

ANNUAL REPORT 2005-2006

Department of Geosciences

Virginia Polytechnic Institute and State University

2005-06 DEPARTMENT ANNUAL REPORT

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Part 1: Executive Summary

The 2005-2006 academic year was one of transition and growth for the Department of Geosciences. Bob Tracy took over as Chairman of the Department in August for the departing Don Rimstidt who stepped down to spend more time pursuing his research interests.

During the spring semester the Department interviewed 14 potential faculty candidates within the two new thrust research areas in rheodynamics and integrated studies of earth systems. As of this writing five offers have been made to two senior and two junior candidates and two outstanding geophysicists (rheodynamics area) have agreed to join our faculty. Apart from these searches the department has hired Bob Lowell a senior research professor in geophysics, and Joerg Jinschek, an adjunct professor to run the new world-class \$1.8M transmission electron microscope that is housed in the Department.

The faculty has had another highly productive research year by securing \$12,048,557 in grant commitments (a 20% increase over last year) with another \$3,257,237 in pending support. A total of 83 research papers were published along with 148 abstracts during 2005-06. Within the existing faculty, one was promoted to full professor and several major meritorious awards were garnered by the faculty including: Virginia Scientist of the Year to Mike Hochella, DOE best University Research Award to Trish Dove, and four society awards for excellence in research and education in the areas of paleontology and sedimentology.

Ten MS and seven PhD degrees were awarded (an increase of 70% over last year) along with 21 BS degrees (a 75% increase over last year) during the 2005-06 academic year. The number of undergraduate majors enrolled in the department over four options—geology, geophysics, geochemistry, and earth science education—has increased to 90 (a jump of 25% over the previous year). Approximately \$120,000 was awarded to students of the Department for scholarships and fellowships from various sources this past year.

Three new graduate course offerings were added to the curriculum. The highly successful Senior Seminar course was taught for the second time in the Spring of 2006 and appears to represent an important culminating capstone experience for our graduating students. The Spring of 2006 also represented the fourth and final semester of the NSF supported experimental Earth Sustainability integrated core curriculum project. Nineteen students completed the series. The Departments seminar series was once again a tremendous success as 21 outstanding speakers presented research talks (apart from the 14 faculty candidate seminars). Seven companies visited the Department of Geosciences to recruit students during the fall semester and six students received offers as a result of those interviews.

In Llyn Sharp's first full year as Outreach Specialist, she was the recipient of the College of Science Outreach Excellence award. The Department continues to make strides to

support K-12 educators and students through mentoring, service-learning, in-class experiments, and the Department's museum (approximately 7,000 visitors this past year).

The Department continues to make strides to meet its goal of becoming a top-15 geoscience department. Development efforts have been highly successful as the Department of Geosciences has secured major financial commitments from alumni to enhance its reputation and visibility both locally and worldwide.

Part 2: Academic Accomplishments

I. Learning: Undergraduate Education (Curriculum, Senior Capstone Course Educational Research, Academic Advising , Evaluation of Student Performances); **Graduate Education** (Mentoring, Recruiting, Academic Assessment, Scholarship Activity); **Seminars**

Undergraduate Education

The primary goal of the Department Geosciences in the education of its undergraduate students is to prepare them for productive careers either by directly entering the job market or after completing a graduate degree. Thus the undergraduate curriculum is simultaneously serving two somewhat divergent paths - immediate employment or continued education. The Geosciences, like many fields, is experiencing an unprecedented growth in technological development and it is necessary for the Department to maintain a balance between traditional basic knowledge and rapidly evolving technology in its undergraduate courses. The programs of study in the undergraduate curricula are designed for graduation in four years, albeit with a rigorous program of study. Traditionally, more than one-half of the students graduating in the Geosciences have transferred into the Department at some point in their undergraduate career. These transfers come from other departments within the College of Science, from other colleges within the University, from community colleges and from other universities. Many have some advanced placement credit and/or transfer credits. Their diverse backgrounds make generalizations impossible and require that each is separately evaluated and that each has a customized program of study. The impact on assessment is that they may have very diverse backgrounds and that some cannot graduate within four years of their initial enrollment in this, or some other, university. Nevertheless, the Department makes every effort to graduate students in four years and works with each transfer student to find the most feasible ways to achieve this goal.

Geosciences has 90 undergraduate majors distributed over four options—geology, geophysics, geochemistry and earth science education.

The Department strives to provide contacts for undergraduates with professionals in the Geosciences. This takes two principal forms - regular seminars offered by visiting scientists to the Department and visiting recruiters from major companies. Undergraduate students are encouraged to participate by attending the seminars and by attending special presentations given by recruiters. When recruiting schedules permit sufficient time (which is common) undergraduates are encouraged to interview with recruiters to gain experience and also to gain insight into job opportunities. In fact, many of the major oil companies now do most of their hiring from pools of students who have first served as interns at some point in their academic careers. Historically, many companies - particularly the major oil companies - have regarded the MS as the terminal degree for students entering industry. Due to work force demographics and large scale retirements now taking place in the oil industry, this hiring practice is beginning to change and oil companies are now starting to hire at the BS level. Hence, it is important for students to meet and talk with recruiters as early as possible in their careers.

Curriculum

Undergraduate Courses			
Courses	No. Sections	No. Students	Credit Hours
1 st Summer 2004	2	33	104
2 nd Summer 2004	0	0	0
Extended Summer 2005	0	0	0
Fall 2005	67	3229	9852
Spring 2006	52	3076	9843

The department's plan for the new university core curriculum requirement for incorporation of general communications (written, oral, and visual) into the undergraduate major (the university acronym for this new approach is VIEWS) has been approved. This plan emphasizes curricular revisions made by Geosciences over the past several years that included as their goals these same student communications skills. No curricular changes or new courses were proposed as part of this program. The university ranked the plan as an ideal model and used it as an example for the entire university, validating the strength of our existing curriculum.

Senior Capstone Course

In the first half of the senior seminar course in Spring 2006, students were required to pick a mine site that was producing acid rock drainage in the US and evaluate the short-term and long-term environmental impacts to human health and the environment. Based on best available data, they were required to decide which site(s) required immediate attention. Throughout the course, they were required to prepare a draft report which was reviewed by their peers and the instructors, make appropriate edits to the report and submit a final report discussing their site. They were also required to prepare a power point presentation with their findings which was presented to the entire class. They were also required to prepare a poster with colleagues from their region, which evaluated environmental impacts of their site compared to other sites in their region and rank each site in terms of their most significant environmental impacts. These rankings were then used to compare all the sites evaluated by the class and the students decided which mine sites are in need of immediate remedial action.

In the second part of the course, students investigated the geologic, hydrogeologic, and geochemical background of arsenic contamination of groundwater in Bangladesh. The students worked with large datasets assembled by the British Geologic Survey to prepare a GIS map of arsenic occurrence, to conduct statistical analyses on the dataset, and to work with different methods of graphing the data. The students then worked in groups to investigate 1) theories of arsenic release into groundwater and 2) mitigation approaches. The last two weeks of class were devoted to research proposals, for which the students 1) came up with ideas to better understand the problem, 2) gave a presentation on their idea,

and 3) prepared a 5-page NSF-type proposal. The students chose topics based on their own interest and background. Proposal topics included using geophysical methods to identify peat and confining units in aquifers, using stable isotopes to delineate arsenic source, and using aquifer testing methods to determine the long-term sustainability of the deep aquifer, in addition to others. The proposal was done in three steps (outline, draft, and final), with review at the first two steps, to give students a chance to respond to comments and concerns. Overall, the students were generally excited about learning about this problem and its geologic origins, and were open to “thinking outside the box”. At the end of the 8-week period, significant improvement in oral presentation skills and ability to communicate their ideas in their research proposals was observed.

