Throughout his career, *Lincoln Hollister* has studied the largest metamorphic complex in the world: the Coast Mountains of western British Columbia, Canada and southeast Alaska. For 45 years, Hollister and his students have shared the tremendous, ice-carved rock exposure of mid- to lower-crustal rocks in the Coast Mountains with wolves, wolverines, bears, eagles, ravens, mountain goats, and with very few other geologists. His work has explored the thermal and structural implications of accretion of crustal fragments to the North American continent, and laid the foundation of his search for a unified theory for the formation of continental crust.

Hollister grew up as a free-range adolescent on a vast cattle ranch. There he learned to thrive in the out-of-doors; and his uncle Joe Hollister, who published the first geologic map of southern California, introduced him to geology. When Hollister encountered civilization in Harvard Yard in 1956, he took aim at a squirrel with his .38 revolver during freshman orientation week. The authorities did not appreciate this, especially since the offense took place on a Sunday. Hollister concluded then and there that the best career for him would be one that would take him out of the city and into the mountains.

Hollister’s skills with guns and survival in the mountains were necessary to do the fieldwork for his Ph.D. thesis (Caltech, 1963-64). This involved backpacking into the Coast Mountains where he had no contact with the outside world for weeks at a time. He extended his time in the mountains by taking game for food, which included mountain goat, deer, bear (*yes, he ate two*), ptarmigan, grouse, duck (*he once shot five...*)

*Lincoln Hollister atop a then-unnamed peak in the Coast Mountains of British Columbia, Canada.*

*Photo by Glenn Woodsworth ’74 during his 1972 field season.*
with three rifle bullets), trout, porcupine (actually, quite good), and marmot.

At the beginning of his career, the overwhelming consensus among petrologists was that most metamorphic minerals were homogeneous, a necessary condition for thermodynamic equilibrium. However, using one of the first electron microprobes available to geologists, Hollister showed that many metamorphic minerals are compositionally zoned. The zoning in garnet, for example, followed the laws of Rayleigh depletion, first published by Lord Rayleigh in 1902 for the distillation of alcohol.

Hollister again challenged conventional application of the principles of chemical equilibrium by showing that two or more compositions of a mineral can grow at the same pressure-temperature conditions. This is because compositions of minerals are in part controlled by the atomic arrangements on crystal faces, and because the atomic arrangements on different faces vary, the compositions on the growing faces can vary as well. If the mineral grows too rapidly for these differences to re-equilibrate, then the mineral can form with several compositions at the same temperature-pressure conditions. He called this phenomenon sector zoning.

Hollister and the moon rocks arrived together at Princeton in 1969. His major paper on the discovery and causes of sector zoning was not yet in print, but he knew sector zoning when he saw it in pyroxene phenocrysts in the mare basalts. Based on this understanding, he showed that the lunar phenocrysts had grown rapidly after the lavas had poured out onto the surface of the moon, and not at high pressures within the lunar interior as then current opinion held.

In 1966, helicopters with lightweight jet powered engines became available to carry heavy loads high onto remote mountain ridges, and Hollister’s fieldwork was transformed. He was able to set out camps with enough food to feed two or three people for weeks at a time; the taking of game was no longer necessary. Even so, communication with the outside was limited to occasional brief contact by radio. One time the camp was blown away in a storm, but an alert colleague, who had been monitoring the weather from Vancouver, sent in helicopters for the rescue.

Hollister recognized that the rocks in the Eocene core of the Coast Mountains had reached granulite facies conditions which were then only recognized in Precambrian rocks. He set out to learn how such high temperatures could have been reached within the crust. One theory was that the apparent high temperatures were due to dehydration of lower crustal rocks by flooding of CO₂ from the mantle; this theory was based on occurrences of liquid CO₂ fluid inclusions in granulite facies rocks.

After several years studying fluid inclusions, Hollister and colleagues concluded that this was not the case and two insights led to an understanding of hitherto unrecognized processes of continental crust formation. The first was that dynamic recrystallization, during ductile deformation, produced pure CO₂ fluids by removing the H₂O component from mixed CO₂-H₂O fluids. Thus, the properties of the CO₂ inclusions reflected P-T conditions during the recrystallization, and not during the formation of the metamorphic minerals. The second insight was that two immiscible fluids, one CO₂-rich and the other H₂O-rich, were likely to be present during medium grades of metamorphism. The physical properties of the two fluids could then be used to determine the P-T conditions for when the fluids were immiscible. The story read from the fluid inclusions, combined with the story preserved in the metamorphic mineral assemblages and textures, led to the general observation (1993) that most crystalline belts are brought to the surface sufficiently fast that temperatures as high as 400°C can occur at depths of only five to ten kilometers.

