GEOLOGY & GEOPHYSICS NEWS

Yale University | Department of Geology and Geophysics Fall 2012

Chairman's Letter

Jay Ague (jay.ague@yale.edu)

This is an exciting period of transition here in Geology and Geophysics. We are sad to bid farewell to outgoing Chair, **Dave Bercovici**, but are truly grateful for his inspirational leadership over the past six years. We wish Dave all the best as he takes a much-deserved one-year leave, and look forward to his return to daily departmental life in 2013. Thanks Dave!

As you read through this issue of our newsletter, I think you'll be impressed by the growing breadth and vigor of G&G's activities. Our students, postdocs, and faculty continue to receive numerous national and international accolades—you can read all about the details inside. This recognition is a testament to G&G's ever-expanding global influence. And speaking of faculty successes, I am delighted to let you know that **Alexey Fedorov** has been promoted to Professor (with tenure). Congratulations, Alexey!

You will also read about the incredible things your fellow alums have been up to. Learn of Afghanistan's mineral resources, invaluable fossil remains unearthed accidentally at construction sites, and so much more. And please keep sending us your alumni news items so that we can feature them in future newsletters.

Our educational programs are experiencing a renaissance of new growth. Last year we taught about 540 undergraduates which, with two isolated exceptions, is the largest number since the mid-1970s! We are projecting about 25 junior and senior majors in the coming few years, many more than we have had for well over a decade. Encouragingly, this positive trend shows no signs of slowing down. The graduate program has grown at an unprecedented rate such that more than 60 students are in residence—by far the largest group in recent memory. And our postdocs now number into the thirties. I am also delighted to report an increase in field-trip activities (see p. 10).

This flourishing interest in G&G no doubt reflects

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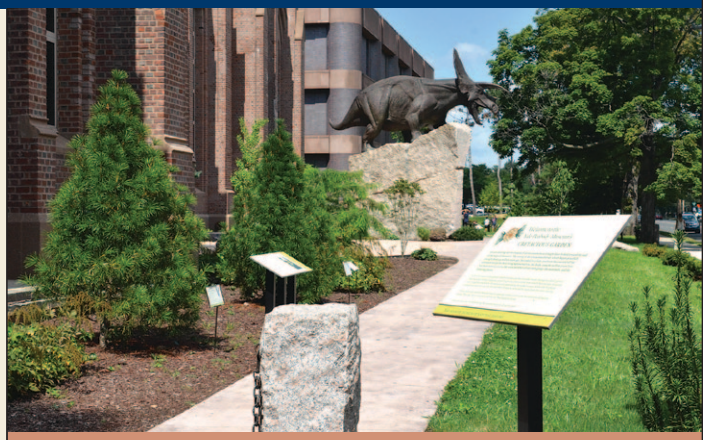

Peabody Museum Installs a "Cretaceous Garden"

The past year saw the completion of the first phase in the installation of Yale Peabody Museum's "Cretaceous Garden" exhibit, overseen by G&G Professor and Museum Curator Leo Hickey. The garden extends for nearly 150 feet along the Whitney Avenue side of the Peabody Museum and Kline Geology Building and features a life-size statue of *Torosaurus*, a relative of *Triceratops*, as well as a simulated dinosaur track-way along its center pathway and some 40 species of trees, shrubs and herbaceous plants belonging to Cretaceous genera or species.

The garden was conceived as an outdoor extension and introduction to Peabody's Great Hall of Dinosaurs so that visitors could get the idea of the size and dynamics of some of the plant and animal players on the Cretaceous landscape. Visitors traverse what is meant to represent a Cetaceous glade following the tracks of a young *Acrocanthosaurus*, a meat-

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our vigorous, multidisciplinary approach to science and burgeoning student interest in energy, climate, and our revitalized field programs. **Mark Brandon's** field-based project in The Apennines, featured herein, is just one example of how our faculty and their research groups are pushing back the boundaries of knowledge around the globe. **Mark Pagani** has been named the new Director of the Yale Climate and Energy Institute (YCEI), and G&G alum **Mike Oristaglio** is the new Executive Director. These exciting new appointments will ensure that G&G will be at the heart of climate and energy science at Yale for years to come.

The rapid growth that our department has experienced, however, has brought new challenges. Our expansion, coinciding as it has with the global financial downturn, is now putting enormous strains on our budget. If you have ever thought of helping G&G maintain its excellence in teaching, research, and outreach, now is the time to act! We have made it easier than ever to contribute by putting a new "Donate" link on our website: *http://earth.yale.edu.* If you prefer to use the mail then that of course is perfectly fine too—you'll find a mail-in gift form on page 26 of this newsletter. These funds will help in myriad ways, including support of undergraduate and graduate students and their research (including field work), and support of vital collegial activities such as departmental field trips. And as you visit our website, note the new front page "Department News" feature complete with pictures and in-depth stories that give insight into all that goes on here in G&G!

Please come and visit us here in New Haven—we would love to see you! During your stay, make sure to check out the new "Cretaceous Garden" installed by the Peabody Museum. This effort, led by **Leo Hickey**, recreates a Cretaceous glade and includes more than forty species of plants with ancient lineages stretching back over the past 65 million years.

Peabody *continued from page 1*

eating theropod dinosaur related to *Tyrannosaurus*. Interpretative signs tell the viewers how they can estimate how fast this predator walked across the glade as it adjusted its gait to avoid an encounter with the much larger *Torosaurus.* A plaza of ripple-marked sandstone blocks, quarried in Arizona especially for this exhibit, allows visitors to gather on what was once a river sandbar to view the *Torosaurus* statue that is the garden's centerpiece.

Thus far, over 40 species of plants, ranging from ferns, to conifers, to early flowering plants have been planted in the garden to represent a woodland clearing and the forest that surrounded it. As they did during the Cretaceous Period, conifers make up the majority of trees in the forest that surrounds the glade, with the flowering plants mostly occupying sunnier spots at the edge of the woods. Here and there the clearing is dotted with the trunks of an extinct group of plants called cycadeoids, which were probably crowded out in such open habitats by the rapidly proliferating flowering plants.

The label for each species of plant features an illustration of its fossil precursor, a short discussion of the geological history of the lineage, and some information about its present distribution and conservation status. Unfortunately, some of these plants, whose ancestors survived the asteroid impact that exterminated the dinosaurs and much of the rest of Cretaceous life, are critically endangered in our modern world.

One of the constraints in the design of the garden arises because the climate of the world during the Cretaceous was much warmer than that of present-day Connecticut. Thus, while the exhibit's planners would like to have included palms and cycads (not to be confused with cycadeoids) in the garden, the harsh reality of our winters prevent this, at least for a century or two. However, the garden does include many beautiful and unusual specimens such as the golden larch of China, the big tree (*Sequoiadendron*) of California, five species of Magnolia, the tulip tree, and the Methuselah of them all, the ginkgo, whose single living species appears unchanged from the Cretaceous Period, over 65 million years ago. The department cordially invites the readers of this newsletter to view this "taste of the Cretaceous" on your next visit to Yale.

—**Leo J. Hickey** (Leo.Hickey@yale.edu)

FACULTY RESEARCH

Active Tectonics at Yale

Mark Brandon
(mark.brandon@yale.edu)

The study of tectonics at Yale started with **James Dwight Dana**, whose research included the structure and evolution of mountain belts. But **Chester Longwell** and **John Rodgers**, who joined the faculty in 1920 and 1946, respectively, initiated the modern era of tectonics research at Yale. Their work emphasized field-based studies, and their papers and books made fundamental contributions to understanding thrust belts in the southwest Cordillera and Appalachians.

The field of tectonics has broadened over the years and has benefited by growth in the Department in the areas of petrology, geochemistry, and geophysics. About a year ago, we set up a new group called Lithosphere and Surface Processes. The idea is to capitalize on multidisciplinary approaches to geologic and tectonic problems.

At present, there are two of us on the faculty that study tectonics. **David Evans** (dai.evans@yale.edu) is interested in "deep time", using paleomagnetics to determine the evolution of the Earth's continental paleogeography. In contrast, my research is on active tectonic processes associated with modern plate boundaries. There are three aspects to this kind of research. The first is to find geologic settings to serve as natural laboratories, that is, places where tectonic processes can be studied using a laboratory style approach, with experiments, controls and variables. Of course, the experiments are actually accidents of geologic history. So the second task is to resolve the controls and variables in these experiments, which is done mainly by synthesis of existing geological and geophysical studies, but also with own studies, as needed. The third task is to analyze the experiment to understand its larger scientific relevance.I have been fortunate to work in many areas over the last 26 years while at Yale, including the Olympic Mountains in Washington State, Kamchatka in the Russian Far East, the South Island of New Zealand, the Swiss Alps, the island of Crete, the Apennines of Italy, and most recently, the Patagonian Andes. These ventures have included 13 PhD students, 10 postdocs, more than 15 G&G majors, and many other scientists outside of Yale. In this article, I will provide a summary of our most recent work in the Apennines and also some lab experiments were have been doing using sand to model tectonic deformation (Figure 1).

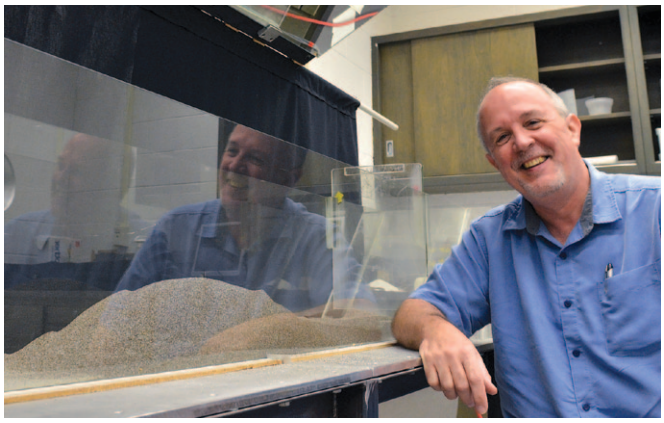

Figure 1. Mark Brandon at the "Beach", which is the lab we use for running experiments using deforming sand to study growth and erosion of mountain belts.

RETREAT Project in the North Apennines

Starting in 2002, I was lead investigator for a group of 11 scientists from 7 US universities and another 20 scientific collaborators for a multidisciplinary project to study active syn-convergent extension in the northern Apennines. The project was funded by the Continental Dynamics Program in the National Science Foundation. All good projects deserve a useful acronym. RETREAT stands for "Retreating Trench, Extension, and Accretion Tectonics".

