Vanderbilt University
Department of Geology

VU GeoNews 2003

November 2003

Noteworthy!

- Leonard Alberstadt retires after 35 years at VU
- Undergraduate research flourishes with Vaughan, NSF and VU funds
- David Furbish recruited as new *Geology* Chair
- *Geology* scheduled for name change to *Earth and Environmental Sciences*
- Joint PhD program with Civil and Environmental Engineering planned
- Seven new graduate students arrive
- Molly Miller reconnects with Antarctica

Inside this issue:

Tribute to Leonard Alberstadt

Professor Leonard P. Alberstadt, who served three terms as Chair of *Geology* (1979-82, 1985-91 and 1998-2003), retired from the faculty this past May after 35 years of service and leadership at Vanderbilt. Alberstadt is now Emeritus Professor in the Department.

Len brought a paleoecological perspective to Vanderbilt. He and his enthusiastic students examined the surrounding Ordovician limestones in integrative studies that reconstructed the environment and the organisms' control of and response to that environment. Len, his students, and Ken Walker wrote classic papers on succession in ancient reefs, documenting that the organisms eventually built the reef up into the surf zone, thus controlling the environmental conditions.

"His concern for individuals and the atmosphere he created within the department have been appreciated by many."

Len's interests migrated from reefs to other aspects of carbonate rocks, including oolites, porosity, and diagenesis. Throughout his career he trained students to study carbonate rocks by directing MS thesis projects and in teaching his ever-popular carbonates class.

Len has been interested in the history of geology and of evolutionary theory since his days as a graduate student at the University of Oklahoma. His interest in 19th century geology meshed perfectly with his passion for the history of Vanderbilt's Geology Department, and he is an expert on Vanderbilt's most famous early scientist, Alexander Winchell. He also completed a book, *From Top to*

Professor Leonard Alberstadt served three terms as Chair of *Geology* (1979-82, 1985-91, 1998-03) and recently retired after 35 years at Vanderbilt.

*(**Tribute:** Continued on page 3)*

Kaye Savage Brings Environmental Geochemistry Expertise to *Geology* Faculty

Professor Kaye Savage having fun rowing a boat in a flooded mine pit!

Professor Kaye Savage joined the *Geology* faculty in 2001, having received her Ph.D. from Stanford University that same year. Savage is interested in physical and geochemical processes which control the distribution and speciation of trace elements at and near Earth's surface, particularly in environments impacted by mining activities. Characterization of soils, sediments, and weathering rock, and waters in contact with these materials, are her primary focus. Understanding the behavior of toxic trace elements in natural systems is critical for assessing their potential health effects and mitigating hazards in watersheds. This type of research aids efforts to remediate contaminated mine sites, as well as providing fundamental information about interac-

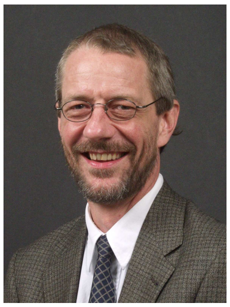
*(**Savage:** Continued on page 3)*

Letter from the Chair

Dear Alumni and Friends:

We are entering an exciting era in Vanderbilt *Geology*! I outline below what I mean by this, but first there are several noteworthy items regarding *Geology* faculty.

Our hats are off with appreciation to Professor Leonard Alberstadt, who served three terms as Chair of *Geology*, and who retired from the faculty in May. Leonard and his wife, Joan, recently built and moved into their "dream house" on country property west of Nashville, and are currently amidst a landscaping campaign aimed at their longstanding passion for gardening! Among his contributions to the Department, Leonard nurtured an important legacy of comradeship among faculty, students and staff. I hope you will examine the tribute to Leonard appearing on page 1.



David Furbish specializes in fluid mechanics applied to problems in hydrology and geomorphology.

We are delighted that Kaye Savage joined the faculty in 2001. Kaye received her PhD in 2001 from Stanford University. Kaye's specialty is environmental geochemistry applied to a variety of problems, notably trace element behavior in soils, sediments and aqueous environments (see page 1).

Thomas Kalakay and Jonathan Gilligan also joined the faculty this fall. Tom and Jonathan will play important pedagogical roles in *Geology* for several years, as outlined in the article below.

