, writing reflections on several aspects of field work, and making a digital, Geographic Information Systems version of their map from the Tucson Mountains.

Advanced Field Methods supplements traditional field camp, but does not replace it. Two of the students had completed field camp before taking the course; these students were pleased that they learned new skills during the course, and practiced old ones. One of the other students took field camp during the summer after *Advanced Field Methods*, and she reports a much improved field camp experience as a result of taking the course. All agree that the first offering of the course was a success, and new students are looking forward to taking the course when it is offered again in 2011.



Graduate student Lisa Walsh walks in the footsteps of Brontotheres.

DEPARTMENT HIGHLIGHTS

ALAN J. KAUFMAN

FACULTY HIGHLIGHT

E-an Zen



Zen and the Art of a Contingent Life

The heart of geology – according to emeritus Adjunct Professor **E-an Zen** – is embedded in the sequencing of strata in Earth’s thin yet mobile crust. The stratigraphic subdivision preserves evidence for Earth contingent history of intertwined tectonic, environmental, and biological change. Similarly, the life of this eminent gentleman scientist is one of contingency. Zen started from Chinese roots in Peking, but the winds of change (and the Japanese invasion) blew him to America where he embraced geological opportunities provided by his deep insight to Appalachian Earth history – and rose to the ranks of the National Academy of Sciences.

Urged by parents that wanted their children to be educated in the U.S., Zen set out on his voyage of geological discovery in the heart of the Appalachian Mountains as an undergraduate at Cornell University in Ithaca, New York. There he met and was strongly influenced by **Bill Holser**, a prescient geologist focused on historical records of global change, who also charted a contingent plan to get Zen through his Chemistry Department requirements. After graduation E-an went to Harvard University where he completed his Ph.D. in four years under

the tutelage of **Jim Thompson**, a world-renown metamorphic petrologist, and **Marland Billings**, a structural geologist widely considered to be one of the greatest 20th century authorities on North American geology.

Zen subsequently worked at the Woods Hole Oceanographic Institute as a post-doctoral fellow investigating sediments in the deep trench offshore of Chile and Peru. “These studies did not pan out,” said E-an, “because I was brought up in the Harvard tradition, which urged caution, caution, caution.” The world view held there suggested that “the idea of a mobile Earth was pure heresy.” Had Zen applied the new ideas of **Harry Hess** and colleagues to these deep ocean sediments, he may have been one of the originators of the plate tectonic theory. Notably, no one at Harvard or at the USGS where Zen subsequently worked for 30 years is written in the history of plate tectonics – although **Bill Menard**, a Harvard Ph.D. deserves at least an Honorable Mention.

While the paradigm shift associated with plate tectonics was the most profound overall change experienced by 20th century geology, E-an contends that – at the working level – the recognition of the cyclic nature of geologic history preserved in ancient sediments had the greatest impact on his early studies of the Taconic Mountains in New England. The Taconic Orogeny was a great mountain building period, with the preserved rocks representing “many, many different snapshots” of discrete events. In a series of publications over 15 years Zen solved the Taconic puzzle, which was the crowning achievement that propelled him into the National Academy of Science in 1976. With regard to these studies E-an said that he “let the rocks lead me to new discoveries, rather than have me tell them what to say.”

E-an completed a brief stint at the University of North Carolina, Chapel Hill before joining the USGS in 1959. It was “a very brave thing for them [USGS] to hire a foreigner at that time,” said Zen.

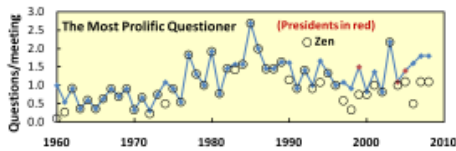
He was brought on board with a number of his Harvard colleagues by branch chief **Preston Cloud** and **Gene Robertson**. “There was such an incredible atmosphere at the survey,” said Zen, and they had confidence that “this young generation of bright young Turks would do something good.”

In 1989 Zen retired from the USGS and became an Adjunct Professor at the University of Maryland in that same year. **Ann Wylie**, currently the Vice President for Administrative Affairs at the University of Maryland, provided him with a microscope and a computer so that he could get started right away. At Maryland Zen had an open door policy and was always available to anyone that would come to see him, but he was unlikely to poke his head into other people’s business. Zen was a welcome voice of reason at faculty meetings and a constant source of questions at departmental seminars as well as graduate and undergraduate presentations. During these years he worked most closely with **Karen Prestegard** insofar as he “always wanted to be a geographer or a geomorphologist.” Geomorphology, he said, “is perhaps the most challenging aspect of Earth science today. The surface of the Earth is such a dynamic system.”



