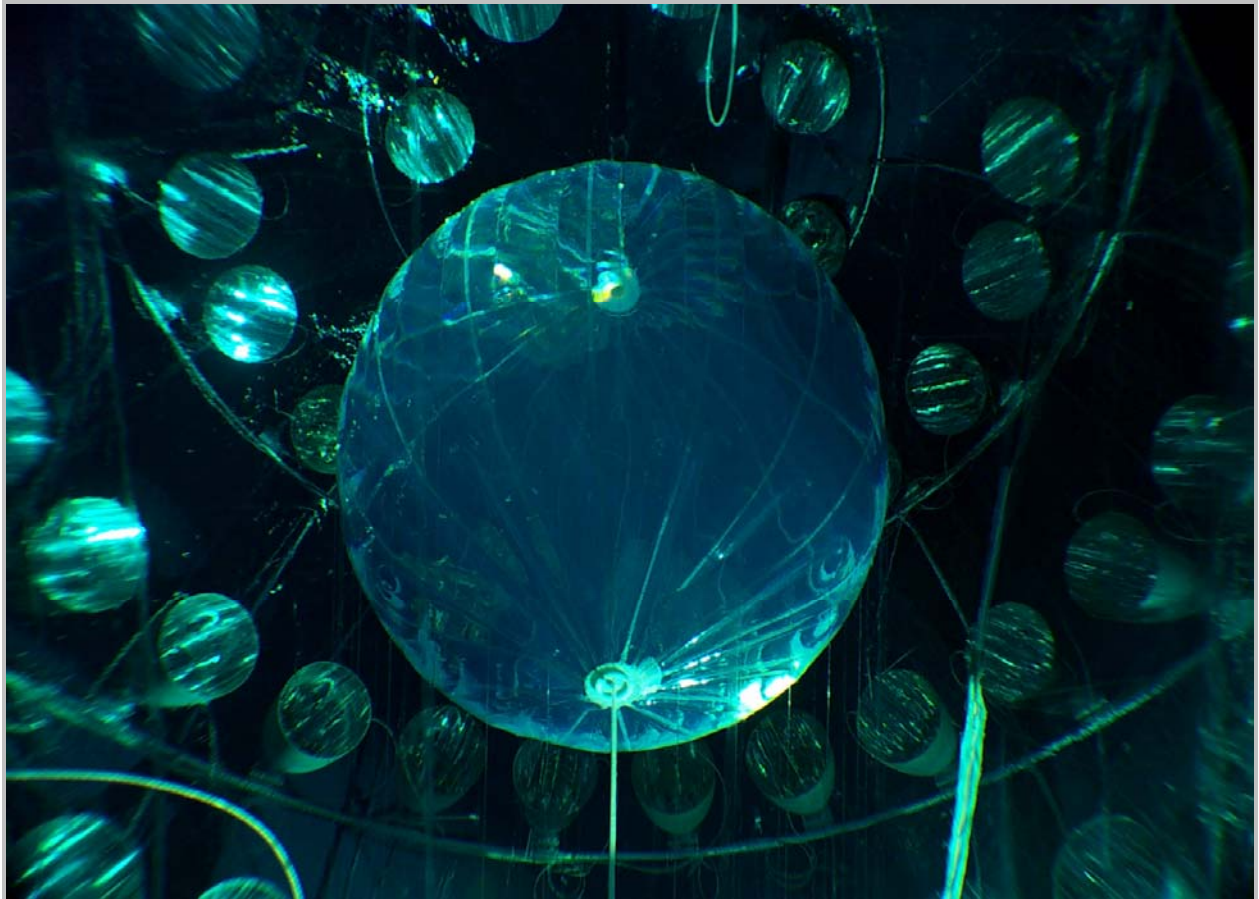


College of Science



Annual Report 2003-04



Introduction

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Welcome to the inaugural annual report of Virginia Tech's new College of Science. The college is a product of the university's restructuring of 2002. Its charge is to support the mission of the university with a focus on discovery and dissemination of basic and applied scientific knowledge. This charge has directed strategic plans whose implementations have begun.

Three strategic initiatives were begun this year in the college: cluster hiring, the Institute for Advanced Study, and intellectual property pre-law. These three strategic areas of emphasis will occupy the marginal time of the college for several years to establish them fully.