The Apennines have long been recognized as an active thrust belt (Figures 2 and 3), formed by westward subduction of the Adriatic plate beneath the east side of the Apennine Mountain. Consider what you see on the two-hour

Figure 2. Subduction zones of the central Mediterranean. The RETREAT project focused on the northern Apennines, in the vicinity of Bologna and Pisa. **Jeff Rahl G' 05** (now Assoc. Professor at Washington and Lee) did related research on Crete, which overlies the Hellenic subduction zone.

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drive between Bologna and Pisa. The northeast flank of the Apennines is underlain by thrust faults that are accommodating the subduction of the Adriatic plate at a rate of about 3 mm/a. The M6.1 earthquake in May of this year was a tangible manifestation of this slowly moving thrust belt (the epicenter was 35 km north of Bologna). Tomographic images by the RETREAT seismology group, lead by faculty colleague **Jeff Park** (jeffrey.park@yale.edu), show that the Adriatic plate continues beneath the Apennines as a vertically dipping slab, extending to a depth of ~300 km. Apennine subduction started at 30 Ma, so the length of the slab suggests that subduction was faster in the past, at an average rate of ~10 mm/a.

From the crest of the Apennines, you see to the southwest a Basin-and-Range style topography. The city of Florence is located in one of the larger Tuscan grabens. This region is actively extending at present, driven by retreat of the Tyrrhenian plate at a rate of about 5 mm/a to the southwest.

You might wonder how we measure these rates. The GPS geodesy group, lead by Rick Bennett (University of Arizona), deployed some 33 GPS stations across the range, which provided displacements over a period of about 8 years. The geomorphology group, lead by **Frank Pazzaglia** (formerly a post-doc, now Department Chair at Lehigh University), was able to get an independent estimate of the subduction velocity using folded fluvial terraces on the Bologna side of the range.

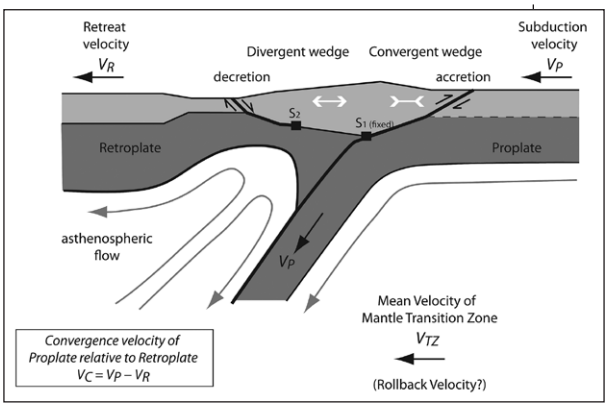

Figure 3. Schematic cross section of an orogenic wedge above a retreating subduction zone. Note that retreat is commonly thought to be related to rollback of the subducting plate. However, at the surface there is no way (and no need) to specify the absolute motions of the plates with respect to the deeper mantle. The nature reference frame is one that is fixed with respect to the point of mantle subduction (S_1). This interpretative model is the result of work by Sean Willett (ETH Zurich) and myself.

The schematic cross section (Figure 3) shows our tectonic interpretation. The mountainous topography of the Apennines is in a balance, defined by accretion of thrust slices beneath the Adriatic side of the range, and by "decretion" on the Tyrrhenian side of the range. The decretion occurs by southwestward stretching of the crust. This interpretation explains the asymmetric formation of the thin crust beneath the Tyrrhenian Sea, which was left in the wake of the Apennine subduction zone as it migrated northeastward from Corsica over the last 30 Ma.

A puzzling feature of the Apennines is that the retreat velocity V_r is greater than the subduction velocity V_p (Figure 2). In other words, one could replace this complicated tectonic boundary with an oceanic ridge, spreading at 2 mm/a. It turns out that subduction zones are easy to shear, but hard to pull apart. The reason is that the lower part of the subduction zone is surrounded by a fluid asthenosphere. The asthenosphere must flow into the interface for the plates to separate, but this requires a large force to produce the pressure gradient to drive this flow. In fluid dynamics, this phenomenon is called viscous adhesion. A familiar example is when you try to lift a flat object, such as a CD disk, from a smooth table. Commonly you have to slide the object to the edge of the table before you can lift it free. In other words, the interface is easy to shear but hard to separate. Thus, the overall divergence across this region has to be accommodated somewhere else in the system.

Karen Paczkowski G '12 worked on this problem as part of her PhD thesis at Yale. She considered how the upper plate lithosphere would respond to a steady rate of horizontal extension. It turned out that the initial response of the lithosphere is to develop large boudin-like structures (boudin is a French word meaning sausage). The analytical methods that she used were actually developed in the late 1970's by faculty colleague **Ron Smith**

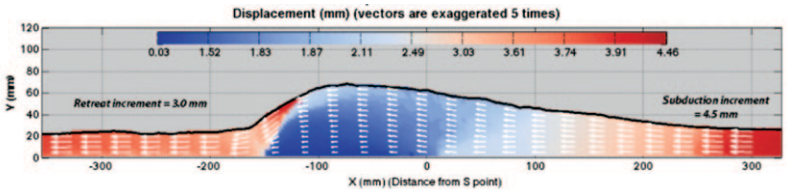

Figure 4. Displacement field for a sand wedge above a retreating subduction zone. The dimensions are all in millimeters. The arrows were determined using a digital optical method that tracks local particle paths between two digital images. This section shows the incremental displacements (arrows, exaggerated 5 time) resulting from a subduction increment of 4.5 mm. The color indicates the magnitude of the displacements, as shown in the color bar at the top. The subducting mylar "plate" drops down through a slot in base at 0 mm on the x axis, and the retreating mylar "plate" emerges from a second slot at -150 mm.

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(ronald.smith@yale.edu), who most of you will know for his research in atmospheric sciences. The necking associated with the boudinaged lithosphere is predicted to initiate at 100 to 200 km rearward of the subduction zone, which is consistent with where localized extension is observed in many retreating subduction zones (e.g., Marianna Islands, Crete in the Hellenic subduction zone).). The conventional explanation is that "back-arc" extension is localized by thermal softening associated with arc volcanism. The problem with this idea is that upper plate extension appears to start at the same time that the subduction zone is formed. There is not enough time to thermally soften the lithosphere. Furthermore, the subduction in the northern Apennines never produced any arc volcanism (presumably because the subduction has been too slow).

Figure 5. Quarries in the Carrara marble, located near Pisa, Italy. These marbles were deposited in the Jurassic as part of the Adriatic plate. They were accreted into the Apennine mountain range at about 25 Ma, and have moved to the back of the range over that last 25 Ma. It is interesting to note that the Carrara marble has been quarried continuously for more than 2000 years.

PhD student **Keith Ma** and undergraduates **Nat Wilson '09** and **Wendy DeWolf '14** are using sand to model the "double wedge" shown in Figure 2. Figure 1 shows an oblique view of our "sandbox" machine. Figure 3 shows a cross section of the deforming sand during one of our experiments. We represent the motions of the Adriatic and Tyrrhenian plates with sheets of mylar plastic. We start with a uniform layer of sand above the mylar plates. The mylar plates are driven by computer-controlled servo motors, which create a subduction velocity for the incoming mylar plate (right side of Figure 3) and a retreat velocity for the outgoing mylar plate (left side of Figure 3). These mylar plates are subducted and "educted" from thin slots in the table beneath the sand "crust". The basic idea here is that the mountain belts form by deformation of a weak crust that is underlain by moving rigid "mantle" plates. The displacement field shown in Figure 3 provides a good representation of the deformation observed in the Apennines, with horizontal shortening above the incoming plate and horizontal extension above the retreating plate. The model also illustrates the overall flux of accreted material from right to left. I am always impressed by the marble quarries near Pisa (Figure 5), which provided the raw materials for Michelangelo's Statue of David. The marbles are formed from Jurassic carbonates of the Adriatic plate. They were initially accreted at the Apennine thrust front and have migrated to the rearward of the mountain belt, as general front-to-back velocity shown in Figure 3.

Concluding Remarks

The Apennines provides one example of the kinds of problems the Active Tectonics group are working on. I want to close with a brief summary of other recent projects. Former PhD student **Devin McPhillips G '11** used thermochronology to determine the topographic evolution of the southern Sierra Nevada in California, and the evolution of the backfolding in the southern part of the Swiss Alps. Devin is now a NSF Postdoctoral Fellow at University of Vermont, where he is studying erosion in the Bolivian Andes. PhD student **Chris Thissen G '13** is using naturally deformed rocks to develop a quantitative flow law for pressure solution deformation in the crust. PhD students **Keith Ma** and **Elizabeth Brown**, together with undergraduates **Chelsea Willett '11**, **Wendy DeWolf '14**, and **Ryan Laemel '14**, are using various methods to measure long-term glacial erosion in the Patagonian Andes. PhD student **Patrick Young** is working on the influence of continental subduction on arc volcanism in the Aeolian Islands in southern Italy, and Graduate student **David Auerbach** is investigating methods for measuring paleoelevation in the Patagonian Andes. Finally, there is **Guangsheng Zhuang**, who has a departmental Bateman Postdoctoral Fellowship. He is working with faculty colleague **Mark Pagani** and myself on the application of organic geochemistry and stable isotopes to measure topographic evolution of northern Tibet over the last 15 Ma.

FIELD STUDIES

The Sons of Leo Get Distracted from their Normal Diet of Fossil Leaves

Ian Miller G '07 (right) and **Kirk Johnson G '89** (left) on site at Ziegler Reservoir near Snowmass Village, Colorado.

Kirk Johnson G '89

The students of Leo Hickey have studied Cretaceous and Paleogene plant fossils and their implications for paleoecology, paleoclimate, paleoelevation, floral evolution, and mass extinction. But for two of his students, **Kirk Johnson G '89** (kirk.johnson@dmns.org) and **Ian Miller G '07**, the time between October 2010 and July 2012 was a bit odd. Johnson is the chief curator and vice president for research at the Denver Museum where he has been since 1991 (see related note on page 18 about his new position as the Director of the Smithsonian's National Museum of Natural History) and Miller is the chair of the Earth Science Department at the Denver Museum of Nature & Science where he has been since 2006.