We are amidst a name change! We have just received approval to become the *Department of Earth & Environmental Sciences*. This reflects the growing breadth of topics covered in our field, and the fact that the geosciences play an increasingly important interdisciplinary role among the natural sciences — notably the Earth and life sciences — the social sciences and engineering. Our immediate agenda includes growing the Department with new faculty hires and student recruiting, and instituting an interdisciplinary PhD program to be administered jointly with the Department of Civil and Environmental Engineering — a challenge that requires maintaining a solid Earth-systems perspective in the curriculum while broadening student training to nurture effective communication with other disciplines. Our challenge also involves balancing this growth in graduate education with continued care given to quality undergraduate education.

Our agenda also includes modernizing our teaching and research space, and our computational facilities. We are currently investing significant resources toward purchasing new computers, related equipment and software, and furniture. We are also preparing plans for renovating office and laboratory space (see page 7). These efforts are aimed at providing top-quality facilities for current students and faculty, as well as improving our ability to recruit the nation's top student candidates, and world-class faculty, to Vanderbilt. Thus, we are moving into exciting times for Vanderbilt *Geology*. Our aim and aspirations are high.

Being new to the Department, I shall close with something about myself: I joined the Vanderbilt faculty this August, coming most recently from the Florida State University where I was Professor of Geological Sciences. I received my PhD (1985) in Geological Sciences from the University of Colorado at Boulder. I specialize in fluid mechanics applied to a variety of Earth surface, and near-surface, processes. I was attracted to Vanderbilt by the University's legacy of quality undergraduate and graduate education, the clear enthusiasm of *Geology* faculty and students for pursuing excellence and, of course, by the rich music of Nashville and the stunning beauty of Tennessee!

I am excited about joining the Vanderbilt faculty. I fully anticipate quickly gaining the fondness for the University and Department that I clearly see reflected in the communications of *Geology* alumni from earlier newsletters. And I hope we will continue to hear from you!

With best wishes,

David Jon Furbish
Professor and Chair

Thomas Kalakay, Jonathan Gilligan and Kinzly Moore: Key Additions to *Geology* Faculty

We are pleased that Dr. Thomas Kalakay joined the Department this fall as an Assistant Professor. Tom will fill a key role in the Department in teaching structural geology and introductory geology, and redesigning introductory geology labs over the next two years. Tom received his PhD from the University of Wyoming and has taught at Montana State University. As a field-oriented structural geologist, he works on the effects of the Laramide Orogeny in western Montana, particularly on defining the relationship between intrusion of magma and other forms of regional deformation. Tom also is an avid rock climber; he and his wife, Beth, recently spent three days climbing the vertical face of El Capitan in Yosemite National Park.

We are also pleased to welcome Dr. Jonathan Gilligan as a Senior Lecturer. Jonathan comes to us from the Department of Physics and Astronomy at Vanderbilt. Jonathan's interests in science policy, risk assessment and global environmental change add an important interdisciplinary dimension to the faculty expertise of the Department — particularly as these topics gain increasing worldwide attention and immediacy. Jonathan also loves to cook fine meals, bake artisanal bread, and hopes in his next life to own a bakery in the hills of Tuscany. When he's out of the kitchen, Jonathan loves to take photographs and work in his herb garden, where he's been delighted to discover that the Tennessee climate is perfect for Vietnamese lemongrass.

***(Moore:** Continued on page 6)*

Students Walk, New Graduates Arrive

Bachelor's Degrees 2002:
Samuel S. Henderson (BS)
Steven B. Ownby (BA with Honors)
Anneke E. Scott (BS)

Bachelor's Degrees 2003:
Kevin M. Belida (BA)
Elizabeth H. Birkos (*cum laude*, BA)
Andrea N. Gehlhausen (BA)
Brian E. Harper (*cum laude*, BA with High Honors)
Allison S. Holmes (BA)
Nathan D. Officer (BA)

Master's Degrees 2002:
Alexandra S. Hartley (*Do Reversals of the Earth's Magnetic Field Affect Life on Earth? A Biometric Test of the Hypothesis, using Calcareous Nannofossils*)
Derek L. Bryant (*Geochemical, Age, and Isotopic Constraints on the Location of the Sino-Korean/Yangtze Suture and Evolution of the Northern Dabie Shan*)
Russell W. Mapes (*Geochemistry and Geochronology of Mid-Paleozoic Granitic Plutonism in the Southern Appalachian Piedmont Terrane, North Carolina-South Carolina-Georgia*)
Miranda I. Loflin (*Monazite as a Tracer of Fluid Infiltration Associated with Contact Metamorphism*)