While the college is young, many of its departments are as old as any in the university. The college's achievements by faculty, staff, and students are thus those of very mature units. Their overarching goals

are to educate students, advance knowledge, and share expertise and experiences beyond the university. The sections of this report highlight some of the achievements in these endeavors this year.

First, however, short descriptions of the strategic initiatives and expressions of pride in appointments are in order.

Cluster Hiring: The university's research goals along with priorities of funding agencies determine that it focus resources toward research areas that cross disciplinary lines rather than first allocating resources to disciplines with hopes of grouping researchers by areas from the disciplines. The College of Science piloted "cluster" hiring during the 2003-04 academic year. The pilot shows that the approach is sound and will generate pools of strong candidates. Five positions were filled in nanoscience and computational science from the pilot. The approach will be continued this coming year incorporating modifications learned from this year's experience. Other groups in the university have examined the college's approach to inform their cluster hiring.

Institute for Advanced Study: Top-tier research universities gain such recognition by being leaders in research. Of course, resource constraints preclude leadership in every important research endeavor. Likewise, leadership requires early entry into an emerging area. The Institute for Advanced Study in the College of Science (COS) was created to identify emerging opportunities in research that will be realistic for the college. The institute will identify emerging areas, win acceptance of the direction in the faculty community, and develop research and search teams to launch the research focus here. This year the institute is gaining experience in building research teams by competing for consideration of NSF's national underground laboratory.

Intellectual Property Pre-Law: One of the growing fields in law is also one of the most difficult tracks in law schools—intellectual property law. The curriculum requires a background in science or technology. COS has begun a collaboration with the University of Richmond Law School that will permit very strong



"MAGNOLIA HOUSE" Home of the Institute for Advanced Study in the College of Science

students in science to move into law school in three years and lead to both a bachelor's degree from Virginia Tech and a law degree with a focus on intellectual property law.

Appointments: COS is most fortunate in building its leadership this year. Professors Nancy Ross and Sheryl Ball were appointed to associate dean positions. Dr. Ross, with geosciences as her home department, is providing leadership in research, graduate studies, and outreach. Dr. Ball, with economics as her home department, is providing leadership in curriculum, instruction, and advising. In addition, important staff positions in administration and fiscal areas were filled this year. Ms. Diane Stearns joined the college as the administrative assistant to the dean, Ms. Janet Sanders came to the college as business manager, Ms. Kristin Alls Wallace joined the college's alumni, development, and publicity operation as the office manager, Ms. Melissa Simpkins moved to the college as the fiscal technician, and Ms. Nita Newswander became the receptionist/executive secretary. These new appointments bring expertise, new ideas, and experience to the staff continuing from the dissolution of the College of Arts and Sciences to form a strong college team.

COS is also fortunate in having many, many noteworthy achievements. All cannot be listed in a report that would be read. Thus a sampling must suffice here. The appendix provides an expanded listing of achievements using the arrangement of categories developed for the University Plan.



Newly opened Chem/Phys Building



Recently renovated Williams Hall, now home to the Psychology Department

Research/Scholarship

The College of Science fully embraces the university's goal to establish Virginia Tech as one of the premier universities in the country recognized for its research and scholarship. Faculty are the key to accomplishing this goal as the reputation and accomplishments of the college depend on their research and scholarly activity. The college is in a prime position to advance as many of our faculty are already internationally-recognized leaders in research and scholarship. Robert Bodnar (*Geosciences*), for example, received a Major Research Instrumentation (MRI) grant from NSF this year for a novel laser ablation mass spectrometer. This was the only MRI grant received at Virginia Tech this year and will help create the only laboratory in the United States (and fourth in the world) with this instrument. The College of Science also has many early-career scientists who show potential to become tomorrow's leaders, as reflected in the number of ASPIRES awards. These awards were designed to support outstanding research proposals from non-tenured faculty across the university. It is significant that one-quarter of the ASPIRES grants were awarded to members of the College of Science, including Julie Dunsmore (*Psychology*), Djordje Minic and Tatsu Takeuchi (*Physics*), John Morris and Rich Gandour (*Chemistry*) and Shuhai Xiao (*Geosciences*). This percentage was the highest awarded to any college in the university.