While participating with a U.S. Geological Survey team (1985-1987) in Alaska, Hollister realized the possibilities for gaining new insights into earth processes by applying a multidisciplinary approach to a single geographic area. The USGS project, called the Trans Alaska Crustal Transect (TACT), succeeded in making a three dimensional geologic image across Alaska, from the surface down.
more than 50 km to the underlying subducting plate. This transect, and another across the Alps, hinted at how much could be learned if one could improve seismic imaging techniques.

In the fall of 1987, when looking down on the inland fjord that is Lake Como, Italy, the idea struck him that one could take a seismic survey up the fjords of British Columbia that cut across the Coast Mountains. This could be accomplished by towing airguns behind a ship that could fire thousands of pulses at known location and time, with the pulses being recorded by hundreds of closely spaced portable seismometers placed along the shores of the fjords and into the continental interior.

Thus in 1993 was born the multidisciplinary project ACCRETE, which included a combined offshore/onshore seismic study that provided an unprecedented image of the top 50 km of the earth’s crust and mantle for a 500 km x 300 km area straddling the Alaska-British Columbia border. The seismic and geologic work of ACCRETE showed that this belt was formed by thickening of the crust 85 to 60 million years ago during oblique convergence of plates, followed by extensional thinning and collapse of this thickened crust 60 to 50 million years ago. By 2006, Hollister, working with his former student Chris Andronicos *99, brought ACCRETE results together in a paper proposing a unified theory for the formation of continental crust.

In starting ACCRETE, Hollister gained the support of local residents who had at first worried that the project might be environmentally threatening: the use of airguns in inland waterways where fishing is the basis of the local economy. He found, however, that the local residents were very receptive to learning what was to be done and how and why. Understanding led to reduced fear, and ACCRETE gained permission to proceed from government agencies, community groups, and native tribes. After the seismic phase of the study was finished, it was clear no whales or fish had been hurt. Lengthy negotiations to carry on research on tribal lands led to subsequent cooperative educational outreach projects with the tribes and with other community groups and schools in the region. Later, at a tribal council meeting, Hollister presented the Nisga’a Nation with a Princeton University NCAA trophy basketball, signed by the coaches of back-to-back Ivy League championship teams.

In 1987 Hollister and his wife, Sarah, joined a six-week expedition organized by his late brother, Charlie, which traversed on foot along and across the Himalayas of Bhutan. That marked the beginning of a research program based in Bhutan that continues to the present. Hollister has led several additional expeditions to the area, following the models of TACT and ACCRETE: bringing together a range of disciplines in pursuit of a common goal. The expeditions led to the proposal of “channel flow” as a mechanism by which hot rock is rapidly expelled from between rigid, converging plates by ductile extrusive flow. This marked a major step toward Hollister’s goal of formulating a unified theory of how continents form.

A critical insight leading to the channel flow hypothesis, and what may be an underlying principle for continental crust formation, was the recognition that when rocks began to melt, their strength drops. Great thrust faults are initiated within this weak zone. The weakening occurs with only 1-2 percent melt. This observation was (and still is) challenged by rock deformation theorists and experimentalists who claim that 30 percent of the rock needs to melt before it is weakened enough to localize deformation.

Underlying all geological work in Alaska and British Columbia is the “Baja British Columbia” hypothesis, which holds that large chunks of western Canada and Alaska have travelled 1000s of km northward to their present locations from latitudes corresponding to Baja.

Friends, colleagues and former students from around the U.S. and the world converged on Princeton over the April 30 weekend for the Lincoln Hollister retirement festivities.
California. The basis of the hypothesis is that remanent paleomagnetic inclinations imply that the rocks had crystallized several thousand km south of where they now occur. However, some had interpreted the paleomagnetism data to be due to tilting of continental fragments that accreted in a direction perpendicular to the Pacific coast. The late Robert Hargraves *59 (faculty 1961-94) set Hollister on the track to resolving this conflict. Hargraves had long advocated the importance of exsolution in Fe-Ti oxides for recording paleomagnetic directions, and observed that the remanent magnetization of the Eccstall pluton, which was used in support of the tilt hypothesis, had the characteristics of this “lamellar magnetization.” Thus, the Eccstall pluton had not been tilted at its present latitude but rather had been transported several thousand kilometers northward and then, without tilting, was reheated at the present latitude by the adjacent hot core of the Coast Mountains.

