2012-13 was a year of transition for the Department of Geosciences. Marc Michel joined the faculty as an assistant professor in August 2012, joining five assistant professors hired in 2011, Mark Caddick, Esteban Gazel, Benjamin Gill, Brian Romans and Robert Weiss. With the influx of new faculty, fresh approaches to the discovery, learning and engagement missions of the department are emerging. There was also a transition among our staff as Linda Bland, grants specialist, retired from the Department of Geosciences in June 2012 after 36 years of exemplary service. She was awarded the 2013 Virginia Tech Staff Career Achievement Award.

Our faculty continue to attract many prestigious awards and honors. Selected highlights include Patricia Dove’s nomination to the National Academy of Sciences in April 2012; she was also named Virginia’s Outstanding Scientist 2013 and was awarded a University Distinguished Professorship in 2013. Michael Hochella served as the 2012 President of the Mineralogical Society of America. Scott King’s prestigious Alexander von Humboldt Research Award continued through 2013. Robert Tracy was elected Fellow of the Geological Society of America. Martin Chapman was elected President of the Eastern Section of the Seismological Society of America. Jim Spotila was selected as Science Editor for the journal Geology one of the premier interdisciplinary journals of the geosciences. Rick Law was selected to be Chief Editor and Chair of Geological Society’s Books Editorial Committee. The Geological Society of London is the oldest geological society in the world with over 10,000 members.

Our graduate programs continue to rank highly and enrolled 65 students in 2012-13. U.S. news and World report ranked the paleontology program 9th in the nation, tying with Ohio State University, and the geochemistry program ranked 13th in the nation, tying with Harvard. The earth sciences program ranks 28th overall, tying with Johns Hopkins University, University of Minnesota-Twin Cities, and Washington University in St. Louis.

The faculty are making a global impact. Bob Bodnar participated in the inaugural semester of the Presidential Global Scholars program teaching a week-long module in Riva, Switzerland entitled Volcanoes in Art, History, Mythology and Cinema. Esteban Gazel took students on a field trip to Costa Rica sponsored by PGS and he has also sponsored visiting scientists from Costa Rica to Virginia Tech. Ying Zhou established a graduate student exchange program between Virginia Tech and Peking University with an MOU for a dual degree graduate program.

The department strengthened links with industrial sponsors. John Hole renewed a 3-year Landmark Graphics Corporation University Grant Program software license, with a commercial value $60,622,866. Brian Romans established a petroleum industry-sponsored research consortium with collaborators at the University of Calgary and University of Utah for stratigraphic research on outcropping deep-marine deposits in southern Chile. Ten companies that have agreed to sponsor the program ($35,000 per company). Discussions with BP led to the acquisition of 30 computer workstations donated by BP to revamp the department’s computer lab which, in turn, revitalized courses that can now access large digital datasets and imaging.
The Department had 113 undergraduate majors in the 2012-13 AY; 33 (23 M;10 F) graduated with degrees in one of four degree options (Geology, Geochemistry, Geophysics, Earth Science Education). 40% of our students participated in research activities with faculty members. Aaron Prunty was awarded the 2013 Outstanding Senior Award of the Department of Geosciences.

Madeline Schreiber was awarded a Certificate of Teaching Excellence by the College of Science at VT. Neil Johnson and John Chermak were nominated as a ‘Favorite Faculty’ member by a student for the Housing and Residence Life program. Barbara Bekken led weekly seminars focused on pedagogical methods for faculty in Geosciences.

The faculty continue to develop novel, topical and skill-based courses:

- Bob Bodnar Participated in the inaugural semester of the Presidential Global Scholars program during which he taught a week-long module in Riva, Switzerland entitled Volcanoes in Art, History, Mythology and Cinema.
- Barbara Bekken and Madeline Schreiber revised Geoscience Fundamentals which is required by all UG majors in Geosciences which was taught in the SCALE-UP classroom and included and writing intensive assignments. John Chermak and Madeline Schreiber also taught a class Shales, Energy and the Environment Graduate Seminar which included a 2-day field trip with Daniel Soeder, DOE to WV, VA, MD and PA looking at the Marcellus and Millboro shales.
- John Chermak taught a section of Resources and the Environment in a SCALE-UP classroom. Information in class, was posted and commented on a facebook page dedicated to the subject of resources and the environment.
- Neil Johnson introduced a new course on Natural Hazards which focuses on current events and uses novel adaptations for engaging students.
- Jim Spotila developed a new course, Geology and Civilization, how geology has influenced human history. The context of this new course is geared toward garnering greater engagement by focusing on societally relevant aspects of geology.
- Brian Romans revitalized Seismic Stratigraphy/ Subsurface Stratigraphic Methods using digital seismic data donated by BP and PGS. Brian also obtained a network license of industry-standard visualization/interpretation software (Kingdom, donated by IHS) with the help of Tim Howland (Assoc. Director of Corporate Relations, College of Science).
- John Hole’s Inverse Theory & Geoscience Applications (cross-listed with Mathematics) attracted students from Geosciences, Civil Engineering, Engineering Science and Mechanics and Biomedical Engineering.