The Denver Museum is very active in salvage paleontology. This activity commenced in 1990 with the discovery of fossil palm fronds at the construction site for Denver International Airport. Subsequent discoveries of a partial *Tyrannosaurus rex* skeleton in a house construction site in Littleton in 1992; a mammoth tusk in a soil test trench in Littleton; a dinosaur rib from near home plate during the construction of the Colorado Rockies stadium in 1994; and the discovery of Paleocene tropical rainforest leaf litter along the side of Interstate 25 in Castle Rock, 30 miles south of Denver in 1994 all demonstrated that amazing fossils were just below the surface in the Denver metro area. These finds grew popular interest in paleontology and pushed local people to enroll in the Museum's Certification Program in Paleontology which generated a steady stream of citizen scientists who began to volunteer for the Earth Sciences department. These volunteers worked in the collections, the lab and the field.

By 1998, Johnson had discovered over 100 fossil leaf sites in the Denver area and the resulting science had grown into to a full blown project to understand the geology, paleontology and hydrogeology of the Denver Basin. In 1999, the Museum drilled and cored a 2226-ft deep well in the center of the Denver Basin and had located the K-T boundary at a depth of 994 feet below the surface. Palynology and magnetostraigtraphy from the well allowed Johnson and his growing team of volunteers to correlate and date a growing number of fossil sites. In 2003, one of the volunteers discovered a superb *Triceratops* skull in a construction site in Brighton, Colorado. In 2009, two teen-aged boys found the lower jaw of Colorado's third known mastodon. By 2010, more than 250 amateur paleontologists had graduated from the Certification Program and the Earth Science department had over 200 trained and active volunteer citizen scientists.

Three contractors, three mastodon tusks, and one D6 bulldozer on October 28, 2010.
Photo credit: Mark Gould

On October 14, 2010, a bulldozer operator named Jesse Steele uncovered a mammoth skeleton while deepening a drained reservoir near Snowmass

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The Denver team on July 1, 2012 after 70 days of solid excavation.

Village, less than 10 miles from Aspen, Colorado. The Museum dispatched a team to inspect the site and they confirmed the presence of a beautifully preserved Columbian mammoth. Ian visited the site a few days later and began the negotiation to begin an excavation. On October 27, Miller, Johnson and Museum archaeologist, Steve Holen, visited Snowmass Village to conclude the negotiation and plan the excavation. While they were visiting the site, the dozer operator pushed a pile of dirt at a lower level and exposed a large limb bone and it became clear that the site was more than a single animal. The next morning, workmen found three tusks and a tooth of an American mastodon.

By November 4, Ian and Kirk had deployed 40 volunteers to the site and were busy assembling a team of Quaternary scientists. Within days they had recovered bones from more mammoth and mastodon as well as Jefferson's Ground sloth and the massive *Bison latifrons.* They also found well-preserved logs, cones, leaves, insects, and salamanders. The site was curious. It was an in-filled glacial lake on the 8725-ft divide between two valleys. Initial radiocarbon dates, the presence of the *Bison latifrons*, and geologic mapping all suggested that the lake was created in the Illinoian glaciation and filled during the Sangamon interglacial and early Wisconsin glaciation. Heavy snowfall and freezing ground drove the team back to Denver by November 17.

They returned in force on May 15 with a well-organized crew that ranged from 40-70 diggers a day. They dug through late spring snows, through the mud season and up until the 4th of July weekend. When all was said and done, the Denver team had logged 3,200 person days of digging in 70 calendar days and had moved more than 8,000 tons of sediment by shovel. They recovered more than 5,426

The magnificent *Bison latifrons* skull found on November 4, 2010.

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large bones and countless small bones, fossil plants, and microfossils. Preliminary radiocarbon, optically stimulated luminescence, and cosmogenic dates show that the site accumulated sediment from roughly 130,000 to 40,000 years ago. Pollen, spores, and chironomid midges are presently being analyzed to generate a paleoclimate record for the Colorado Rockies.

These exploits were featured on NOVA on February 1, 2012 in a show called Ice Age Death Trap. In March, Johnson and Miller's book, "Digging Snowmastodon: Discovering an Ice Age World in the Colorado Rockies," was published by the People's Press in Aspen. In June, 2012, the Snowmastodon science team, composed of 42 scientists from 19 institutions in 4 countries met in Denver for a 3-day meeting to assemble the data and begin the process of publishing the science. The project can be followed on www.snowmastodonproject.com.

Ian and Kirk have now returned to their day job of fossil leaves. Ian is leading the Museum's field effort in the Grand Staircase Escalante National Monument in southern Utah and Kirk is relocating turn of the century fossil sites in Alaska where he is working with Alaskan artist, Ray Troll, on a book about the deep time history of the west coast of North America.

A Yalie Loose in Afghanistan Evaluating Potential Mineral Resources

Bob Tucker G '85 (foreground) and villagers at the Balkhab volcanogenic massive sulphide deposit, Sar-i-Pol Province, Afghanistan (November 2009).

R.D. Tucker G '85

Beginning in 2004, and continuing to the present day, the U.S. Geological Survey (USGS), U.S. Department of Defense (DoD), and the Afghanistan Geological Survey (AGS) have been working to identify and quantify the mineral resources of Afghanistan for competitive development by private industry. The identified resources include deposits of copper, iron, gold, and the rare earth elements estimated by some to be valued as high as ~ $1-3 T (USD). Independent analysts within the Departments of Defense and State believe that exploitation of Afghanistan's mineral deposits is a key to that nation's future. Today, Afghanistan has a gross domestic product of just over $100 billion, nearly all of it as direct assistance from foreign governments. With over a trillion dollars of estimated wealth beneath its surface, Afghanistan has the potential to produce sustainable wealth, create jobs, secure its borders, and become an economically sovereign nation.

Although stories of mineral wealth in Afghanistan have been circulating in academic journals and the popular press, little is reported about Yale University's connection to the project. Among the small group of American geoscientists tasked to evaluate the Afghan resources is **Bob Tucker G '85**, whose reports of the Haji-Gak (iron), Aynak, Balkhab, Shaida, Dusar (Cu,Co, Pb, Zn), and Khanneshin (REE) deposits are a highlight of the USGS research. "Together with my USGS colleagues," says Tucker, "we have identified somewhere between 10 and 12 world-class deposits of copper, gold, iron ore, and the rare earth elements. In our 2012 publications (http://afghanistan.cr.usgs.gov/minerals), we estimated the tonnage and grade for some of these and... you can add these up to calculate an estimated wealth... But the important thing is that Afghanistan has many mineral deposits of exceptional quality... and we, as scientists, have made an important contribution in showing the Afghan people a possible path forward."

"For me, it was the process of discovery and evaluation which I value most," said Tucker. "Whereas my previous academic research focused exclusively on topical issues—the regional setting and age of

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U.S. Marine silhouetted by the volcanic mountains of the Khanneshin (carbonatite) massif, Helmand Province, Afghanistan (February 2011).

R.D. Tucker G '85 (blue ski hat) and Ted Theodore (facing away) at the enormous Haji-Gak iron ore deposit, Bamian Province, Afghanistan. Special Forces security detail in the background. (November 2009).

the rocks, aspects of their metamorphic and igneous petrology, matters related to student instruction and training—the Afghan project forced me to focus on entirely new subjects: What is the nature and magnitude of the geochemical anomaly? What are the ore-bearing minerals and how did they form? Is the anomaly significant enough to be economically prospective ?" "It was a real learning experience" says Tucker "one that made me think back to my days at Yale." "Brian Skinner's lectures, with his emphasis on clarity of thought and the practical, economic aspects of geology, greatly influenced my attitude" said Tucker, "and as a geologist, trained by John Rodgers, I was quite prepared for rigorous field work ...but I never anticipated doing geological prospection in an active war zone."

The field work was definitely challenging. With little more than Kevlar vests and Special Forces personnel for protection, the USGS geologists were dropped into rugged terrain by helicopter and given a few hours to evaluate each site. In the case of the Khanneshin REE deposit, that meant walking over 5 km to a potential occurrence high in a carbonatite volcano, with temperatures approaching 100° F, and making it back to the drop site for the helicopter flight to Camp Leatherneck. In total, Tucker spent over a hundred days in the mountains of Afghanistan working in most of the major sites currently tendered or up for auction in 2013. With most of their work behind them, the efforts of the consortium USGS-DoD-AGS are starting to pay off as Chinese and Indian investors have already injected over $3 billion (USD) into deposits of copper (Aynak) and iron (Haji-Gak), and in June 2012, officials from the Afghanistan Ministry of Mines opened for tendering deposits of gold (Badakhshan and Zarkashan) and copper (Balkhab and Shaida). Tendering of the highly-prized Khanneshin REE deposit may begin in 2013. Once the bids are awarded, and US troops have departed, the challenge of developing their resources remains with the Afghan people. That includes developing the human, economic, and political infrastructure of Afghanistan, as well as the physical infrastructure of water, transportation, and power.

The 2010 field crew, Khanneshin massif, Helmand Province, Afghanistan. Left to right: Mark King (DoD security detail), R.D. Tucker, G '85 and Mike Chornak (USGS), Eric Clark (Special Assistant to Deputy Under Secretary Paul Brinkley, DoD), Emily Scott (Minerals Program Coordinator, Task Force for Business and Stability Operations, DoD), Forrest Horton (TFBSO) (August 2010).

FIELD TRIPS

G&G111La to Quebec and the Maritme Provinces, Canada

This academic year, Yale College instituted a new Fall recess, from Tuesday to Sunday in late October. An anonymous donor to the College provided support for class-related field trips, vetted by a competitive proposal process administered by the Dean's office. As part of the introductory G&G 110a class ("Dynamic Earth," for many years taught as "Physical Geology") and the newly separated half-credit laboratory class G&G 111La, Profs. David Evans and Mark Brandon led thirty students into eastern Canada for the entirety of the vacation. Highlights included a cross-section of the Quebec Appalachian foreland, including the Thetford Mines ophiolite suite, and several geological sites along the Bay of Fundy in Nova Scotia. In the latter region, the group was joined by Prof. Brendan Murphy and students, from St. Francis Xavier University, who led discussions of ancient and modern geology in the Canadian Maritime Provinces. Throughout the trip, the weather cooperated magnificently, and the group returned to campus just in time to brace for hurricane Sandy's arrival.

Professor Mark Brandon leading a discussion on oceanic lithosphere atop the Vimy harzburgite ridge near Thetford Mines, Quebec. Asbestos tailings piles are visible in the distance.

Hard-hat safety along the cliffs at Joggins Fossil Cliffs UNESCO World Heritage Site, Nova Scotia. The site is famous for its Carboniferous in-situ (standing) tree-like flora and some of the earliest terrestrial animal fossils.

