GeoGram

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2013

Four of the five Chairs of Geology, through the ages. From left to right: Mike Brown (1990-2011), Ann Wylie (1989-1990), Roberta Rudnick (2011-present), Galt Siegrist (founding chair: 1973-1980). In addition, Luke Chang (deceased), chaired the department from 1980-1989.

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LETTER FROM THE CHAIR

Dear Alumni and Friends,

It's been another great year for our Department: our students and faculty continue to win honors and publish ground-breaking science, we built a new student lounge on the fourth floor of Geology (see story and photos later in this issue), and the highlight of the year was our 40th Anniversary party, held on October 19. As you will read later in this issue, over 70 alums attended, as well as five of the founding faculty: **Bob Ridky**, **Tony Segovia**, **Galt Siegrist**, **Pete Stifel** and **Ann Wylie**. We came together to celebrate the remarkable ascendency of the Department over the past four decades.

The Department was founded in 1973, with a faculty of 5.5 (Bob Ridky had a shared position in the Department of Science Education). Galt Siegrist was the founding chair and under his leadership both the undergraduate and graduate degrees were established in Geology. In 1980 **Luke Chang** was hired from Miami University of Ohio to lead the Department, which moved into the renovated fisheries building (now Geology building) in 1982. Under Dr. Chang's leadership the Department moved from the College of Agriculture and Natural Sciences into the College of Computer, Mathematical and Physical Sciences. **Mike Brown** was hired out of the UK in 1990 to grow and strengthen the Department. Instead, in that time of budgetary constraints, he had to fight to keep it alive. With improvement of economic fortunes and the arrival of **Steve Halperin** as Dean, the Brown-Halperin partnership was able to make good on the initial promise. The Department invested heavily in geochemistry and rose in the U.S. News & World Report rankings for geochemistry from infinity (i.e., not ranked) to 7th in the nation (ahead of the likes of Stanford, Princeton, Yale, and Harvard).

Over the past six years we have added geophysics to our areas of expertise, with the hiring of some very talented young faculty. We aim to continue to grow and strengthen our program with the goal of becoming a top-10 all-around geosciences department.

What makes for a Department on the rise? Clearly, hiring talented faculty is a crucial step. Investing in those faculty by providing resources to carry out cutting-edge research, and recruiting talented students, and others. But there's one area where we have much room for improvement, and that is in growing an endowment. You likely know that Maryland recently joined the Big 10 conference. One result of that is that we are now part of the Committee on Institutional Collaboration (CIC). In early October I had the privilege of attending my first meeting of Geology Heads and Chairs of CIC Departments. From that meeting I learned a lot. But one of the disconcerting things I learned is that Maryland is the only Geology Department within the Big 10 that does not have an endowment. Other Departments are able to use their endowments to great effect: student scholarships, named chairs, funds for fieldwork, etc. One of my goals as Chair is to reach out to alumni, to listen to what you view to be important, to engage you as a community, and to encourage you to support your alma mater to help us continue our ascendancy. This is truly a win-win situation. I hope you feel as I do, that there has never been a better time to be a Terp!

Roberta Rudnick

Geology's 40th Anniversary Celebration

by
Research Scientist Philip Piccoli
(Class of 1992)

Founding Geology Professors Bob Ridky (left) and Anthony Segovia (right), with Former Provost, founding Geology Professor and current Geology Professor Ann Wylie (second from left) and Geology Alumnus & First Geology Club President Guillermo "Willy" Accame (second from right).

On October 19th, we celebrated the 40 year history of the Department of Geology. For only the third time in our history, alumni and friends gathered to celebrate our history, current activities and hear about future plans.

In 1973, the well-laid foundation of the department moved from the basement of the H.J. Patterson building, where it was a program in the Agronomy Department, and laid the groundwork for the initiation of the department. As part of this recent celebration, 75 alums, and over 125 additional guests and friends, celebrated the Ruby anniversary of the department. Alums from as far back as the Class of 1973 attended, and traveled from as far as the Rockies, to be at the event.

Many alums and guests arrived early to tour the campus and Department facilities. Ten Laboratories, the Geology Museum, and the new student lounge were open for visits. For the approximately 25% of "original" alums, this was their first opportunity to see the Geology Building.

By 5 p.m., everyone had assembled in the atrium of the Chemistry Building, the bar was open, and hors d'oeurves were served. While dinner was being grilled outside, past and present members got acquainted with founders of the department, including Galt Siegrist (hired 1965), Pete Stifel (1966), Tony Segovia (1967), Ann Wylie (1972) and Bob Ridky (1973). Unfortunately, Prof. Jerry Weidner (1969) was not able to attend.

Posters were set up in the Atrium and guests walked through at their own pace. Three students had posters explaining their research. **Caitlin Brown** (current M.S. student) presented part of her graduate research on determining the age and chemistry of rocks from Antarctica. **John Kemper** (B.S., Spring 2013) came back to campus to present his work on the effect of sand on bar morphology in Paint Branch Creek. **Hollie McBride** (current senior) presented findings about her work on geothermometers in melange rocks from Santa Catalina Island, California. Several other posters included information about the history of the Geology Building, a timeline of significant events in the department, lists of degree recipients, the College Park Scholars program, and students in the field. One poster became an impromptu historical display, with five well-worn, 20+ year old Geology Club t-shirts displayed alongside the current offering.

Dinner consisted primarily of pulled pork and (veggie) burgers, with enough sides to keep even the pickiest eaters content. Cake and pie were served for dessert.