Along the contingent path of his career Zen received many honors and distinctions in addition to his membership in the National Academy of Science. He is currently emeritus there; “even cardinals retire,” he said. Along the way E-an led many different organizations: in 1975/76 he was President of the Mineralogical Society of America, in 1992 he was President of the Geological Society of America,

and in 1974 was the President of the Geological Society of Washington where he has been a regular fixture since 1959 when he gave his first talk on “Mineral assemblages in slate in western Vermont.” This was the first of five presentations he gave at the GSW, including his presidential address in 1974. More impressively, he is known as the Grand Inquisitor of the society. Society Historian **Jeff Grossman** demonstrated at the last annual meeting that E-an asked more questions of speakers – in 31 different years – than anyone since the GSW was founded in 1893 by **C.D. Walcott** and others.



John McPhee, the Pulitzer prize winning author considered a pioneer of narrative nonfiction, featured E-an in a New Yorker magazine article on Plymouth Rock. He characterized both the glacial erratic and Zen as exotic [visitors to the Geology Museum can see a piece of the rock and its detailed description]. McPhee also highlighted Zen in his book titled ***Irons in the Fire***. For sure, E-an has been an iron in the Maryland Geology fire for twenty years; his example provides us with a guiding principle through changing times and future global change.

The discipline of geology can contribute to future contingencies, Zen said, by “providing an appreciation that the earth is a closed system, except for the fixed input of solar energy, that humans are a part of the ecosystem, and that time scale is especially important. If we tamper with a complex system containing subsystems running on different time scales, we might find the path that the larger system actually follows is not what our preconceptions had led us to expect.”

(See sidebar: **WHAT IS SUSTAINABLE LIVING?**).

WHAT IS SUSTAINABLE LIVING?

E-an Zen

If you have been following news accounts of current events, you probably have encountered the term “sustainable living”. What do we mean by it, and why is it important?

To live sustainably means to live within our means. Photographs of the Earth taken from space by astronauts show what a beautiful place it is: the “blue planet” with oceans and clouds, verdant with vegetation, in contrast with the other solar planets and their satellites: which are either “dead”, brown and dry, or, like Venus, hot enough to melt lead, with a sulfuric acid-rich atmosphere.

But these space shots also tell us that Earth is an isolated globe in space. Except for the so-far minuscule human effort to inject material into outer space, it must remain self-sufficient except for the input of sun’s energy and occasional in-fall of meteorite.

Virtually all living things require solar energy for sustenance. Many also need other living and nonliving earth material. Humans are far ahead of other life forms in utilizing earth materials, including rocks, water, soil, plants, and animals. We consume the locked-up fossil energy such as petroleum, natural gas, and coal, derived from pre-historical sunlight, and nuclear energy from chemical elements formed since the beginning of the earth. We use rocks and minerals (“ores”) for our industry. We change the configuration of the land by earth-moving machines; we change the composition of the atmosphere and the climate by the waste heat and gasses from our energy consumption. We dump waste in landfills, rivers, and oceans. Humans are growing in numbers, so cumulatively we consume earth resources at increasing rates, much too fast for natural recovery (remember: even “renewable” resources become functionally non-renewable if the rate of use exceeds the rate of replenishment).

To save the earth as livable place for our children and their children, we need to change the way we regard the ethics of expanding human population, prolonging life expectancy, and consuming earth resources. The challenge applies to every society in the world, but we in the United States, being the leading consumers and generators of waste, both as a group and on a per-person (*per capita*) basis, must take the lead to assure the future of a healthy world ecosystem. Remember: without a healthy ecosystem, there can be no healthy human society. A healthy ecosystem requires unpolluted water and soil, accessible to non-humans and humans alike, so we must see to it that humans do not hog it all. We need to do all this while ensuring justice and fairness to all societies in the world, to future generations. See <http://bcn.boulder.co.us/basin/local/sustainin0.html> for more discussions.

