

**2006-07 ANNUAL REPORT
DEPARTMENT OF BIOLOGICAL SCIENCES**

PART 1: EXECUTIVE SUMMARY

In memory of our lost colleagues and students

On April 16, 2007, a lone individual killed 32 Virginia Tech students and faculty, wounded many others, traumatized countless people, and then took his own life. This terrible event had profound impacts on all aspects of the department, including the mental well being of its people, their scholarship, and the learning environment. With a tremendous effort, buoyed by a strong sense of community and mutual support, the Biological Sciences faculty, staff, and students completed spring semester. At spring commencement, Ryan Clark, Rachael Hill, and Michael Pohle, Jr. were awarded posthumous B.S. degrees in Biological Sciences. Healing and plotting a future of hope will be among the most important challenges facing the department in AY 2007-08 and beyond.

Learning: Undergraduate

Enrollment continued to increase in the Biological Sciences major, most likely reflecting the public perceptions of the value of life science education and the reputation of the university, college, and department. This trend, plus biological sciences growth in other departments and colleges, has increased demands on instruction provided by department faculty and graduate students. Classroom and experiential learning activities were diverse and impacted many students beyond those who are Biological Sciences majors. Success and quality of majors (measured by numbers of students receiving various honors and awards or being accepted into professional or graduate schools) remain high. Biological Sciences faculty actively pursue teacher training to maintain or improve learning outcomes for undergraduate and graduate students. The department is a campus leader in academic advising and providing substantive first-year experiences.

Learning: Graduate

The 2006-07 academic year was marked by an increase in the number of PhD students and postdocs in the department, a continuing trend for interdepartmental graduate student recruitment and training, and a very successful fourth annual graduate research day event. The number of graduate students supported by research funding declined, possibly reflecting increased investment in postdocs.

Discovery

Research productivity increased modestly in CY 2006 relative to the previous two years. A sharp rise occurred in the numbers of books and peer reviewed publications in print or press, and small increases occurred in presentations and invited seminars in CY 2006 relative to CY 2005. Various indicators of funding show more or less similar activity in FY 2007 compared to FY 2006. Indicative of the nationally prominent role they have in research, Biological Sciences faculty members co-organized two research symposia/workshops held at Virginia Tech and four national/international programs held at other institutions.

Engagement

The department focused efforts on strengthening its partnerships with corporations and developing new resources to support a growing program in K-12 STEM (Science, Technology, Engineering, and Math) education. International aspects of the undergraduate curriculum remain a modest but high impact element within the total undergraduate learning environment. International collaborations are common within the department's research programs. Faculty members provide valuable service to their profession in addition to major efforts to support departmental, college, and university operations.

Diversity

The department continues to improve the quality of work life, support science training for underrepresented groups, and celebrate cultural diversity.

Goals for 2007-08

In AY 2006-07, the department underwent a thorough review of its programs. The reports from a self-analysis (led by an internal committee composed of Drs. Duncan Porter (chair), Brent Opell, Janet Rankin, Jill Sible and Zhaomin Yang) and from an external committee of five scientists will be reviewed and discussed broadly in summer and fall of 2007. From these discussions, an action plan will be developed to improve departmental operations and programs.

PART 2: ACADEMIC ACCOMPLISHMENTS

I. Learning

A. Undergraduate programs

Enrollment continued to increase in the Biological Sciences major, most likely reflecting the public perceptions of the value of life science education and the reputation of the university, college, and department. This trend, plus biological sciences growth in other departments and colleges, has increased demands on instruction provided by department faculty and graduate students. Classroom and experiential learning activities were diverse and impacted many students beyond those who are Biological Sciences majors. Success and quality of majors (measured by numbers of students receiving various honors and award or being accepted into professional or graduate schools) remain high. Biological Sciences faculty actively pursue teacher training to maintain or improve learning outcomes for undergraduate and graduate students. The department is a campus leader in academic advising and providing substantive first-year experiences.

- Undergraduate enrollment in the Biological Sciences major has increased substantially since 2002.

	Fall 02	Fall 03	Fall 04	Fall 05	Fall 06
• Primary Majors	1049	1217	1297	1295	1312
• Secondary Majors	24	43	73	58	65
• Total	1073	1260	1370	1353	1377

- In addition to the 1377 majors in fall 2006, 175 students were enrolled as Biological Sciences minors; each of these is equivalent to approximately one half of a major (measured by hours of biological sciences courses required). If the latter are counted as 88 additional students, then the total enrollment impact in fall 2006 was equivalent to 1465 full-time students.
- Early indications are that the number of students in the major will increase in fall 2007 relative to fall 2006.
- Participation in the University Honors program provides an indicator of the quality of Biological Science Majors. Using institutional research data, we calculate that in fall 2006:
 - 6.7% of all Biological Sciences Majors (92 out of 1377) were enrolled in the University Honors program
 - Out of the University's 1042 Honors Students, 8.8% (92) were Biological Sciences Majors.
- Students accepted as freshmen at Virginia Tech who transfer into and out of the Biological Sciences major typically do so before the end of the sophomore year. The net change in majors is usually very small (see last year's annual report for an analysis).
- In AY 2006-07, 357 students graduated (up from 295 last year). Many achieved honors, as shown in the flowing table.