Hollister thoroughly enjoys teaching about rocks and minerals. He has built his courses around natural occurrences, and expanded the range of field experiences for his students to include the western U.S., British Columbia, and Brittany, France. His favorite area for field trips has been northern New Mexico, which is rich in spectacular metamorphic and igneous rocks. Students collect samples to bring back to Princeton, and learn mineralogy and petrology as they work on their own samples.

Never abandoning his rock hammer, Hollister’s tools of research have continuously evolved: he was one of the first to use the electron microprobe to study chemical zoning in rock-forming minerals, was one of the first to use jet-powered helicopters to reach previously inaccessible regions, introduced the study of fluid inclusions in metamorphic rocks to petrologists in North America, and was the first to use a seismic ship to study metamorphic geology. Hollister also benefited from the Apollo rockets that carried his “field assistants” to the moon to bring back rocks formed at the beginning of the solar system.

What next? Hollister is working on an article based on his undergraduate class exercises in New Mexico; it provides new insights into the Proterozoic metamorphic history of the southwest. He continues on a multidisciplinary quest to find a natural occurrence of a mineral with forbidden 5-fold symmetry. He also continues working on a project that contrasts Phanerozoic crust-forming processes with those of the early Archaean. He expects to complete a geologic guide to the Coast Mountains of British Columbia, an effort at informal science education. In the Department, he keeps an eye on the reassembling of the mineral collection and continues to be involved in the teaching of petrology and mineralogy.

For more photos and remembrances, see Linc’s program booklet at URL: https://www-dept-edit.princeton.edu/geosciences/people/hollister/.

A Good Excuse....
Harold Stowell *87 and Kim Ouderkirk had a good excuse for missing the Hollister retirement celebration; at left they stand in front of their home in Tuscaloosa, Alabama which was partially destroyed by the April 27 tornado. Harold rode out the storm in a basement of a sturdy university building, but Kim was at home when the storm hit. She took refuge—with their two cats—in the bathroom shower next to the tree in the photo, and emerged unscathed. The image at right, from NASA’s Earth Observing-1 satellite shows the location of their home and the SE-NW tornado track through Tuscaloosa, roughly parallel to a plane contrail. Funds collected for a Hollister retirement gift were instead sent to Harold and Kim to aid in their recovery effort. Harold writes, “(We) are greatly moved by the wonderful gift that we received. This action on the part of all of you reinforces a great feeling about people and friends that has been growing since the disaster...(We) have learned that people will pull together under adversity and help one another!...The meaningful gift that all of you gave will always be remembered by us as a signal of friendship and giving in a time of great loss…”
On November 12, 2010, friends, relatives and colleagues gathered in the University Chapel to pay their respects to Franklyn van Houten *41, a member of the Department of Geosciences for 39 years, from 1946 to 1985. The following is modified from remarks prepared for the University by faculty members Lincoln Hollister and Tullis Onstott.

Van Houten and his wife, Jean, always lived near the intersection of Western Way and Fitzrandolph Road from where he jauntily walked every day to his office in Guyot Hall. He suffered a devastating stroke in 1991 and Jean died in 1997 after 54 years of marriage; yet he kept on walking. Van, as he was known to his students and colleagues, published continuously from 1940 to 1990, with one final paper in 1997 when he was 83. He died on Aug. 27, 2010 at the age of 96.

He was born in NYC in 1914, and majored in biology and geology at Rutgers University. He arrived at Princeton intending to focus his dissertation on the study of vertebrate fossils with Professor Glenn Jepson ’27. But, by the time he had finished his Ph.D. in 1941, Van’s interests had shifted toward understanding the environments of deposition of terrestrial sediments within which these fossils resided.

In 1942 he enlisted in the U.S. Navy where he tracked German U-boats in the North Atlantic and after D-Day was transferred to Europe where from various billets he managed to publish his thesis. In 1946 he left active duty to join Princeton’s Department of Geology as an assistant professor.

During the 50’s Van used a differential thermal analysis instrument and a primitive X-ray diffraction unit to characterize the mineral content of fine-grained sediments from the Rockies. Among many notable results was the surprising discovery of zeolites that had grown within the sedimentary layers. Tracking these occurrences eventually led Van to study the sedimentary rocks of the Newark Basin in New Jersey.