ROBERT BEAUCHAMP, Ph.D. Geology, 1988

"I was privileged to be the first UMD graduate to receive a Ph.D. in geology. The faculty who I had the privilege of working with included Drs. Galt Siegrist (advisor), Luke Chang and Peter Stifel. It was a most rewarding experience."

Professor and Chair **Roberta Rudnick** stepped to the microphone to welcome the crowd and give a brief history of the Department and goals for the future (see Chair's letter). She thanked the alumni organizing committee, whose ideas inspired many of the day's events, and the generous sponsors, for their support of the event. She also thanked in particular staff members Todd Karwoski and Michelle Montero, whose efforts greatly contributed to the success of the event.

First Chair of the Geology Department, former Geology Professor and founding faculty member Henry (Galt) Siegrist.

Dean Banavar followed, and in an impromptu talk recognized the heroic efforts of former Geology chairs and college deans, and their role in the formative years of the department.

Later in the evening, **Galt Siegrist** (the first Chair of the Department) took the microphone and quickly debunked the myth that the Department was 40 years old. He rightfully explained that the groundwork had been laid 10 years prior with the hiring of **Len Fernow**, a Cornell grad, who was working in the oil industry. Galt, smiling from ear to ear, told tales of stealing academic lines from other departments to make faculty hires for positions that would ultimately be in Geology. Galt spoke of hiring four additional faculty in nearly four years, and their jobs prior to being

Photos by Hailong Bai

GARY DWYER, B.S. Geology, 1987

"Happy Birthday and congratulations on building and maintaining an awesome program! I have very fond memories of my time there (1985-1987) and a deep appreciation for the great foundation I got in geology and in the scientific method from Ann Wylie and the gang in Geology. Glad to hear that the Senior Thesis program survives. Although I doubt I realized it at the time, I think a Senior Thesis is a critical component of a UG B.S. degree, regardless of future career path."

hired: he (Siegrist) was working as a 'color man' studying rutile and anatase as coloring agents for a paint company; **Pete Stifel** was busy in Cottonwood Canyon (implying Pete spent his time skiing); **Tony Segovia** was "looking for" lineaments in South America; and **Jerry Weidner** was a post-doc at NASA in Greenbelt via Palo Alto. **Ann Wylie** came later directly from Columbia. **Bob Ridky** came from the Education Department. Galt also spoke of large populations of students, sometimes surpassing 200 in number, in the Geology program, and the formidable problems this large number of students created (Stifel elaborated in his own way later). There was no graduate program. They were thought of as "The Community College within Agronomy." Galt closed with, "We had no space, no recognition and we didn't care."

The next person to the microphone was **Pete Stifel**, facilitator of the original Senior thesis program. Pete brought props: soy beans, straws, and an odd piece of rock. Pete described a bit of mischief. "Over 1000 students" taking physical, historical, mineralogy, sed-strat, and petrology, were sharing the same single lab space. There was no time during the day for them to study. Windows were propped open at night so they could enter the building to study their lab material outside of normal lab time. Folks across the hall from the lab were crop scientists within the Agronomy Department. On one of these late study nights, they found that soybeans could be shot in provocative ways with rubber bands. They later found that soybeans travelled much better when propelled with a clipboard (Pete used a plate to demonstrate and launched soy beans into the audience). Pete explained that this escalated to where an entire garbage can (barrel) of soybeans made their way onto the floor. Pete's next prop, the straws, was a reminder of a practical joke wherein a faculty office was filled with straws (although it is not clear whose office it was). Pete finished by holding up the rock from his senior thesis, steatite (soapstone). Pete was charged by his advisor with determining "how this rock got to the middle of Vermont." That was before the Theory of Plate Tectonics. Pete did not explain how he managed to defend his senior thesis to faculty at Cornell in 1958.

Facilitator of the original Senior thesis program, former Professor and founding faculty member Peter Stifel.

Ann Wylie ended the program by thanking attendees. She requested that alums be engaged in the educational process in our Department. She recognized what faculty can't give students—a thorough understanding of the workings of the employment life outside the university. She requested help from the alums, in the form of an advisory committee, to help with these matters in the future. If you are interested in serving in such a capacity, please contact Ann: awylie@umd.edu.

It was great to see former students, staff and faculty. Photos from the event can be found in the Album section of the Department's Facebook Page (www.facebook.com/UMDGeology), including nearly 100 photos of the Geology Department's first 50 years. You don't have to be a member of Facebook to view these photos. ■

LAUREL COLLINS, B.S. Geology, 1974

"From my time as a UM undergrad I remember wading in streams to collect sediments for my senior thesis with Siegrist. He was always there for me when I needed help outside of class. I remember studying crystal lattice models into the night in the lab, and lovely weekend camping trips to look at geology. Segovia was a terrific structural geology instructor."

GREGORY C. OHLMACHER, B.S. Geology, 1974

"What I remember most were field trips. Peter Stifel's trip to Lee Creek Bone Beds in North Carolina and a trip to a Taconite Mine in Pennsylvania. I still have shark teeth and unidentified bones from Lee Creek."

Gracious donations by several companies (Environmental Alliance; National Stone, Sand and Gravel Corporation; NYCO; RJ Lee; ThermoFisher Scientific; and Vanderbilt Minerals) were used as subsidies to keep costs for attendees low. Many alums (including some who could not attend) also stepped up to the plate to support students to attend at no cost, and their contributions are greatly appreciated.