Two important indicators of research activity and scholarly reputation are the number of publications and presentations at national and international meetings and the amount of external funding. In FY 2003, the College had 511 publications in peer-reviewed journals, 57 book chapters and books, and 829 presentations. In FY 2003, the college had sponsored research funds totaling \$19,346,284 from federal agencies, accounting for 15% of the entire University. It is important that the College of Science be in a position to benefit from all external opportunities. This is especially critical in trying to enhance the national and international research and scholarship reputation of the college and the university. We will therefore be active in investigating new opportunities for funding, encouraging interdisciplinary research and mentoring scientists in the early stages of their career.

The College supports mutually beneficial partnerships between departments and encourages the establishment of strategic partnerships with industry. William Spillman (*Physics*) continues as Director of the Virginia Tech Applied Biosciences Center (VTabc). The total investment to date by the University is \$5M and by the Carilion Biomedical Institute is \$3.7M. The Virginia Tech Crystallography Laboratory directed by Ross Angel (*Geosciences*) is a co-located facility of the Departments of *Geosciences*, *Chemistry*, and *Biology* under the College of Science. The research in the facility ranges from studies of materials at extreme conditions of pressure and temperature to the determination of the structures of proteins, supporting one of the University's major initiatives in structural biology. The co-location of these facilities has led to the development of a number of interdisciplinary research projects between members of the participating departments. The VT Crystallography

NEW HIRES IN THE COLLEGE OF SCIENCE:

JOINED IN 2003-2004

Lisa Belden, *Biology*

Julie Dunsmore,
Psychology

Serkan Gugercin,
Mathematics

Chris Lawrence,
Biology & VBI

Iuliana Lazar,
Biology & VBI

Ignacio Moore, *Biology*

Ramaswamy Raghavan,
Physics

Shuhai Xiao, *Geosciences*

ARRIVING IN 2004-2005

Giti Khodaparast, *Physics*

Rahul Kulkarni, *Physics*

Hans Robinson, *Physics*

Dorothea Tholl, *Biology*

Diego Troya, *Chemistry*

SPECIAL AWARD WINNERS: (SEE SPOTLIGHTS PAGE)

Jeff Borggaard,
Mathematics

Helen Crawford,
Psychology

Alan Esker, *Chemistry*

I.J. Good, *Statistics*

Michael Hochella,
Geosciences

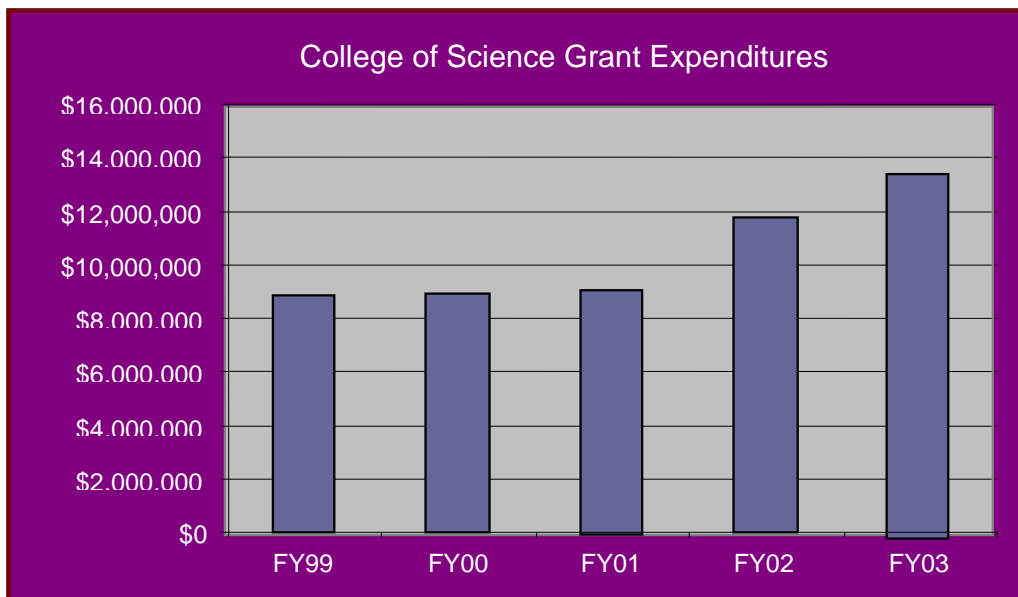
Thomas Ollendick,
Psychology

Duncan Porter, *Biology*

John Tyson, *Biology*

Royce Zia, *Physics*

Laboratory is also sponsored by Oxford Diffraction Ltd, who promoted the laboratory to being their one and only "Platinum Level Reference Site" in the United States.