In addition, the Senior Seminar (GEOS 4024) led by Bob Bodnar, continues to provides graduating seniors with a communications-intensive (both written and oral presentations) course, and the opportunity for to develop their ability to communicate scientific information to diverse audiences. Each student is required to write an NSF-style proposal (10 pages minimum) and also prepare and deliver a professional-style oral presentation using Powerpoint media. This class has proven to be an excellent “hands on” tool for students who are completing their undergraduate course of study.
Learning: Graduate

The Department of Geosciences continues to maintain a strong graduate program with an enrollment of 65 students (23 MSc, 42 PhD) in 2012-13. 10 MSc and 12 PhDs were awarded in Spring 2013.

Graduate student mentoring, activities, awards, and admissions are coordinated by the Graduate Student Affairs Committee (GSAC), which is led by the Graduate Program Director, Ken Eriksson. The department administration is aided by a graduate liaison committee that consists of six graduate students, which meets with the Graduate Program Director each semester and is a line of open communication for feedback and concerns of graduate students.

The 17th Annual Geosciences Student Research Symposium (GSRS) was held March 1-2, 2013. GSRS is produced and organized by the graduate students. The symposium is designed to allow students the opportunity to prepare and present talks in their current research areas for both professional growth and public awareness. Forty students presented talks. The organizing committee attracted funding from BP, Conoco-Phillips, Consol Energy, and Schnabel Engineering.

New courses were developed for graduate students. Esteban Gazel and Ben Gill led a trip to Costa Rica to study the evolution of a volcanic arc in Spring 2012. Robert Weiss provided a course in Simulation and Modeling in Geosciences: This class introduces simulation a research project and modeling as a research tool in Geosciences. Mark Caddick introduced students to “Computing Phase Relations: Thermodynamics in Geochemistry”. A significant component of the course involved exercises aimed at showing how ‘real research problems’ might be tackled with a suite of software tools.

Our graduate students attracted many awards and honors:

- Oluyinka Oyewumi was the Featured Graduate Student, February 2012
- Matthew Joseph Steele-MacInnis wa awarded the College of Science Outstanding Doctoral Student Award
- Aida Farough was awarded a College of Science Roundtable “Make A Difference” Scholarship
- Kyle Ashley, James Dale, Sebastian Mergelsberg were awarded ICTAS Fellowships:
- Carol Johnson was selected for Who’s Who among Students in American Universities
- Kyle Ashley was awarded the Sigma Gamma Epsilon W. A. Tarr Award

Discovery

The 22 teaching and research Faculty members in the Department of Geosciences have been awarded 47 new research grants totaling $3.039M. The decrease from FY2012 (64 awards for $3.695M) reflects the transition as new faculty come on board on ramp up their research programs.

The scholarly output from the department continues to excel. In 2012, 116 research papers and 215 abstracts were published by the Department’s faculty. In addition, our faculty are demand and give many keynote and invited lectures. Also our faculty serve on review panels and are invited members of workshops. Esteban Gazel, for example, was invited to participate in the Earth Cube Next Generation Strategic Visioning Workshop, Carnegie Institution, Washington,
DC, October 2012. Robert Weiss served as a member of the Scientific Committee for Sediment 2012: Of Land and Sea in Hamburg, Germany. Nancy Ross was nominated to serve on the Committee on Seismology and Geodynamics, Board of Earth Sciences and Resources of the National Academies. Ken Eriksson served as a member of External Review Committee for Department of Earth and Planetary Sciences, University of Tennessee, Knoxville.