	Dec 2006	May 2007	Total
Total graduates	39	318	357
Magna Cum Laude	4	35	39
Summa Cum Laude	2	27	29
Cum Laude	1	49	50
Commonwealth scholars	0	6	6
In honors	1	11	12
Health scholars	0	7	7

- Success in providing excellent pre-med and pre-dent advising, leading to a high percentage of applicants being accepted in medical and dental schools, has been a hallmark of the department and the university. Data for students who were juniors and seniors in 2005-06 provide an example of the good preparation and guidance our students receive. For example:
 - 24 students were interviewed by the honors advising office for competitiveness in the pre-dent program
 - 17 students were considered competitive and applied to dental school.
 - 16 were accepted, a 94% acceptance rate for official applicants.
 - 11 of these 16 (68%) were Biological Sciences majors.
 - For pre-medical students seeking placement in med schools in fall 2007
 - 60 within the university were interviewed by the honors advising program, and of these 27 had strong interviews and competitive MCAT scores.
 - All 27 of these applicants were accepted in medical school.
 - 14 of the 27 (52%) were Biological Sciences majors.
- From data available through the Banner system to the Department of Biological Sciences, we calculated that the quantity of undergraduate teaching in CY 2006 (32,289 student credit hours, which are the product of the credit hours in a course times the number of students) was virtually the same as in CY 2005 (32,357). However, data from institutional research that includes all hours (graduate and undergraduate) with the BIOL prefix show an increase in 2006 (35,713) versus 2005 (34,789).
- Of the Banner-derived undergraduate hours taught in 2006, 4040 (12.5%) were taught by faculty outside the department.
- Quality of classroom teaching also remained high. It is departmental policy to obtain student evaluations for each course using the student perception of teaching (SPOT) method. In the fall 2006 and spring 2007 semesters, of 107 lecture and upper division laboratory classes rated by students, the mean overall SPOT score was 3.3, which lies between “good” and “excellent.” Lower division (freshman and sophomore) laboratories offered by the department, taught by graduate students and evaluated by undergraduate students (total of 49 sections evaluated, spring only, no data available for fall), had a mean overall SPOT of 3.4.
- To help build quality of teaching, the department also conducts peer evaluations (some formal and others more informal, but all including classroom visits and review of teaching materials), and faculty attended training sessions or workshops to build teaching skills. In AY 2006-07, 5 faculty had peer evaluations, and in CY 2006, 15 faculty attended a total of 24 teacher training sessions or workshops.
- Undergraduate research provides a capstone experience for many Virginia Tech students. In calendar year 2006, faculty provided research mentoring for 94 undergraduate students.
- Undergraduate advising activities were extensive in AY 2006-07. Most academic advising and a large proportion of career advising were provided by the department’s Center for Academic Advising, which includes two full time classified staff, one non-tenure track faculty member, and one tenure track faculty member. A special freshman advising program to help first year students deal with college life was led by the advising center, but also included several other faculty.
- Biological Sciences continued its active role in leading the Biological and Life Sciences Learning Community (BLSC), which included 41 students in AY 2006-07. **Dr. Joe Cowles** and **Ms. Betsey Waterman** organize this residential learning community for students to develop a sense of community and a focus on academics.

B. Graduate education and postdoc training programs

The 2006-07 academic year was marked by an increase in the number of PhD students and postdocs in the department, a continuing trend for interdepartmental graduate student recruitment and training, and a very successful fourth annual graduate research day event. The number of graduate students supported by research funding declined, possibly reflecting increased investment in postdocs.

- Active full-time students with GTA or GRA support have been averaging in the 60s to 70s over the past five years; 76 were enrolled in spring 2007 (2 additional were self funded).
- The numbers of PhD students, and ratio of PhD students to MS students increased in 2006-07 relative to previous years (see table below).
- The funds expended for Biological Sciences GTA and GRA stipends were \$1,212,360 in 2006-07, which was an increase of \$69,074 (6%) over the previous year (see table below).
- Postdoc numbers increased substantially from 10 in AY 2004-05 to 17 in AY 2005-06 and 25 in AY 2006-07.
- Because of new faculty recruitment and increasing emphasis on PhD training, it is anticipated that the number of PhD students will continue to rise over the coming several years.
- No progress has been made in the past year in increasing the total number of graduate students.

Summary of graduate student enrollment, types of graduate support, graduate stipend payroll, and number of postdocs for FY 2003 through FY 2007.

	2002-03	2003-04	2004-05	2005-06	2006-07
PhD students enrolled ¹	33	38	37	46	52
MS students enrolled ¹	34	31	40	26	21
Total students enrolled ¹	7	69	77	72	73
PhD/MS ratio ¹	0.97	1.23	0.93	1.77	2.48
Fellowships/training grants ⁴					13
Funded GRAs ^{1,2}	26	27.5	27	32	17
Funded GTAs ^{1,2}	44	38.5	46.7	39	41
Active students not funded					2
(GRA+fellow)/GTA ratio ^{1,2}	0.59	0.71	0.58	0.82	0.76
Fellowship payroll ^{3,4}					\$231,133
GRA stipend payroll ³	\$416,658	\$553,817	\$571,061	\$614,801	\$413,812
GTA stipend payroll ³	\$511,894	\$516,707	\$583,192	\$528,485	\$567,415
Total Payroll	\$928,552	\$1,070,524	\$1,154,253	\$1,143,286	\$1,212,360
Full-time postdocs ¹	8	9	10	17	25

¹ Snap shot taken in spring of academic year.