Van discovered and described cyclic sedimentation of the Triassic/Jurassic age Newark Basin, at both a macro- and micro-scale. At the macro-scale, packages of sedimentary rock, some 6 meters thick, repeated lithologies, gray to red, over and over again. At the micro-scale, some of the sedimentary rocks were made up of thin laminations; these reminded him of similar features described elsewhere in sediments that were due to annual variations in precipitation. Van speculated that the longer cycles could be due to the same orbital variations of the Earth around the Sun that Milankovic invoked to explain the ice ages.

This suggestion that rocks could record Milankovic’s cycles came 15 years before work on deep sea cores would confirm the concept, and Van admitted that his proposal was speculative for its time. Twenty-five years later, Van’s “guess” was verified and resulted in a major advance in climate science. The cycles are now known as Van Houten cycles and you can still see these cycles and Van’s delineating paint marks if you drive along state highway 29N going from Stockton to Frenchtown.

Van also incorporated the new paradigm of plate tectonics when it erupted in the Princeton geology department in the mid-60’s. He was able to match the Triassic geology of Morocco.
From the Chair

It was about a year ago at this time that we celebrated the recognition by Bill Bonini by the University as a recipient of the Alumni Award for Excellence in Alumni Education. In addition to the celebrations sponsored by the University, we honored Bill at our annual Alumni Reception during Reunions. Bill was resplendent in his orange and black jacket, and was roundly cheered by many old friends. Laurel Goodell ’83 (Academic Lab Manager) summarized the history of The Smilodon and presented Bill with a framed copy of pages from a few early editions. We are all very sorry to see Bill leave The Smilodon, but we thank him for leaving us with a strong tradition and a long subscription list. I want to thank him especially for his tireless support of the Department, keeping us informed and on time with our commitments. I appreciated his insights and advice as the resident departmental historian, and I miss his watchful eye.

As the end of spring term approaches, we are very pleased with the performance of our current junior and senior class students and excited about the rising junior class, which at 13 will be somewhat larger than in the recent past. We hope this interest will be sustained, and we attribute increased student interest to a strong commitment to excellence in undergraduate teaching among the faculty. I would like to mention in particular the revitalization of our curriculum that was carried out by the undergraduate work committee in the last few years, with special thanks to faculty members Adam Maloof.

Van’s exploits and adventures in his fieldwork are legendary. One example: in the summer of 1953, he spent four months working for the Geological Survey of Canada, along the Yukon-Northwest Territories border. Two geologists, a guide, several pack horses and a floatplane, set out for the Mackenzie Mountains. They survived a crash landing of their floatplane. The same cannot be said, however, of two grizzlies that encountered Van during the long trek out, one of which became a rug in Van’s office.

Van vigorously guarded his role as a college professor: attentive to his classes, his students, his colleagues, and his research. A myriad of students have taken his courses or been with him in the field, written a senior thesis or produced a Ph.D. dissertation, have had their manuscripts Van Houten-edited, or have been politely but incisively questioned in oral examinations. The overall philosophy of Van’s research and teaching style was to question dogma, challenge theories, pursue original ideas to their conclusion, and do what needs to be done without complaint or fanfare and with humility. He was very conscientious in doing things that would help others down the road. An example was the guidebooks he wrote on the geology of New Jersey, and especially of the Newark Basin.

In 1985, the year he retired, Van was awarded the William H. Twenhofel Medal, the highest honor bestowed by the Society of Economic Paleontologists and Mineralogists for outstanding contributions in sedimentary geology. The citation read by one of his students states: “For four decades of distinguished research and achievement in the study of the relationships between deposition and tectonics, superior teaching and training of students, and demonstrating what a difference one excellent, industrious geologist of great integrity can make.”

Bess Ward and Nadine McQuarrie enjoy the final “TeaTime” of the 2010-11 academic year, in the glade between Guyot and Eno Halls.
The year has seen relatively few changes among the faculty and their research endeavors continue apace. Of special note, François Morel has received major international recognition in the past year, including the ENI Award for Protection of the Environment from the ENI Foundation (2010), the Award for Creative Advances in Environmental Science and Technology from the American Chemical Society (2010) and the Einstein Professorship of the Chinese Academy of Sciences (2011). As part of the Einstein Professorship, Morel will spend a week in China and will present several lectures at Xiamen University.