Educational Research

In Spring 2006, Barbara Bekken together with a team of four diverse faculty and a graduate student from four different colleges, completed the fourth and final semester of the experimental Earth Sustainability (ES) integrated core curriculum project begun in Fall 2004. Nineteen of the original 23 students completed the series and will receive credit towards six of the seven areas of the core curriculum in six fewer credit hours than if they had enrolled in the traditional core, thus providing them greater elective flexibility. The ES series curriculum is designed in accord with a well-established curricular/developmental model that supports student development along three key domains: cognitive/epistemological, interpersonal, and intrapersonal. The series is augmented by a four-year long NSF-supported longitudinal study to evaluate student gains in learning and development along these three domains relative to a control group of students who are enrolled in the traditional core. Beginning in Fall 2006, the series will be expanded to accommodate 75 incoming first-year students who will also be evaluated relative to a control group of first-year students. This second cohort will be taught by a new group of instructional faculty and graduate students who will also participate in a faculty development program and study that encourages them to rethink, revise and revitalize core education. It is the ES team's hope that programs such as these become prototypes that encourage a paradigm shift in general education toward a more fully integrative core in which multiple disciplines are integrated in a learning-centered environment that encourages students to take far greater responsibility for deep learning, retention, and application, especially of STEM-related subjects, than is currently documented for traditional core curricula.

Academic Advising

The Department strives to provide superior academic and career counseling for the undergraduate students. Every undergraduate is interviewed at the time he or she enters the Department as a new undergraduate or as a transfer and is given information on academic expectations, course requirements, departmental activities, employment opportunities and other professional opportunities. Each student is assigned an academic advisor who oversees the student until graduation. Students are required to meet regularly before pre-registration each Fall and Spring semester to ensure that progress is being made towards their degrees. These meetings consist of two stages: first a meeting with Mrs. Connie Lowe (Student Coordinator) to check the technical details of their plan of studies and registration for the up-coming semester, and second a meeting with their academic advisor to discuss

such broader issues as designing and maintaining a plan of study to achieve long term career goals. In combination with student course evaluations, these meetings have also proved to be an important (although un-quantified) source of student feedback on the curriculum.

Evaluation of Student Performances

The Department of Geosciences continues to administer an entry and exit exam (initiated in 1992) of in-coming Freshmen and graduating Seniors as a means of determining if students are learning and retaining new information from their courses. Data generated by this exam complement the data base generated by the Virginia Tech Academic Assessment Program's *Survey of Degree Candidates*. The exam which is currently being used was developed in a collaborative effort by the entire faculty and hence examines a broad spectrum of the Geosciences. Incoming Freshman take the exam at the beginning of the first semester (usually before any classes have met) and graduating seniors retake the exam in the last week of their undergraduate careers. They have no contact with the exam in between so there is no specific preparation for it. The results have been, and continue to be, gathered each year. However, this exam has not been up-dated since many of the younger faculty were hired in the mid-late 1990s, and is now being modified to more accurately reflect the broad changes in curriculum associated with new course offerings.

Graduate Education

Course Development

- GEOS 5154: Strong-Motion Seismology and Seismic Hazard Analysis, Martin Chapman, Fall 2006
- GEOS 5004: Analytical Geosciences, Michal Kowalewski, Fall 2006.
- GEOS 5834: Chemical Hydrogeology, Madeline Schreiber, Spring 2007

Mentoring

The Department of Geosciences maintains a strong graduate program with a large number of students given the size of the faculty. Although graduate students work with a primary advisor, there is considerable interaction among individual research programs, as collaboration is fundamental in the diverse field of geosciences. The responsibility of mentoring graduate research falls first on the primary advisor, but significant support is provided by a student's thesis committee as well as other faculty within and outside of the department.

The department also offers several programs to facilitate the overall mentoring of graduate students as a collective. Activities include an annual orientation and field trip (August 2005), a faculty-seminar day and reception (September 2005), the 2-day Graduate Student Research Symposium (GSRS) (March 2006), an annual graduate student-faculty meeting, and several dinners, picnics, and socials throughout the academic year. There are also plans to enhance the annual graduate orientation for next year, beyond the traditional logistical and TA-training focus. Next year, this orientation will include faculty presentations that focus on graduate careers and the "expectations of

graduate students". These expectations will focus on a vision for what is expected of graduate students as they become professionals in their field and how graduate work goes beyond the undergraduate student experience, and will include such things as scientific culture, active participation and contribution in a scholarly community, and professional ethics.

Graduate student mentoring, activities, awards, and admissions are coordinated by the Graduate Student Affairs Committee, which is lead by the Graduate Program Director and Associate Chair (J. Spotila). The department administration is aided by a graduate liaison committee that consists of about 6 graduate students, which meets with the Graduate Student Affairs Committee each semester and is a line of open communication for feedback and concerns of graduate students. For example, in 2005 the liaison committee was instrumental in revising procedures for the Graduate Student Symposium based on a survey that they implemented independently from the faculty.

As a result of these activities in graduate mentoring, the Department of Geosciences maintains not just a graduate student body, but a cohesive community of students that interact and help each other, thereby enriching their graduate experience at Virginia Tech.

Recruiting

At the beginning of fall semester 2006, Geosciences will have 14 M.S. and 40 Ph.D. students (54 total). This includes 16 new graduate students (9 M.S. and 7 Ph.D.). The following summarizes graduate applications and admissions for the 2005-2006 academic year:

Graduate students supported during the 2005-2006 Academic Year: 55

Graduate students successfully completed in 2005-2006: 10 M.S., 7 Ph.D.

New graduate applications: 53

New graduate applications accepted for admissions: 27

Graduate students offered support: 27

New graduate students accepting offer for admission: 16

Special student recruiting and information booths to promote the Department of Geosciences were set up and tended by faculty and graduate students at the following professional meetings: Geological Society of America (Salt Lake City, UT), Southeast Section of Geological Society of America (Knoxville, TN), and the American Geophysical Union (San Francisco, CA). In addition, the departmental website has been completely redone over the past few years, and is now operational. The new website is more accessible for individuals to create and upload content, and should enhance the department's visibility to potential graduate students. The department also continues to use a web-based pre-application form to reach potential applicants and to match their research interests with potential faculty advisors.

Academic Assessment

As requested by the Office of Academic Assessment in Spring 2005, the Department of Geosciences created a plan for graduate education assessment to be carried out in the

2005-2006 academic year. The Office of Academic Assessment subsequently retracted their request for this assessment program, so that they could undergo restructuring. However, Geosciences was not notified of this change until December 2005, by which time most of the plan had been carried out. Results from our assessment activities will be synthesized and presented as needed for future assessment requests by the Office of Academic Assessment.