² Includes a small number of students from other life science departments occasionally funded to meet critical teaching on short notice.

³ Stipend data are for a 12-month basis, August 10 through August 9.

⁴ Fellowships include the "PhD 2010", Cunningham, Maly, Paterson, Cairns, and various minority fellowships plus training grants.

- The fourth annual Biological Sciences Research Day was held on Saturday, February 24, 2007 in Torgersen Hall.
 - Co-organized by graduate students **Nassiba Adjerid**, **Sheena Friend**, and **Ben Orsburn**, and by faculty members **Drs. Lisa Belden**, **Carla Finkielstein**, **Khidir Hilu**, and **Jeff Kuhn**.
 - 8 invited talks by current graduate students, 39 posters by current graduate students, and an invited plenary talk delivered by **Dr. Ujwala Warek** (a former PhD student of the department).
 - An abstract book was published, and over 120 people attended the meeting, including several from the Biological Sciences Alumni Advisory Board.
 - Also in attendance were 19 graduate student prospects (9 for the Biological Sciences and 10 for the Microbiology recruiting program).
- In conjunction with Research Day, a juried art show with purchase awards (purchased items to be displayed in the new Life Sciences Building) was held using the theme of “Biologically Inspired Art.”
 - Organized by **Dr. Robert Jones**, **Ms. Deb Sim**, and **Ms. Tracy Price**.
 - Sponsored by the departments of Biological Sciences, Art and Art History, and the VT Office of the VP for Research.
 - 79 art pieces from 31 artists were displayed in Torgersen Bridge; over 200 people attended the show, and 4 art pieces were purchased.
- Department faculty and graduate students led the organization of two major university seminar series: the Molecular and Cell Biology and Biotechnology series (MCBB) and the Ecology Evolution and Behavior (EEB) series. **Dr. Asim Esen** chaired the MCBB committee this year and made significant progress in securing funds to support it. **Dr. Lisa Belden** chaired the EEB seminar series committee. Weekly seminars were held for both series in fall and spring semesters.
- The department entered the fourth year of the “preparing the future professoriate” project. Graduate students who wish to build a strong resume in teaching and in preparation for academic careers can participate in a graduate school certificate program or teach a lecture course in the department, provided that they have taken a course in pedagogy or teaching at the college level and provided that they find a willing faculty mentor. Participants this year (summer sessions 2007) included **Sarah Sebring**, who taught the 3-credit Principles of Biology (BIOL 1105) course, and recent graduate **Brian Olsen**, who taught the 3-credit Principles of Biology (BIOL 1106) course.
- The quantity of all graduate recruits has not changed appreciably in recent years in terms of number of applicants, percent accepted, and percent accepted who chose to enroll (see table below). However, a trend is emerging for more PhD and fewer MS recruits.
- The quality of recruits has also remained very stable as indicated by GRE and GPA scores of students enrolled in regular status (see following table). However, looking ahead to the fall 2007 class, there is an increase in the quantitative GRE, and there are decreases in the Verbal GRE and GPA, probably reflecting an increase in proportion of incoming students who have English as a second language.

Class ¹	No. Applicants	% Accepted	% of Accepted Enrolled	GRE Verbal ²	GRE Quantitative ²	GRE Total ²	GPA ²
1991	125	46	14	530	650	1180	3.1
1992	114	26	11	566	654	1220	3.5
1993	99	32	22	539	640	1179	3.5
1994	108	56	66	550	605	1155	3.45
1995	154	28	72	582	626	1208	3.59
1996	121	24	59	591	670	1261	3.66
1997	113	25	68	517	601	1118	3.43
1998	93	31	69	502	635	1137	3.68
1999	102	25	54	538	636	1164	3.43
2000	98	33	73	540	637	1177	3.46
2001	93	32	90	505	639	1144	3.52
2002	115	25	59	522	671	1193	3.39
2003	113	31	69	490	625	1115	3.42
2004	79	20	80	547	652	1199	3.50
2005	105	20	76	540	634	1174	3.65
2006	115	29	79	544	641	1185	N/A
2007	94	28	69	445	681	1126	3.26
Mean	108	30	61	532	641	1172	3.5

¹ Students applying for spring and fall semester of indicated year

² Calculated for students entering in regular status; GPA is for undergraduate degree

- The Biological Sciences faculty maintained leadership in two existing university-wide graduate recruiting programs and began a third program.
 - The Graduate Program in Microbiology was initiated in 2003 and includes over 40 faculty participants from across the university. Nine students were recruited into this program during its first three years, but seven have been recruited for 2007. Students who apply and are recruited spend their first semester rotating through laboratories before the decision is made on a major advisor. For details, see http://www.biol.vt.edu/vtmicro/g_study.html
 - The Graduate Program in Molecular Plant Sciences was initiated in 2005 with 20 participating faculty from 7 departments; this year marked the third year of an aggressive recruiting effort at regional schools, followed by students rotating through labs before a decision is made on a major advisor. For details, see <http://www.molplantsci.org.vt.edu/INDEX.HTM>
 - A new Graduate Program in Cell and Developmental Biology (CDB) was initiated in AY 2007 with participation by 8 faculty in Biological Sciences plus other faculty from the Virginia Maryland Regional College of Veterinary Medicine and Department of Chemistry. Following the model of the Microbiology program, students in the CDB will rotate among several labs before being accepted into a particular lab. Recruiting was successful in the first year; nine students have committed to start in fall 2007. Details of this nascent program can be found at: <http://www.biol.vt.edu/research/cdb/index.html>