Lincoln Hollister will officially retire from the University as of July 1, 2011 after 43 years at Princeton. In anticipation of this event, the Department hosted a celebration of his life and work over the weekend of April 30. After lunch in The Great Hall on Saturday, attendees headed down to Guyot 10 for a welcome by W. Jason Morgan *64 (faculty 1967-2003), followed by panel discussions highlighting six different aspects of Lincoln’s career: British Columbia/Alaska led by Glenn Woodward *74 and Chris Andronicos *99; The Moon Rocks led by Robert Dymek ’71, Bhutan led by Djordje Grujic (Visiting Scholar 1999), Fluid Inclusions led by Robert Burrrus *77, Informal Science Education/Outreach led by Robin McKinney Martin ’75 and Peter Freeman, and Teaching Geology in New Mexico led by Katherine Barnhart ’08 and Robin McKinney Martin.

In addition to recognizing his scientific achievements, panelists regaled the audience with numerous “Linc trip” stories of remote and rugged expeditions—some of which included subsistence hunting, helicopter rides, impromptu side trips and bear encounters. Festivities moved on to cocktails and dinner at Prospect House, and ended with a Sunday brunch generously hosted by Caroline and Bob Phinney (faculty 1963-2005) at their farm in the hills of northern Princeton.

It is with regret that we say goodbye to Nadine McQuarrie, who is leaving to take a professorship at the University of Pittsburgh. McQuarrie has also been awarded a Humboldt fellowship and after her field season this summer, will take up residence for a year in Tübingen, Germany to continue her research on the thermal evolution of mountain belts.

A very important addition to the department this year was in the staff area; Georgette Chalker joined us as our communications manager and web developer. Her beautiful work is very much in evidence in our much improved webpage—both attractive and functional—and in the brochure for Lincoln Hollister’s celebration, as well as in the very pages of this issue of The Smilodon. I urge you to make use of the webpage to keep informed, and we welcome your feedback and suggestions.

Around the Department

This year’s Hess Fellows are Bonnie Chang and Maximillian Werner. Chang received her Ph.D. in Chemical Oceanography from the University of Washington, and is interested in marine nitrogen cycling. At Princeton she is working with Bess Ward’s group on pelagic nitrogen removal from the oxygen deficient zones of the ocean, and with Danny Sigman’s group on the isotopic fractionation effect of sedimentary denitrification.

Before coming to Princeton, Werner received his Ph.D. from UCLA and postdoc at the Swiss Seismological Service at ETH Zurich. His research focuses on understanding the physical mechanisms that control earthquake occurrences and earthquake triggering. At Princeton, he’s collaborating with faculty members Allan Rubin on the mechanics of creeping faults and with Frederik Simons on the predictability of ongoing earthquake ruptures.

Now working with Tom Duffy (faculty) are Associate Research Scientist Amartya Sengupta from Washington State University; Dominique DeLigny, a former postdoc (1996-97) in the Department and now visiting from Universite Claude Bernard in Lyon, France; and first year Department of Chemistry graduate student Camila V. Stan. Former postdoc Javier Montoya is now an assistant professor at the University of Cartagena, Colombia.

Jeroen Tromp’s *92 (faculty) research group welcomes postdoc helioseismologist Shrvan Hanasoge from the Max Planck Institute for Solar System Research in
German, and bids farewell to Research Associate Christina Morency who has taken a position with the Lawrence Livermore National Laboratory. On May 4-6, the Princeton Center for Theoretical Science hosted an interdisciplinary conference on Seismology of the Earth and Stars, organized by Tromp, Hansase and graduate student Yang Luo. The program included talks by Tromp, Hansase, Frederik Simons (faculty), Ingrid Daubechies (faculty, Princeton Department of Mathematics) and other speakers from around the world. URL: http://www.physics.princeton.edu/pcts/seismo/Seismologyearthstarsprogram.pdf.

Joining Frederik Simons’ research group are Chris Harig from the University of Colorado Boulder to work on geodynamical modeling of time-dependent mass fluxes from glaciated regions based on satellite gravity data, and Alain Plattner from Die Eidgenössische Technische Hochschule (ETH) Zurich to work on vectorial localization techniques for terrestrial magnetic field modeling of satellite data.