Master's Degrees 2003:
Nicole L. Cates (*Perspectives on the Development of an Intermediate, Open-System Magma Chamber: Aztec Wash Pluton, Nevada*)
Lorrie V. Coiner (*Cyclic Stratigraphy in the Aztec Wash Pluton, Nevada: Vertical Construction of a Composite Intrusion*)
James R. Cook (*Study of Large Scale Faulting on the Median Valley Walls of the Tag Segment of the Mid-Atlantic Ridge*)
Christopher K. Hall (*Biostratigraphic*

*(**Students:** Continued on page 7)*

Antarctica Provides Clues to Ancient Freshwater Ecosystems and Polar Climates

As you read this, Molly Miller and graduate student Nichole Knepprath are extracting secrets of ancient high latitude climate, ecology and environments from rocks exposed in the Transantarctic Mountains. The >2 km thick Permian through Jurassic sedimentary sequence contains arguably the world's best record of ancient continental (lake, stream, terrestrial) environments.

Molly and students Steve Smail (MS '97), Trent McDowell (MS '01), Suzanne Ankerstjerne (BA '01) and Lisa Berrios (current MS) developed a semi-quantitative method for assessing bioturbation and have used this as a proxy for abundance of animals living within the sediment. Applying this technique to time-equivalent rocks in Antarctica, as well as in Kentucky, the Colorado Plateau, and, most recently, the Newark and Deerfield Basins, they have found that levels of bioturbation, and thus of animal

*(**Antarctica:** Continued on page 7)*

*(**Tribute**: Continued from page 1)*

Bottom, on the history of the Vanderbilt Geology Department.

Len's influence on the Department over the past 35 years has been profound, from his early infusion of energy and excitement regarding the Ordovician world to his passion for building the department. His concern for individuals and the atmosphere he created within the department have been appreciated by many.

A text version of Professor M. Miller's tribute to Len at the College of Arts and Science dinner for retiring faculty is at: http://sitemason.vanderbilt.edu/geology/alber/retr

*(**Savage:** Continued from page 1)*

tions between mineral surfaces and aqueous environments.

Savage is particularly interested in arsenic speciation and its relationship to geochemical soil parameters, because the toxicity of arsenic is related to its chemical form. Savage and her students are currently studying smelter impacts to soils and streams on islands in Puget Sound, Washington. The ASARCO copper smelter released lead and arsenic into the atmosphere during its ~100-year operation. Wind blew these contaminants onto surrounding areas, where they have entered the soil column; both physical and chemical processes govern their transport in the near subsurface. Subsequent erosion introduces these sediments to stream environments, where aquatic plants such as horsetail incorporate lead.

Savage also studies gold mine sites, examining arsenic geochemistry within tailings piles, mineralized outcrops, and an open pit mine lake. In the Mother Lode Gold Mining District of California, located along the western foothills of the Sierra Nevada mountains, arsenic is found in naturally occurring sulfide minerals such as pyrite. These minerals are concentrated in mine tailings. When the arsenic minerals decompose during weathering, arsenic is released into iron oxide and sulfate minerals, and lake and river waters which react with the mine waste. Differences in the mode of arsenic uptake, mineral solubilities, and stabilities in different types of aqueous environments have significant consequences for release of arsenic to surface and ground waters.

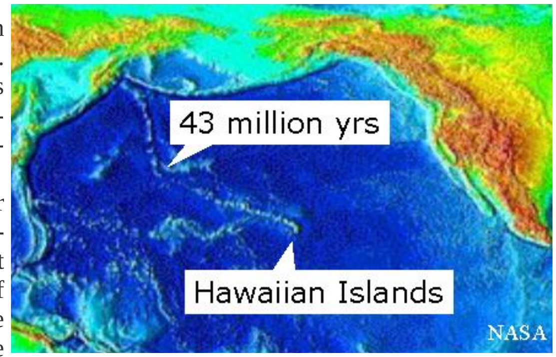
These field studies have motivated another interest, which Savage and her students explore in the laboratory: the effects of trace elements on crystal structure and reaction rates of sulfide and sulfate minerals. Presently, the Savage group is learning how the oxidation rate of pyrite is affected by the presence of various trace elements which impart semiconducting properties to the mineral. They are synthesizing pyrite crystals with controlled trace element concentrations, and carrying out laboratory oxidation experiments on both synthetic and naturally occuring pyrite crystals. Detailed characterization of the crystals is conducted to learn about the distribution and bonding environment of the trace elements, to better predict oxidation rates.

Hot Spots: Moving or Fixed?