II. Discovery

Research productivity increased modestly in CY 2006 relative to the previous two years. A sharp rise occurred in the numbers of books and peer reviewed publications in print or press, and small increases occurred in presentations and invited seminars in AY 2006 relative to AY 2005. Various indicators of funding show more or less similar activity in FY 2007 compared to FY 2006. Indicative of the nationally prominent role they have in research, Biological Sciences faculty members co-organized two research symposia/workshops held at Virginia Tech and four national/international programs held at other institutions.

Summary of research outputs for the departmental faculty (39-42 FTE research and teaching faculty) for CY 2002–2007 (except fiscal year where noted).

Indicator of research/scholarship activity	2002	2003	2004	2005	2006	2007
Books, book chapters, and journal articles in print or press (calendar year)	142	133	132	146	187	
Presentations at professional meetings and conferences (calendar year)	104	110	103	129	132	
Invited seminars (calendar year)	54	44	26	51	58	
Total research grants dollars in force regardless of PI versus co-PI status and regardless of location of funds (fiscal year)	19,000,000	26,000,000	36,500,000	45,543,627	48,292,617	
Research expenditures (actual dollars spent during fiscal year; source = COS)	2,219,357	2,871,899	2,607,532	3,113,895	3,438,121	TBD
Research expenditures (expenses paid via contracts and grants; source = Banner)	2,219,124	2,888,599	2,617,071	3,116,899	3,461,698	3,337,385
Total overhead generated from contracts and grants (source = Banner)	512,216	738,465	555,625	740,544	1,009,565	980,837
Research expenditures calculated as sum of previous two rows	2,731,341	3,627,064	3,172,696	3,857,443	4,471,264	4,318,221
New research awards (FY basis; source = OSP awards data base; all numbers were adjusted by OSP in 2007)	4,803,456	3,830,978	3,487,396	4,309,819	4,764,319	4,529,600 (Subject to further revision)

Note: these numbers do not include any double counting; in cases where more than one Biological Sciences faculty member is an author or Co-PI, the data are only counted once.

Other significant contributions and accomplishments that reflect the high level of scholarship in the faculty include:

- In CY 2006, 16 individual faculty members were invited to present their research at other institutions.
- The second annual conference on structural biology was hosted by Virginia Tech with leadership from Biological Sciences faculty (**Drs. Ross Angel (chair), Carla Finkielstein, Florian Schubot, and Nancy Vogelaar**) and the VT Crystallography Lab. As in the previous year, the conference included local faculty across the university who are studying protein structure, plus two outside guests. 205 people (mostly faculty) from VT and regional schools attended. For more information see: http://www.biol.vt.edu/structural_symposium/index.htm
- **Dr. Dana Hawley**, Assistant Professor specializing in disease ecology, co-organized the Wildlife Infectious Disease Symposium for the North American Ornithological Congress in Veracruz, Mexico, which included invited contributions from internationally recognized avian disease ecologists.
- **Dr. Liwi Li**, Associate Professor in Immunology who joined the faculty in August 2005, hosted a regional conference on innate immunity at Virginia Tech (mentioned in last year's report, but the event happened in spring 2006). Innate immunity is a fast moving research field that cuts across many kinds of organisms (both plants and animals). For more information see: <http://www.conted.vt.edu/innate/schedule.html> Dr. Li also co-organized a national minisymposium: The 14th International Meeting of the Inflammation Research Association, Cambridge, MD, October 2006.
- **Dr. Jeb Barrett**, Assistant Professor in ecology who moved to Blacksburg in 2006, was co-chair and organizer of a National Science Foundation supported workshop on Soil Moisture Dynamics in the McMurdo Dry Valleys, Dartmouth College, Hanover, NH.
- **Dr. Daniela Cimini**, Assistant Professor in cell biology, was co-author on two articles featured on the cover of a journal -- one in *Science* and the other in the *Journal of Cell Biology*. She was also first author on a paper in *Current Biology* that was highlighted later in the journal in a dispatch article. The full citation of the latter is: **Cimini D.**, Wan X., Hirel C.B., and Salmon E.D. (2006). Aurora kinase promotes turnover of kinetochore microtubules to reduce chromosome segregation errors due to merotelic kinetochore orientation. *Curr. Biol.*, 16: 1711-1718. [Highlighted in a 'Dispatch' article by Zhang and Walczak in *Curr. Biol.*, 16: r677-r678].
- **Dr. Carla Finkielstein**, Assistant Professor in cell biology, published an article in *Journal of Biological Chemistry* that was featured as an editor's choice article in the journal *Science*. The details are: **Finkielstein C.V.**, Overduin M., Capelluto D.G.S. (2006). Cell migration and signaling specificity determined by Rac1's phosphatidylserine recognition motif. *J. Biol Chem.* 281(37): 27317-26. Editor's Choice by Science Editor, 9/19/06; see: <http://stke.sciencemag.org/cgi/content/abstract/sigtrans;2006/353/tw323> She was also the recipient of a \$132,000 grant from the American Heart Association to develop a model to study alternative mechanisms for accumulation of cyclin-dependent kinase inhibitors.
- **Dr. Khidir Hilu**, Professor of botany, co-authored a paper in *Molecular Phylogenetics and Evolution* that became one of the journal's top 10 most downloaded articles. The full citation is: Kai F. Müller, Thomas Borsch, and **Khidir W. Hilu**. 2006. Phylogenetic utility of rapidly evolving DNA at high taxonomical levels: contrasting matK, trnT-F and rbcL in basal angiosperms. *Molecular Phylogenetics and Evolution* 41: 99-117. He also co-organized and chaired a Land Plants symposium for the centennial meeting of the Botanical Society of America in summer 2006.
- **Dr. Jeff Kuhn**, Assistant Professor in cell biology, joined our department in fall 2006 and brought with him a prestigious "Interfaces in Science Career Award" provided by the Burroughs Wellcome Fund. This grant provides support for postdocs and then \$330,000 to help during the first three years of a tenure track faculty position.