STUDENT SPONSORSHIP CONTRIBUTORS

Guillermo "Willy" Accame
Pamela Barnard
Leon Basdekas
Peggy Basdekas
Tracey Centorbi
Michael Centorbi
Eric Dougherty
Michael Evans
Anu Gupta
Michael Eybel
Allie Gale
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James Schmidt
Laura Schmidt
Peter Schweitzer
Susan Schweitzer
Alicia Siegrist
Henry (Galt) Siegrist
William Smith
Dori Smith
Vicki M. Soto
Paul Tomascak
Katherine Watter

FACULTY HIGHLIGHT

Robert W. Ridky
A JEDI Knight *for* Geoscience Education

BY
Professor Alan J. Kaufman

Before there were world-class laboratories, research faculty, and graduate students, the nascent Geology Department was sustained by teaching the undergraduate masses. Among the founding teaching faculty that toiled in the basement and attic eaves of H.J. Patterson Hall was **Robert "Bob" Ridky**, who joined **Galt Siegrist**, **Pete Steifel**, **Tony Segovia**, **Jerry Weidner**, and **Ann Wylie** in 1973 in the Geology Department's first year of incorporation. Ridky held a joint appointment in Geology and the Department of Science Education, which at the time was considered the best in the country.

Fascinated by the new frontiers of earth science that emerged at the dawn of the Sputnik era and inspired by Jeffersonian ideals, Ridky said, "I was interested in the great national experiment for education of the masses."

Beyond educating thousands of undergraduate students each year, Ridky was part of the faculty that bought into the senior thesis program (initiated by Peter Stifel) as a means to engage departmental majors in active learning and to jump start their own research agendas. Bob said that the faculty wanted the students to be more engaged in their chosen discipline and to understand the limitations of research (especially in a small department that lacked laboratory facilities). Over the succeeding 28 years Ridky advised at least 31 senior thesis projects. According to Ridky, one of the most fascinating of these was by **Amanda Sigillito**, who did a fractal shape analysis of Wisconsinan Age (roughly 85 to 11 thousand years ago) glacial deposits in upstate New York.

This project was closest to Bob's own research on the reconstruction of the extent, thickness and dynamics of the Late Wisconsin ice dome above the present-day Finger Lakes region. The synthesis of his geomorphologic studies in upstate New York was published in a 1990 lead article in *GSA Bulletin* by Ridky and colleague Robert Bindschadler at NASA Goddard that estimated the ice sheet at the last glacial maximum to be over two kilometers thick. Bob's studies of ice sheet dynamics led him to be the first UMD Geology Department faculty member to study in Antarctica (**Mike Brown** and his graduate students **Chris Yakumchuk** and **Caitlin Brown** are currently working in the Fosdick Mountains of West Antarctica); Ridky was accompanied by Bindschadler and undergraduate student Erik Roberts who had completed his 1984 senior thesis project on heavy metal concentrations in soils with **Phil Candela**, the current faculty member in charge of the program.

> "I was interested in the great national experiment for education of the masses."

During his career, Ridky developed educational programs in the geosciences across campus and the nation, and has been duly recognized for his efforts. He was nominated for an American Council of Education fellowship in 1979 before becoming Senior Assistant to UMD Chancellor **John Toll** from 1980 to 1984, during which time he continued to teach in the Geology Department. Then he became the Director of the Joint EDucation Initiative (JEDI) and was successful in a 1992 NSF proposal for $1.2M over three years to develop educational methods that aimed to teach educators at the high school and college level to use real data as part of their pedagogy. The Institute held evening teaching sessions in a computing laboratory on campus, led monthly field trips to local geological sites, and ran two-week intensive programs in the summers on both the east and west coast.

One of the graduate students involved in the JEDI project was **Christopher Keane**, who completed a Ph.D. with Ridky through the Marine-Estuarine-Environmental Sciences (MEES) program. His dissertation was on quantitative terrain analysis methods, but his involvement with JEDI—especially the use of DOE-based data as a teaching tool—got him deeply involved with the American Geosciences Institute (AGI). He is currently the AGI Director of Communications and Technology, editor of the monthly newsmagazine EARTH, publisher of the annual Directory of Geoscience Departments, and Executive Producer of the Discovery Communications television series Faces of Earth. Keane said, "Bob is the kind of guy that inspires loyalty in students. He threw 100% into the JEDI project."

After the JEDI project was completed in 1996, Ridky rotated to the NSF where for three years he served as the Program Director of the Division of Undergraduate Education. In this position he developed an early distance learning

program, including activities for students and teachers using real time data, called EarthInquiry, which was jointly published with the AGI. Bob returned to teach Introductory Geology and Geomorphology in the Geology Department for another two years after his time at the NSF, but then became the National Education Coordinator at the U.S. Geological Survey and left urban College Park for rural Reston, Va.

Active in many professional organizations, Bob served as a member of AGI's Education Committee and was honored with the William B. Heroy, Jr. Award for Distinguished Service. He served as President of the National Association of Geoscience Teachers, Chair of GSA's Geoscience Education Division, Chair of GSA's Task Force on New Goals and Directions for Geoscience Education, geoscience representative to the National Research Council's National Science Education Standards Committee, and on several State Boards and Commissions, including the State of Maryland's Geological Survey.

Ridky reflected on the exciting years building the Geology Department before the Graduate Program was started. "We were developing something important," he said, "but I am not sure we would have done it in hindsight." According to Bob, teaching and camaraderie is what sustained the department in the early years, and allowed for its future growth as a major research institution. Standing beside the statue of John Wesley Powell in the foyer of the U.S. Geological Survey on the day before the government was shut down, Bob said, "He [JWP] was a teacher for seven years before he became a great explorer and administrator. Powell knew that we are all about the transfer of knowledge, and he would have stressed that there should be no separation between educators and scientists." ■

Bob and Eric hoping the twin otter will arrive on schedule.