The College supports the participation and advancement of women in academic science careers. The appointments of Nancy Ross and Sheryl Ball as associate deans were mentioned in the introductory section. Twenty-one female faculty within the College are tenured, and eight hold tenure-track appointments. The College has actively participated in AdvanceVT, a five-year \$3.5M institutional-transformation grant from the NSF to increase the participation and advancement of women in academic science careers. Beatte Schmittmann (*Physics*) and Catherine Eckel (*Economics*) were selected to serve as AdvanceVT Professors and Brenda Winkel (*Biology*) was awarded a leadership fellowship. Dr. Winkel will be appointed Associate Director of the Fralin Center for Biotechnology, working with the Director to provide leadership and vision for the Center.

For the past several months, faculty from the College of Science have been working with faculty from other Colleges at Virginia Tech to develop a proposal for National Science Foundation's Deep Underground Science and Engineering Laboratory (DUSEL) initiative. Bruce Vogelaar and Raju Raghavan (*Physics*) use a muon flux detector to monitor low-intensity radiation as background for neutrino experiments that would reside in the underground laboratory as shown below.



Graduate Education

The graduate programs in the College of Science (COS) are a source of considerable pride to its faculty members. Seeing students become professionals in their disciplines and moving to positions in academe, government, and commerce is most rewarding. The achievements of these graduates bring prestige to the departments and thus to the college and university. It is with pride that the departments report a total of 58 PhD graduates in 2003-04.

Recruiting strong graduate students is always a challenge and departments are succeeding. Geosciences found that the expedited application program in the graduate school helped it contact candidates more promptly and the department recruited 18 high-caliber students for fall 2004. Physics had its largest class in recent years with 17 entering in fall 2003. Two of these students came with NSF fellowships. Statistics and Mathematics increased recruiting inter-nationally. One student is already here in Statistics from Peru where that department and Math have established relations with universities. Math also has relations with universities in Russia and Tunisia. It recruited 19 students for fall 2004, up seven from last year with nine coming from its international recruiting. Chemistry has increased enrollments by 20%. Psychology continues to enroll outstanding students with mean GRE scores over 1200.

COS embraces fully the university goal of focusing on PhD education. Economics granted a record number of PhD degrees this year. Geosciences increased the ratio of PhD to MS students from 1 to 1.85, and Biology moved from 0.97 to 1.23. Mathematics is also supporting the goal of more MS theses by permitting the thesis to count in place of a preliminary exam.

Graduate programs encourage students to present research results and attend national and regional meetings. Geosciences held its ninth annual student research Symposium this year at which 50 projects were presented. Biology launched its first research day at which 25 research posters were presented.

Connections external to academe are important in graduate training. Graduate programs in geosciences, physics, and statistics benefit from corporate affiliations. Statistics has five corporate partners that enhance graduate assistants and provide opportunities for internships. Physics links with high-tech companies for its applied and industrial masters program. Geosciences benefits from long-term relations with petroleum companies. It hosted several visits this year by companies interviewing graduate students for possible employment. Psychology's required internship component relies on strong and abiding relations with institutions and on the quality of students placed in the internships. This year four students received internships at highly selective research institutions.

Chemistry has two of the very prestigious IGERT programs funded by NSF. One grant trains students in the interdisciplinary degree program of Macromolecular Science and Engineering. The second trains students in macromolecular interfaces with life sciences. Each grant will result in approximately 40 graduate student fellowship awards over a five year period.