- **Dr. Iulia Lazar**, Assistant Professor with a joint appointment in VBI, published a paper describing the first use of microfluidic devices for the detection of a panel of cancer biomarkers. Full citation: **Lazar, I.M.;*** Trisiripisal, P.; Sarvaiya, H., “Microfluidic Liquid Chromatography System for Proteomic Applications and Biomarker Screening,” 2006. *Anal. Chem.* 78(15): 5513-5524. The significance of this paper was discussed in *Journal of Proteome Research* and highlighted on ~14 websites/newsrooms.
- **Dr. Rachel Muheim**, a postdoc working with **Dr. John Phillips**, published an article that appeared in *Science* that addresses one of several mechanisms for navigation in animals. The full citation is: **Muheim, R, J.B. Phillips**, and S. Akesson 2006. Polarized light cues underlie compass calibration in migratory songbird. *Science* 313: 837-839. Drs. Muheim and Phillips, who have done much to advance theories and provide supporting evidence behind animal navigation, also co-authored a key review article on the subject (full citation is: Freake, M.J., **R. Muheim** and **J.B. Phillips** 2006. Magnetic Maps in Animals – a theory comes of age? *Quart. Rev. Biol.* 81: 327-347).
- **Dr. David Popham**, Associate Professor in microbiology, was convener of a paper session at the General Meeting of American Society for Microbiology, Orlando, FL. He began the session by introducing the theme of the session: “Forces Generated by Bacteria.”
- **Dr. Stephen Scheckler**, Professor of botany, provided a keynote address at one of the topic sessions at the annual Geological Society of America meeting in Philadelphia, PA. He discussed “Devonian forest expansion, increased land-based trophic capacity, and food web connections.”
- **Dr. Jill Sible**, Associate Professor in cell biology, was awarded a 5-year NIH R01 grant for \$905,010. She will be developing a systems-level view of cell cycle checkpoints, working in collaboration with the project’s Co-PI **Dr. John Tyson**, who is also a member of the Biological Sciences Department.
- **Dr. Ann Stevens**, Associate Professor in microbiology, is Co-PI on two newly funded grants, one from the Department of Energy and the other from the Virginia Water Resources Research Institute. She is using her expertise on bacterial quorum sensing and molecular biology to help researchers in the Departments of Geosciences and Civil and Environmental Engineering learn more about bacterial mediated chemical transformations and bacterial resistance to pollution in the environment.
- **Dr. Dorothea Tholl** and **Dr. Lisa Belden**, Assistant Professors, each received an AdvanceVT seed grant to develop their research programs. These grants are highly competitive and are supported via an NSF grant to Virginia Tech.
- **Dr. John Tyson**, University Distinguished Professor, was awarded a \$1,290,419 grant from NIH titled “Stochastic Models of Cell Cycle Regulation in Eukaryotes.” This work will use new data and advances in mathematical approaches to build on John’s well-known studies of mechanisms behind cell replication.
- **Dr. Jeff Walters**, Bailey Professor of Biology, successfully developed two multi-investigator research grant proposals, each resulting in funding through the Department of Defense. One is a 5-year \$1,585,122 project to investigate ways to map habitat connectivity for multiple rare, threatened, and endangered species on and around military installations, with Co-PIs located at NC State, UNC, and Duke University. The second, a 3-year \$876,992 project, will develop a decision support system to aid in identifying critical habitat. These projects continue Dr. Walters’s focus on the use of basic research to aid in development of effective practices in conservation management.
- **Dr. John Cairns, Jr.** Emeritus University Distinguished Professor and member of the National Academy of Sciences, reached a new milestone in publishing a career total of over 1500 peer-reviewed papers, book chapters, and books.

III. Engagement

The department focused efforts on strengthening its partnerships with corporations and developing new resources to support a growing program in K-12 STEM (Science, Technology, Engineering, and Math) education. International aspects of the undergraduate curriculum remain a modest but high impact element within the total undergraduate learning environment. International collaborations are common within the department's research programs. Faculty members provide valuable service to their profession in addition to major efforts to support departmental, college, and university operations.