DEPARTMENTAL FIELD TRIP

By
Assistant Professor Aaron Martin

For the department field trip this year, Assistant Professor **Aaron Martin** led 22 faculty and students to Appalachian Blue Ridge and Piedmont province outcrops in Maryland and northern Virginia. Saturday, September 7 was dedicated to Proterozoic rocks of the Blue Ridge province in Virginia. We visited the ca. 1120 Ma Marshall meta-granite in Marshall, Va., and the ca. 1160 Ma Mary's Rock charnockite in Shenandoah National Park, as well as a spectacular Park outcrop of columnar (meta)basalt of the ca. 570 Ma Catoctin Formation. The group was fortunate to be joined by Geology Department alumnus and Distinguished Alum **Scott Southworth** at an outcrop of c. 700 Ma volcaniclastic rocks near Marshall. The social highlight of the day came at lunch time as we shared pizza while tasting wine in the courtyard of Gray Ghost Vineyards in Amissville, Va. We passed the night ensconced in tents in Mathews Arm campground high in Shenandoah National Park.

On Sunday we left Shenandoah and the Blue Ridge province, travelling east to the Piedmont. Our first stop explored ca. 200 Ma granophyre in Ashburn, Va., that constitutes part of the Central Atlantic Magmatic Province (CAMP). The CAMP formed during breakup of Pangea and opening of the Atlantic Ocean and field trip participants were excited to discuss the end-Triassic mass extinction that was caused by emplacement of CAMP magmas. Unfortunately, the bees that lived near the outcrop were not as interested in this discussion, so we left for our next stop at Sugarloaf Mountain, Md. After lunching near the top of the mountain, we examined the rippled Sugarloaf Mountain Quartzite and enjoyed the fine views of the Frederick Valley Synclinorium and Catoctin Mountain to the west. The final field trip stop was at an outcrop of Ordovician Bear Island granodiorite where it intruded the Mather Gorge Formation in the Chesapeake and Ohio Canal National Historical Park, Maryland, a few miles downstream from Great Falls. Tired but educated, we returned to College Park with two days full of stimulating discussions making us eagerly await next year's trip. ■

Aaron Martin discusses Appalachian tectonics on Sugarloaf Mountain quartzite. (Photo: Huan Cui)

GRADUATE STUDENT HIGHLIGHT

Stephanie Johnston

by
Associate Professor Laurent Montési

Stephanie Johnston in front of an active lava flow on Kilauea volcano, Hawai'i in 2013.

Sometimes, one planet is simply not enough. Stephanie Johnston, the department of Geology's "planetary girl", is not one to remain bound by the gravity of our home planet. As she says, "Space is cool: It gives us a chance to test things that we know on Earth and see if they hold up in different conditions."

Stephanie received a Bachelor's degree in Geology from Centenary College of Louisiana. She honed her geophysical skills by working at Hill Geophysical Consulting in Shreveport, LA, for two years before joining the Department of Geology at the University of Maryland.

Stephanie's Ph.D. work combines fire and ice. She simulates in her computer how the icy shell of Europa, a satellite of Jupiter, deforms in response to the crystallization of water-filled cracks inside the ice. Europa's ice-covered ocean presents the best opportunity to shelter life outside our own planet. Her project aims to reproduce formation of the prominent ridges that crisscross the surface of the satellite, giving it the appearance of a ball of yarn.

The water-filled cracks are analogs to the magma-filled dikes associated with volcanoes on Earth. Therefore, Stephanie spends a lot of energy learning about Earth's volcanism. She joined a NASA-sponsored field workshop in summer 2013 to study the active volcanoes of Hawai'i. Skills learned during this expedition included mapping of lava flows from field and remote sensing data, and using a non-stick skillet to collect fresh lava samples. "It's amazing how it was still non-stick even after it was plunged in the lava flow." Stephanie says. "Also I had to wear a bandana on my face. You really feel that burst of heat when you break the crust to collect the fresh lava!"

Stephanie's journey through the solar system has lead her to an even fierier place than Hawai'i: Venus. She interned at the Jet Propulsion Laboratory, in Pasadena, CA, where, under the direction of Dr. Susan Smrekar, a summer spent analyzing the gravity field of the planet Venus confirmed her resolve to become a planetary scientist. Although Stephanie is not currently conducting research on Venus, she is active in the Venus scientific community, even taking a leadership role in NASA's Venus Exploration Analysis Group (VEXAG). There, she chairs the Early-Career Scholars Focus Group.

As her participation to VEXAG demonstrates, Stephanie not only studies but also advocates for planetary sciences research. Exploring other planets can inform us about Earth. Fiery Venus may have been once a planet very much like Earth, until a dramatic climate change event turned it into an inferno.

Discovery sometimes takes unexpected turns. While in Hawai'i, Stephanie noticed a ukulele in the corner of the room where the group was staying. Stephanie recollects: "I always wanted to learn the guitar, but it's just too big for me. When I saw a ukulele in a corner, I had to try, and it fits my hands just perfectly." We can always count on Stephanie to respond whenever opportunity knocks or strums. ■

NEW STUDENT LOUNGE

By Michelle Montero

Our student lounge has taken on many forms over the past decades. First, it was located on the first floor of the Geology building, an accordion wall separating it from the faculty conference room. Soon after, those rooms were converted to offices and the lounge had to find a new home. Enter the fourth floor. The lounge on the fourth floor, furnished with a ratty couch, was long and narrow and not very comfortable. Many students may remember the space simply as "the bowling alley". Unsurprisingly, this uncomfortable incarnation of the lounge didn't last too long. Soon after, the space was repurposed as an office for about 6-8 graduate students, before becoming a humble and poorly equipped storage space.