The following summarizes assessment activity in 2005-2006. A detailed survey (100+ questions) related to academic and professional preparation and overall satisfaction with the graduate program was written and distributed in Fall 2005. Approximately 40 active graduate students completed the survey. A similar survey was sent to graduate alumni over the past 10 years. Approximately 90 surveys were mailed, of which we received approximately 42 back. The results of these surveys will be very useful in assessing our graduate program, given the level of participation by current and former students. In addition, the graduate academic assessment committee interviewed hiring representatives from 6 companies that represent the main industrial employers (petroleum and environmental industries) for graduate students (non-academic employment). These interviews focused on what qualities they seek in potential hires, what aspects of our graduate program that work, and how the graduate program can be improved. The anecdotal results from these interviews will also be useful in assessing the graduate program.

Scholarship Activity

Foundation funds were used effectively to support graduate students in the past academic year. Six graduate students in fall 2005 and seven graduate students in spring 2006 were funded (i.e. stipend and/or tuition) using Foundation funds. The total scholarship funds granted to students in the past academic year was approximately \$120,000 (which includes both graduate and undergraduate scholarships). Other creative funding sources were also used to support graduate students, including a total of 4 semesters of funding from the University's 2010 program (i.e 2 students for the entire year), 2 semesters of funding from MAOP support, 2 semesters of support from the Cunningham Scholarship, 2 semesters of support from IGERT, and 3 semesters of support from GAANN.

Departmental Seminars

William Anderson, Appalachian State University, "Inferences from Water-Table Hydrographs on Hatteras Island, North Carolina"

Janok Bhattacharya, AAPG Distinguished Lecturer, University of Houston, "Applying Deltaic and Shallow Marine Outcrop Analogs to the Subsurface"

Tim Bralower, Penn State, "The Paleocene-Eocene Thermal Maximum: Resolving the Biotic and Environmental Responses to Ancient Global Warming"

Mickey Gunter, University of Idaho, "BLOSS (books, light, optics, spindle stage): An Acronym for 50 Years of Excellence in Optical Mineralogy"

Mike Hochella, Virginia Tech Geosciences, "Materials Science in the Geosciences: Examples of Properties, Behaviors, and Consequences of Natural Nanomaterials in the Environment"

Steve Holland, University of Georgia, “The Accuracy of Fossil Ranges: Sobering Implications and Promising Applications of a Combined Modeling-Field Approach”

David Kohlstedt, University of Minnesota, “Shearing Melt Out of the Mantle: The Relation Among Mantle Flow, Melt Migration, and Seismic Anisotropy”

Rebecca Latimer, AAPG Distinguished Lecturer, Chevron Energy Technology Company, “Uses, Abuses, and Examples of Seismic-derived Acoustic Impedance Data: What Does the Interpreter Need to Know?”

Jeff Lee, Central Washington University, “Gneiss Domes and the Himalayan Orogeny—Did the Middle Crust Flow?”

James Markello, ExxonMobil Upstream Research Company, American Association of Petroleum Geologists Distinguished Lecturer, “The Carbonate Analogs through Time (CATT) Hypothesis-A Systematic and Predictive Look at Phanerozoic Carbonate Reservoirs”

Matthew Mikulich, Chevron Corporation, Chief Geophysicist/Principal Technical Advisor (Retired), Adjunct Professor of Geophysics, VT, “Hubbert’s Peak and Global Oil Reserves or Is It Time to Sell the SUV, Yet?”

Richard Norris, Scripps Institution of Oceanography, “Ocean Flip-Flops and Greenhouse Warming at the Paleocene-Eocene Boundary—Possible Analog to Earth’s Future?”

Patrick O’Brien, University of Potsdam, “From Microscopic to Macroscopic: How What We See in the Microscope Can Be Used to Explain the Formation of the Himalaya”

Richard O’Connell, Harvard University, “Models of the Development of Heterogeneity in the Mantle”

Mike Oskin, University of North Carolina, Chapel Hill, “Fault System Behavior of the Eastern California Shear Zone from Intercomparison of Geodetic, Paleoseismic, and Geologic Strain Budgets”

George Philander, Princeton University, “State of Fear the Day after Tomorrow? A Geological Perspective on Global Warming”

Robert Sheridan, Rutgers, Emeritus, “Mapping the Pre-Breakup Coastal Plain and Continental Shelf Basement, The EDGE Project with Lynn Glover”

Taury Smith, New York State Museum, “Hydrothermal Dolomite, Hydrocarbon Reservoirs and Carbonate-Hosted MVT Ore Deposits; Faults, Fluid Flow, Lithologic and Seismic Expression”

Kip Solomon, Darcy Lecturer, National Ground Water Association, University of Utah, “Inert Gas Tracers in Ground Water”

Alexis Templeton, University of Colorado, “Submarine Bioalteration of Volcanic Glasses by Metal-Oxidizing Bacteria?”

Lonnie Thompson, Ohio State University, “Abrupt Climate Changes in the Earth System: Past, Present and Future”

Bernhard Wehrli, Department of Environmental Sciences, ETH Zurich, EIGER Distinguished Speaker, “The Last Millimeter – Observations in the Transit Zone between Water and Sediment”

Faculty Candidate Seminars

Jonathan Ajo-Franklin, Massachusetts Institute of Technology, “Evaluating High Resolution Borehole Geophysics for DNAPL Detection and Environmental Site Characterization”

Emily Allen, Bryn Mawr College, “The Mode and Occurrence of Extinction Selectivity in the Fossil Record”

Elizabeth Cochran, Scripps Institution of Oceanography, “The Fragility of Faults: Cracks, Damage and Fault Interaction”

Dennis DeMets, University of Wisconsin-Madison, “Toward an Improved Understanding of Mexican Neotectonics and Subduction Zone Mechanics”

David Goldsby, Brown University, “Experimental Constraints on the Flow of Ice: From Greenland to Ganymede”

Steven Jacobsen, Carnegie Institution of Washington, “Is there a Deep-Earth Water Cycle?”

Alan Kaufman, University of Maryland, “Geochemical Models of Neoproterozoic Earth System History”

Scott King, Purdue University, “The Good, the Bad and the Ugly: Surface Deformation and Mantle Convection from a Planetary Perspective”

Shanan Peters, University of Michigan, “The Geologic Record and Macroevolution”

Jacob Sewall, Utrecht University, The Netherlands, “Understanding Global Climate One Region at a Time: RCM and GCM Investigations of Regional Climate”

Linda Warren, Carnegie Institution of Washington, “Constraints on the Physical Mechanism of Deep Earthquakes from Observations of Source Finiteness”

Chester Weiss, Sandia National Laboratories, “Large Scale Computing of Electromagnetic Phenomena in the Earth: Physical Insights and their Impact on Redefining the Exploration Strategies of the Oil and Gas Industry”

Ying Zhou, Carnegie Institution of Washington, “Global Upper-Mantle Structure from Finite-Frequency Tomography--What Drives Tectonic Plates?”

Wen-Lu Zhu, Woods Hole Oceanographic Institution, “Fluid Flow in Earth's Crust and Upper Mantle”

II. Discovery: Scholarly Articles, Books, and Grants

Scholarly Articles

Angel, R.J., Zhao, J., and **Ross, N.L.** (2005) General rules for predicting phase transitions in perovskites due to octahedral tilting. *Physical Review Letters*, 95, 025503.