One of the triumphs of the theory of plate tectonics holds that volcanic chains — for example the Hawaiian Islands and associated seamounts — provide direct evidence that Earth's rigid plates are steadily on the move. The premise is that these chains owe their existence to "hot spots" — hot plumes of deep mantle material that sit beneath the plates, periodically penetrating through them to produce volcanic activity. With hot spots that are fixed in a global reference frame, relative plate motion is then recorded by the chain of volcanoes which increase in age away from the site of modern volcanic activity. Hmmm...

Maybe not. That is, perhaps hot spots are not as "fixed" as previously supposed. *Geology* professor William Siesser, working with an international team of scientists on board the *Joides Resolution* — a deep-sea drilling vessel — recently completed key work on a project aimed at rigorously reexamining the idea of fixed hot spots.

Here is the problem. The Hawaiian-Emperor Chain has a noticeable "kink". Scientists have explained this sharp change in the orientation of the chain as evidence that the Pacific plate abruptly (geologically speaking!) changed direction 43 million years ago — assuming the hot spot which created the chain was fixed relative to plate motion. This explanation, however, does not accord well with other evidence of former motion of the Pacific plate.



To resolve this problem, Siesser and his colleagues needed to collect two key data sets. The first involved determining the ages of the sediments accumulating on the ancient seamounts, which provide a lower limit on the ages of the seamounts. The second data set involved determining the paleolatitudes of the seamounts at the time of their formation. In the "fixed hot spot" scenario, these paleolatitudes ought to be constant, regardless of the current positions of the seamounts.

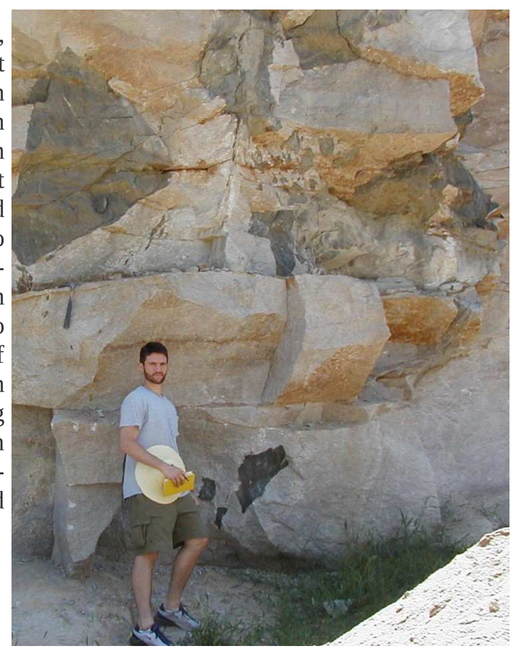
During a summer 2001 voyage of the *Joides Resolution*, paleolatitudes of six seamounts in the Emperor Chain were determined from paleomagnetic analyses of samples collected from the base of drill cores. At the same time, Siesser examined fossil calcareous nannoplankton — remains of microscopic floating organisms — within both sediments overlying the volcanic rocks and in marine volcaniclastic sediments intercalated with basalt flows making up the seamounts. Based on nannofossil assemblages, Siesser provided estimates of the ages of the seamounts to within about one million years. The combined data sets yielded a far-reaching result.

During its first 37 million years, the hot spot beneath the Hawaiian-Emperor Chain moved — and in a direction different from that of the Pacific plate. Then, 43 million years ago, the hot spot became more-or-less fixed while the plate continued its motion. This result means that scientists must fundamentally reexamine their understanding of hotspot dynamics and interactions with lithospheric plates.

Parts of this story are excerpted from The Vanderbilt Register, *January 2002*.

Demystifying the History of China's Dabie Mountains

Shortly after receiving tenure in the summer of 1998, Professor John Ayers received an e-mail from Professor Shan Gao, a prominent geochemist at the China University of Geosciences, asking if Ayers would like to collaborate on the study of ultrahigh-pressure rocks in the central Dabie Mountains of east-central China. What started for Ayers as a curiosity-driven tour of China in the summer of 1999 led to his first significant field work and the Senior Honors thesis of Stacie Dunkle that was published in *Chemical Geology* in 2002. What Ayers found there was astonishing – crustal rocks that had been subducted more than 150 km into the earth and then rapidly returned to the surface bearing high-pressure minerals such as coesite and diamond. In the summer of 2001 Ayers returned to the Dabie Mts with Gao and Masters student Derek Bryant to study the northern Dabie Mts, which are not ultrahigh-pressure but even more puzzling: it was not known whether they were part of the northern Sino-Korean craton or the southern Yangtze craton (the suture is nearby but has not been identified). Bryant used geochronology and trace elements to establish that they are part of the Yangtze craton, and his results are now in press in *GSA Bulletin*. Ayers has also collaborated with Gao on a study of adakites in northern China that has been submitted to *Nature*, and is continuing his collaborations with Calvin Miller on monazite studies and his laboratory-based studies of accessory minerals and fluids.