Brisk morning hike along the Chaudiere River, south of Quebec City. The outcrop illustrates deformed Cambrian strata of the Laurentian continental margin, as well as impressive modern fluvial features of the St Lawrence watershed.

Triassic redbeds along the Bay of Fundy coastline, Nova Scotia. The group had just forded around steep coastal cliffs, through waist-high water of a rapidly rising tidal surge.

FIELD TRIPS

Field trip to Northeastern Pennsylvania, October, 2012

In the Lehigh Anthracite pit. The object of attention is a fragment of a fossilized tree trunk from the shale unit immediately above the main anthracite layer.

Rusty Taylor, President of Lehigh Anthracite, explains the mining procedures used to recover anthracite from a stratum dipping at 50 degrees

Students in Geology and Geophysics 274A, "Fossil Fuels and Energy Transitions", taught by Michael Oristaglio and Brian Skinner, traveled to Pennsylvania for a two-day introduction to coal mining and the production and distribution of shale gas. They first visited the operations of Lehigh Anthracite in Tamaqua, and the next day examined the gas cleaning and distribution center of Williams Energy, and the gas production and water recycling operation run by Carizzo Oil. Carizzo produces gas from the Marcellus Shale near Montrose.

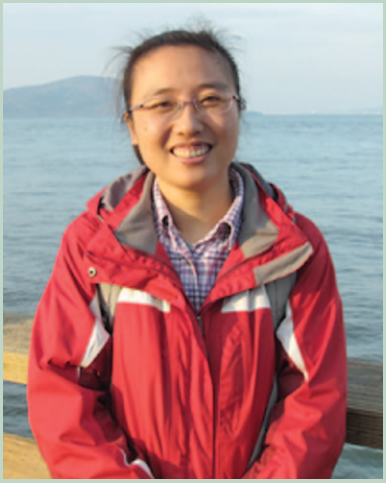
Field Work in Peru

Maureen Long has a field based project in Peru that relies on seismic data collected from various sites. The data are stored in the instruments and must be read periodically, requiring Maureen and/or her students to travel to Peru and download the information.

Reading the record stored at a seismic station.

Graduate student Caroline Eakin (Left) and Jennifer Kasbohm '12, in eastern Peru, above the headwaters of the Amazon.

VISITING FACULTY FROM OTHER INSTITUTIONS



Haiyan Li (haiyan.li@yale.edu) is an Associate Professor of Geology and Geophysics at China University of Geosciences (Beijing) (CUGB). Her research focus is on rock magnetism and environmental magnetism of the Ediacaran Doushantuo Formation (ca. 635 Ma – 551 Ma) in South China, in order to distinguish the main magnetic minerals in these limestone-dolomite ribbon carbonates and to reveal the past environmental changes. Haiyan is currently working with David Evans (dai.evans@yale.edu).

Xiaohu Li (xiaohu.li@yale.edu) is an Associate Professor, working in the Second Institute of Oceanography (SIO), State Oceanic Administration (SOA), China. Xiaohu will be working with Zhengrong Wang (zhengrong.wang@yale.edu) focusing on mineralization processes of hydrothermal sulfide deposits at the Southwest Indian Ridge (SWIR) and East Pacific Rise (EPR) using Cu, Fe and Zn isotope geochemical methods.

Monia Marti Mus (martimus@unex.es) is a Professor in the Paleontology Section, at the University of Extremadura, Spain and she is collaborating with **Derek Briggs** (derek.briggs@yale.edu). She works on early, problematic shelly fossils, mostly from the Ediacaran and early Paleozoic. Her research focuses on their functional morphology and phylogenetic relationships.

Bo Wang (bo.wang@yale.edu) is an Assistant Professor at the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences. Dr. Wang is currently working with **Derek Briggs** (derek.briggs@yale.edu) in the area of the taphonomy of insects from China. This research focuses on three topics: preservation patterns of some important insects; formation of pyritized insects from the Early Cretaceous Jehol Biota; preservation of color bands in wings of fossil insects.pesticides in soils and water systems with the aim of characterizing oxygen isotope values of the phosphate in relation to natural biodegradation processes.

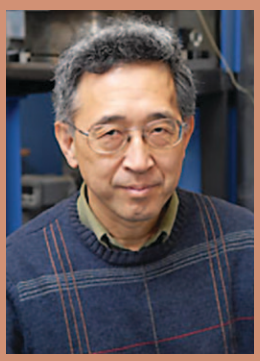
RECENT AWARDS & HONORS: FACULTY


Jay Ague

Congratulations to **Jay Ague** (jay.ague@yale.edu) who has been asked to deliver a high-profile talk at the AGU Fall meeting in San Francisco, December 2012. Jay, who tentatively plans to speak about aspects of the natural carbon cycle, will join a distinguished line of scientists who have delivered the AGU's Daly Lecture, part of a series known as the Bowie Lectures. The Daly Lecture is the core talk in the AGU's volcanology, geochemistry, and petrology section. Ague will likely address "what we know, and what we need to know, about the chemical reactions that release carbon dioxide, methane, and water in the deep crust of the Earth during mountain building some 20-50 miles below the surface."


Robert Berner

Congratulations to **Robert Berner** (robert.berner@yale.edu) a double header, he was awarded the Vernadsky Medal of the International Association of Geochemistry (IAGC) at the Goldschmidt Conference in Montreal, June 2012. The Vernadsky Medal is awarded "biennially to a single person for a distinguished record of scientific accomplishment in geochemistry over the course of a career." As this newsletter was going to press, The Franklin Institute announced that Bob is to receive the 2013 Benjamin Franklin Medal in Earth & Environmental Science. The award is "for deepening our understanding of the earth system through studies of the elements of geologic processes and the influence on the atmosphere and ocean."


Shun Karato

Congratulations to **Shun Karato** (shun.karato@yale.edu) who was elected to Fellowship in the Mineralogical Society of America. Professor Karato was also awarded the "Science Lecturship Award" from Chiba University on October 19th. He was the second Earth scientist to receive this award (the first was Steve Sparks of the UK in 2006). This award started in 2005 and goes to one scientist per year. Previous awardees include Harold Kroto (Chemistry, 2008 and Frank Shu (Astronomy, 2005). And the award includes a bottle of "sake"!


Jun Koorenaga

Congratulations to **Jun Korenaga** (jun.korenaga@yale.edu) for being a finalist for the Blavatnik Award for Young Scientists, presented by the New York Academy of Sciences in November 2011.

Congratulations to **Maureen Long** (maureen.long@yale.edu) who has won a Career Award from the National Science Foundation, for her continuing study of the Earth's interior. The Faculty Early Career Development (CAREER) Program is the National Science Foundation's most prestigious awards program in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research. An expert in the structure and dynamics of the Earth's mantle, Long has focused on subduction zones—where one plate dives beneath another plate into the mantle. "These are very important features on Earth's surface, because they are prime sites for earthquakes, volcanoes, and tsunami hazards," she said. "Subduction is important for understanding how the Earth's deep interior works, because subducting slabs are a major driver for mantle processes." The grant will support her group's study of the way subducting plates interact with surrounding mantle as they sink from the surface. "It's crucially important to understand this interaction if we are going to understand the Earth's mantle as a dynamic system."


Maureen Long

Ron Smith

Congratulations to **Ron Smith** (ronald.smith@yale.edu) for being the 2012 recipient of the Harward Byrnes / Richard Sewall Teaching Prize. To quote the letter from Dean Mary Miller to Ron: "I am delighted to inform you that you have been chosen by the Committee on Teaching, Learning, and Advising to receive the 2012 Harwood F. Byrnes/ Richard B. Sewall Prize Teaching Prize, one of six Yale College prizes awarded in recognition of distinguished undergraduate teaching. *This prize is one of the highest honors for teaching that Yale College can bestow...*" Ron's class is also the first online course for the department http://oyc.yale.edu/geology-and-geophysics

Ellen Thomas

Congratulations to **Ellen Thomas** (Ellen.Thomas@yale.edu) who is this year's recipient of AGU's Maurice Ewing Medal. This is one of AGU's top honors. It is awarded "for significant original contributions to the scientific understanding of the processes in the ocean; for the advancement of oceanographic engineering, technology, and instrumentation; and for outstanding service to the marine sciences."

RECENT AWARDS & HONORS: STUDENTS

Congratulations to **Jennifer Axler** (jennifer.axler@yale.edu) for winning the Mineralogical Society of America Undergraduate Award for excellence in the field of mineralogy in her senior year at Smith College.

Jennifer Axler

Congratulations to **Simon Darroch** (simon.darroch@yale.edu) who was awarded a Smithsonian Predoctoral Fellowship to spend the Fall semester 2012 at the National Museum of Natural History Department of Paleobiology. Simon's advisor is Derek Briggs.

Simon Darroch

The Yale Peabody Museum of Natural History (YPM) awarded its George Gaylord Simpson Prize for 2011 to **Una Farrell G '12** (ufarrell@ku.edu), for her submission entitled "Paleoecology of the Olenid Trilobite *Triarthrus:* New Evidence From Beecher's Trilobite Bed and Other Sites of Pyritization." Una's advisor was Derek Briggs. YPM's George Gaylord Simpson Prize is awarded annually to a Yale University graduate student or recent doctoral candidate for a paper concerning evolution and the fossil record. The prize is named for George Gaylord Simpson (1902-1984; G '26) one of the most influential paleontologists of the 20th century and a major proponent of the modern evolutionary synthesis.

Una Farrell

Una is now working at the Biodiversity Institute, University of Kansas, as a collection manager for the Invertebrate Paleontology collection. Her main project right now is to database and georeference specimens (http://biodiversity.ku.edu/newsroom/project-digitize-ancient-fossils-could-clarify-influence-climate-change). She's also finishing up some work on the geochemistry of the Beecher's Bed site.

Congratulations to **Daniel Field** (daniel.field@yale.edu) who was awarded both the NSERC (Natural Sciences and Engineering Research Council of Canada) Canada Graduate Scholarship worth three years of funding, and the masters and doctoral level Sir James Lougheed Award for research funds.

RECENT AWARDS & HONORS: STUDENTS


Daniel Field

Woosok Moon (woosok.moon@yale.edu) was awarded a Yale Institute for Biospheric Studies Dissertation Enhancement Award for his research: *Arctic Sea Ice: Trends, Stability and Variability.* Woosok's advisor is John Wettlaufer.


Woosok Moon


Alison Nugent

Congratulations to **Alison Nugent** (alison.nugent@yale.edu) who won second prize at the 15th Conference on Mountain Meteorology in Steamboat Springs, Colorado, sponsored by the American Meteorological Society, for her presentation "Orographic initiation of moist convection in the tropics."