Our faculty are recognized by many prestigious awards and honors:

- Tom Burbey was elected as full working member on UNESCO’s Working Group on Land Subsidence (only 2 members per nation allowed as per bylaws).
- Martin Chapman was elected President of the Eastern Section of the Seismological Society of America. He was also invited to be a visiting scientist National Earthquake Information Center, Golden, Colorado, in July and August 2012.
- Patricia Dove: nomination to the National Academy of Sciences in April 2012; she was also named Virginia’s Outstanding Scientist 2013 and was awarded a University Distinguished Professorship in 2013.
- Michael Hochella served as the 2012 President of the Mineralogical Society of America
- John Hole elected as one of the 9 members (from 114 universities) on the Board of Directors of IRIS (Incorporated Research Institutions for Seismology)
- Scott King’s prestigious Alexander von Humboldt Research Award continued through 2013. He was also elected to serve on the Computational Infrastructure for Geodynamics (CIG) Executive Committee
- Rick Law was selected to be Chief Editor and Chair of Geological Society's Books Editorial Committee
- Nancy Ross was a Distinguished Lecturer of the Mineralogical Society of America in 2012. She also served as an elected member of the Executive Committee of COMPRES (Consortium for Material Properties Research in Earth Sciences) sponsored by NSF
- Jim Spotila was selected as Science Editor for the journal Geology
- Maddy Schreiber was elected the Geological Society of America’s Hydrogeology Division 2nd Vice Chair
- Robert Tracy was elected to a 4-year term as a member of the Council of the Geological Society of America (2011-2014). He was also elected Fellow of the Geological Society of America
- Shuhai Xiao was elected Chair, Subcommission of Ediacaran Stratigraphy, International Commission on Stratigraphy

Our faculty serve as editors and associate editors of prestigious international journals:

- Tom Burbey: Associate Editor, *Ground Water Journal* and Associate Editor, *Hydrogeology Journal*
- Patricia Dove Principal Editor of the major earth science publication, *Elements* and Associate Editor, *Proceedings of the National Academy of Sciences*
- Martin Chapman: Editor of the *Eastern Section Pages*, *Seismological Research Letters* and Associate Editor of the *Bulletin of the Seismological Society of America*
- John Hole: Associate Editor for *Journal of Geophysical Research*
- Scott King: Executive Editor for new multi-disciplinary, open-access journal from Elsevier (launched summer of 2013)
- Maddy Schreiber Associate Editor, *Ground Water* (2004-current)
• Shuhai Xiao: Associate Editor of *Evolution and Development*, AE of *Solid Earth*, AE of *Palaios*; AE of *PalaeoWorld*; AE of *Precambrian Research*; AE of *Frontier of Earth Science in China*; he also serves As Deputy Editor-in-Chief, *Journal of Stratigraphy*;

Other notable activities include:

Martin Chapman hosted the 2012 annual meeting of the Eastern Section, Seismological Society of America, at the Inn at Virginia Tech which attracted more than 50 seismologists to Virginia Tech.

Brian Romans was selected to participate in two-month-long scientific ocean drilling expedition (IODP Exp 342, June-July 2012), which successfully acquired >5 km of sediment cores to investigate Paleogene paleoclimate and paleoceanographic events and conditions: ([http://iodp.tamu.edu/scienceops/expeditions/newfoundland_sediment_drifts.html](http://iodp.tamu.edu/scienceops/expeditions/newfoundland_sediment_drifts.html)).

Ben Gill set up a stable isotope laboratory in the department with 2 mass spectrometers, bringing new capabilities to the department and university.

Marc Michel has established links with national laboratories such as the Advanced Photon Source, Argonne National Laboratory and the Stanford Synchrotron Radiation Laboratory, SLAC National Accelerator Laboratory.

### Engagement

The Department of Geosciences has a commitment to engagement and outreach to increase public understanding of the value and relevance of the geosciences through publications, presentations, exhibits, and formal and informal science education programs. The department has highlighted the role of engagement and public outreach in the broader impacts of funding proposals, making them more competitive as a result. External funding for engagement activities provided for ~25% of a staff position during 2012-13.

In addition to engagement of faculty as part of their professional activities, the Department of Geosciences further demonstrated its commitment to outreach by housing the Museum of Geosciences programs, tours, exhibits, and collections. This staffed program includes management of Museum functions as well as support for K-12 field science studies and in-class experiences, mentoring students in projects, Education Resource Center (ERC) kit and material loans, earth and environmental education training workshops and teacher institutes, facilitation of community partnerships.