US News ranks the Sedimentology/Stratigraphy program as 9th and the applied mathematics program 33rd in the country

MAOP Interns Summer 2003: psychology, three; mathematics, three; geosciences, one; chemistry, three; and biology, seven

Forest Walker, geosciences, holds a Department of Education GAANN Fellowship

Chris Burcher, biology, won the Frigid Units award for best presentation at the 2003 NABS conference

Natasha Wiles, biology, won the Best Student Paper in Biology at the meeting of the Virginia Academy of Science

Kirsten Bradbury, psychology, received the Lizette Peterson-Homer Injury Prevention Grant Award from the Society of Pediatric Psychology

Eric Vugrin, mathematics, received the university's Graduate Teaching Assistant Excellence Award for 2003-2004

Derrell McPherson, biology, received the 2004 Outstanding Dissertation Award in Sciences

Rebecca Abler, biology, last year's winner of the university's graduate student teaching award, spoke at the university's spring graduate commencement

Undergraduate Education

Students in the College of Science excel. Virginia Tech's Man and Woman of the Year for 2004 are both from COS, see sidebar. Two Mathematics seniors received NSF graduate fellowships to Duke and Stanford. A Biology graduate in 2003 is attending Harvard on an NSF graduate fellowship. Freshmen for 2003 entered Virginia Tech with records comparable with university averages but 32% of them earned Dean's List status compared with 28% for the university.

The college is tailoring its programs and advising to give students every opportunity to reach their potential and goals. Working with the University of Richmond Law School, the college is developing a multi-part program to prepare students for Intellectual Property law, a rapidly growing field with an exceptionally challenging curriculum. For example, students must hold a degree or equivalent coursework in science or engineering to sit for the "patent bar." This spring a course on intellectual property (IP) law was offered to students by Kimbley Muller, senior trademark counsel for Shell Oil Company. A class for freshmen and sophomores who want to explore IP law will be offered this coming year. Departments are emphasizing under-graduate research for qualified and interested students. Over 200 students participated in undergraduate research and nineteen participated in the 2nd Annual Undergraduate Research & Potential Graduate Student Conference. Geosciences established an undergraduate research endowment fund, Mathematics has a plan to double participation in undergraduate research next year, and Statistics will require all students to participate in undergraduate research beginning this coming academic year. Students entering COS this fall will be coached to plan carefully and, thanks to support from employers of COS graduates, will be provided with a daily planner to implement the coaching. Career panels, offered by alumni, continue with increasing alumni participation. Likewise, companies and agencies continue strong support of career fairs held for COS majors. Students on probation will find their schedules blocked until they meet with their advisor. Students eager to build a strong undergraduate foundation in the sciences will find COS an excellent home.

COS wants all qualified students to know the opportunities here and has set in motion plans to recruit them. It is collaborating with MAOP, the Greater Richmond Higher Education Consortium, Hampton University, the Greater Hampton Alumni Association and other organizations to contact strong students. Geosciences is working with Richmond area high schools and the effort brought three African Americans this year. (To place in context, only one African American currently majors in that program.)

Departments continue to explore and implement ways to use technology to instruct students. Two examples provide a flavor of the efforts. Catherine Eckel and Sheryl Ball, Economics, tested the use of wireless devices to bring active learning into large Principles of Economics classes—one class using the approach was compared with one not. Mathematics continues to expand the use of technology in the Math Emporium. This year a testing "engine" was developed that allows asynchronous testing in three courses. With assistance of a CEUT grant, automated quiz and homework grading was developed for business math and vector geometry.

Virginia Tech's Man and Woman of the Year hail from the College of Science!



Nicole Reynolds, biology Woman of the Year, and Outstanding Senior in COS
<http://www.technews.vt.edu/Archives/2004/April/04146.htm>



Jason Reese, psychology Man of the Year
Executive Officer, Highy-Tighties
<http://www.technews.vt.edu/Archives/2004/April/04145.htm>

Over half a million tests were given at the Math Emporium in 2003

The local chapter of the Society of Physics Students (SPS) received an Outstanding Chapter Award for the seventh year in a row. Also, SPS named emeritus professor Jerome Long the National Advisor of the Year

Outreach/Service

Faculty members and students in the College of Science are extensively involved in outreach and service. The involvement ranges from considerable interactions with K-12, to short courses for professionals, to newsletters, to service in governmental and non-governmental agencies, to reviewing grant proposals, to service in professional societies.