Congratulations to **Rachel Racicot** (rachel.racicot@yale.edu) who was awarded a Yale Institute for Biospheric Studies Dissertation Enhancement Award for her research: *Phylogenetics of Dolphins and their Relatives (Cetacea: Delphinoidea): Evolution and Diversification of Extant and Fossil Delphinoids as Depicted by Inner Ear.* Rachel's advisor is Jacques Gauthier.


Rachel Racicot

Congratulations to **Srikanth Toppaladoddi** (srikanth.toppaladoddi@yale.edu) who was accepted as a Fellow in the GFD Summer Program at Woods Hole Oceanographic Institution. Graduate students and researchers from a variety of fields who share a common interest in the nonlinear dynamics of rotating, stratified fluids participate in an intense ten-week research experience which includes vigorous discussions of concepts that span different disciplines. Fellows pursue a research project under the supervision of the staff and present a lecture and a written report for a proceedings volume. Srikanth's advisor is John Wettlaufer.


Srikanth Toppaladoddi


Courtney Warren

Congratulations to **Courtney Warren** (courtney.warren@yale.ed) for receiving a YCEI Research Grant. The YCEI Interdisciplinary Research grants aim to promote research projects that provide innovative approaches as well as practical and implementable solutions to climate change and future energy needs. Research projects with collaborations that transcend traditional research boundaries are strongly preferred. This project represents an interdisciplinary collaboration between the Departments of Geology and Geophysics, Ecology and Evolutionary Biology, and Engineering. It primarily funds the thesis work of Courtney Warren, a PhD candidate in organic geochemistry working with Mark Pagani on evaluating the biological underpinnings of biogeochemical proxies used in temperature reconstructions of ancient climate systems.

Congratulations to **Yi Ge Zhang** (yige.zhang@yale.edu) who received a Schlanger Fellowship (U.S. Science Support Program for International Ocean Drilling Program) from June 1, 2012 to May 31, 2013 for his research


Yi Ge Zhang

project entitled: "Late Miocene-Pliocene Evolution of the Pacific Warm Pool and Cold Tongue: Implications for El Nino."

Shikma Zaarur

Congratulations to **Shikma Zaarur** (shikma.zaarur@yale.edu) who was awarded a Yale Institute for Biospheric Studies Dissertation Enhancement Award for her research: *U- and Th-bearing phases in aquifer host rock- source for high radium activity in the Nubian Sandstone aquifer.* Shikma's second discourse advisor is Jay Ague.

The **Von Damm Fellowships** were endowed by the late **Karen Von Damm '77**, to support undergraduate field research and field trips.

Von Damm Fellowship recipients for 2012:

Catherine Chamberlin '12, Using delta-D in biological n-alkanes for altimetry purposes in New Zealand (advisor: Mark Pagani). **Wendy DeWolf '14**, Retro-wedge dynamics in a sandbox model (advisor: Mark Brandon). **Sarah Ditchek '14**, A monsoon depression genesis potential index (advisor: Bill Boos). **Lucila Dunnington '12**, Impact of mineral reactions on porosity during carbon sequestration in low-permeability rocks (advisor: Jay Ague). **Jennifer Kasbohm '13**, Mesoproterozoic magnetostratigraphy in southern Namibia (advisor: David Evans). **Pearson Miller/Yale Drop Team '14**, Taylor instability in various gravities (advisor: John Wettlaufer). **Eli Mitchell-Larson '13,** Isotopic characterization and paleoclimate reconstruction from nontropical Mediterranean corals (advisor: Mark Pagani).

STUDENT NEWS

Congradulations to the graduate students who were awarded their PhDs within the past year.

May 2012 PhD Graduates:

Matthew Benoit's thesis was "Multiphasic Allometric Analyses of the Felidae: Addressing Variation and Covariation in Endangered and Extinct Populations" and his advisor was Elisabeth Vrba. Matt is currently a Visiting Assistant Professor in the W. M. Keck Science Department at Claremont McKenna College in Claremont, California.

Melanie Parker's thesis was "Ocean Response to Wind Perturbations: Implications for ENSO and Decadal Climate Variability," and her advisor was Alexey Fedorov. Melanie is working as a Research Scientist at AIR Worldwide in Boston.

December 2012 PhD Graduates:

Tyler Lyson's thesis was "The Origin of Turtles and their Enigmatic Shell: Insights from Morphology, Molecules and Development," and his advisor was Jacques Gauthier. Tyler is now at the Smithsonian National Museum of Natural History for a two-year postdoc, working with Kevin de Queiroz.

Kazuhiko Otsuka's thesis was "Core-Mantle Chemical Interactions Caused by Trans-Crystalline Melt Migration," and his advisor was Shun Karato. He's now working in the Boston Consulting Group in Tokyo.

Karen Paczkowski's thesis was "Dynamics of the Sub-Slab Mantle for Subduction Systems with Trench Migration," and her advisor was Maureen Long. Karen is working as an engineer at Hamilton Sundstrand, a division of UTC located in Windsor Locks, Connecticut. She's applying the fluid dynamics and thermodynamics analysis skills she learned during her PhD to design airplane systems that keep the airplane cabins and flight decks pressurized and comfortable (at the correct temperature and humidity).

Congratulations to the seniors who graduated in the class of 2012:

Nicolas Casasanto's senior essay was "Frack Attack: Weighing the Debate over the Hazards of the Shale Gas Production" (Advisor: Jay Ague). Nico will be teaching chemistry at the Oundle School (in the town of Oundle, UK) under the Peter Ling Fellowship.

STUDENT NEWS

Catherine Chamberlin's *(Chemistry major)*, senior thesis was "Using ĐD in Biological *n*-Alkanes for Altimetry Purposes in New Zealand" (Advisor: M. Pagani). Cathy will be in Russia with a year-long Fullbright English Teaching Assistantship.

Margaret McCall's senior thesis was "Changes in the Character of the Pacific Water in the Central Canada Basin from 2004-2012" (Advisor: Mary-Louise Timmermans). Margaret is moving to Denver for a fellowship as an environmental advocate for two years, working with Environment Colorado.

Lucila Dunnington's senior thesis was "Mineral Reactions During Natural Carbon Sequestration in Low-Permeability Rocks" (Advisor: Jay Ague).

Joseph O'Rourke's senior thesis was "Terrestrial Planet Evolution in the Stagnant-Lid Regime: Size Effects and the Formation of Self-Destabilizing Crust" (Advisor: Jun Korenaga) This summer, Joe was a space policy intern at the National Research Council. Beginning this fall, he will be a graduate student in planetary science at the California Institute of Technology.

Daksha Rajagopalan's *(Physics major),* senior thesis was "Characterizing Fjord Oceanography Near Tidewater Glaciers Kronebreen and Kongsvegen, in Kongsfjorden, Svalbard" (Advisor: Mary-Louise Timmermans) Daksha has begun her Master's degree in Glaciology at Aberystwyth University in Wales.

Rick Russotto's senior thesis was "Microphysical Modeling of Cloud Droplet Activation over Dominica" (Advisor: Trude Storelvmo). Rick is now at the University of Washington working toward a PhD in Atmospheric Sciences.

POSTDOC NEWS

Over the past several years, the Department's postdoctoral program has grown rapidly, and currently numbers 30 members. The growth has fueled a bi-weekly postdoctoral seminar series that is popularly attended by not only other postdoctoral fellows, but also faculty and students, both undergraduate and graduate. The influx of postdocs began with a few prestigious departmental fellowships, namely the Wells, Bateman and Flint Fellowships and, more recently, the Interdepartmental and YCEI Fellowships. Now, with the program proceeding nicely, most postdocs are either paid by PI's grants or have other fellowships that they have been individually awarded. Unfortunately, we sense troubles ahead. With the recent budgetary woes of the university, we have not been able to award any new departmental postdoctoral fellowships for the year ahead, but we hope this will change in the near future.

Upon leaving Yale, our postdocs have been very successful, with many securing tenure-track faculty positions and other positions of note in industry, museums, and research communities. We are proud of the vibrant community that has formed in the Department, in part due to the presence and creativity of the postdoctoral fellows.

Kanani K. M. Lee (kanani.lee@yale.edu)
Director of Postdoctoral Affairs

Yahya Al-Khatatbeh (yalkhatatbeh@simons-rock.edu who was working with Kanani Lee is a Visiting Assistant Faculty and Research Associate, Bard College at Simon's Rock, in the Department of Science, Mathematics & Computing.

Congratulations to **Colin Cooke** (Colin.Cooke@yale.edu) on being selected for a Postdoctoral Scholar Travel Fund award for attendance at the Goldschmidt Geochemistry Conference in Montreal, Canada June 2012. Colin is an Interdepartmental postdoc working with Jay Ague in Geology & Geophysics and Richard Burger from the Department of Anthropology.

Hendrik Hansen-Goos (Hendrik.Hansen-Goos@dlr.de) who was working with John Wettlaufer, is now a Research Scientist at the Institute of Planetary Research in Berlin.

Joachim Haug (joachim.haug@uni-greifswald.de) was awarded the Horst Wiehe Award from the German Zoological Society. This is a biennial award for the best PhD thesis in zoology. Joachim was working with Derek Briggs, and is currently a Feodor-Lynen Postdoctoral Fellow at Zoological Institute and Museum, University of Greifswald in

POSTDOC NEWS

Germany. Joachim and Caroline Haug's website is: http://www.palaeo-evo-devo.info

Tobias Kluge (t.kluge@imperial.ac.uk) who was working with Hagit Affek, is doing a postdoc in the lab of Cedric John at Imperial College, London, where he is helping to build a new clumped isotopes lab. He continues interacting with us through several papers that are in the works, and a potential new collaboration between the Imperial College and the Yale labs.

Maria McNamara (maria.mcnamara@yale.edu) who was working with Derek Briggs, will be moving to Bristol, UK to take up a 3-year NERC position at the Department of Earth Sciences, University of Bristol, working on the evolution of feathers and their coloration.

Justin Minder (justin.minder@yale.edu) who was working with Ron Smith, is an Assistant Professor at SUNY Albany in the Department of Atmospheric and Environmental Sciences.

Lowell Miyagi (lowell.miyagi@montana.edu) who was working with Kanani Lee, is a Adjunct Assistant Professor at Montana State University (http://www.montana.edu/wwwes/facstaff/miyagi.htm) for the time being. In January 2013 he will begin as a tenure-track Assistant Professor at University of Utah.