There were 7200 visitors to the Museum of Geosciences during 2012-13. Visitors include individuals and families, K-12 school tours, youth groups, VT course uses, teacher workshops, meetings, and receptions for various events. Virginia Tech academic use of exhibits and learning stations such as the OmniGlobe served 1820 VT students. Museum programs served 3306 K-12 students and 267 teachers. There were 115 loans of teaching materials, specimens, and equipment from the ERC, used by educators mostly from campus and the local area. Museum of Geosciences exhibits (Allosaurus dinosaur “Hokiesaurus”, and OmniGlobe) appear in the Virginia Tech Athletics half-time video shown in Lane Stadium and on national television.
The Museum worked with the Patricia Dove and the BGEP group to coordinate a major geosciences outreach event for middle school youth and their families at Kids Tech University (KTU) in January, 2013. Patricia Dove gave the KTU keynote lecture to 220 middle school kids and 250 adults. In the afternoon, over 250 kids and about 320 adults participated in the STEM fair where she and her research group hosted exhibit stations and were joined by other faculty, graduate and undergraduate students from Geosciences who engaged families in 12 Geoscience hands-on activity stations. Paticia Dove and her research group give a Teacher Workshop in March on Biomineralization which provided teachers from the underserved region of Southwest Virginia with an opportunity to learn cutting edge science.

The Museum and Outreach Committee, chaired by Bob Tracy, developed the Museum of Geosciences Public Program. Seminars included: The August 23, 2011, magnitude 5.8, central Virginia earthquake (John Hole, Martin Chapman) in Fall 2012 and Extreme Mars (Scott King) in Spring 2013. John Chermak was an invited guest speaker on the topic, Fossil Fuels and the Environment, at the Taubman Museum to a group of more than 50 people in November 2012. John Chermak organized a panel discussion and viewing of the GSA sponsored program of SWITCH Energy (www.switchenergyproject.com) on Earth Day, April 22, 2013 in Squires Colonial Hall. Mike Hochella and Madeline Schreiber served as panelists. John Hole was invited as an instructor for EarthScope Workshop for Interpretive Professionals in the Central Appalachian Region in March 2012, a 4-day workshop for outreach professionals in parks and museums and gave 2 science presentations: http://www.youtube.com/watch?v=znpp1mn8kH0.

Robert Weiss and Jennifer Irish from Civil and Environmental Engineering started the Interdisciplinary Coastal Hazards Research Team, which was initiated on a small scale with the help of a NSF-RAPID grant for Hurricane Sandy. Dr. Yang and Dr. Buckvic from the Department of Urban Affairs and Planning and Dr. Dixit from Political Sciences conduct interviews in the Sandy-affected region to study the economic impacts and long-term impact on environmental and security policy. Dr. Irish, Dr. Lynett (University of Southern California) and myself collected quantitative data on residential and infrastructure damage, coastal change and sedimentological effects of Hurricane Sandy in November 2012. They will conduct a series of workshops in 2013 with interested people from the campus community.

John Hole was invited by the American Geosciences Institute to be a presenter at the Congressional Exhibition of the Coalition for National Science Funding, Washington, DC in May 2012. John presented science about the 2011 central VA earthquake and met with staffers in the offices of state representatives, Senator Warren, Senator Webb, and Congressman Griffith, and with staffers on the Senate Science Committee.

Bob Bodnar is the leader of a large multi-disciplinary research project on the Coles Hill uranium deposit in Pittsylvania County, Virginia I have become the de facto expert on uranium mining. During 2012, he gave ~40 briefings related to environmental and public health issues associated with uranium mining to members of the Virginia Executive Branch and General Assembly, local government officials and various NGOs and public interest groups.

The department also strengthened links with industrial sponsors:

- John Hole renewed a 3-year Landmark Graphics Corporation University Grant Program software license, with a commercial value $60,062,866. This software is designed for oil and gas exploration and incorporates seismic and stratigraphic data processing.
interpretation, and integration.

- Brian Romans established a petroleum industry-sponsored research consortium with collaborators at the University of Calgary and University of Utah for stratigraphic research on outcropping deep-marine deposits in southern Chile. Ten companies that have agreed to sponsor the program ($35,000 per company). Discussions with BP led to the acquisition of 30 computer workstations donated by BP to revamp the department’s computer lab which, in turn, revitalized courses that can now access large digital datasets and imaging.

- Graduate student, Ty Buller, helped establish a Student Chapter of the AAPG (American Assoc. of Petroleum Geologists) in the Department of Geosciences.

- John Hole serves a member of Collaborations Committee jointly sponsored between the Society of Exploration Geophysics (SEG) and the American Geophysical Union (AGU).