Psychology works closely with Montgomery County Public Schools counseling at-risk students early in their school years. Thirty under-graduates in *Physics*, working with a graduate student in education, reached about 1000 K-12 students this year. *Mathematics* hosted its ninth annual Women in Mathematics Career Day for middle-school girls; 250 sixth-grade girls from 18 schools attended; directs, with Wayne Patty as PI, extensive projects in teacher professional development programs funded by NSF; and offers an online course in statistics that helps teachers better prepare students for SOL tests. Michael Hochella and Susan Eriksson, *Geosciences*, organized a four-day workshop (funded by NSF) for teachers on nano-scale science and technology. A web site was also created, www.nanoed.vt.edu, to help educate teachers. *Chemistry's* outreach to K-12 has reached around 8,500 students in the past seven semesters and trained over sixty teachers in workshops, see <http://www.chem.vt.edu/chem-dept/mcl/index.html> for more. *Biology* and *Geosciences* continue to use the museums to train teachers and host student groups.

James McGrath and Thomas Ward, *Chemistry*, received the Flory Award given by the American Chemical Society Polymer Division for their outstanding teaching of polymer related short courses. *Geosciences* taught short courses in Saudi Arabia and Germany. Scott Geller, *Psychology*, presented dozens of workshops and addresses at corporate and professional meetings. *Statistics* also offers short courses each year. In *Economics*, Aris Spanos teaches a four-week, intensive applied econometrics course to 20 graduate students from Korea each January, and Sheryl Ball taught a course in experimental economics at Roanoke College.

Departments use newsletters and websites to keep alumni informed of happenings in their departments and thus to continue reaching out to this important community, see below for some links.

Faculty members in COS hold more than 100 editorships or associate editorships on professional journals. Many serve on editorial boards also. Faculty members serve on numerous review panels at federal agencies and foundations for grant selection. Governor Mark Warner appointed Cahit Coruh, geosciences, to a six-year term on the Gas & Oil Board of the State of Virginia. Nancy Lutz, *Economics*, and J. Ken Shaw, *Mathematics*, are serving as program directors at NSF.

Links to newsletters:

Chemistry <http://www.chem.vt.edu/news/ElementsSpring2004.pdf>

Geosciences http://www.geol.vt.edu/general/newsletter/fall2003/Newsletter_F03.pdf

Physics <http://www.phys.vt.edu/Newsletters>

Biology <http://www.biol.vt.edu/newsletters.php>

Dozens of faculty members in COS serve as officers in professional societies

Over 100 people visited the Price's Fork Observatory this year

Over 30 grade-school groups visit the geosciences museum annually

Participants in an Elderhostel sponsored by Wilderness Conservancy spent 25 hours in an instruction and observing session at the Mountain Lake Hotel and Martin Observatory in October 2003

Thirty-eight individuals learned about birds and butterflies in southern Appalachia during an Elderhostel directed by Jerry Via of biology

Joseph Falkinham serves on the WHO and EPA task force on assessing risks from *Mycobacterium avium*

Susan Hagen, mathematics, is part of a five-university consortium to increase the number of "highly qualified" middle-school teachers as part of the "No Child Left Behind" program

College Spotlights

The PhD program in Genetics, Bioinformatics and Computational Biology highlighted in *Nature Biotechnology* magazine

Two mathematics seniors received NSF graduate fellowships.

Alan R. Esker, chemistry, earned a five-year, \$500,000 NSF CAREER award designed to encourage promising young researchers.

Harry Gibson, chemistry, received the Alumni Award for Research Excellence.

Royce Zia, physics, received an Alexander von Humboldt Award

Helen Crawford, psychology, received the 2003 Ernest R. Hilgard Scientific Excellence Award from the International Society of Hypnosis.

Gary Long and Barbara Bunn, chemistry, Alumni Outreach Award winners.

John Tyson, biology, one of Virginia's three Outstanding Scientists of the Year 2004. John was recognized for his world leadership in developing the new field of computational cell biology

Tom Ollendick, psychology, received the 2004 Virginia Academy of Clinical Psychology Award for Distinguished Scientific Contributions in Clinical Psychology

The SPS chapter in physics received its seventh consecutive Outstanding Chapter Award in fall 2003

Kevin Bradley, psychology, won the International Personnel Management Association Assessment Council Student Paper Competition Award for his dissertation.