Johanna Salminen (johanna.m.salminen@helsinki.fi) who was working with Dave Evans, is a research scientist at the University of Helsinki. Her position is only until next February, and she's on the job hunt now. She and Dave just completed a successful paleomagnetic sampling trip to Angola.

Florian Sevellec (florian.sevellec@noc.soton.ac.uk) who was working with Alexey Fedorov, is a Lecturer in Physical Oceanography at the School of Ocean & Earth Sciences at the University of Southhampton in the UK.

Yuejian Wang (ywang235@oakland.edu) who was working with Kanani Lee, is an Assistant Professor of Physics at Oakland University.

Jin-Qiang Zhong (zhongjinqiang @gmail.com) who was working with John Wettlaufer, was the recipient of the "Recruitment Program of Global Young Experts" awarded by the Chinese National Program. The program recognizes outstanding young research scientists who have worked overseas and return to China. The recipients are honored with a title in Chinese "Qing Nian Qian Ren" and awarded $ 0.5 million to establish their research projects in China. Jin-Qiang has recently started his faculty position at TongJi University and is establishing a new fluid dynamics laboratory. He is a professor in the Dept of Physics.

RECENT AWARDS AND HONORS: ALUMNI

Congratulations to **Don Canfield G '88** (dec@biology.sdu.dk) for election to Fellowship in the American Geophysical Union.

Donald Canfield

Congratulations to **Kirk Johnson G '89** (Kirk.Johnson@dmns.org) chief curator and vice president of research and collections at the Denver Museum of Nature & Science, who has been appointed the Director of the National Museum of Natural History, effective October 29, 2012. As a vice president of the Denver Museum of Nature & Science, Johnson was part of a team that led the museum and managed its $40 million annual budget.

Kirk Johnson

RECENT AWARDS AND HONORS: ALUMNI

The museum receives 1.4 million visitors per year and has a staff of 400. "Kirk brings an established national and international reputation as a top scientist, educator and museum administrator to the National Museum of Natural History," said Wayne Clough, Secretary of the Smithsonian. "He is a perfect match to lead the museum—among the very best in the world—into the next decade."


Kenneth Pierce

Congratulations to **Kenneth Pierce G '64** (kpierce@usgs.gov) U.S. Geological Survey Geologist Emeritus, who has been selected as the recipient of the Distinguished Career Award of the American Quaternary Association (AMQUA), to be presented at the 2012 Biennial Meeting in Duluth, Minnesota. The American Quaternary Association Distinguished Career Award recognizes an outstanding researcher of the Quaternary Period, or the last 2.6 million years, who has contributed significantly and steadily to the advancement of the Quaternary sciences. "It is the culmination of any scientist's career to receive the highest award from his scientific peers for his life's work," explained USGS Director, Marcia McNutt. "I want to personally congratulate Dr. Pierce for this remarkable achievement and to thank him for the honor that it brings to all of us at the USGS."

Ken has also been selected to receive the Distinguished Career Award of the Quaternary Geology and Geomorphology Division of the Geological Society of America. He will receive this award at the same time he receives the award from the American Quaternary Association—November 2012.

Ken received his doctoral degree in 1964 and joined the USGS regional office in Denver in 1965, where he spent almost 35 years of his career. In 2000, he moved to the USGS Northern Rocky Mountain Science Center (NOROCK) in Bozeman, Montana, to focus on research in the Yellowstone region. He officially retired in 2003 and remains in active emeritus status at NOROCK.

Dr. Pierce's work spans much of the fields of Quaternary geology and geomorphology, especially natural landscapes and the geologic processes responsible for their formation.


Bob Tucker

Congratulations to **Robert Tucker G '85** (rtucker@usgs.gov) for being elected a Fellow of the Geological Society of America.

ALUMNI NEWS


David Meyer with students including Jessica Bazeley Utrop (middle) who is a curator at YPM now and Austin Hendy (far right) who was a postdoc at Yale.

David Meyer, **G '70** (meyerdl@ucmail.uc.edu) writes: This year I am retiring from full time teaching at the University of Cincinnati after 37 years! I will continue teaching for five more years thanks to a phased retirement plan under which I will have one course per semester plus my research. What have I been doing since defending my PhD at Yale in fall of 1970? A post-doc with the Smithsonian led me to Panama where a four-month stay turned into four years with the Smithsonian Tropical Research Institute doing tropical marine ecology. In 1975 I joined the Geology faculty at the University of Cincinnati, the job in paleontology I had hoped for. Cincinnati has been an ideal place for me as we sit on some of the most fossiliferous strata in North America that have been the focal point for some of my research. In 2009 I published a book with Richard Davis about the rich Cincinnati fossil trove, A Sea Without Fish (Indiana University Press). I have also been able to continue working on present day

ALUMNI NEWS

marine animals, crinoids and other echinoderms, as well as projects in taphonomy and coral reef ecology. I spent one sabbatical on the Great Barrier Reef of Australia and another at the University of Tokyo, and continue diving and working in the Caribbean, currently with support from National Geographic. Kani and I have one son, Ross, who is married to Emilou. They live in Cincinnati and have enriched our lives with three grandsons! Although we spend part of each summer at Kani's old family home on Swan's island, Maine, we plan to stay in Cincinnati, a great place to live, where I hope to remain active in teaching and research—and spend a lot of time with our grandchildren! I will never forget that Yale made possible so much of what I've been able to do: an interdisciplinary foundation in paleobiology, the opportunity to explore new worlds, and of course, meeting Kani in the halls of Peabody!

Philip Gingerich G '74 (gingeric@umich.edu) writes: I finished my Ph.D. at Yale in 1974 and started a professorship at the University of Michigan the same year. I am still at Michigan because of the support for research provided by the university's Museum of Paleontology. My interests, focused on evolution, developed in three directions: (1) The Paleocene-Eocene transition, with summer field work in richly fossiliferous strata of the Bighorn Basin in Wyoming—here interest in mammalian evolution expanded into continental evidence for the Paleocene-Eocene Thermal Maximum or PETM global greenhouse warming event, and now the role planetary orbital cycles play in modulating Paleocene-Eocene climate. (2)

Philip Gingerich, G '74 in Egypt with an Eocene whale skull and skeleton emerging from sandstone. Crew in the foreground is filming a Korean Educational Broadcasting System feature on evolution. Photo credit: Manja Voss.

Rates of evolution—I developed methods to quantify rates for comparison across a broad range of time scales: all evidence shows evolution to be fast on the generation-to-generation scale of natural selection. And finally, (3) the origin and early evolution of whales, with winter field work in Pakistan or Egypt —the evolutionary transition of whales from land to sea provides an engaging and effective means to help people understand that life has changed through time, and evolution is an undeniable fact of earth history!

My wife Holly (Ph.D. in paleoanthropology) and I have two sons finishing high school. I recently stepped down from 30 years as director of the Museum of Paleontology, and will soon complete a two-year term as president of the Paleontological Society.

Bruce Chai G '75 (chai@crystalphotonics.com) writes: Although I was a graduate student of the Department, my career and work really have little to do with Geology at all. I left Yale in 1977 and went to then Allied Chemical, now part of Honeywell, as a staff chemist to work on man-made single crystals for optical and acoustic applications. In 1989, I was hired by the University of Central Florida as a tenured Professor in Physics, EE and ME and worked at the Center for Research on Electro-optics and Lasers.

In 1995, while my Ph.D. and master degree graduate students were finishing, I started a small company, Crystal Photonics, Inc., to work on crystals for medical and semiconductor industries. I was surprised that the company did not die but grew steadily over the years. By the year 2000, I left the University and worked full

Bruce Chai

time at my company. Currently, we are making gamma-ray detector arrays for PET (Positron Emission Tomographs) scanners. We are the OEM suppliers to major Medical Equipment companies. We are a small manufacturing company. Right now we have two manufacturing facilities, one in Florida and one in China with combined employees only just over 100 with an annual revenue around $25M. So we are just making a nice living.

Joseph Carter G '76 (clams@email.unc.edu) writes: I have worked in the Department of Geological Sciences at the University of North Carolina at Chapel Hill since

ALUMNI NEWS

Joe Carter and his wife Beth at Chimney Rock, North Carolina, 2012.

1976. My research has focused primarily on bivalve systematics and evolution, but I have also published papers on gastropods, biostratigraphy, archosaurs, and a therapsid. My paper on thermal potentiation received best paper of the year award from the Journal of Paleontology in 1998, and I have also received a university-wide teaching award. My coordination of Bivalvia volumes for the Treatise on Invertebrate Paleontology includes over 50 authors from 20 countries; this recently resulted in a revision of the class that integrates cladistics with evolutionary systematics, a new approach that I have called paracladistics. My daughter Julie is the manager of an organic foods store in Portland, Oregon. My son Will and his wife Amanda have a farm in southwestern North Carolina, and they have three children, Simon, Alice, and Matilda.

Kennth Jennings '76 (k2jenvironmental@gmail.com) writes: Hi, everyone, from Kirkland, Washington! Since Yale, I went to UC Santa Barbara (with **Paul Link '76**), and completed a Masters in Geology there (Paleoecology of the Pleistocene Saugus formation); then finished a doctorate in environmental science and engineering at UCLA. I have worked for US EPA, Amoco, Microsoft and as a consultant since. My areas of focus have been environmental sustainability and innovative remediation. Recently, I have become involved in the uranium and REE mining industry in Africa in addition to running an environmental consultancy.

I have been married for 21 years to my wife, Marie, whom I met

Ken Jennings '76 in southwestern Tanzania, in a dry river bed. The rock is a gneiss from the Bukoban.

when we both worked for US EPA HQ inWashington, DC. Since 1991 we have lived here in Seattle and have one daughter, Shelby, who graduates from high school this year.

Hope all goes well for everyone and would love hearing from folks.

Steve Naruk '77 (steve.naruk@shell.com) writes: I've been in Houston with Shell since 1987, after working for the minerals industry in Colorado, and subsequently acquiring a MS, PhD, and Mrs. (Regina Capuano) at The University of Arizona. We have one son, and have become quite devoted Texans over the years, although we still insist on pronouncing Yale with only one syllable (as opposed to the local Texian drawl, "Yayul.") I do quite a bit of traveling; to some quite

Steve Naruk at the Shell Miri-1 well monument in the town of Miri, Malaysia.

civilized places like London, where we used to have an office (Shell Mex House) with a bar on the top floor, where you could take your G&T looking down on Parliament and the Thames; but more often to more exotic places like Bolivia, Brunei, Bangalore, Colombia, Cairo, Nigeria, and New Orleans. (We have to have the same uninterruptible power supplies in New Orleans as in Port Harcourt, Nigeria!) I typically go for a week or two at a time to work with the local staff; just enough time to get immersed in the local geology and culture, without getting home- or otherwise sick! Perfect!