T. C. Onstott’s *80 (faculty) Geomicrobiology group welcomes Maggie Yin M. Lau from Hong Kong University as a postdoctoral fellow working on developing an isotope microarray for two projects: analyzing carbon cycling in Arctic permafrost and carbon cycling in deep fracture water environments in South Africa. In January, Onstott organized the Carbon Cycling in the Deep Biosphere Workshop in Bloemfontein, South Africa, which attracted an interdisciplinary and international group of scientists exploring new approaches to retrieving geochemical, isotopic, metagenomic, transcriptomic, metabolomic and proteomic information from the deep subsurface biosphere. Princeton senior Christel Chehoud also attended and gave a presentation at the workshop. URL: http://www.princeton.edu/southafrica/conference/

New researchers in The Program in Atmospheric and Oceanic Sciences (AOS) include Martin Jucker from the Swiss École Polytechnique Fédérale de Lausanne and visiting faculty member Pablo Zurita-Gotor from the Universidad Complutense de Madrid in Spain. They’ll both be working with Geoff Vallis (faculty). AOS also welcomes Chris Ober as their new Systems Administrator.

The incoming 2010-2011 GEO graduate students include: Blake C. Dyer, Rice University; Johanna A. Goldman, ESPCI Paris Tech, France; C. Brenhin Keller, Cornell University; Dario Marconi, Universita della Tuscia, Italy; Ryan T. Modrak, Penn State University; Anne M. O’Leary, Williams College; Xuefeng Peng, Connecticut College; Jahnavi N. Punekar, IIT, Bombay, India; Kyle M. Samperton, Univ. of North Carolina at Chapel Hill; and Xingchen Wang, Nanjing University, China. They are joined by AOS students Kityan Choi, Chinese University, Hong Kong and Wenyu Zhou, Tsinghua University, China.

AOS Graduate Student Ilissa Ocko was recently honored with the Outstanding Student Poster Presentation Award at the 91st American Meteorological Society (AMS) Meeting.

On March 24, 2011, four Department members were honored at the annual Service Recognition Luncheon. Undergraduate/Graduate Administrator Sheryl Robas received her 30-year Service Award and was interviewed for a glimpse into her Princeton experience. In the video, Sheryl talks about her rewarding relationships with students. View the entire Human Resources video, where Robas’ segment starts at about the 6:42 mark. URL: http://bc.princeton.edu/flash/16x9_progressive_large.

Also recognized were Senior Research Staff Member Amal Jayakumar, and Academic Laboratory Managers Laurel Goodell ’83 and Danielle Schmitt for 10, 15, and 10 years of service, respectively.

And finally, it is with great sadness that we report the death of Elisabeth Dahlen on March 29, 2011. Loving wife of Tony Dahlen (faculty 1970-2007) who predeceased her, she was a dear friend and member of the Department, as well as a long serving member of the University community. A memorial service will be held at 2:00 p.m. Friday, June 3, in the University Chapel. There will be a gathering in Chancellor Green following the service. Please visit URL: http://www.princeton.edu/oit/news/archive/?id=4986 to read Elisabeth’s obituary.
**News**


It was nice to hear from Dave Park ’58 who has vivid memories of Rose and Bill Bonini (faculty 1953-1996) taking care of him as a “newbie” geologist in Red Lodge during the summer of 1956.

As a member of the National Association of Geoscience Teachers (NAGT), Laurel Goodell *83 serves on the NAGT Field Course Scholarship Committee. Joining her on the committee this year was Andy Buddington, a geologist at Spokane Community College in Washington state. The name sounded familiar and, sure enough, Andy is a (distant) relative of Arthur C. Buddington *16 (faculty and Department chair from 1936-1950). Andy has interesting written correspondence between his grandfather and Buddington dating from a time they worked on the family history together.

John DeYoung, Jr. ’61, Chief Scientist of the USGS Minerals Information Team, appreciated the article in the Spring 2010 *Smilodon* about the Department’s Franklin Suite and the Franklin mining district. He sends a correction and elaboration to the information about the Palmer family’s involvement in the New Jersey Zinc Company and with Princeton. According to the Mining Artifacts and History website, “The Palmer family controlled the company for 46 years until the death of Stephen’s son Edgar in 1943, when the estate of Edgar Palmer was forced to sell its controlling interest in order to pay inheritance taxes,” and so Edgar Palmer’s service as University trustee ended in 1943, not 1949. URL: [http://www.miningartifacts.org/NewJerseyMines.html](http://www.miningartifacts.org/NewJerseyMines.html).

Karen Kleinspehn *82 and Eric Mohring ’79 live in Minneapolis, MN, where Kleinspehn is on the faculty of the University of Minnesota Department of Geology and Geophysics. Her research interests are in sedimentary basin analysis and tectonics. Mohring is a hydrologist with the Minnesota Board of Water & Soil Resources, focusing on wetland hydrology, preservation, and restoration.