Bujak, M., and **Angel, R.J.** (2005) Single crystal X-ray diffraction studies on $[(\text{CH}_3)_n\text{NH}_{4-n}]_3[\text{Sb}_2\text{Cl}_9]$ ($n = 2, 3$) chloroantimonates(III) in their low-temperature ferroelectric phases - structures and phase transitions. *Journal of Solid State Chemistry*, 178, 2237-2246.

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Fan, J., Sleboznick, C., **Angel, R.J.**, and Hanson, B.E. (2005) New zinc phosphates decorated by imidazole-containing ligands. *Inorganic Chemistry*, 44, 552-558.

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Benusa, M., **Angel, R.J.**, and **Ross, N.L.** (2005) Compression of albite, $\text{NaAlSi}_3\text{O}_8$. *American Mineralogist*, 90, 1115-1120.

Burt, J., **Ross, N.L.**, **Angel, R.J.**, and Koch, M. (2006) Equations of State and Structures of Andalusite and Sillimanite to 10 GPa. *American Mineralogist*, 91, 319-326.

Angel, R.J. (2005) High-pressure structure determination and refinement by X-ray diffraction. In C. J. Y. Wang, T. Duffy, G. Shen, and D. L., Eds. *Frontiers in High-Pressure Research*. Elsevier.

Jacobsen, S.D., Lin, J.-F., **Angel, R.J.**, Shen, G., Prakapenka, V., Dera, P., Mao, H.-K., and Hemley, R.J. (2005) Single-crystal synchrotron X-ray diffraction study of wüstite and magnesiowüstite at lower-mantle pressures. *Journal of Synchrotron Radiation*, 12, 577-583.

Van Aken, P.A., Mieke, G., Woodland, A.B., and **Angel, R.J.** (2005) Crystal structure and cation distribution in $\text{Fe}_7\text{SiO}_{10}$ ("Iscoreite"). *European Journal of Mineralogy*, 17, 723-731.

Vanpeteghem, C.B., **Angel, R.J.**, **Ross, N.L.**, Jacobsen, S.D., Litasov, K.D., and Ohtani, E. (2005) Al, Fe substitution in MgSiO_3 perovskite structure: a single X-ray diffraction study. *Physics of Earth and Planetary Interiors*, doi:10.1016/j.pepi.2005.10.003

Angel, R.J., **Ross, N.L.**, and Zhao, J. (2005) The compression of framework minerals: beyond rigid polyhedra. *European Journal of Mineralogy*, 17, 193-199.

Bodnar R.J. (2005) Fluids in Planetary Systems. *Elements*, v. 1, no. 1, p. 9-12.

Stockstill, K.R., McSween, H.Y., Jr. and **Bodnar, R.J.** (2005) Melt inclusions in augite of the Nakhla Martian Meteorite: Evidence for basaltic parental melt. *Meteoritics and Planetary Science*. 40, no. 3, 377-395.

Zajacz, Z., Halter, W., Malfait, W.J., Müntener, O., **Bodnar, R.J.**, Bachmann, O., Webster, J.D., Ulmer, P., Mandeville, C.W., Hirschmann, M.M. and Morizet, Y. (2005) A composition independent quantitative determination of the water content in silicate glasses and silicate melt inclusions by confocal Raman-spectroscopy. *Contributions to Mineralogy and Petrology*, **150**, no. 6, 631-642.

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Iannacchione, A.T., Swanson, P.L., Esterhuizen, G., Bajpayee, T.S., **Chapman, M.C.** (2005) The Characteristics of Mining Induced Seismicity Associated with Roof Falls and Roof Caving Events, in , proceedings, 40th U.S. Rock Mechanics Symposium, June 25-29, 2005, Anchorage, Alaska.

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In addition to the above publications, 148 abstracts were documented during this reporting period.

Books

Law, R.D., Searle, M.P., Godin, L. (eds.), Channel Flow, Ductile Extrusion and Exhumation of Lower-mid Crust in Continental Collision Zones. Geological Society of London Special Publication.

As at 03/01/06: 28 manuscripts accepted and now being copy edited by GSL. Estimated size of publication is ~ 600 pages. Projected publication date is September 2006.

Geoinformatics: Data to Knowledge, edited by A.K.Sinha, Geological Society of America Special Paper 397 (publication 2006)

Grants

DEPARTMENTAL ACTIVE RESEARCH GRANTS

Angel, R	NSF	9/1/04 - 8/31/06	\$46,200.00
Angel, R	Oxford Diffraction	9/1/02 - 8/31/07	\$50,000.00
Bekken, B	NSF	3/15/05 - 2/29/08	\$53,962.00
Bodnar, R	NSF	1/1/02 - 12/31/05	\$336,500.00

Bodnar, R	NSF	10/1-03 - 12/31/06	\$199,748.00
Bodnar, R	NSF	11/15/03 - 1/31/06	\$296,010.00
Bodnar, R	NSF	12/15/05 - 11/30/06	\$75,000.00
Bodnar, R	NSF	7/15/04 - 7/31/07	\$400,866.00
Burbey, T	Va. Dept. of Env. Quality	4/15/03 - 9/30/06	\$47,825.00
Chapman, M	Univ. of South Carolina	9/1/05 - 9/30/06	\$38,434.00
Chapman, M	USGS	1/1/06 - 12/31/06	\$40,000.00
Chapman, M	USGS	12/1/03 - 1/31/07	\$81,525.00
Dove, P	DOE	8/10/00 - 10/31/06	\$852,412.00
Dove, P	NSF	8/1/05 - 7/31/08	\$379,989.00
Hochella, M	DOE	8/10/02 - 5/14/06	\$290,611.00
Hochella, M	NSF	7/1/05 - 6/30/06	\$3,000,000.00
Hochella, M	PNNL	12/21/04 - 9/30/06	\$200,000.00
Hochella, M	SANDIA	8/4/04-9/1/06	\$49,700.00
Hole, J	NSF	8/1/03 - 8/31/06	\$430,924.00
Hole, J	NSF	9/15/01 - 11/30/05	\$497,118.00
Imhof, M	Marshall Miller	11/1/04 - 12/31/05	\$121,087.00
Kowalewski, M	NSF	6/1/06 - 5/31/09	\$219,290.00
Kowalewski, M	PRF	12/15/03 - 8/31/06	\$80,000.00
Law, R	NSF	1/1/06 - 12/31/08	\$229,996.00
Law, R	NSF	4/12/02 - 5/31/07	\$251,889.00
Read, J	NSF	2/15/04 - 3/31/07	\$189,387.00
Rimstidt, D	DOE	5/1/03 - 12/31/06	\$355,524.00
Rimstidt, D	USDA	8/17/01 - 9/30/05	\$10,000.00
Rimstidt, D	Va. Dept. of Conservation	8/10/05 - 7/31/06	\$41,000.00
Rimstidt, D	Va. Dept. of Mines	5/1/05 - 12/30/05	\$6,031.00
Ross, N	COMPRES	5/1/02 - 4/30/07	\$294,436.00
Ross, N	DOE	5/15/05 - 5/14/06	\$73,000.00
Ross, N	NSF	12/1/02 - 12/31/06	\$208,995.00
Ross, N	NSF	6/28/04 - 6/30/06	\$222,037.00
Schreiber, M	NSF	6/1/05 - 8/31/06	\$11,022.00
Schreiber, M	NSF	8/1/02 - 7/31/07	\$219,998.00
Schreiber, M	USDA	7/1/02 - 9/14/06	\$290,000.00
Sinha, A	NSF	12/15/03 - 7/31/05	\$33,500.00
Sinha, A	NSF	9/6/02 - 9/30/06	\$777,140.00
Spotila, J	NSF	11/1/02 - 12/31/06	\$155,071.00
Spotila, J	NSF	9/15/04 - 8/31/06	\$164,578.00
Tracy, R	NSF	2/1/02 - 9/31/06	\$44,512.00
Tracy, R	Va. Dept. of Mines	9/1/05 - 6/30/06	\$19,309.00
Xiao, S	NASA	9/15/05 - 9/14/08	\$69,206.00
Xiao, S	NSF	6/1/06 - 5/31/07	\$140,154.00
Xiao, S	NSF	7/16-03 - 7/31/06	\$150,573.00
Xiao, S	PRF	9/1/05 - 8/31/07	\$80,000.00
Xiao, S	Va. Space Grant	5/1/05 - 5/31/06	\$5,000.00