Masters student Derek Bryant with amphibolite blocks that are floating in a granitic magma chamber, northern Dabie Mountains, China.

Students Present Research at GSA

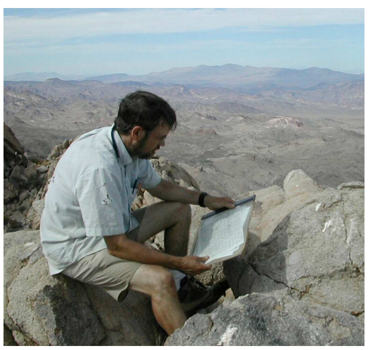
Last Spring, seven VU undergraduate and graduate students gave talks at regional meetings of the Geological Society of America (GSA). Four more will be presenting results at the national GSA annual meeting in Seattle in early November, 2003.

Giving papers at the SE GSA meeting in Memphis were Allison Holmes, BA'03, (Composition and Feldspar Alteration in Pleistocene Glacial Sands, Wind River Range, WY); Miriam Borosund, BA '04, (Sandstone Composition and Feldspar Weathering, Weller Coal Measures (Permian), Transantarctic Mountains, Antarctica); Nathan Officer, BA '03, (Western Blue Ridge basement of northeastern TN and northwestern NC: age, geochemistry, and possible relationships to Proterozoic rocks of the southeastern USA); and Peter Bergquist, MS candidate (The Mars Hill Terrane: Extent, Age, and Origin of the Oldest Rocks in the Southeastern USA).

Students working in southern Nevada were fortunate that this year the GSA Cordilleran held its meeting in Puerto Vallarta on the west coast of Mexico. Reporting results of their research at that meeting were Lorrie Coiner, MS '03, (Cyclic stratigraphy in the Aztec Wash Pluton, Nevada: Vertical construction of a composite intrusion); Nicole Cates, MS '03, (Longevity of plutonic systems: SHRIMP evidence from Aztec Wash and Searchlight Plutons, Nevada); and Brian Harper, BA '03, (Granite Accumulation and Fractionation in a Dynamic, Open-System Magma Chamber, Aztec Wash Pluton, Eldorado Mtns, Nevada).

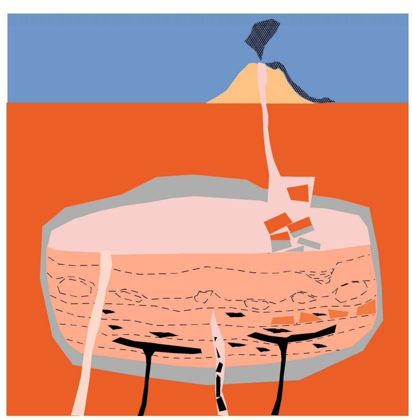
Traveling to Seattle to give talks on their MS thesis research will be Brett Beaulieu (B.A. '00, MS candidate: X-ray Absorption Spectroscopic Investigation of Arsenic Speciation and Coordination Chemistry in Smelter-Contaminated Soil Profiles); Laura Jacobs (MS '03; Uptake in Common Horsetail (*Equisetum arvense*) at Smelter Impacted Islands in the Puget Sound); Chris Koteas (MS candidate, Granites, Dynamic Magma Chamber Processes, And Pluton Construction: Aztec Wash Pluton, Eldorado Mountains, Nevada); and Peter Bergquist (MS candidate, Anomalous Ancient Crust In The Southeastern USA: Implications For The Assembly Of North America And Rodinia).

Under the Volcano: Probing Magmatic Plumbing Systems



Volcanoes and their erupted products represent the tip of the magmatic iceberg — spectacular but brief flare-ups that punctuate long-term processes of generation and migration of magma from the mantle and lower crust toward the surface. Common views hold that the migrating magmas pause and pool in their upward journey in chambers beneath the surface; eruptions document tapping of these chambers, but much of the magma is retained at depth to solidify as plutons. The physical nature of magma chambers while they are "alive" and the dynamic processes that act within them are highly controversial, but they are critical for understanding what triggers eruptions and how the earth's crust has been constructed.