A. Outreach

- Corporate partnerships
 - In 2006, PPD Incorporated provided two Sciex API 3200 mass spectrometers valued at over \$500,000 to the Department of Biological Sciences. The machines are capable of identifying small to large molecules in biological samples, even if present in trace quantities, and will be located in Biological Sciences teaching and research labs in Derring Hall. During 2006:
 - PPD then followed this commitment with service contracts and technical support to maintain the equipment, which resides in the laboratory of **Dr. David Popham**.
 - Two members of the Popham lab, **Ben Orsburn** and **Pradeep Vasudevan**, participated in an ABI training course (2/27/2006-3/2/2006) in Framingham, MA. On-site training in general instrument and software use, focusing on analysis of small molecules, was provided by Hesham Ghobarah, ABI Field Application Specialist (3/29-31/2006). Additional on-site training, focusing on protein and peptide analysis, was provided by John Hevko, ABI Field Application Specialist (10/3-5/2006).
 - In fall 2006, 40 students in the BIOL 4774 Molecular Biology Lab used the machines in one of their lab exercises.
 - The equipment has already supported graduate education and research programs in the labs of 3 PIs: **Drs. David Popham** and **Florian Schubot** (Biological Sciences) and **Dr. Felicia Etkorn** (Chemistry).
 - During 2006, planning began for a new building at the Corporate Research Center to house the Virginia Tech X-ray Crystallography Research Center, which is being built in partnership with Oxford Diffraction Limited. Occupation of the building is anticipated for August 2008.
 - Fall 2006 saw an investment of \$1.6 million in the X-ray Crystallography Lab, with \$1.35million coming from Oxford Diffraction in the form of direct equipment and \$250,000 in the form of a Commonwealth Research Initiative grant to **Dr. Nancy Ross** (Associate Dean for Research, Graduate Studies, and Outreach, College of Science).
- Activities for the Science Outreach Program (SOuP, <http://www.socm.vt.edu/>; led by **Dr. Mike Rosenzweig**, in collaboration with the Department of Geosciences and the College of Science) in CY 2006 include:
 - Partnerships with PIs on 3 NSF funded grants, providing educational components that meet the broader impact requirement of the NSF.
 - Partnered or was co-PI on 7 grants submitted in CY 2006, six to NSF and one to the Virginia DOE.
 - Served 4132 teachers and students directly in CY 2006 through outreach programs and kit loans.
 - Worked closely with the Montgomery County Public Schools and Roanoke City Schools curriculum coordinators to improve and coordinate science programs.
 - Completed a full-day GLOBE workshop serving 73 teachers at the National Science Teachers Association Conference.
 - Made five presentations to local and regional workshops/meetings on STEM education or service learning topics.

- **Dr. Rosenzweig** and **Llyn Sharp** (Geosciences) continued to serve as co-coordinators of the VT-STEM initiative. This is a statewide leadership role involving the main campus and all VT geographic centers. This is a two-year appointment with a Aug 06–July 08 term, with some salary funding and support from the outreach division.
- Massey Herbarium activities included:
 - Associate Curator **Tom Weiboldt** continued to refine data and significantly upgrade the web pages for the atlas of the vascular plants of Virginia, which is available to the public at http://www.biology.vt.edu/digital_atlas/.
 - Between June 2006 and May 2007, the herbarium added 1124 plant specimens (916 newly mounted, plus 208 gifts) to its collection and had 28 official visitors from outside the campus. These are mainly off-campus users. Local users often don't sign in.
 - There were 601 plant identification requests for extension and research purposes.
 - Weiboldt provides other sorts of information about plant science for about 10 requests per month.
 - 11 loans, including a total of 797 plant or fungal specimens, were made to off-campus researchers or other institutions.
 - Many fungal specimens left behind by the retired Dr. Orson Miller were either returned to their home institutions or filed into the VPI Mycological Herbarium.
- The alumni advisory board met in Blacksburg on November 10, 2006 and on February 24, 2007 (the latter coinciding with our graduate research day event).
 - The Alumni Board completed its endowment of a Friends of Biological Sciences fund (through the Virginia Tech Foundation) and was active in planning for a new Corporate Partner's program.
 - Dr. David Kiser, who has served on the Advisory Board since its inception, was the invited keynote speaker at the department's 2007 commencement on May 12, 2007.
- The OWLS, our emeritus faculty group, met monthly to keep in contact with the Department's programs. They also attended most of the Department's social events, and maintained many professional activities (e.g., publishing papers). Specific activities include:
 - **Dr. Bruce Parker** assisted in building scholarship funds toward endowment status.
 - **Dr. Robert Benoit** taught general microbiology and medical ethics.
 - **Dr. Noel Krieg** taught prokaryote diversity.
 - The OWLS met 8 times for lunch programs; Biological Sciences faculty made presentations on the latest in research at 6 of these events.
- Many Biological Sciences faculty are involved in local schools, providing lectures and other types of support for science education. **Drs. Dorothea Tholl** and **Brenda Winkel** were active in the regional high school educational project PREP (Partnership for Research and Education in Plants), which is a joint project between scientists and the VA Governor's school. Activities in 2006 included membership on the advisory board, travel to schools to present lectures, providing research materials to high schools, mentoring a high school student researcher, and participating in a scientist-teacher conference held in Charlottesville.
- International aspects of the undergraduate curriculum remain a modest but high impact element within the total undergraduate learning environment.
 - Plants and Civilization (BIOL 2204; fall 2005, 76 students enrolled), taught by **Dr. Khidir Hilu**, continues as an Area 7 course within the university core curriculum, and Plant Taxonomy (BIOL 3204; spring 2006, 52 students), taught by **Dr. Duncan Porter**, is of international scope.
 - **Dr. Art Buikema**, with help from **Dr. Rick Fell** of the Department of Entomology, took 13 undergraduate students to south Africa to study culture and biology.