III. Engagement: Industrial/Corporate Partnerships, International Education/Research, Outreach

Industrial/Corporate Partnerships

Seven companies visited the Department of Geosciences to recruit our students during Fall semester: Amerada Hess, BP, Cabot Oil & Gas, Chevron Corp, ConocoPhillips, Newmont Mining and Schnabel. The following graduate students received offers as a result of these interviews:

Mary Harvey offered position with Amerada Hess

Daniel Yancey employment with BP

Bob Bodek received job offers from BP, ConocoPhillips, Hess, and Chevron; accepted BP offer

Ryan Lester offered a position with ConocoPhillips and an internship with ChevronTexaco

Aaron Berger offered internship with ConocoPhillips

David Loveday offered summer internships with Chevron and BP; accepted Chevron offer

International Education/Research

In February 2002, a Memorandum of Understanding between Virginia Tech and Università di Napoli Federico II, Napoli, Italy was signed to establish an exchange program to study the volcanoes of southern Italy. The program coordinators are Dr. Benedetto DeVivo from Italy and Dr. Robert Bodnar from Virginia Tech. In March, 2005, this program was renewed for five years. Under this agreement, one Italian student, Claudia Cannatelli, has completed the requirements for the Masters degree at Virginia Tech, and two students from the Università di Napoli Federico II will enter the PhD program at Virginia Tech in August 2006. During the 2006-07 academic year, a PhD student from Virginia Tech will spend one semester at the Università di Napoli Federico II in Italy conducting research on the volcanic island of Procida in the Mediterranean Sea. In addition to the student exchange, Dr. Bodnar has visited the Università di Napoli Federico II several times during the term of the agreement to teach courses, and will return in November 2006, to present a week-long short course entitled "Fluids in the Earth". Past courses taught by Bodnar at Università di Napoli Federico II were attended not only by students from that university, but also by many other students from other Italian and European Universities.

In May 2006, Tom Burbey participated in the inaugural International Faculty Development Program sponsored by the Provost's office that was held at Virginia Tech's Switzerland campus in Riva San Vitale. Dr. Burbey visited colleagues in Padova, Italy; Zurich, Switzerland and Milan, Italy for the purpose of building research collaborations and student exchange programs.

Outreach 2005-2006

The Department of Geosciences has a commitment to outreach: increasing public understanding of the value and relevance of the geosciences through publications, presentations, exhibits, and formal and informal science education programs.

In addition to engagement of faculty as part of their professional activities, the Department of Geosciences demonstrates its dedication to outreach through a staffed program that includes support for K-12 field science studies and in-class experiences, mentoring students in projects and service-learning, Education Resource Center (ERC) kit and material loans, earth and environmental education training workshops and teacher institutes, facilitation of community partnerships, and the Museum of Geosciences programs, tours, exhibits, and collections.

The professional development and engagement of students in the Department includes encouragement to practice communicating with a variety of audiences on geoscience content and the value of geosciences to society. The skills they gain will serve them well throughout their careers. Service Learning, volunteer, assistantship, intern, and student wage opportunities are provided. Students may lead museum tours, manage outreach projects, visit K-12 classes with hands-on programs, build exhibits, make hands-on teaching kits, create inquiry-based programs for K-12 youth, assist with field experiences, develop informational materials for the web and other media, work in research projects (including REU), work with community projects, or participate in conferences and events. Interdisciplinary, collaborative teamwork is encouraged in these activities.

Outreach Outcomes

During AY 2005-06 over 52,000 people have been contacted as a result of the outreach coordinator's activities. These activities included supervision of the Museum of Geosciences (MoGs); supervision of the Education Resources Center (ERC) and collaboration with the Science Outreach Program; supervision of undergraduate labs; support for K-12 field science studies; coordination of the New River Watershed Roundtable; mentoring students and student organizations in projects; loans of kits, materials, and specimens; and training workshops for WET, GLOBE, and SOS.

The coordinator's work with VT-STARS in summer 2005 helped introduce a cohort of 16 high school students under-represented in Science, Technology, Engineering, and Math (STEM) to water quality field work, data collection and interpretation, and community watershed planning. VT-STARS works with Southside Virginia to address pipeline issues (getting more, and more diverse, students) in science and technology. [www.vtstars.vt.edu]

In spring 2006, the Museum of Geosciences installed a new exhibit "Gemstones in the Rough", which showcases some of our unique large cut stones side-by-side with beautiful examples of corresponding gemmy mineral crystals. This exhibit is possible through the generosity of our alumni donors, in particular Dr. Arthur A. Kirk.

There have been:

- 6,870 visitors through the door in the Museum of Geosciences (this number has been adjusted to remove staff maintenance visits). Visitors include individuals and families, the Roanoke and Lynchburg Rock and Mineral Clubs, a Paleontology tour for Auburn High School, tours for 4-H bringing all the 4th graders from Tazewell County, Dublin Middle School 7th grade tours, VT course uses, a VT-STEM Hands-on kit Evaluation session, and receptions for various events including graduation, where **Secretary of Natural Resources Preston Bryant** was the speaker.
- 1,145 in-person contacts with and about New River Watershed Roundtable
- 3,000 viewers of 2nd floor hallway exhibits in Derring (estimated 100/week, which is low)
- 25,000 Calcite exhibit at Tucson International Gem and Mineral Show
- 14,000 Quartz exhibit at Denver Gem and Mineral Show, **won 1st prize in Museum category**
- WBRA PBS Blue Ridge Excursions segment on the Museum of Geosciences aired in May (estimated viewership is not known)
- 1,800 ERC and Museum of Geosciences loans and direct program contacts, 92 were SOS kit loans

Many people—faculty, staff, alumni, community members, and students—help make this level of outreach possible.