Calvin Miller and his students study extraordinary exposures in southern Nevada, trying to better understand how magma chambers work. Extensional faulting produced huge tilted, rotated, domino-like fault blocks that expose up to 15 km of the upper crust. The magma feeder systems in these thick sections can be traced from bases of plutons to thick, erupted volcanic sequences. Within these frozen plumbing systems they have found abundant evidence for protracted, complex histories, with both basalt and granitic magma repeatedly pumped into dikes and chambers and mingling there. They also note field relations that suggest magmatic depositional processes akin to those seen in dynamic, high-energy sedimentary systems, repeated collapse of chamber roofs, and possibly the residues of major melt extraction events — eruptions!



Calvin and VU students have been studying the southern Nevada magmatic centers for more than 10 years - initially aiming to generally describe them and determine the sources of the magmas, and now focusing on the physical processes that lead to chamber filling, eruption, and ultimately pluton construction. The current research emphasizes very detailed field studies and microanalysis of zircon by ion microprobe to determine the timing and rates of magmatic processes. In the past five years, grad students Kellie Townsend, Mary Beth Cheversia, Nick Lang, Lorrie Coiner, and Nicole Cates and undergrad Brian Harper have all completed theses on problems in Nevada. Currently, Chris Koteas and Heather Bleick are working on Master's theses and Thomas Steinwinder on a Senior Honors thesis. Jonathan Miller (VU MS 1989), now a professor at San Jose State University, is collaborating on the project. This group and their predecessors have spent many fine times beneath the desert sky, bonding with each other and with Nevada weather and flora and fauna (for better and for worse).

Calvin has also continued to study southern Appalachian tectonics with recent grad

(***Volcano:*** *Continued on page 6)*

Brett Beaulieu: News from Washington

Brett Beaulieu, Geology *MA student, recently completed a 2003 summer internship with the American Geological Institute's Government Affairs Program. The AGI summer internship program, funded in part by the American Institute of Professional Geologists, is highly selective. Brett was one of only three interns selected from a national pool. Below is his report on his experience.*

Geoscience issues are so frequently the subject of Congressional hearings, executive agency actions, and federal court decisions that they kept myself and two other interns busy reporting these topics back to the geoscience community via the web this summer. Despite its importance to public policy decisions ranging from energy to natural hazards to environmental protection to science education, geology continues to be misunderstood and overlooked by policymakers and the public. This was one of the major take-home lessons of my internship experience: geoscientists must educate the public about what we do or else funding for programs many of us take for granted – including the US Geological Survey – face continued vulnerability every year as Congress takes up appropriations.

Right now is an especially important time for geologists to speak up, because the current administration favors removing or relaxing protections on almost every media in the natural environment. Issues that I reported on this summer as an AGI intern serve as examples of the need for scientific input into these issues. The Clean Water Act is under attack by those who fail to recognize the hydrogeological interconnectedness of the nation's waters. Despite the overwhelming consensus of the geoscience community that carbon dioxide emissions are causing climate change, the administration released a "strategic vision" that focuses on reducing uncertainty while doing nothing to curb emissions. For more information on these and other issues, or to see what the internship involves, check out AGI's Government Affairs website at http://www.agiweb.org/gap/index.html or look for my article in the November issue of *The Professional Geologist.*

The internship at AGI was an exceptional learning experience that provided me with a first-hand look at how science informs public policy, an up-to-the minute understanding of current geoscience-related public policy issues, useful contacts in Washington, and practical skills including science writing and web publishing. It provides geology students at the undergraduate or graduate level the opportunity to become the informed citizens needed to improve public perceptions of geoscience and to improve the way we govern ourselves, whether as policy-savvy scientists or scientifically-knowledgeable policymakers.

*(**Moore:** Continued from page 2)*

Geology has been fortunate to have N. Kinzly Moore (VU BA '69, MS '72; PhD from UT, '78) teaching for the past three years. Because Kin had been sharing responsibility for the Maymester Coastal Geology course with Art Reesman for several years prior to that, he was familiar with the challenges and rewards of teaching courses populated primarily by non-majors. His favorite course is Geology 100, Environmental Geology, because it provides opportunity to introduce so many people to environmental issues. He currently is teaching History of the Earth to potential and just-declared majors, and is thoroughly enjoying convincing them that Nashville's limestones and their fossils tell exciting stories about the history of Earth and life. The best part of teaching, he feels, is interacting with students.