- **Dr. Ignacio Moore**, with help from **Drs. Bob Jones** and **Duncan Porter**, took 13 undergraduate students to Ecuador in summer 2007 to study plant and animal communities and their relationships to different environments and human impacts.
- **Dr. Khidir Hilu** took 12 undergraduate students in summer 2007 to the European Alps to study plant biodiversity and ecology.
- International aspects of discovery are a strong element of the Department of Biological Sciences. Fourteen of the department's faculty had substantive research interactions with researchers or field sites outside of the United States in a total of 17 different countries.

B. Service

- The following table of committee assignments for academic year 2005-06 shows that the department's faculty members were involved in many governance and service activities on behalf of the department, college, and university. In addition to the regular standing committee assignments shown in this table, faculty are often called on for special service to ad hoc committees, including search committees for various administrative, faculty, and staff positions and committees to examine curricula, university policies, or resource issues.
- Significant activities for the profession included:
 - 12 faculty participated in a total of 14 national grant review panels for the National Institutes of Health (6 panels), National Science Foundation (4 panels), NSF of China (1), EPA (1), National Endowment for the Humanities (1), and USDA (2).
 - **Dr. Robin Andrews** served as the president of the Society for the Study of Amphibians and Reptiles.
 - **Dr. Fred Benfield** is a member of the Virginia Department of Forestry Riparian Research Team, member of the Virginia Gap Analysis Advisory Panel, member of the Virginia Division of Environmental Quality Academic Advisory Committee, and voting member of the Joint Task Force "Standard Methods for the Examination of Waster Water" of the American Waterworks Association. In 2006, he was appointed to the USEPA Science Advisory Board. Dr. Benfield is also very active with the North American Benthological Association, holding three committee posts, co-editing the Association's professional journal, and judging graduate student papers at the national meeting. He was a member of an NSF team that visited scientists at the Karst Institute, Postonia, Slovenia, in October 2006, to initiate cooperative ecosystem level studies in the Slovenian Karst.
 - **Dr. Art Buikema** served as a judge for the USA Today 2006 All-USA College Academic Team. He also served as the Chair of the Sub-Saharan Africa Review and Selection Committee for the National Fulbright Fellowship Program.
 - **Dr. Jack Cranford** is a member of a Statewide Mammal Committee of VA State Department of Game and Inland Fisheries; he is also advisor to the Board of Directors of the Wintergreen Conservation Foundation, Wintergreen, VA, and has continued his appointment as an officer in the U.S. Coast Guard Auxiliary.
 - **Dr. Joe Falkinham** is a member of the Standard Methods Joint Task Force for 9260 Pathogenic Bacteria, which is part of the American Public Health Association and American Water Works Association; in 2006 he wrote two chapters for the current edition of Standard Methods for the Examination of Water and Wastewater, revised 15 other chapters and edited an additional 22 chapters in the same work.
 - **Dr. Brent Opell** is a member of the board of directors for the American Arachnological Society. He also served in 2006 as a MacArthur Fellowship Program evaluator.
 - **Dr. David Popham** is serving as Chair of Division J (Ultrastructure and Function) of the American Society of Microbiology.
 - **Dr. Duncan Porter** identified specimens of Anacardiaceae for the Natural History Museum, London; the Field Museum of Natural History; the Missouri Botanical Garden; the Royal Botanic

Garden, Edinburgh; and the Royal Botanic Gardens, Kew. He also served as a member, Commission of the Organization for Flora Neotropica, and member, General Assembly, Charles Darwin Foundation for the Galapagos Islands.

- **Dr. John Tyson** serves on the Board of Governors, National Resource for Cell Analysis and Modeling, University of Connecticut Health Center, Framingham, CT.
- **Dr. Jeff Walters** served as member of the Committee on independent Scientific Review of Everglades Restoration Progress, which was commissioned by the National Research Council. He is also a member of several teams and committees involved in recovery and protection of the red-cockaded woodpecker and protection of the sandhills ecosystem, a member of the US Fish and Wildlife Service (USFWS) recovery committee for the Guam Micronesian KingFisher, member of the Virginia Bird Conservation Initiative Ridge and Valley Working Group, president of the Sandhills Ecological Institute, and served on a delegation of five Virginia scientists organized by the Union of Concerned Scientists to inform Senator John Warner about proposed legislation affecting the Endangered Species Act.
- **Dr. Brenda Winkel** was an invited member of a team that reviewed the academic programs of the Department of Plant Sciences, NC State University. She also served as an elected member of the North American Arabidopsis Steering Committee.
- **Dr. Zhaomin Yang** served on a grant review panel for the Natural Science Foundation of China. Similar to the US NSF, this program provides competitive funding to support science research.
- A number of the faculty are editors or on the editorial board of professional journals:
 - Fred Benfield – *J. North Amer. Benthological Society* and *Southeastern Naturalist*
 - Jack Cranford – *Southeastern Naturalist*
 - Joe Falkinham – *Applied and Environmental Microbiology*
 - Khidir Hilu - *Kurtziana, Annals of Botany*
 - Bob Jones – *J. Forestry Research* and *J. Ecology*
 - Liwu Li – *J. Immunology*
 - Anne McNabb – *J. Experimental Zoology, Poultry & Avian Biology Reviews*
 - Erik Nilsen – *J. American Rhododendron Society*
 - Brent Opell – *J. Arachnology*
 - John Tyson – *J. Theoretical Biology, J. Nonlinear Science, and Experimental Biology and Medicine*
 - Jeff Walters – *Ornithological Science*
 - Jack Webster - *Freshwater Biology*