It took some time, but with the renovation of the Geology labs (reported in last year's *GeoGram*), a supportive external review that noted the need for a student lounge, and support from Dean Banavar and his able staff (Associate Dean Tom McMullen and Director of Facilities Sean Davis), a new lounge was built by tearing down walls on the 4th floor of Geology. The lounge is a far cry from the office that it called home on the first floor of the Geology Building so many years ago. With its' open and inviting space, this new 800 square foot lounge provides seating, an espresso maker, a projector, computers, a foosball table and some pretty spectacular photo art taken by Department students and faculty.

The students in Geology deserved a space of their own and we're glad we could finally give them something that fits the bill. To view a photo of the new student lounge, please visit http://www.geol.umd.edu/EventsNews/lounge.htm ■

After running a successful dredge on board the RV Knorr, Will is now a graduate of the school of rock. He got a gold star for it!! (Photo: Hailong Bai).

UNDERGRADUATE STUDENT HIGHLIGHT

Will Junkin

BY
Associate Professor Wen-lu Zhu

Will Junkin has been a whitewater kayaker from an early age. While kayaking along the Great Falls and Mather Gorge rapids on the Potomac River, he was captivated by the mesmerizing landscapes. However, he never thought of geology as a career choice until he took an introductory geology course in college.

Will started his college education at Colby College in Waterville, ME. He was an English major who took as many science courses as possible because of his interests in physics. When he took the first geology course, something clicked. He realized that geology provides an ideal career for him to pursue his interests in physics and his love for the great outdoors. After he graduated from Colby with a B.A. in English in May 2011, Will entered the UMD geology department the following January.

An honors student in the geology department, Will has won several awards and honors, including the Green Scholarship in Environmental Science and Policy, the Marc Lipella Memorial Scholarship, as well as the Mineralogical Society of America Undergraduate Prize. In Spring 2013, Will was invited by Dr. Wen-lu Zhu to participate in a research expedition over the Mid-Atlantic Ridge (MAR) at 16.5°N. From May 11th to June 19, Will sailed on the Research Vessel Knorr with an international team of marine geologists led by Dr. Deborah Smith (Chief Scientist) to study the development of detachment faults at intermediate magma supply ridges. During the expedition, Will gained hands-on experience using high-resolution multibeam bathymetry, magnetic instruments, as well as data collection from the Autonomous Underwater Vehicle Sentry. He was also in charge of collecting the photographs from the WHOI Towcam. "I had a great time with a very fun, intelligent, and international group of scientists from a variety of geology fields" says Will.

Not all dredging operations yielded positive results. The science team lost a dredge basket during one operation, and Will wrote this poem to say goodbye to the basket covered with pounds of duct tape (to keep things from snagging) that rests "forever" on the seafloor:

A jagged crag or chasm gave our hapless
dredge obstruction
And there it lies, abandoned to its rust
Till time aligns its present spot with one
more near subduction
Therein to rise, and with a buoyant thrust
To spew anew from out the Earth:
such singular eruptions
Form islands of volcanic duct tape crust

Will plans to enter graduate school in Fall of 2014 where he will focus on the structural geology and tectonics of the upper crust and surface. ■

Beneath Earth's surface, scientists find long "fingers" of hot material

By
Assistant Professor Vedran Lekic

Observations of seismic waves excited by earthquakes and recorded by seismometers around the world can be used to image structures and processes inside of the Earth, using a technique akin to computer assisted tomography (CAT) scans commonplace in medicine. An improved computer modeling approach developed by University of Maryland Department of Geology seismologist **Vedran Lekic** and colleagues at the University of California Berkeley has yielded images of a previously unknown pattern of large-scale structure in the Earth. The study, published in September in the journal *Science*, documents the presence of finger-like channels of low-speed seismic waves about 120 to 220 miles below the sea floor, and stretching out for thousands of miles in bands spaced 1,400 miles apart. Because higher temperatures slow down seismic waves, these channels are likely to be hotter than the surrounding material. Their presence suggests that plumes of hot material that rise up from deep in the Earth's material giving rise to volcanic islands such as Hawaii and Tahiti, interact with the motions of overlying plates to produce the finger-like channels. The findings indicate that an intermediate scale of convection operates in the Earth, and should motivate new geodynamical simulations. The study has attracted attention from several online general and scientific publications, and was featured in the Los Angeles Times. ■

RESEARCH FOCUS

BY
ASSOCIATE PROFESSOR SUJAY KAUSHAL

How do human activities affect hydrologic and biogeochemical cycles at the Earth surface, especially in streams and rivers? That is the research focus of our group. We use long-term water chemistry monitoring and geochemical tracers to identify human alteration of biogeochemical processes and the sources of contaminants. We also seek to identify what can be done to assist recovery of impaired surface waters and evaluate the effects of watershed management actions and policy decisions. Most of our field research takes place at the National Science Foundation supported Baltimore Long-term Ecological Research site, the Anacostia river watershed, and major rivers of the US Geological Survey River Input Monitoring Program. In addition, we also work on comparative analyses of water chemistry and water quality trends and drivers at regional and national scales.