The Department of Geosciences has strong alumni base who provide valuable support for the department in the form of awards and scholarships. In 2012-13 AY, $67,327 was awarded in undergraduate and graduate academic and research scholarships and excellence awards. These included **Industry Sponsored Scholarships:** Jacalyn Wittmer (Conoco Phillips Graduate Fellowship); Ryan Brandon, Andrew Hawkins, Andrew Muscente, Maria del Pilar Madrigal Quesada (Petroleum Industry-Geosciences Scholarship). **Endowed Scholarships:** Ty Buller, Natalia Bykova, Cody Mason (Charles E. & Frances P. Sears Endowed Scholarship Fund); David Mercier (Matthew J. Mikulich Geophysics Scholarship); Kyle Ashley, Theodore Them (Wallace D. Lowry Geosciences Endowed Graduate Scholarship Fund); Neil Auchter, Kai Deng, Aida Farough, Kui Lui, Pavithra Sekhar, Qimin Wu, Jing Xue (John K. Costain Graduate Geophysics Scholarship); Natalia Bykova (Charles J. Gose, Jr. Scholarship for Geological Sciences); Lindsay Funkhouser, Donald Stahr (Leo and Melva Harris Geosciences Scholarship Fund); Kyle Ashley, Lowell Moore (David R. Wones Geological Sciences Scholarship Fund); Kathleen Craft, Aida Farough, Maria del Pilar Madrigal Quesada (Aubrey E. and Eula H. Orange Award in Geosciences).

The faculty in Geosciences are making a global impact. Bob Bodnar participated in the inaugural semester of the Presidential Global Scholars program teaching a week-long module in Riva, Switzerland entitled *Volcanoes in Art, History, Mythology and Cinema*. He also taught in a short course on Fluids in the Earth in Naples, Italy. Esteban Gazel took students on a field trip to Costa Rica sponsored by PGS and he has also sponsored visiting scientists from Costa Rica to Virginia Tech. Robert Weiss was invited to speak on transport processes that cause tsunamis and are caused by tsunamis at the King Abdulaha University of Science and Technology, Saudi Arabia in 2012. Ying Zhou established a graduate student exchange program between Virginia Tech and Peking University with an MOU for a dual degree graduate program. She is also collaborating with Qingju Wu at Chinese Earthquake Administration on regional seismic tomography using recent seismic data collected by Chinese Earthquake Administration. This collaboration will focus on imaging the global tomography of discontinuities in the Earth's crust and mantle, taking advantage of rich seismic data collected by CHINArray.

### Diversity

The Department of Geosciences has been active in improving diversity within our student and faculty populations. We currently have four female tenured/tenure track faculty (2 Full Professors and 2 Associate Professors out of 21 tenure-track faculty) and one non-tenure track female faculty member. We are making strides to improve the diversity of our faculty and
students. Our 2012 diversity activities for the reporting period include the following:

**Advance VT:** Madeline Schreiber served as the AdvanceVT liaison for the College of Science in 2012-13 AY. Nancy Ross was a panelist for the Future Faculty Program in Jan. 2013 providing an overview of the academic search process. She was also a panelist in a March program for graduate students to discuss becoming a Professor and Head of Department. Patricia Dove serves as a member of the Advance VT Advisory Committee.

**Recruiting and Retention:** As co-chair of the College of Science (COS) Diversity Committee, faculty member Madeline Schreiber has been involved in developing programs to enhance diversity of undergraduate, graduate and faculty in COS. For recruitment, Nancy Ross hosted Elizabeth Ferrers, Ph.D. student at Columbia University, for the Future Faculty Program. Esteban Gazel recruited Pilar Madrigal, a Hispanic woman graduate student.

**Leadership:** John Hole was lead scientist on the Idaho-Oregon (IDOR) seismic refraction survey, funded by NSF and the 69-person fieldwork crew consisted mostly of student volunteers from 24 different colleges and universities. Volunteers were solicited from a) undergraduate-only institutions, b) Historically Black Colleges and Universities, and c) Hispanic-Serving Institutions, resulting in a) 10, b) 2, and c) 1 participants. These volunteers interact professionally with professors and graduate students in the research such engagement in field research has been shown to excite students towards pursuing further study in a STEM-related field.

**Scholarships and Awards:** Multicultural Academic Opportunities Program (MAOP) Scholarships were awarded to graduate students, Kathleen Craft, Kristin Dorfler. Esteban Gazel received a Carl Storm Underrepresented Minority (CSURM) Fellowship to support his invited participation in the 2013 Interior of the Earth Gordon Research Seminar and Gordon Research Conference.