Where are our recent Ph.D.s? Brigitte Brunelle *10 has a position with the National Geospatial-Intelligence Agency; Peter DiFiore *10 works for the Capital Markets Group of Risk Management Solutions, Inc.; Neven Fuckar *10 (AOS) is a postdoc at the School of Earth and Ocean Science and Technology, University of Hawaii in Honolulu; Brian Gertsch *10 is a postdoc at The Massachusetts Institute of Technology in Cambridge; Fuyu Li *10 (AOS) is at Lawrence Berkeley National Lab; Sean Long *11 is a research assistant professor at the Nevada Bureau of Mines and Geology and University of Nevada in Reno; Zhu Mao *10 is a postdoc at the University of Texas in Austin; Abby Ren *10 is a postdoc at Columbia University’s Lamont-Doherty Earth Observatory.

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**Geophysicists in Paris**

Former geophysics graduate students (left to right) Alon Ziv ’01, Richard Allen ’01 and Alex Fournier ’04 all found themselves together again in Paris during the fall 2010. Alon and Richard, on sabbatical from Ben-Gurion University and UC Berkeley, joined Alex, on the faculty at the Institut de Physique du Globe, in the city of lights. All three are seen sporting strollers for the recent additions to their families, all born in 2010 (left to right): Amitai born February 13, Henry born April 26, and Adèle born February 27.
in New York; Yue Tian *10 has a position with Chevron in California, Yuanyuan Fang *10, Chris Little *10 and Silvia Newell *10, however, have stuck around Princeton as postdocs: Fang in the Woodrow Wilson School, Little working with Michael Oppenheimer (faculty) and Newell in the other half of Guyot Hall with the Department of Ecology and Evolutionary Biology.

Lydia Fox ’81 has been appointed the Director of Undergraduate Research at the University of the Pacific. In this position, she oversees internal grants for undergraduate research and travel, provides support for faculty who do research with undergraduates, and connects student with research opportunities both on and off campus.

As a visiting scholar and consultant at the Tsinghua University World Resources Institute British Petroleum in Bejing, China, Logan West ’07 assists in the development and publication of guidelines for carbon capture and storage. He also coordinates exchanges and study tours for Chinese and American stakeholders.

On May 8, senior Michael Eddy was a member of the winning 4x400m relay team that clinched a victory for the Princeton Men’s Track and Field team at the 2011 Ivy League Heptagonal Championships at Yale University. Eddy’s prowess in running and geology was spotlighted in an article in the New York Times. URL: http://www.nytimes.com/2011/04/29/sports/29track.html.

**Honors**

In addition to the three honors bestowed upon François Morel over the past year (see From the Chair section), two other faculty members have been recognized. W. Jason Morgan *64 (faculty 1967-2003), has been named a fellow of the American Academy of Arts and Sciences. In doing so he joins the ranks of one of the nation’s most prestigious honorary societies and a leading center for independent policy research. Morgan is spending his “retirement” as a Visiting Scholar at Harvard University.

Geophysical Fluid Dynamics Lab senior meteorologist Syukuro Manabe was awarded the 2010 William Bowie Medal at the American Geophysical Union (AGU) Fall Meeting in San Francisco. AGU’s highest honor, the Bowie Medal is awarded for “outstanding contributions to fundamental geophysics and for unselfish cooperation in research,” and recognizes Manabe’s pioneering work in the development and application of climate models. This follows on the heels of the 2009 Bowie Medal being awarded to another Princetonian: Ignacio Rodriguez-Iturbe of the Civil and Environmental Engineering Department.

**Books**

*Volcanoes: Global Perspectives* by Jack Lockwood *66* and Richard W. Hazlett (2010, Wiley-Blackwell, 552 pages, 300 illus.) In the “Big Picture” section of the book, Jack gives Harry Hess *32* (faculty 1934-69) his due: “Harry’s revolutionary insights allowed volcanologists to finally understand why volcanoes were located where they are, and quickly led to understandings of their role in Earth dynamics.