As an example, we recently discovered how acid rain and other unintended side effects of human activities are changing the basic chemistry of many rivers in the Eastern U.S., with potentially major consequences for drinking water supplies and aquatic ecosystems. We looked at long-term records of alkalinity and calcium trends in 97 streams and rivers from Florida to New Hampshire. Over a period of 25 to 60 years, two-thirds of the rivers had become significantly more alkaline and none had become more acidic. Alkalinity is a measure of water's ability to neutralize acid. In excess, it can cause ammonia toxicity and algal blooms, altering water quality and harming aquatic life. Increasing alkalinity hardens drinking water, makes wastewater disposal more difficult, and exacerbates the salinization of fresh water. Paradoxically, higher acid levels in rain, soil and water, caused by human activities, appear to be major triggers for these changes in river alkalinization. We hypothesized that acid rain, acid mine drainage, and agricultural practices accelerated the dissolution of surfaces that are naturally high in alkaline minerals. During the process of human-accelerated chemical weathering, acid eats away at limestone, other carbonate rocks, and even concrete sidewalks, dissolving alkaline particles that wash off into streams and rivers.

Clockwise from top: Rose Smith and Michael Pennino;Tamara Newcomer; Rose Smith.

Our work has also documented long-term salinization of fresh water in the northeastern U.S. Increased development and impervious surfaces have led to an increase in the use of road deicer, contributing to increased chloride concentrations to approximately 25% the salinity of sea water in some urban streams. We have also found increasing sodium concentrations in drinking water supplies. Salinity remains elevated even during warmer months when road salt is not applied due to chronic groundwater contamination. There is a strong relationship between the salinization of fresh water and extent of impervious surface cover (roadways, parking lots, etc.) in watersheds. Graduate student **Rose Smith** is now examining the interactive effects of salinization on in-stream biogeochemical processing of nitrogen (a key pollutant in Chesapeake Bay). Research associate **Shuiwang Duan** uses laboratory experiments to examine the effects of salinization on mobilization of contaminants from sediments to streams.

Finally, graduate students in our lab are evaluating watershed restoration strategies to improve water quality. Ph.D. student **Michael Pennino** uses stable isotopes to track transport and transformation of nitrate from the Blue Plains Wastewater Treatment Plant (the largest advanced wastewater treatment plant in the world) to the Chesapeake Bay. The question is whether advanced wastewater treatment plant upgrades have reduced the amount of nitrogen from wastewater sources that enter Chesapeake Bay. Ph.D. student **Tamara Newcomer** is investigating the potential for steam and floodplain restoration to reduce nitrogen loads in streams and rivers, in collaboration with the U.S. EPA. This work is being shared with water resources managers to guide evaluation of current strategies and management decisions. ■

RECOGNITION & AWARDS

Faculty

In 2013 we saw two faculty members receive promotions. **Sujay Kaushal** and **Sarah Penniston-Dorland** were both promoted to Associate Professors. We also welcomed a new faculty member, **Nicholas Schmerr**, to the department as an Assistant Research Scientist.

Michael Brown will receive the 2014 Collins Medal from the Mineralogical Society of Great Britain and Ireland.

Daniel Lathrop has been selected to deliver the Lorenz Lecture at the Fall 2013 AGU meeting. The AGU Nonlinear Geophysics Focus Group's Lorenz Lecture was established in 2001 to honor Edward N. Lorenz (discoverer of chaos) for his outstanding pioneering work in nonlinear geophysics and annually acknowledges original contributions to this domain.

Ved Lekic will receive the 2014 Charles F. Richter Early Career Award from the Seismological Society of America.

Laurent Montési received the 2012 Editors' Citation for Excellence in Refereeing for Journal of Geophysical Research-Solid Earth.

Students

Thomas Johnson Middle School Student **Michelle Marsandi** (1. pictured above with John Merck) won the 2013 Geology Department prize for Best Earth Science-related project entitled "CO2: How it Affects You" at the Prince George's County Science Fair.

Daniel Eldridge (advisor: Farquhar), Best Talk Award 2013, Ph.D. post-candidacy category.

Hailong Bai (advisor: Montési), Best Talk Award 2013, Ph.D. pre-candidacy.

Zachary Reeves (advisor: Lekic), Best Talk Award 2013, M.S. post-candidate category.

Michael Antonelli (advisor: Farquhar) was awarded a doctoral fellowship from the Natural Sciences and Engineering Research Council of Canada (NSERC) as well as a Mineralogical Association of Canada Travel grant.

Caitlin Brown (advisors: Brown/Walker) was presented with one of the best student poster awards presented by the Geochemical Society at this year's Goldschmidt meeting, in Florence, Italy. Her poster was entitled "Petrogenesis of Peraluminous Granites from Deep Crustal Sources." Caitlin also received a GSA research grant.

Huan Cui (advisor: Kaufman) was selected by the Geology Department, the Center for Teaching Excellence, the Office of Undergraduate Studies, and the Graduate School as a 2012-2013 Distinguished Teaching Assistant. Huan also received a Jacob K Goldhaber Travel Award.

Austin Green received the Earth Science Interdisciplinary Center (ESSIC) Undergraduate Travel Award.

Brian Harms (advisor: Farquhar) was awarded an inaugural Graduate Dean's Dissertation Fellowship for academic year 2013-14.

Palma Jarboe (advisor: Kaufman) was awarded the 2013 Green Fund in Global Climate Change for her integrated work on the Devonian-aged Marcellus Shale. Palma also received a '2013 Pittsburgh Association of Petroleum Geologists Named Grant' through AAPG's Grants-In-Aid Program.

Grant Jiang received a Marc Lipella Memorial Scholarship.