*(**Volcano:** Continued from page 5)*

students Betsy Gorisch, Sam Vinson, Chuck Carrigan, Chris Thomas, and Russ Mapes and undergrads Susanne Meschter, Steven Ownby, Tiffany Kolsrud, and Nathan Officer, with current grad student Pete Berquist and senior Sarah Snyder, and with UT distinguished professor Bob Hatcher (VU BA '61, MS '62). He brings an interest in zircon and other accessory minerals to all of his work, including collaborations with John Ayers, and has just published a paper in *Geology* entitled "Hot and cold granites?: Implications of zircon saturation temperatures and preservation of inheritance."

Staff Changes

Nancy Schaad retired in May, 2002, still looking well below retirement age, after 39 years on campus, 37 years in the *Geology*. Call during those years and you'd get "Geology Depaahhtment"; the Boston accent remained strong, jolting those expecting something else.

Step in the doorway and you'd get a friendly smile and an invitation to talk, reflecting Nancy's interest in you. She knew and appreciated everyone who visited, and remembered his/her story.

The "Nancy Network" on campus was legendary for its size and strength. She is missed everywhere, but most in *Geology*. In retirement, she loves the Schaad rustic retreat and walks along the Harpeth River with her Golden Retriever, Dan. As Jewell Williams said, "Nancy may have retired from *Geology* but she has not retired from life."

Jewell Williams, who began her service to the Vanderbilt community out of high school in 1974, has been the Administrative Assistant for *Geology* since 1999. She has worked in the School of Nursing, the Departments of Chemistry, Psychiatry, Physics & Astronomy, and Teaching & Learning. Jewell loves the academic environment and serving students and faculty. She is mother of four children (ages 16-20), and her hobbies include horseback riding, softball and charcoal drawing. Jewell is a Titans fan and enjoys watching football with her husband.

Michele Cedzich, Office Assistant in *Geology* since 2002, began working with Vanderbilt in 2001 as a Photo Editor in Creative Services. She enjoys assisting the students and faculty with their day-to-day needs and activities associated with academics. Michele is the proud mother of three young children, Savannah (10) and twins Jackson and Conner (5). In her free time Michele enjoys photography, art and hiking.

New Department Facilities: Analytical, Computational and Structural

During the summer of 2003 the Department, with Civil and Environmental Engineering, purchased two powerful new analytical instruments, a Laser Ablation Inductively Coupled Plasma Mass Spectrometer (LA-ICPMS) and a Thermal Gravimetric Analyzer with Mass Spectrometer (TGA-MS). The ICPMS can detect parts per *trillion* levels of solutes in water samples; the laser ablation attachment can be used for in-situ analysis of solids. Department faculty and students have already started using the LA-ICPMS for measuring trace element concentrations, isotope ratios and age dates in accessory minerals. The TGA-MS can measure ppm levels of volatiles that are released during programmed heating of samples to 1500 ° C. Together these instruments have greatly increased our analytical capabilities, and they *look really cool*. Come visit and we'll proudly show them to you!

In cooperation with the College of Arts & Science, *Geology* is in the midst of making a significant investment to improve the quality of the working space and computational facilities for students in the Department. We are currently redesigning the office space for our graduate students, and planning a "commons" study area for our undergraduate students. Very soon our graduate students will have modern, spacious carrels with new seating. They will have access to new Pentium 4 computers with large disk capacity and memory, and a suite of software. These will be networked with two new black-and-white laser-jet printers, a new high-resolution color laser-jet printer, and a high-end large format plotter. We are also purchasing several Pentium 4 computers for our undergraduates. In addition, students and faculty will have access to two new high-performance dual-processor work stations, one with dual screens, and each connected to a disk storage bank. These work stations will be dedicated to specialized tasks specific to the Earth and environmental sciences, ranging from GIS applications to large-scale dynamical simulations to advanced visualization. This commitment to improving the working space and computational facilities for our students reflects *Geology's* philosophy that such facilities are a fundamental part of the modern working environment in all areas — academics, the private sector and government — and that our students should have immediate access to these facilities as part of their training.

Also in cooperation with the College, *Geology* is in the midst of reorganizing and redesigning much of its space on the 7th floor in the Science & Engineering Building as well as space on the 1st floor in the Math Building. This will include moving the introductory teaching laboratories to the 1st floor, opening areas on the 7th floor to new research and office space. The introductory laboratories will occupy space that currently houses rock, mineral and fossil collections; these collections are being transferred to high quality museum facilities in Memphis and elsewhere, where they will become key parts of displays highlighting Tennessee geology, as well as made available to researchers from around the nation.