Outreach Personnel (partial listing)

Llyn Sharp, Coordinator

Jennifer Stempien, Museum Programs Manager

Sarah Windes, Museum Programs

Janette Peters (BSE), Watershed Programs Assistant

EunYoung Choi (CS), Watershed Programs Webmaster

Colin Deschamps (CEE) Watershed Programs Assistant

Faculty assistance from: Jim Beard, Bob Bodnar, Patricia Dove, Bill Henika, Mike Hochella, Mike Rosenzweig (BIOL), Nancy Ross, Bob Tracy, Shuhai Xiao

Staff assistance from: Linda Bland, Jim Langridge, Ellen Mathena, Carolyn Williams

Graduate Student Volunteers:

in-school outreach programs: Deric Learman, Kelly Plathe, Nick Wiggington, Allison Stephenson, Dongbo Wang

on-site outreach programs: Kat McFadden, Jim Shiffbauer, Jennifer Stempien,

exhibit development: Cenk Ozerdem, Jennifer Stempien, Allison Stephenson, Dongbo Wang

Undergraduate Volunteers: Jason Betzner, Summer Brown, EunYoung Choi (CS), Sam Denning, John Frame, Karla Hoffman, Nathaniel Miller, Jennifer Moll, Janette Peters (BSE), Jason Waters, Chelsea Guterrez,

Student Organizations: Sigma Gamma Epsilon (SGE), Geology Club, American Society of Agricultural and Biosystems Engineers (ASABE), American Water Resources Association (AWRA), Soil and Water Conservation Society (SWCS), Society of Environmentally Focused Students (SEFS).

Partners: Science Outreach Program, Biological Sciences, Biological Systems Engineering, Virginia Water Resources Research Center, Montgomery County Public Schools, New River Watershed Roundtable, Virginia 4-H, VT-STEM

Llyn Sharp serves as the Department's outreach coordinator. She is the recipient of the **2006 College of Science Award for Outreach Excellence**. Her degrees are in Geology and Instructional Technology and Design, with a research emphasis on informal science education and distance learning. She is a trainer for national earth and environmental science programs including GLOBE (www.globe.gov), Project WET (www.projectwet.org), and Save Our Streams (www.vasos.org). Her background in community and K-12 informal science education has expanded the educational and outreach uses of our Museum and collections through institutional changes and technology. She is available to help integrate outreach into research programs so that innovative products and activities increase the impact of the Department's research agenda.

Funding Efforts

AY 2005-2006 support from outside the Department of Geosciences for outreach activities was ~\$56,500 plus in-kind donations valued at ~\$3300, for a total of ~\$60,000. Supporters included private individuals, clubs, the Virginia Department of Conservation and Recreation, the Virginia Department of Environmental Quality, NASA, and NSF.

IV. Diversity Activities

The Department of Geosciences has been active in improving diversity within our student and faculty populations. We currently have 4 female faculty (out of 19 tenure-track faculty). As of Spring 2006, our graduate population was over one-third female (19 out of 57 students). Several faculty members, including Nancy Ross and Madeline Schreiber, are active in the AdvanceVT Program. Megan Madden, a former PhD student who finished in 2005, was an AdvanceVT pre-doctoral fellow. In addition, post-doc Carine Vanpeteghem was an Advance VT post-doctoral fellow in 2004-2005.

In terms of increasing the number of ethnic minority students, we have struggled, as have other Geoscience Departments around the U.S. A July 2005 article in *Eos*, a weekly journal of the American Geophysical Union, reported on a study of ethnic differences in geoscience attitudes of college students. The study found that both cultural and social factors, including exposure to what geoscientists do, involvement in outdoor activities, and family support, play a role in explaining the poor representation of ethnic minorities in Geosciences (Whitney et al., 2005). Currently, there were 2 African-American and 1 Hispanic undergraduate majors in Geosciences. In our graduate program, we have 1 Native American and 1 Hispanic in our graduate program. The Department has several graduate students that are MAOP Scholars. For 2005-2006, we had 2 MAOP Scholar recipients (1 Native American, 1 female); for 2006-2007, we will have 3 recipients (1 Native American, 2 females).

The College of Science Diversity Committee has recognized that each department in the College has different strategies for addressing diversity issues. This spring, the committee set forth to gather data from each COS department to determine what diversity activities are already occurring in departments, and to inquire about what type of assistance departments need in the area of diversity enhancement. Responses from the survey showed that Geosciences is very similar to other COS departments with respect to diversity initiatives. All departments that responded, including Geosciences, participate in MAOP academic year graduate programs and expressed interest in pursuing graduate recruiting at HBCUs or other minority institutions. Several COS departments are currently hosting MAOP summer interns; Geosciences is not one of those departments but expressed interest in participating in the future. Geosciences also has a faculty mentoring program for new faculty, as does several other COS departments.

Although we are closing the gender gap in Geosciences, we have yet to significantly improve the participation of ethnic minorities in our field. As this is a national trend, our struggles are not unusual, but we hope to increase minority students in our field in the coming years through more active recruiting of graduate students in HBCUs and other minority institutions. We also hope to participate in supporting minority students in high school and college summer research programs, to increase the number of minorities in our undergraduate major.

References

Whitney DJ, Behl RJ, Ambos EL, Francis RD, Holk G, Larson DO, Lee CT, Rodriguez CM, and Wechsler SP. 2005. Ethnic differences in geosciences attitudes of college students. *EOS*, Transactions of the American Geophysical Union 86 (30): 277.

V. Faculty Service

Service Activities

Service: University/Professional	Angel	Bekken	Bodnar	Burbey	Chapman	Dove	Eriksson
Department Committees Chair /Mbr (includes search committees)	4/1	2		1/2 Assoc. Dept. Chair	1 Director VT Seismic Obs.	2	1/2
College/University Committees Chair /Mbr (includes search committees)	1		2 UDP	1/1		1	8
Professional Society Committee Chair /Mbr	2/4		2	3	3	3	1
Manuscript Reviews	13		numerous	8 Rev. 100 abstracts			Read 19 of theses
Proposal Reviews	4		numerous	3			
Editor/Assoc Editor for Journal(s)	1		1	1	2	1	
Invited Lectures/Seminars	2	4	5 SEG Distinguished Lecturer	5		5	
Sponsored Workshops/Short Courses	1		3				
Advisor/Dept. Rep. Student Clubs				Career Adv.			
Convenor/Session Organizer for Professional Society Activities			1				

Service Activities Continued

Service: University/Professional	Hochella	Hole	Imhof	Kowalewski	Law	Read	Rimstidt
Department Committees Chair/Mbr (includes search committees)	1	2/2 Chair Geop. Search	2	1/3 Chair Earth Systems Search	2/1	2	2
College/University Committees Chair/Mbr (includes search committees)	1/3 Dir. EIGER Proj.	1				1	1
Professional Society Committee Chair/Mbr	2	1	1/3	3			
Manuscript Reviews	12	4	5	15	34	9	14
Proposal Reviews	20	4	4	50	3	6	10
Editor/Assoc Editor for Journal(s)	1			2	1		
Invited Lectures/Seminars	9	5	3	4	5		2
Sponsored Workshops/Short Courses			1			1	
Advisor/Dept. Rep. Student Clubs			Advisor Geophysical Soc.		Advisor Geology Club	Career Advisor	
Convenor/Session Organizer for Professional Society Activities						1	

Service Activities Continued

Service: University/Professional	Ross	Schreiber	Sinha	Snoke	Spotila	Tracy	Xiao
Department Committees Chair/Mbr (includes search committees)		3		3	1/6 Assoc. Chair	Dept. Chair	1/4
College/University Committees Chair/Mbr (includes search committees)	Assoc. Dean	1/3 Elected to Fac. Senate			1		
Professional Society Committee Chair/Mbr		3	2		3		2/3
Manuscript Reviews		6			5		34 papers/16 journals
Proposal Reviews		Reviewed for NSF		1	9		17
Editor/Assoc Editor for Journal(s)		1		1			4
Invited Lectures/Seminars		3	3		3		9
Sponsored Workshops/Short Courses			3				
Advisor/Dept. Rep. Student Clubs							
Convenor/Session Organizer for Professional Society Activities			2 Primary organizer for new Div. of Geoinformatics				

VI. Honors and Awards

Faculty/Staff Honors and Awards

Ross Angel was appointed adjunct faculty in the Department of Biological Sciences, VT, August 2005

Patricia Dove received the DOE Best University Research Award, *Analytical and Isotope Geochemistry. Symposium* June 2005

Mike Hochella received the following:

- Virginia Scientist of the Year, 2005
- Virginia Tech Alumni Award for Research Excellence, 2005
- Elected AGU Fellow (2005) competition; awarded 2006
- Selected by Provost McNamee to serve on two university-level committees (CRC Space Committee and College of Science Dean's Search Committee).
- Elsevier's Science Direct listed Hochella et al. (2005a) (see Scholarly Activities) as the most downloaded article in the first three months of 2005 from *Geochemica et Cosmochemica Acta*.