Heather Alvarez, psychology, received a Dissertation Research Grant from the Melissa Foundation.

Duncan Porter, biology, received the Thomas Jefferson Medal for Outstanding Contributions to Natural Science, by the Virginia Museum of Natural History Foundation.

Khidir Hilu, biology, authored the featured article in the December issue of the *American Journal of Botany*. His research is breaking new ground in the molecular evolution of flowering plants

Jeff Borggaard, mathematics, received a National Research Council Fellowship and a PECASE award.

I. Jack Good, statistics, was elected an honorary fellow of the Royal Statistical Society

Robert Bodnar, geosciences, is included in the book "Notable Scientists: The A to Z of Earth Scientists,"

Jason Reese, psychology senior, is the Virginia Tech Man of the Year for 2003-04.

The Department of Chemistry holds two NSF IGERT grants.

Nicole Reynolds, biology, is the Virginia Tech Woman of the year.

Michael Hochella, geosciences, received the DoE's Geoscience Research of the Year Award

The Department of Statistics has nine Fellows of the American Statistical Association.

Alumni Relations and Development

The College of Science at Virginia Tech is a multifaceted, multidimensional organization. Students, faculty, staff, and alumni revolve around each other in a cycle that continually evolves, grows, and hopefully strengthens. The students that once walked the halls of our academic buildings are now alumni who either are or are becoming leaders in our country's societal and business structures. The faculty are a critical element to the backbone of the students' education foundation as they reach for their goals and dreams. Many of our faculty and staff members make impacts of life changing and lifelong magnitudes and are remembered years after the students transition into College of Science alumni. Currently, our alumni number almost 22,000 Hokies!

The goal of the College of Science Alumni Relations Office is to offer opportunities for alumni to reconnect or enhance their connections with Virginia Tech. The office works closely with alumni and academic departments to organize regional events and reunions, to add alumni pages to websites and newsletters, to invite alumni to speak to students, and to establish and support departmental and collegiate advisory boards.

The College of Science Office of Development strives to develop permanent relationships between alumni and the college by informing them of funding opportunities such as endowed scholarships, endowed professorships, and capital projects. Endowments and facilities "naming" permanently establish their enduring affection for Virginia Tech while also providing an investment in the future of the university and those faculty and students who work to further its mission and their academic interests.

All College of Science alumni can make lasting contributions, and many are very generous in the diverse avenues of opportunity to support the college and its departments. We rely on them with ever increasing frequency and gratitude. Examples of their support include:

- Perspectives of the outside work environment by speaking to students either one-on-one or through career panels;
- Connections with corporations and agencies that have interests in the research and teaching we do;
- Opportunities for our students to gain practical, real-world experiences through internships;
- Counsel to the departments and the dean regarding shifts and changes in business and service agencies that could impact curricular decisions for our students; and,
- Financial support giving opportunities to students, faculty, and departments that otherwise may not be possible with the decline of state funding.

The College of Science is immensely appreciative for the gifts of time, ideas, energy, and financial support from our alumni and friends and looks forward to increasing the awareness of opportunities of involvement to our alumni.

2004 ALUMNI RELATIONS ACTIVITIES

- Geosciences Faculty/Alumni Dinner in Houston, TX
- COS Grand Opening Celebration, Parts I & II
- COS Homecoming 2003
- Biology Reunion honoring George Simmons and Muriel Lederman
- Psychology Graduate Student Reunion
- Pregame Hospitality Tents
- Career Panels featuring alumni
- Biophysics Symposium honoring Dr. Royce Zia
- Departmental advisory committee meetings
- COS Old Guard Breakfast
- COS Dean's Roundtable committee meetings

2004 ESTABLISHED ENDOWMENTS

- Leonard & Melva Harris Scholarship
- Friends of Larry Taylor Chemistry Excellence Fund
- Friends of Biology Excellence Fund
- Wilbur Francis Wells Memorial Scholarship
- William C. "Bill" and Francia J. Presley Scholarship
- James Jacobs Memorial Fellowship
- James McGrath Endowed Fund
- Endowment for the Institute of Advanced Study
- Meyer Oskuie Endowed Undergraduate Scholarship