M. Meghan Miller '79 (meghan@unavco.org) writes: I came to Yale as a junior–I was a misfit at Smith. My father had graduated Yale a 43S—he took his final exams as he shipped out for training upon enlistment in the Army.

Upon arrival at Yale, I had already confirmed my instinct that geology would be for me, having loved my time in the Sierra Nevada high country in high school and the lower division courses at Smith. I took classes from Brian Skinner,

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Karl Turekian, Bob Tracy, Robert Gordon, and John Rodgers, among others. Phil Orville supervised my senior thesis. I had a fantastic summer after my junior year with a fellow student Bob Ortega, in minerals exploration from a helicopter supported bush camp near the Forty Mile River in central Alaska—thanks to Brian Skinner.

On my graduation, my dad said many memorable things. Here are two of them: that he had never attended a Yale graduation until mine (even his own, given the war), and that he had always hoped to have a son, but had never dreamed that he could have a daughter graduate from Yale. I am pleased to be the one who lived that dream...

Megan Miller with her youngest daughter Marith.

Upon leaving Yale in 1979, I worked for the Marine Branch of the USGS for a few years before going on to Stanford for my Ph.D. in structural geology and tectonics with Elizabeth Miller. The Yalies among us loved it when the review committee would come—Brian would collect us all for a fine dinner somewhere or another that we could never have gone on our grad student stipends.

I arrived at Caltech in the fall of 1986—for a post-doc fingerprinting detrital zircons as continental tracers in accreted terranes, and cementing contributions to the debate about exotic vs. fringing Paleozoic island arcs in the western U.S. Cordillera. I was married then, and we became Resident Associates in an undergraduate dorm at Caltech for several years —what were we thinking? Karl Turekian was visiting a faculty member at Caltech during this period, which was a very nice reconnection as well.

Somehow all of this led me to the Jet Propulsion Laboratory where, after another structural geology and regional tectonics project in the Proterozoic of the northern Sudan, I eventually got involved in using emerging GPS technologies to study tectonics in action. These were very exciting times—riding the wave of this extraordinary technology, working in places like Baja California (and later the Tien Shan Kyrgyzstan, Cascadia). My first GPS network, in the eastern California shear zone of the Mojave Desert, gave up a magnitude 7+ earthquake shortly after my first set of observations; this is when I became aware that while I may not always have good luck, I do have great timing. My longstanding interest in long-term processes of mountain building was fated to devolve into contributing to understanding the earthquake cycle and other short-period deformation processes. Perhaps my favorite—years later—was recognition of the periodic nature of slow earthquakes along the Cascadia subduction zone, down-dip of the locked fully seismogenic zone but above the freely slipping plate interface at depth. This resulted in my shortest and most cited paper.

In 1991, with a baby girl in tow, we headed north to Ellensburg, Washington to serve on the faculty at Central Washington University. I spent 18 years there, as a professor and chair (with a fine sabbatical at M.I.T.), and eventually dean of social and natural sciences for more than five years. We took a small geology department (8 majors) and built a vibrant program in a geological wonderland (a faculty of strong teacher-scholars with strong research programs, 75 majors and a master's program focused on natural hazards and environmental geology). I loved living on the east side of the Cascades, where yellow pine and larch forests grace the leeward slopes, and sagebrush fill the lowlands. The Columbia River Basalts, Yakima fold belt, channel scablands, Cascades volcanoes, and Mesozoic granitic and metamorphic highlands were a perfect backyard. The precipitation is sparse and mostly frozen, lending itself to winter fun. My two daughters grew up there until my move to Boulder, Colorado four years ago, now on my own with a senior in high school, and her sister a junior at Pitzer College.

In Boulder, I lead one of the National Science Foundation's 17 large facilities: UNAVCO (for University Navstar Consortium, we are governed by university members like Yale, so Maureen Long on behalf of Yale helps elect the board that I report to). UNAVCO supports U.S. university researchers and their international collaborators for work on every continent—using these rapidly evolving GPS (and now lidar) technologies to measure with millimeter-precision just about anything on the Earth's surface that moves or changes: tectonic plates and intra-plate deformation, glaciers, time-dependent fault and volcano related deformation, geomorphology and land surface dynamics, isostatic rebound, atmospheric water vapor.... We operate the EarthScope Plate Boundary Observatory, recently ranked #1 of Popular Science's "Big Science: The Universe's Ten Most Epic Projects." We are also building

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a GPS network in the Caribbean called COCONet to provide basic kinematic constraints on the plate motions that yield earthquakes like that in Haiti in 2009, and to help constrain hurricane models and forecasting through direct observation of water vapor in the lower atmosphere. We also support GPS observations in Greenland and Antarctica that are critical to untangling the contributions glacial isostatic adjustment from ice loss in the GRACE satellite observations.

I travel quite a bit for this work, both at home and abroad, but it is more on the science planning side than actual fieldwork. I do reconnect with Yale friends as a result of this travel—I have seen **Craig Schiffries '80** in D.C., the Calhoun crowd at the annual Madison beach party and many others in a reunion year, **Peter Shearer '78** and I are on a committee for the National Academy of Sciences together... Actually, he's a member of the Academy, so I am in fine company there!

It is not all work and no play. I continue to hike in Colorado and elsewhere, most recently the Alta Via 2, hut-to-hut in the Italian Dolomites—with spectacular structural geology on the side! I also enjoy windsurfing and skiing—and pretty much anything that gets me outside....

Look me up if you are in Boulder! I don't see enough Yalies here.

Julie Galton '81 (juliegalton@gmail.com) writes: To make a long story short, I got my MS in Applied Earth Science (Environmental Geology) from Stanford in 1984. I worked on sediment transport research to address water quality issues around Lake Tahoe, and on the Glen Canyon Environmental Studies in the Grand Canyon

Julie Galton '81 on the Potomac River in Washington, DC.

in 1983 (living and collecting hydrologic data along the Colorado River for 6 months). Then I worked as a wetlands conservation consultant in the San Francisco Bay Area and in southern California 1984–1991.

Beginning in 1992, I became the Washington, DC-based Government Affairs Director of the Grand Canyon Trust, a conservation group in Flagstaff, Arizona, focused on protecting the natural and native cultural resources of the Colorado Plateau.

THEN, in 1997 I left my job and went back to school, earning a doctoral degree in Clinical Psychology in 2004. I am now self-employed as a Licensed Clinical Psychologist in private practice in Fairfax County, Virginia. I specialize in treating eating disorders and anxiety disorders, and work with children, adolescents, adults and couples.

I am the proud mother of a young man who graduated in 2012 from the University of Colorado-Boulder with a degree in Electrical Engineering (and a job!) and a young woman, a rising sophomore at Tulane University, likely to focus on Public Health and International Development.

I enjoy whitewater rafting, yoga, piano, reading, and raising and fostering rescued Golden Retrievers.

I transferred to Yale as a sophomore, and so enjoyed Dr. Skinner's intro class. I am pleased to hear that he is still active in the Department.

Blair Wheeler '81 (blairwheeler@comcast.net) writes: I spent the summer of 1981 after graduation looking for a job in the US oil patch, but after striking out in Oklahoma, Texas and Colorado (no one wanted to sponsor my visa), I headed back to Canada and got a job with Amoco Canada in Calgary. I spent four years as an exploration geologist working various plays and fields in the Alberta Basin. In 1984, I transferred to Amoco International in Houston. The next four years I did field work, well site geology and geological assessment in Japan, Indonesia, Australia (where I lived for a year), Colombia, China, Denmark,

Blair and Diane Wheeler with daughters (L-R) Abby, Elizabeth, Sarah. June 2012.

Argentina and Trinidad. In addition to the day-to-day work, Amoco had an excellent training program for its geoscientists, typically a week of training every quarter in one of its training centers combined with field excursions. Essentially, I received the equivalent of a graduate degree in petroleum geology. After the oil price collapse in the mid-80's the industry began downsizing and I decided to change careers. In 1988, my wife (Diane "Dede" Fox, Yale '83) graduated with her

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MBA from Rice University. During her second year, I was admitted to the Harvard Business School. That summer we packed up and moved to Cambridge. I received my MBA in 1990, spent two years with the Boston Consulting Group, then got into the Boston-area high tech scene and joined or started a series of software companies—Avid Technology (went public), WebLine Communications (acquired by Cisco) and Relicore (acquired by Symantec). In 2005, I accepted the position of Senior Vice President of Marketing at Aspen Technology (www.aspentech.com). Aspen's software is used by the world's leading oil and gas companies meaning I once again work with petrochemical professionals globally (although the topics are about producing, gathering and processing hydrocarbons rather than geology and reservoirs). One nice tie for me: A number of customers use our software to help them more efficiently extract and process oil from the Athabasca Tar Sands which was the topic of my Yale senior thesis under Brian Skinner. But the most important part of the whole journey has been my family (see photo). Diane and I are blessed with three beautiful daughters—Sarah, a college freshman; Abigail, a high school senior; and Elizabeth, grade 6.

Tricia Suvari (Borga) '83 (tsuvari@openspacetrust.org) writes: After graduating from Yale College in 1983 with a B.S. in geology and geophysics, I headed to Washington D.C., where naturally I ended up working with attorneys. This led me to attend Harvard Law School, which I graduated from in 1988. While at Yale I'd always said my dream job would be working with the USGS in Menlo Park, CA; with J.D. in hand, I headed

Tricia Suvari (Borga) with her daughter Claire at Yosemite.

to California and started out in private practice at a large firm, doing real estate and corporate transactions. In 1991 I had an opportunity to move to the San Francisco Bay area—which I'd fallen in love with during a law school summer job—and took my first of two wonderful in-house attorney positions in the biotechnology industry. I spent 9 years at Genentech, then 9 years at a smaller Bay area biotech that was acquired by Gilead Pharmaceuticals in 2009. It was so rewarding to be able to work with world class researchers and help turn fascinating technologies into products that help patients and healthcare providers every day. After over two decades in the biotechnology sector, including some time as a consultant, this year I started what is truly my dream job: as VP of acquisitions and general counsel at the Peninsula Open Space Trust (POST). POST is a non-profit land trust that has spent decades helping to acquire, steward and transfer open space properties in Silicon Valley and the Santa Cruz Mountains. I have hiked for many years now on trails in parklands that were originally saved from development by POST and the many donors and volunteers who support it. The work I'm doing now combines my legal skills and practical desire to get things done with my life-time love of the land and the environment—and regularly gets me out of the office to hike around. As much as I've always loved my work, especially now, the deepest source of happiness in my life is our daughter Claire, a smart, funny, beautiful redhead who is now almost 8. She enjoys hiking too, and makes us smile every day.