**Deaths**

Elisabeth Dahlen, March 29, 2011
Robert W. Gloyn *64, September 6, 2004
Penn H. Holsapple ’36, March 8, 2008
Franklyn van Houten *52, August 27, 1010
John Stager Shirk ’39, April 1, 2008

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**Degrees and Awards**

*As of Commencement June 2010*

**Ph.D.**

Brigitte G. Brunelle, *Nitrogen Isotope Constraints on the Biogeochemistry and Paleoclimatology of The Subarctic North Pacific*

Peter DiFiore, *Nitrate Isotope Dynamics in the Southern Ocean*

Neven-Stephan Fuckar (AOS), *Adaptive Scaling Model of the Main Pycnocline and the Associated Overturning Circulation*

Fuyu Li (AOS), *Emission, distribution, and transport of mineral dust in the Southern Hemisphere, and the dust deposition in Antarctica during present-day and the Last Glacial Maximum*

Christopher Montgomery Little, *Glaciological Control of Ice Shelf Basal Melting, and Implications for the Coupled Response*

Zhu Mao, *Single-crystal Elasticity of Hydrous Mantle Minerals*
Agnieszka Anna Smith-Mrowiec (AOS),
Hurricane intensity in dry and moist atmospheres

Yue Tian, Multiple-Frequency Tomography with Shear Waves and Love Waves

M.A.
Andrew Peter Ballinger (AOS)
Sarah Elizabeth Fawcett
Mathis Hain
Jessica Cleary Hawthorne
Kuan Huang
Jenna L. Losh
Yang Luo
Haojia Ren
Catherine Rose
Erica Marie Staehling (AOS)
Tobgay Tobgay
Shannon Elena Tronick
Dong Wang
Enning Wang
Lisha Xie
Peng Xie (AOS)

Graduate School Centennial Fellowship
Brigitte G. Brunelle
Jessica Cleary Hawthorne
Zhu Mao
Erica Marie Staehling

Charlotte Elizabeth Procter Fellowship
Zhu Mao
Haojia Ren

EPA Star Graduate Fellowship Program
Christopher Montgomery Little

NASA Graduate Research Fellowship
Kuan Huang
Fuyu Li

NSF Graduate Research Fellowship
Jenna L. Losh

National Defense Science and Engineering Graduate Fellowship
Brigitte Gina Brunelle
Erica Marie Staehling

2010-2011 Harold W. Dodds Fellowship
Nicholas L. Swanson-Hysell

Arnold Guyot Graduate Student Teaching Prizes
Silvia Elena Newell
Sean Patrick Long

BA/BSE+
Sylvia Genevieve Dee+
Carl Alan Hamming
Christopher Hepburn
Jordan Cooper Hill+
Benjamin P. Oliver+
Lauren Samantha Miller
Zachary Michael Morse
Darcie Erin Little Badger Ryan

Geological Engineering Program
Certificate of Proficiency
Sylvia Genevieve Dee
Jordan Cooper Hill
Benjamin P. Oliver

Princeton Environmental Institute
Certificate of Proficiency
Sylvia Genevieve Dee
Lauren Samantha Miller
Benjamin P. Oliver

Department of Chemistry Highest Honors
Lauren Samantha Miller

Department of Geosciences Honors
Zachary Michael Morse
Darcie Erin Little Badger Ryan

Department of Civil and Environmental Engineering Honors
Benjamin P. Oliver

Phi Beta Kappa
Lauren Samantha Miller

Sigma Xi
Sylvia Genevieve Dee
Jordan Cooper Hill
Benjamin P. Oliver
Lauren Samantha Miller

Edward Sampson ’14 Prize in Environmental Geosciences
Zachary Michael Morse

Arthur F. Buddington Award
Darcie Erin Little Badger Ryan

Sigma Xi Book Award
Lauren Samantha Miller

The Morgan McKinzie Men’s Volleyball Award
Carl Alan Hamming

Benjamin F. Howell ’13, Junior Prize
Nora Lan Xu
Reunions Reception
Friday, May 27, 2011 3:30-5:00 p.m.
Informal poster session and visiting with faculty and friends in the Great Hall

Save The Date
April 30 – May 4, 2012
GeoGrad Reunion

Hosted at Princeton by the Department and the Graduate School
Open to all graduate alumni/ae

Mon., April 30: Talks in Guyot Hall by alumni and faculty
Tues.-Thurs., May 1-3: Appalachian field trip led by Don Wise *59 and Ed Cotter *63
Fri., May 4: New Jersey field trips (Sterling Hill already booked)

When available, further information will be posted on the Department website. To get on the e-mail list, send your e-mail address to Lincoln Hollister (linc@princeton.edu)

Send us your e-mail address if you would like to receive an electronic copy instead of a print copy of The Smilodon at smilodon@geo.princeton.edu.