Will Junkin received the Green Scholarship in Environmental Science and Policy for the 2012-2013 academic year in recognition of his outstanding academic accomplishments and environmental activities. He also received the Mineralogical Society of America undergraduate prize, as well as a Marc Lipella Memorial Scholarship.

Irene Kadel-Harder received a Marc Lipella Memorial Scholarship. She was also one of 18 recipients of the National Association of Geoscience Teachers (NAGT) Field Study Scholarship.

1

Sean Kayser and **Tyler Newton** received a Mineralogical Society of America undergraduate award, which includes a complementary year's membership in the Society, a certificate and an MSA publication of their choice.

Alex Lopatka (advisor: Evans) was selected to receive The Green Fellowship in Global Climate Change and was awarded Honorable Mention in the 2012 National Science Foundation Graduate Research Fellowship Competition.

Tamara Newcomer (advisor: Kaushal) was offered a Knauss Postdoctoral Fellowship and was awarded an Ann G. Wylie Dissertation Fellowship.

Michael Pennino (advisor Kaushal) received the Joan Ehrenfeld Award for Best Student Presentation in Urban Ecology for his presentation, "Effects of watershed management on sources and fluxes of water, carbon, and nitrogen in streams: Climate implications" at the annual Ecological Society of America meeting.

Michael Ream received a Marc Lipella Memorial Scholarship and a Mineralogical Society of America undergraduate award.

Rose Smith (advisor: Kaushal) was awarded a Graduate Student Summer Research Fellowship for Summer 2013.

Anna Statkiewicz (advisor: Prestegaard) was awarded a GSA research grant.

Chris Yakymchuk (advisor: Brown) was awarded the Ann G. Wylie Dissertation Fellowship and was the recipient of a GSA and Explorers Club of Washington Group Grant. He also received an outstand mention (for a proposal of exceptional merit in conception and presentation) for his GSA research grant.

ALUMNI NEWS

ALLISON (ALLIE) GALE, B.S. ENSP-ESP, 2006
Allie was appointed as an Assistant Professor at the University of Wisconsin-River Falls.

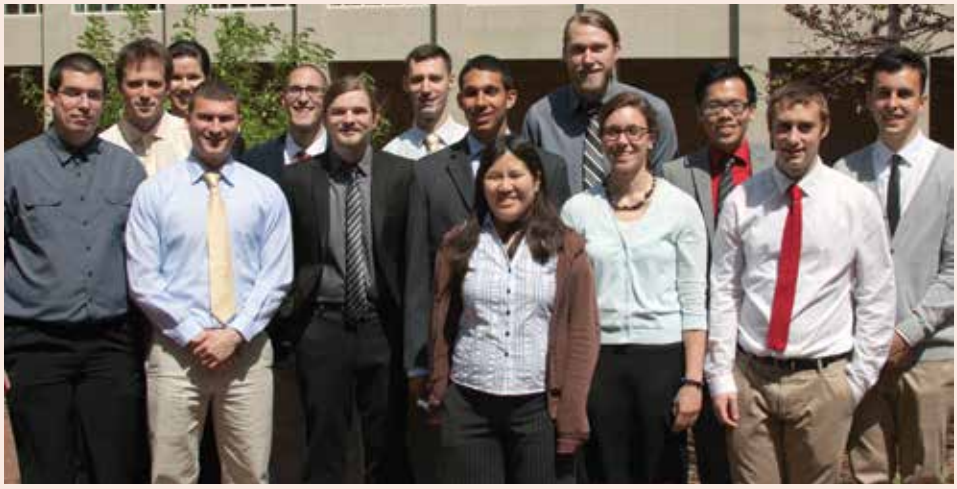
XIAOMING LIU, PH.D. GEOLOGY 2013
Xiaoming has accepted a post-doctoral position at the Geophysical Laboratory, Carnegie Institution of Washington.

BARRY RENO, PH.D. GEOLOGY, 2009
Barry accepted a position as Senior Geologist with the Northern Territory Geological Survey in Australia. While at Maryland, Barry performed a detailed study of the timing of orogenesis in the Southern Brasilia Belt (with Brown and Piccoli).

LISA WALSH, PH.D. GEOLOGY, 2013
Lisa is now working as a seismologist at the Nuclear Regulatory Commission.

NANPING WU, PH.D GEOLOGY, 2013
Nanping has commenced a postdoctoral position at the University of New Hampshire to work with Rosemary Came on clumped isotopes.

ZOLTAN ZAJACZ, POST-DOCTORAL FELLOW, 2007-2011
Zoltan, a former post-doc in the Laboratory for Mineral Deposits Research at the University of Maryland, accepted a faculty position at the University of Toronto. Zoltan worked with Phil Candela and Phil Piccoli on a variety of topics related to the genesis of magmatic-hydrothermal ore deposits. While at Maryland, he was instrumental (along with former grad students Michael Mengason and Brian Tattitch) in designing and building a new high-T rapid-quench, cold seal experimental system.



(L-R): John Nance, Noah Bowman, Hollie McBride, Evan McMullen, Matthew Domingues, Austin Green, Sean Kayser, Rishi Sugla, Christine Liu, Tyler Newton, Irene Kadel-Harder, Grant Jiang, Stephen Ginley, John Kemper

Senior Thesis

The Department of Geology senior thesis program, coordinated by **Philip Candela** for 15 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.