(**Students:** *Continued from page 3)*

Investigation of the Oligocene in Mississippi and Alabama using Calcareous Nannofossils)

Laura E. Jacobs (*An Analysis of Smelter Sourced Pb in Stream Sediment, Pore Water, Surface Water, and Plants on Vashon and Maury Island, Washington*).

We are also pleased to welcome seven graduate students who began this Fall 2003: Heather Bleick (MS), Vena Jones (MS), Nichole Knepprath (MS), Simon Mudd (PhD), Bobbie Vallotton (PhD), Barry Walker (MS) and Lichun Zhang (MS).

(**Antarctica:** *Continued from page 3)*

population, are a fraction of those in equivalent marine deposits. This indicates that the bottoms of lakes and streams were barely inhabited by the late Paleozoic — contrasting strikingly with marine substrates that have been densely inhabited since the explosion of complex animal life in the Cambrian. Results of this work have been published in 2002 issues of *Geology* and *GSA Today*.

This year Molly and Nichole have two primary goals. One is to use the distribution of burrows in Permian and Triassic stream channel deposits; their hypothesis is that flow was constant year round in the Permian but highly seasonal in the Triassic. The second is to search for, and hopefully find (!!!), very early mammals, perhaps the earliest. Molly and co-workers previously discovered giant burrows in Lower Triassic floodplain deposits, some of which were produced by mammal-like reptiles. This year, with the help of vertebrate paleontologist Christian Sidor, they will look for mammalian descendents of these mammal-like reptiles still preserved in their burrows, snuggled in for the long Triassic polar (but warmer than today) winter.

With collaborators from the University of Wisconsin, Milwaukee, including sedimentologist John Isbell, Molly and Nichole will be camping for over two months within a 200 mile radius of a temporary base camp near the Beardmore Glacier. (This is the glacier traversed by Robert Scott on his failed 1912 attempt to be the first to the South Pole.) Helicopters stationed at the base camp will provide speedy access to localities with excellent and extensive exposure and will also move the Miller-Isbell camp. Molly loves the terrific exposures of fascinating rocks, the scenery, the simple life (work and survive), and the isolation, with its attendant opportunity to build a close community.

Exploration, Vanderbilt's on-line research magazine (http://exploration.vanderbilt.edu/home.htm), will have an article about Molly's work, biweekly e-mail updates, and photos from Molly and Nichole in Antarctica starting in November.

VANDERBILT UNIVERSITY
DEPARTMENT OF GEOLOGY

VU Station B #351805
2301 Vanderbilt Place
Nashville, Tennessee 37235-1805

Phone: 615-322-2976
Fax: 615-322-2138
Email: geology@vanderbilt.edu

The viscosity of Kilauean lava at eruption is approximately the same as that of ordinary hair shampoo at room temperature!

Vaughan Research Scholarship Program, NSF REU's and VUSRP Provide *Geology* Undergraduates with Research Experience

The Eugene H. Vaughan, Jr. Undergraduate Research Scholarship program, established in 2000 by a generous donation from Mr. & Mrs. Ernest Cockrell in honor of Board of Trust member Eugene Vaughan, Jr., has provided funds to support nine students and their research projects in the last three years. Students supported in 2002-04 include Andrea Gelhausen, who worked with Kaye Savage on the environmental impact of a car battery dump site; Nathan Officer who worked with Calvin Miller and MS student Pete Berquist on defining a tectonic terrane in northeastern Tennessee, Brian Harper, who worked with Calvin on dynamics within a Miocene magma chamber in Nevada, and Thomas Steinwinder who is studying dike emplacement and tectonics in the same area.

Faculty members Calvin Miller and Molly Miller have had Research Experience for Undergraduates (REU) supplements added to their grants from the National Science Foundation. This has allowed them to provide summer salary and/or offset field expenses for Brian Harper ('03) and Thomas Steinwinder ('04) who have worked in southern Nevada with Calvin, and for Miriam Borosund ('04), Allison Holmes ('03), and Kelsey Bitting ('05) who worked (or are working) on Antarctic-related projects, some entailing field investigations in the Northern Rockies.

In addition, three students in the last two years, Miriam Borosund, Brian Harper, and Thomas Steinwinder, have received summer stipends from the Vanderbilt University Summer Research Program (VUSRP).

With these sources of funding, *Geology* has been able to provide research experiences for all students who want them. The Vaughan Undergraduate Research Scholarship program is particularly important because, as an endowed program, its funds provide a dependable source of support that can be counted on to help students year after year.

Please take a moment to fill in the *Request for News* insert and send it to us. We very much want to hear from you!