Is that so hard? Yes and no. Yes because of the vast scale of the transformation, because we are racing against time, and because we must rein in “growth”. Growth is the nemesis of sustainability. But no, because we have no choice. When something must be done for survival, nothing can be too hard.

What do you think?

GRADUATE STUDENT HIGHLIGHT

Ricardo Arevalo, Jr.



Rick Arevalo, Jr. – the graduate student highlight this year – wanted a life, “a more dynamic existence” than the future he faced in medical school.

Arevalo grew up everywhere having moved with his family across the nation 11 times in ten years. Wherever he went, he found common ground in academics, and meteorology. These interests ultimately led Rick to the University of Florida where he completed his Bachelors of Sciences in 2005 as a Geology major working with **Mike Perfit**.

Rick’s senior thesis was on Pb isotope geochemistry was the foundation of his tungsten isotope and trace element studies here at Maryland. These are largely focused on evaluating the degree of heterogeneity of the mantle – and hence its relative heat production – through the analysis of mid ocean ridge and hot spot basalts. Rick is developing compositional models of the modern mantle, and by extension to better understand the driving forces behind mantle mixing and plate tectonics.

Together Arevalo, his advisor **Bill McDonough** and colleagues in the department have already published five papers in high impact journals including *Chemical Geology*, *Geochimica et Cosmochimica Acta*, and *Earth & Planetary Science Letters*.

Rick is a “can do kind of guy,” said McDonough, “He provides and unparalleled level of reliability.”

Arevalo is finalizing his Ph.D. for a May graduation while funded by an Ann Wylie Dissertation Fellowship. Graduate students in the Geology Department have greatly benefited by these university funds with four (Arevalo, **Klochko**, **Reno**, and **Schiederich**) supported in 2009. Rick is leaning towards government work although the common ground of academia may lead him to a post-doc first.

He concluded “There are a lot of crises facing the country, and I think I can do my part [within the government] to save the world...but I would also like to teach!” Whatever the direction, we are sure this dynamic young scientist will succeed in making a difference.

UNDERGRADUATE STUDENT HIGHLIGHT

Brittany Jenner



The undergraduate student highlight this year is **Brittany Jenner**, a native of nearby Gaithersburg, Maryland. Brittany, who is major in Geology with a minor in Math, has been at the top of all of her Geology classes, especially those focused on Earth’s fragile wetlands. In her application for a Measurement and Signal Intelligence (MASINT) scholarship, she said, “It is essential that we understand how sea level rise is impacting wetland environments as these delicate areas need attention.” Brittany won the scholarship this year, which takes the form of a \$10,000 award for tuition, books, and/or room and board.

Originally a Math major, Brittany left the University of Maryland for several years as in the major she just “felt like a number.” She nonetheless continued her studies at Frederick Community College focusing there on the environmental

sciences. When she was ready to rejoin university life her FCC advisor, **Bob Ford**, suggested that Maryland was still the place to go. On her return visit **John Merck** assured her that the Geology Department was small and collegial, and that she would find a welcome home with us.

She really got hooked into the major after taking GEOL 123: Causes and Consequences of Global Change (including lectures by **Elizabeth Brabson** and **Jay Kaufman** in the Geology Department), and found that Geomorphology with **Karen Prestegaard** “was the coolest class ever.” Brittany also took Watershed and Wetlands with Karen and next spring will be enrolled in Karen’s graduate level course Fluvial Geomorphology. There is little wonder that Brittany’s senior thesis entitled “Hydraulics of a Freshwater Tidal Wetland: Exploring Changes in Velocity and Discharge with Seasonal Variations in Vegetative Roughness” is advised by Prestegaard.

After the spring semester Brittany hopes to join the rolling field camp course offered by the University of Miami (Ohio), which explores the geology of the national parks in the northwest USA and southwest Canada to finish up her undergraduate degree. She then plans on taking a walkabout throughout the western part of the country to “embrace the geology” she never appreciated as a child, but has now learned to love.