Michal Kowalewski received the following:

- 2005 Charles Schuchert Award, Paleontological Society (awarded annually by the Paleontological Society to one scientist under 40 for "Excellence and Promise in Paleontology")
- Elected as Fellow of the Paleontological Society (the society has ~1500 members and ~30 active fellows [2%])

Fred Read received the following:

- Outstanding Educator Award, Eastern American Association of Petroleum Geologists, 2005. Awarded at the Eastern Section Meeting, Morgantown, WV, September, 2005. Region covers eastern one third of the United States.
- Awarded the F.J. Pettijohn Medal for Sedimentology for 2006 by AAPG-SEPM. The Francis J. Pettijohn Medal for Sedimentology is awarded in recognition of "Excellence in Sedimentology."

Krishna Sinha was appointed Adjunct Professor of Geoinformatics, 2005 and continuing, San Diego State University, San Diego, CA

Shuhai Xiao was nominated for the Paleontological Society Charles Schuchert Award

Llyn Sharp was the recipient of the College of Science Award for Outreach Excellence for 2006

Undergraduate Honors and Awards

Geosciences Outstanding Senior Award: Elizabeth Glusica

Geosciences Outstanding Service Recognition Awards:

Summer Brown, Samuel Denning

Geosciences Endowed Scholarships:

Lowry Field Camp Scholarships: Paul Betka, Elizabeth Glusica, Jason Waters

Charles J. Gose, Jr. Scholarships: Stuart Hyde, Sally Morgan

Charles Edward and Frances Peppin Sears Scholarships:

Elizabeth Glusica, Alice Lee, Kara Smith, Claire Waller, Jason Waters

Thomas T. Jeffries Scholarship: Kara Smith

Alumni Scholarship: Andrew Jeffery

Dean's Freshman Scholarship: Sally Morgan

Academic Excellence Awards:

Christopher Amos, Heather Baron, Summer Brown, Cara Heberling,
Michael Mattox, Nathan Miller, Laura Nesor, John Sarao, Kara Smith,
Justin Sommerville, Claire Waller, Katherine Walraven, Jason Waters,
Lindsey Yann

Undergraduate Research Awards:

Christopher Amos, Adam Bradley, Matthew Bychowski, Samuel Denning,
John Sarao

Sigma Gamma Epsilon W. A. Tarr Award: Summer Brown

College of Science David and Ruth Henderson Scholarships:

Claire Waller, Lindsey Yann

Graduate Honors and Awards

Tillman Teaching Award for Lower Level Laboratory Instruction: Andras Fall

Tillman Teaching Award for Upper Level Laboratory Instruction: W. Ryan Lester

Tillman Teaching Award for Upper and Lower Level Laboratory Instruction:

David Rugh

Geosciences Outstanding Service Recognition Award: Susan Barbour Wood

Geosciences Endowed Scholarships:

Byron Cooper Memorial Geoscience Scholarship: Benjamin Schwartz

Heath Robinson-Roy J. Holden Scholarship: Adam Wallace

Geoscience Foundation Scholarships: Rachel Lauer, Jiedi Wu

John K. Costain Geophysics Scholarship: Jiedi Wu

Tillman Scholarships: Kathleen McFadden, Peter Voice

Aubrey E. Orange Award in Geophysics: Arvind Sharma

Thomas T. Jeffries Scholarship: Tingting Yang

Heath Robinson-Roy J. Holden Fellowship: David Rugh

Geosciences Research Awards:

Byron Cooper Awards: John Huntley, Peter Voice

Wallace D. Lowry Award: Micah Jessup

C. G. "Jake" Tillman Awards: Lin Dong, James Schiffbauer, Bing Shen

David R. Wones Awards: Kathleen McFadden, Lisa Tranel, Adam Wallace

College/University Awards

College of Science Outstanding Graduate Student Award: Jennifer Stempien

Cunningham Doctoral Scholar Award: Elizabeth Diesel

National Science Foundation IGERT Fellowships: Kelly Plathe, Dongbo Wang

Ph.D. 2010 Fellowships: Micah Jessup, Kristin Staats, Peter Voice

Multicultural Academic Opportunities Program Scholarships: Aaron Berger, Kelly Plathe

Government and Professional Societies Awards

AAPG Grant: Alison Spengler

2005 Crystallographic Research Grant (Krause Award): Jason Burt

Department of Education GAANN Fellowships: Deric Learman, Benjamin Schwartz

Geological Society of America Awards: Jamie Buscher, Elizabeth Diesel,

Ryan McAleer, Alison Spengler (SE Section)

Graduate Student Assembly Graduate Research Development Project Awards:

Saumyaditya Bose, Lin Dong, Mary Harvey, Ryan McAleer, Benjamin Schwartz,

Lisa Tranel

Mineralogical Society of America Grant for Student Research in Mineralogy & Petrology:

Saumyaditya Bose

Ralph Stone Graduate Fellowship: Benjamin Schwartz

Virginia Space Research Grant: James Schiffbauer

Virginia Water Resources Research Center Grant: John Huntley

Corporate Awards

BP Fellowships: Robert Bodek, Elige Grant, Alison Spengler

Chevron Corporation Fellowships: David Loveday, Arvind Sharma, Alison Spengler

VII. Future Directions

In January 2005, the Department of Geosciences conducted a one-day faculty retreat to focus on the future strategic directions of the department. The aim of this retreat was to evaluate new strategic niche areas that would enhance our department's national and international reputation, dictate future hiring plans, and complement and broaden the department's current strengths.

The two strategic focus areas that emerged from this retreat with a strong faculty consensus were broad interdisciplinary programs that explore new research areas for the department as well as tie in with existing strengths. The two "umbrella" strategic initiatives are *Rheodynamics* and *Integrated Studies of Earth Systems*.

Rheodynamics focuses on evolution of the upper mantle and crust of the earth, with emphasis on deformation processes within the earth, from large scale geodynamics through tectonics to the rheological properties of rocks and minerals. This strategic area involves several disciplinary areas within geosciences but a central component is geophysics, including geodynamics, geodesy, seismology, and rock and mineral physics. Other disciplinary areas within this initiative are structure and tectonics, volcanology and magmatic petrology. In addition to the solid-earth and theoretical geophysics implicit in the Rheodynamics initiative, we also have a longstanding need to hire at least one exploration-oriented geophysicist to replace a recently retired faculty member and another who is going on leave, in order to maintain strong links with the energy industry.