Geology Senior Thesis Titles (GEOL 394)
2012/2013 Academic Year

Matthew Domingues. Trace Metal Retention on Manganese Oxides in First Order Streams: A Promising Form of Environmental Remediation (Advisors: Prestegaard/Ash); **Stephen Ginley**. Geochemical history of the convecting upper mantle: A comparison of ophiolites (Advisor: Walker); **Austin Green**. Thermal Evolution and Overpressurization of Europa's Subsurface Ocean (Advisor: Montési); **Grant Jiang**. Characterizing carbon sources and quality in four Baltimore streams with fluorescence spectroscopy (Advisor: Kaushal); **Irene Kadel-Harder**. Determining continental crust sources using zircons from Proterozoic Piedmont rocks of central Virginia (Advisors: Martin and Piccoli); **John Kemper**. The Effect of Sand Content on Sediment Transport, Deposition, and Bar Morphology (Advisor: Prestegaard); **Hollie McBride**. Zirconium in Rutile Thermometry: Temperature Estimates for Metamorphic Rocks of the Catalina Schist (Advisors: Penniston-Dorland and Piccoli); **Evan McMullen**. The Effect of Bedding Laminations on Crack Propagation in the Marcellus Shale (Advisor: Zhu); **Tyler Newton**. Geochemistry of the Timberville Zn-Pb District, Rockingham County, VA. (Advisors: Candela/Piccoli/McDonough); **Natalie Sievers**. Altered dioritic clasts in lawsonite-blueschist facies metaconglomerates: Catalina Schist, CA (Advisor: Penniston-Dorland); **Rishi Sugla**. Orbital and Structural Evolution of Triton (Advisors: Hier-Majumder/Hamilton/Lekic); **Chris Weller**. Origin of the variation of amplitude of the Hawaiian swell (Advisor: Montési).

To see the posters from this year's presentations and lists of theses over the past 37 years, go to: www.geol.umd.edu/pages/undergraduates/SeniorThesis.htm.

CONGRATULATIONS TO OUR RECENT GRADUATES

DOCTORAL GRADUATES

Xiaoming Liu
Advisor: Rudnick/McDonough, Spring 2013

Lisa Walsh
Advisors: Martin/Montési, Spring 2013

Nanping Wu
Advisor: Farquhar, Spring 2013

MASTERS GRADUATES

Greg Archer
Advisor: Walker, Fall 2012

Michael Antonelli
Advisor: Farquhar, Summer 2013

Dana Borg
Advisor: McDonough, Summer 2013

Julia Gorman
Advisor: Penniston-Dorland, Summer 2013

Kristy Long
Advisor: McDonough/Rudnick, Spring 2013

Katherine Watter
Advisors: Candela/Piccoli, Summer 2013

Yadviga Zhelezinskaya
Advisor: Farquhar/Kaufman, Summer 2013

Thank you to 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.

As you will see in the "Your contributions, at work" section below, your generosity benefits our students in many ways. Therefore, once again, we ask for your support. Tax-deductible gifts to the department can be made online through the UMCP Foundation website (**http://advancement.umd.edu/giving/index.php**). Enter "Geology" in the search box in the right hand corner to ensure that your donations are allocated to the correct department. We've also enclosed a postage-paid return envelope for check or cash gifts. If you are writing a check, please be sure to include "Geology" in the notes section to ensure that your funds are allocated properly.

YOUR CONTRIBUTIONS, AT WORK.

Irene Kadel-Harder received a senior thesis grant to offset costs related to her senior thesis. Field camp scholarships were awarded to Kalev Hantsoo, Sean Kayser, and Grant Jiang, and the department acquired several new petrographic microscopes for use by students in the classroom.

BENEFACTORS

OCTOBER 2012 - CURRENT

Up to $99 per annum
Brian Arkell
Robert Beauchamp
Sharon Dudek
Michael Evans
Mark Feigenson
Suzanne Martin
Mary McCormick
Robert L. McCormick
Robert M. Najewicz
Barrett L. Smith
Daniel K. Tarkington
Mary K. Tarkington

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Steven Goldstein
David R. Grogan
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Steven Keirstead
Laurent Montési
Henry Siegrist
Gene Taylor
Martitia Tuttle
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Wen-lu Zhu

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Sujay Kaushal
William McDonough
Neha Patel
Roberta Rudnick
William Smith
Richard Walker
Ann G. Wylie
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Department of Geology
University of Maryland
College Park, MD 20742

GEOLOGY DEPARTMENT • FALL 2013

(L-R) FRONT ROW: William McDonough, Tracey Centorbi, Philip Piccoli, Ann Wylie, James Farquhar, Thomas Holtz, Karen Prestegaard, Roberta Rudnick, Sujay Kaushal, John Merck, Aaron Martin, Richard Walker, Igor Puchtel, Philip Candela, Richard Ash, Daniel Lathrop, Michael Evans, Wenlu Zhu, Alan Jay Kaufman

SECOND ROW: Kristi Engle, Huan Cui, Su Li, Kevin Miller, Jeremy Banker, Jon Urban, Caitlin Brown, Brian Harms, Emily Worsham, Chris Yakymchuk, Kang Chen, Alex Lopatka, Ming Tang, Chao Gao, Yu Huang, Michael Wilks, Leigh Roble, Yadviga Zhelezinskaya, Miriam Sharp, Valentina Puchtel, Nivea Magalhaes, Carolyn Plank, Anna Statkiewicz, Rose Smith, Zachary Reeves, Kaitlyn Steele, Gregory Archer, Erin Cunningham, James Dottin, Harrison Lisabeth, Daniel Eldridge, Mathieu Touboul, Austin Green, Hailong Bai, Todd Karwoski, Rebecca Plummer

BACK ROW: Joanna Patterson, Michelle Montero, Dorothy Brown, Sandy Romeo

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