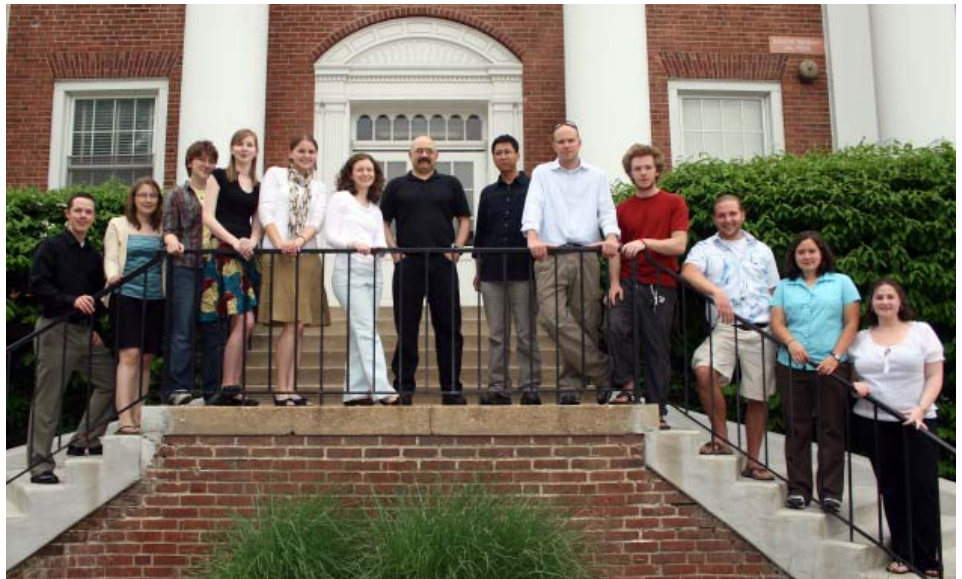
“I am passionate about the Earth, and protecting it,” she said, “and wetlands are one of its most important components. There is mounting evidence that the Earth is changing and I think that there are too few people out there trying to do something about it. I want to help make a difference.”

With her exceptional drive and determination, we are sure that Brittany will make a difference and succeed in whatever role she will play in protecting Earth’s fragile ecosystems.

SENIOR THESIS PROGRAM

The Department of Geology senior thesis program, coordinated by Phil Candela for 13 years has been a fixture of the Department of Geology since 1972. Senior thesis posters have enhanced the program since 2003; these represent one of the four presentations associated with the long established program, which is used as a model of success across campus. We wish each of our departing students, and newest alumni, the best of luck with their future endeavors.

To see the posters from this year's presentations and lists of theses over the past 36 years go to <http://www.geol.umd.edu/pages/undergraduates/SeniorThesis.htm>.



The 2008-2009 Senior Thesis Class (left to right): Jeff Lillibridge, Jessica Little, Darya Slobodyanik, Susan Drymala, Jill Gribbin, Marcie Occhi, Phil Candela, Achyut Dangol, Garrett Mitchell, Cory Hanson, Gus Kingman, Nina Werneke, and Jodi Gaeman

Dangol, Achyut: Transport and Storage of Coarse and Fine Grained Sediment, Little Paint Branch Creek (Advisors: Prestegaard/Blanchet); *Drymala, Susan*: Floral Indicators of Late Paleocene-Eocene Thermal Maximum Climate Change in the Bighorn Basin, Wyoming (Advisors: Holtz/Kaufman/Wing); *Gaeman, Jodi*: Thermal Evolution of an Early Magma Ocean (Advisor: Hier-Majumder); *Gribbin, Jill*: Insights into deep-sea hydrothermal vent environments from measurements of permeability and porosity (Advisors: Zhu/Tivey); *Hanson, Cory*: Vein Related Mass Transport in the Ritter Range Roof Pendant during Late Cretaceous Contact Metamorphism (Advisors: Penniston-Dorland/Piccoli/McDonough); *Kingman, Gus*: Constraining depositional ages of Potomac Terrane formations by zircon U/Pb isotope analysis (Advisors: Martin/Piccoli); *Lillibridge, Jeffrey*: Estimating water flux over a tidal cycle in tidal marsh networks based on tidal prism and gauge height (Advisors: Prestegaard/Seldomridge); *Little, Jessica*: Biomarker analysis of carbon rich shales of the Bambui Group (Advisor: Kaufman); *Mitchell, Garrett*: Rift interaction at the Galápagos Triple Junction (Advisor: Montesi); *Occhi, Marcie*: Sources of Stream Discharge in the North East and North West Branches of the Anacostia Watershed (Advisor: Prestegaard); *Slobodyanik, Darya*: Using Chemical Contaminant Profiles to Determine Sediment Depositional History at Little Paint Branch Creek (Advisors: Prestegaard/McDonough/Ash); *Werneke, Nina*: The Color of the Lower Mantle (Advisor: Campbell)