Integrated Studies of Earth systems involves synergistic and collaborative research within the broad disciplinary areas of global climate change, paleoceanography, carbon cycle geochemistry, glaciology, geomorphology and marine geology. This area would both enhance and complement our existing faculty strengths in sedimentology, stratigraphy, paleobiology, hydrogeosciences, and geomorphology.

During the Spring of 2006 the Department of Geosciences aggressively sought to take advantage of a university-wide cluster-hiring plan in Computational Science to begin the process of implementing the Rheodynamics initiative. The recent retirement of Cahit Çoruh (2004), the pending 2-year leave of Matthias Imhof (2006-2008), and the imminent retirement of Arthur Snoke reduced (or will reduce) geophysics faculty to one Associate Professor (Hole) and one Research Assistant Professor (Chapman) by Fall of 2007. The Department interviewed ten outstanding candidates from among a very strong pool of applicants that covered a wide range of geophysics disciplines: one senior candidate in geodesy, three junior candidates in seismology, one senior candidate in geodynamics, one junior and one more senior candidate in exploration geophysics and three candidates in experimental rheology and mineral physics. Two candidates from this list (one junior, one senior) have accepted our offers to join the Department in January and August of 2007, respectively, and we hope to make further offers to the remaining three candidates in the near future, all potentially to start in August of 2007. In addition, the Department interviewed four candidates for an additional Computational Cluster position in Integrated Studies of Earth systems and has made one offer to date, to a junior paleoclimatologist.

The hiring of additional candidates from those interviewed is imperative for the future growth and goals of the Department. Our principal goal is to become a top-15 Geoscience program, and a top-5 program in public universities, and the faculty agree that expansion into these new growth research areas is essential. Our plan, which has been approved by the Dean, is to augment faculty size from the current nineteen tenure-track positions into the low- to mid-thirties of

tenure-track positions and simultaneously to increase our graduate student population from the current 65 to about 100. In addition to expansion into the two new strategic interdisciplinary areas, the Department must also address critical needs in its disciplinary profile. In the next five to six years, we anticipate five additional retirements in geochemistry, petrology, carbonate and clastic sedimentology and in tectonics. A healthy departmental profile requires addressing these disciplinary needs and will add additional challenges that the existing faculty must address in order to keep the Department on a course of growth and enhanced national standing, while providing students with a world-class education.

The Department's current administration is also diligently working to enhance alumni relations. We recognize that the future intellectual and fiscal well-being of the Department of Geosciences is closely tied to its alumni and friends. The strong commitment to development by the department and the College of Science has already led to several large donations that we hope will result in a new state-of-the-art Geosciences Building in the near future. We expect to be given the opportunity to begin the planning process for this new building in the next year.

Part 3: Additional Information

I. Statistical Information

Academics:

Present Enrollment:	Undergraduate majors	90
	Graduate majors	57
No. of Courses:	Undergraduate	36 (119 sections)
	Graduate	27 (27 sections)
Student Credit Hours:	Undergraduate	19,799
	Graduate	2,331
Degrees:	B.S.	21
	M.S.	10
	Ph.D.	7

Full-time Faculty and Staff:

Professors (includes 1 University Distinguished Professor)	11
Associate Professors	7
Assistant Professors	0
Research Professor	1
Research Assistant Professors	1
Instructor	1
Classified Staff	12

Part-time Faculty:

Assistant Professor	1
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Other Affiliates:

Emeritus Faculty	13
Research Associates/Postdoctoral Associates	8
Adjunct and Cooperating Faculty	11

Publications:

Newsletters	2
Research Papers	83
Abstracts	148

Grants:

Externally funded	\$12,049,557.00
Proposals pending	\$3,257,237.00

Gifts:

Industry support	\$55,000.00
Scholarships and Endowments	\$170,606.50

Note, all numerical entries are based on statistics as of May 31, 2006.

Current Faculty and Staff

Professors:

Robert Bodnar, Patricia Dove, Kenneth Eriksson, Michael Hochella, Richard Law, J. Fred Read, J. Donald Rimstidt, Nancy Ross, A. Krishna Sinha, J. Arthur Snoke, Robert Tracy

Associate Professors:

Thomas Burbey, John Hole, Matthias Imhof, Michal Kowalewski, Madeline Schreiber, James Spotila, Shuhai Xiao

Assistant Professor:

Barbara Bekken

Research Professor:

Ross Angel

Research Assistant Professor:

Martin Chapman

Instructor:

John Chermak

Emeritus Faculty:

Richard Bambach, Donald Bloss, Gil Bollinger, Cahit Çoruh, John Costain, Jim Craig, Gerald Gibbs, David Hewitt, Gordon Grender, Wallace Lowry, Dewey McLean, Edwin Robinson, Paul Ribbe

Research Associates/Postdoctoral Associates:

Nizhou Han, Richard Krause, Scott Mutchler, Husin Sitepu, Carine Vanpeteghem, Jinyuan Yan, Yurena Yanes, Jing Zhao

Adjunct/Cooperating Faculty:

James Beard, John Chermak, Benedetto De Vivo, Nicholas Fraser, William Henika, Joerg Jinschek, Maureen Julian, James Martin, Matthew Mikulich, Stephen Scheckler, Lauck Ward

Classified Staff:

Linda Bland, Phillip Burcham, Charles Farley, Richard Godbee, Jim Langridge, Mark Lemon, Connie Lowe, Ellen Mathena, Mary McMurray, Llyn Sharp, Daniel Smith, Carolyn Williams

II. Faculty/Classified Searches

Computational Geophysics

Sixty applications were received for a search for one or more positions in Computational Geophysics. Ten candidates were interviewed in early spring semester. Of those interviewed, two were senior candidates (full professors at other universities), 4 candidates were female, and two candidates were Asian. Four offers have been made, resulting in two faculty hires and two declined offers. Ying Zhou, a female, Asian, seismologist will join the department as assistant professor in January 2007. In summer 2007, geodynamicist Scott King will join the department as full professor. As of early May 2006, the dean's office is telling us we may soon be authorized for additional geophysics offers from this search.

Computational Earth Systems

Thirty-three applications were received for a search for one or more positions in Computational Earth System Science. Based on the applicants' CVs, first names, and our knowledge of specific applicants, we estimated that at least 7 (21%) of the applicants are women and at least 5 candidates are Indian Americans (1) or Asian (4). Four candidates were interviewed in late spring semester. Of those interviewed, one was a senior candidate (tenured associate professors at University of Maryland), and one was a female candidate. Two of the interviewed candidates have strong support among the faculty. As of early May 2006, no formal offer has been made. The department chair and the dean are currently negotiating with the candidates.

Technical Support

A new staff position will be filled during summer 2006 in unix computer system administration. This will reduce demand on over-subscribed staff and will support new faculty hires in computational science.

III. New Website

At the end of the 2005-2006 academic year, the Department's website at www.geos.vt.edu was refreshed to include new content, enhance usability, and allow easier site updates by staff. The new website is more accessible for individuals to create and upload content, and should enhance the department's visibility to potential graduate students. The department also continues to use a web-based pre-application form to reach potential applicants and to match their research interests with potential faculty advisors.