Laurel Collins G '88

Laurel Collins G '88 (collinsl@fiu.edu) writes: In 1987 I left Yale for a predoctoral fellowship at the National Museum of Natural History, Washington, DC, where I finished up with my dissertation advisor. I then moved to Panama for a postdoctoral fellowship at the Smithsonian Tropical Research Institute, and my husband Tim joined me with a postdoc 6 months later. My research on paleobiological and

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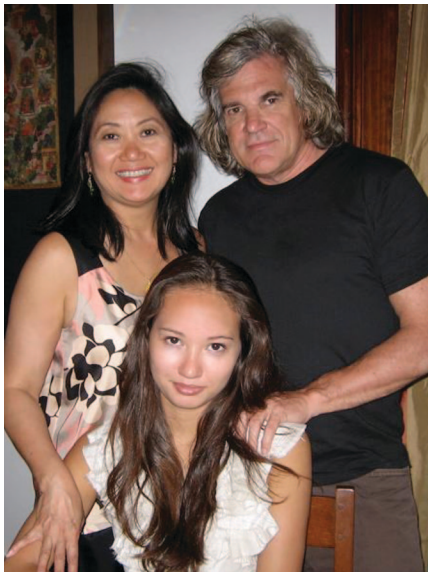
paleoceanographic effects of the uplift of the Isthmus of Panama still continues. Our research in Panama was interrupted by the U.S. invasion in December '89, and after (quickly) finishing up there we were soft-money researchers at U. Michigan for 5 years. In 1996 I moved to Florida International University, the state university in Miami. Tim and I are FIU professors and have continued tropical research with our students. We hate the hurricanes but enjoy the warm winters, tropical fruit trees, ocean and Everglades.

Key Family from left to right–Back row: Lily, Dylan, Kevin, Marcus, Maria. Front row: Peter & John.

Marcus M. Key Jr G '88 (key@dickinson.edu) writes: After finishing my Ph.D. in paleontology in 1988 under Dave Schindel and Liz Vrba, I started teaching at Dickinson College in Carlisle, PA. I have been here ever since and have progressed up the academic ranks in the Department of Earth Sciences to my current chair as Joseph Priestley Professor of Natural Philosophy. My wife, Maria, and I started a family and have five wonderful children, the oldest already out of college and 3 more still at home. My teaching and research have continued in the same vein as my Ph.D. thesis: using bryozoans as model organisms for testing hypotheses regarding evolution and environmental change. At Dickinson I teach our soft rock courses including Sedimentology/Stratigraphy, Paleontology, and Energy Resources. I have taught classes for Dickinson in the Bahamas, Galapagos, England, and Iceland. My family and I recently enjoyed a two-year assignment at the University of East Anglia, UK running Dickinson's study abroad program there. I have had the opportunity to work with wonderful undergraduate students on my research in places from New Zealand to Estonia to Greenland to Ireland. My current research involves the use of stable isotopes from bryozoan skeletons to constrain the timing of the uplift of the Central American Isthmus.

Vivian Pan G '89 (vpan@hamlincm.com) writes: It has been a long while since both of us have wandered the hallways of KGL. Like many graduates today, we left with big hopes but had limited vision as to what our futures held. Since those tough economic times in the early 1990's, our professional journeys since New Haven have taken us to far and varied ends.

After Yale and a post-doc at Arizona State University, Vivian devoted a year to an AGU Congressional Fellowship in the U.S. Senate and then onto a brief career at the U.S. Department of Energy in environmental radiation monitoring. As we started our family in the mid-1990s, Vivian joined a boutique capital management firm and earned her Chartered Financial Analyst designation. Presently, Vivian is a co-founding partner and Chief Investment Officer of Hamlin Capital Management. She is also honored to be the sitting President of the Investment Adviser Association, a national organization dedicated to promoting high standards in the investment advisory profession.



Vivian Pan with her husband Mark Norell, Biology G'88 and their daughter Inga.

Mark, a member of the Yale Geology department by marriage, just finished his 23rd dinosaur excavation season in Mongolia and has active field projects as well in China and Romania. In his 23rd year at the American Museum of Natural History (AMNH) he has been Chairman of the Division of Paleontology for 16, and is a faculty member at the museum's Richard Gilder Graduate School. Mark visits Yale fairly often as he has research overlap with several faculty and students, and there is much collaboration on the Peabody fossil collection. Aside from paleontology, Mark spends time curating special exhibitions at the AMNH and is also a trustee of the Rubin Museum of Art in New York's Chelsea district.

Life after Yale has been deeply rewarding. We are proud parents to Inga, our 16-year-old who is a junior at the Brearley School in New York City. With a lot of hard work and a healthy dose of luck, who knows, we could be routinely visiting Yale once again in a couple of years!

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Laura Jeanty at work with Peter Higgs, after whom the Higgs Boson was named. Also in the picture is Giovanni Zevi Della Porta (Yale '07, Physics).

Laura Jeanty '02 (laura.jeanty@gmail.com) writes: I'm in my final year of a PhD program in Physics at Harvard. I'm studying experimental particle physics and I work on ATLAS, one of the main detectors on the Large Hadron Collider. I lived on the French/Swiss border near Geneva for 3 years, allowing me to work at CERN, but now I'm back in Boston and starting to write my thesis. This July, ATLAS announced the discovery of a new particle that looks like the Higgs Boson (to be confirmed with more data), which was very exciting for the whole collaboration!

I'm still good friends with other G&G majors from '06—a group of us including Catherine Izard and Sara Enders went canoeing together in Maine this summer.

Garrett Leahy G '08 (Garrett.Leahy@emerson.com) writes that he, his wife **Melissa Spannuth G '10** (melissa.spannuth@gmail.com) and their young son Malcolm, have relocated from Houston

Melissa Spannuth and 9-month old Malcolm at Lysebotn, Norway.

to Stavanger, Norway. Melissa is working on borehole imaging techniques for Visuray, and Garrett is employed by Roxar, a developer of technical software. The family reports that they are enjoying hiking when it is not raining.

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IN MEMORIUM

Varanasi Rama Murthy G '57 passed away on October 12, 2012, in San Clemente, CA, under the loving care of his daughter, V. Katyayini Murthy, his son, V. Aanand Murthy, and three of his younger brothers.

Rama was born on July 2, 1933, to late V. Ramabrahmam and V. Yasoda in Andhra Pradesh, India. Rama graduated with honors from Indian School of Mines in 1954. He was the first member of the Varanasi family to arrive in USA on a scholarship. He earned his Ph.D. from Yale in 1957.

Rama joined University of Minnesota in 1965 after serving as a postdoctoral fellow at Caltech and assistant professor at Scripps Institute in La Jolla specializing in Isotope research in Geochemistry. From 1965 to 2006 Rama achieved distinction in research, teaching and administration during his tenure at the University of Minnesota where he rose to the ranks of Distinguished Professor emeritus, Dean of Institute of Technology to Vice President and Vice Provost. He was elected as a Fellow of American Geophysical Union (AGU) in recognition of his contributions to Earth and space sciences.

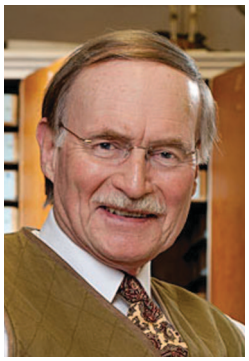
Since 2007 Rama was a Research Professor with Institute of Meteoritics at the University of New Mexico and continued to study application of Isotope Geochemistry and trace-element systematics to understand a variety of geological and planetary science problems.

Rama's children request any donations or gifts be given toward an earth and environmental scholarship in honor of V. Rama Murthy made to: University of Minnesota for the Department of Earth Sciences, College of Science & Engineering, 310 Pillsbury Drive SE, Minneapolis, MN 55455, (612) 624-1333 or American Geophysical Union, 2000 Florida Avenue Northwest, Washington, DC 20009, (202) 462-6900.

Cyrus West Field III G '61 died November 21, 2011.

Cyrus West Field was born May 5, 1933, to Thorold and Katherine Field in Duluth, Minnesota, where he spent most of his childhood. He graduated from Dartmouth College and Yale University. He was a geology professor at Oregon State University for 34 years, and department chairman for six years. He retired to Newport, Oregon in 1997.

During his six-year tenure as department chairman, he chaired the committee that employed the first female geology professor, presided over the merger of geology and geography into the Department of Geosciences, and served as its first chairman. He is survived by his childhood friend and wife of 53 years, Rebecca, and four sons: Cyrus (Stephanie), Thorold, Frederic and Edward (Linda); three grandchildren; and sister, Katherine Field.



Farish A. Jenkins, Jr., G '68 joined the Department of Anatomy of Columbia's College of Physicians and Surgeons in 1968, and subsequently moved to Harvard in 1971. Sadly, Farish died Nov. 11, 2012. He was the Alexander Agassiz Professor of Zoology, and also served as Professor of Anatomy in the Harvard-MIT Division of Health Sciences and Technology (Harvard Medical School) and Curator of Vertebrate Paleontology (Museum of Comparative Zoology). In 2011 he was appointed as Harvard College Professor in recognition for his contributions to undergraduate and graduate education. Jenkins' research interests were broadly in the area of vertebrate evolution, and focus on diverse structural and functional complexes during major evolutionary transitions in fish, amphibians, reptiles, birds and mammals. He undertook experimental studies of living animals to gain insights into the fossil record, and was the first to employ cineradiography to study animal locomotion, including bird flight. He maintained an active field program in vertebrate paleontology, with expeditions to the American west, South America, China, Africa (Namibia, Morocco), Greenland and the Canadian Arctic archipelago. He served as President of The Society of Vertebrate Paleontology (1981–82), received the Romer-Simpson Medal from the Society for sustained and outstanding excellence and service to the discipline of vertebrate paleontology, and in 2011 was elected to The American Academy of Arts and Sciences.

GEOLOGY & GEOPHYSICS NEWS

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www.yale.edu/geology

Class in Global Tectonics, G&G 212b, on a field trip to Barbados, Spring 2012. The instructors are Mark Brandon, in the center of the back row, (red shirt), and David Evans who's not in the photo.