WE ACKNOWLEDGE OUR DONORS

We are grateful for the generosity and continued commitment of our donors during the past several years, and we salute those of you who contribute each year. We acknowledge the importance of each contribution in support of our education and research missions. Making available opportunities for students to be involved in the excitement of advancing knowledge is critical to the development of the next generation of scientists who will solve problems of societal relevance. In addition, for many of our undergraduates our ability to help with the costs of field camp and senior thesis research is critical to their success. Please accept our apology for any error or omission; please notify us of any such infelicities so that we do not repeat the mistake in future.

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Front row, left to right: Aaron Martin, Igor Puchtel, Richard Ash, Rich Walker, James Farquhar, Jay Kaufman, Bill McDonough (in photo), Tom Holtz, Zella, Roberta Rudnick, John Merck, Karen Prestegaard, Sash Heir-Majumder, Mike Brown, Phil Candela, Ann Wylie, Andy Campbell, Phil Piccoli, James Day, Mike Evans, Wenlu Zhu

Second row along stairs, left to right: Craig Hebert, Sang-Tae Kim, Garrett Mitchell, Michael Mengason, Emily Seldomridge, Ryan Kerrigan, Kristen Miller, Lin Qiu, Nick Gava, Lisa Walsh, Yu Huang, Harry Oduro, Brian Harms, Xiaoming Liu, Tracey Centorbi, Kate Scheiderich, Tommy Tamarin, Brian Mumaw, Rick Arevalo, Gregory Shofner, Jill Gribbin, Jingao Liu, Jodi Gaemon, Miriam Galenas, Daniel Hawkins, Brian Tattich, Marci Occhi, Madalyn Blondes, Jeremy Bellucci, Todd Karwoski

Back row, left to right: Suzanne Martin, Jeanne Martin, Dorothy Brown, Sandy Romeo

CALL TO ACTION – HOW CAN YOU HELP US?

This is a difficult time at Maryland; please consider strengthening your connection to the Department. We have one of the best Geochemistry Programs in the world, and we are in the process of building one of the best Geophysics Programs as well; our goal is to become one of the top Geology Departments in the Nation. Our Faculty and students are receiving recognition for their achievements. But, we need your help to reach our goal to be the best!

How can you help us? In this tight economy, the support of alumni and friends like you is the key to our success and to maintaining our commitment to excellence. Whether you support us yourself or put us in contact with someone who can, your contribution is sincerely appreciated. A tax-deductible donation will help us strengthen our program with faculty and student recruitment tools, state-of-the-art facilities, an enhanced fieldwork program and research opportunities for our undergraduates, and innovative outreach programs.

A growing problem for our undergraduates is the transfer of the cost of Tertiary education from the State to the individual via reduced State support and increased tuition rates. The extra cost commonly increases the time it takes to complete the degree, and our ability to help is limited by a significant under-funding in scholarship support for students. In Geology, this is particularly important, since there are the additional costs associated with field camp and research for the Senior Thesis, and additional financial help to those in need commonly allows these students to succeed. Through the generous support of our faculty, alumni and friends we were able to provide financial support to several students to assist with the costs of field camp and research in 2008–2009. But we must do more.

You can assist us to support future generations of Geology majors by earmarking your tax-deductible gift for Geology.

Gifts to the Department of Geology also may be made directly to the Department by check or online (https://advdev.usmd.edu/Admin/OnlineGiving/umcp_online_giving_first.cfm) using a credit card. Contributions to the Department of Geology by check should be made out to the University of Maryland College Park Foundation with “Geology” in the memo. To ensure that Geology is the receiver of your gift to the University of Maryland, please be careful when completing the Online Gift Form. In response to the drop down menu “Select School,” please specify the College of Computer, Mathematical and Physical Sciences; and, in response to the drop down menu “Select Fund,” please specify Department of Geology. If you do not specify these items correctly, Geology will not receive your gift.

I want to thank those of you who have responded in previous years, offer my thanks in advance for your early and positive response to this request for your help this year.

Michael Brown, Professor and Chair of the Geology Department