2006 -2007 GOVERNANCE AND SERVICE SCHEDULE

Curriculum Committee

Cranford and Walker, Co-chairs
Cimini / Evans / Melville / Lazar
Opell / Scheckler

Departmental Review

Porter, Chair
Opell / Sible / Yang

Diversity Committee

McNabb, Chair
Banerjee / Conner / Jones / Langer / Link
J. Moore / Schubot / Turner

Executive/Personnel Committee

Jones, Chair
Andrews / Benfield / Li
Melville / Nilsen / Tholl
Walker / Webster

Faculty Recognition Committee

Buikema, Chair
Cranford / Jones / Turner

Faculty Search (bio members only)

Computational Sciences: Tyson and Sible
College Cluster Committee rep: Valett
Microbiology: Stevens and Popham

Graduate Evaluation Committee

Walters, Chair
Cherry / Elgert / Lawrence
Nilsen / Sible

Graduate Selection Committee

Andrews, Chair
Barrett / Cimini / Moore
Rasmussen / Schubot / Yang

Honors Advisors

Buikema / Cowles
Simmons / Jones / Porter

Student Recognition Committee

Lipscomb, Chair
Cranford / Evans / Rosenzweig / Tyson
Via, ex officio / Waterman

Programs and Technical Functions

Alumni: Falkinham and Conner
Animal Care: Elgert and Jarrett
BGSA President: Eric Sokol
Collections: Porter/Weiboldt/Cranford/Rosenzweig
Computers: Webster/Gunter/Renner
Facilities: Benfield and Waller
Freshman Labs: Buikema and Schaeffer
Greenhouse: Hilu / Nilsen / Wiley

Micro/immuno labs: Popham and Link
Research Day: Finkielstein / Belden
Hilu / Kuhn / Adjerid / Friend / Orsburn
Web page: Andrews / Banerjee / Conner / Renner

University/College Reps

Academic Support: Cowles
Animal Care: Tom Jenssen
College Curriculum: Opell
College Faculty Association: Cowles
College Grad Affairs: Andrews
College Honorifics: Winkel
College P&T: Hilu
College Research: Tyson
College Scholarship: Banerjee, Falkinham, Nilsen, Tyson
College Teaching Excellence: Buikema
Commission on Research: Phillips
EEB Seminar: Belden / Hawley
EIGER IGERT grad training program: Winkel (interim director)
Faculty Senate: Evans / Jenssen
Grad School Diversity & Recruiting Think Tank: Winkel
Library: Cherry
Life Sciences Learning Community: Cowles
MCBB seminar: Esen
Phi Sigma advisor: Popham
Senate Committee on faculty ethics: Cranford
Sigma Xi: Jenssen / McNabb / Winkel
University Council: Cranford
University Animal Care Comm.: Jenssen
University Eiger IGERT core faculty: Winkel
Univ. Intellectual Properties: Falkinham
Univ. Micro Grad Program: Popham (chair)
Univ. Plant Mol Bio Grad Program: Winkel

OWLS (organization of retired faculty)

Bruce Parker and Ernie Stout, Co-chairs
Curt Adkisson / Bob Benoit
John Cairns / Bill Claus
Al Heath / Al Hendricks
Buck Holliman / Noel Krieg
Bob Patterson / Charles Rutherford
George Simmons / Harry Steeves
David Stetler / Al Youston

Assistant Professors: Mentors

Lisa Belden: Jeff Walters
Dana Hawley: Robin Andrews
Iuliana Lazar: Brenda Winkel
Dorothea Tholl: Brenda Winkel
Ignacio Moore: Anne McNabb
Daniela Cimini: Rich Walker
Carla Finkielstein: Jill Sible
Florian Schubot: Dave Popham
Jeff Kuhn: Rich Walker
Diya Banerjee: Jill Sible
Jeb Barrett: Jack Webster

IV. Diversity (faculty, staff, student)

The department continues to improve the quality of work life, support science training for underrepresented groups, and celebrate cultural diversity.

- In AY 2006-07, **Dr. Anne McNabb** led both the department's and college's faculty diversity committees. Under her leadership, accomplishments were made in several areas:
 - The department distributed a folder that includes short informational items on work life issues and policies and resources on campus to assist employees.
 - A program on "Negotiating at Hiring and on the Job" was organized as part of the Advance VT Workshop on Transforming the Professoriate: Preparing Women for Careers in Science and Engineering, July 20-22, 2006.
 - An international picnic for ~30 incoming foreign graduate students was held in fall.
- **Dr. Bruce Turner** organized the department's 3rd annual international day luncheon (March 15, 2007). This was a pot luck lunch attended by over 50 people, with recipes from around the world.
- **Dr. Jill Sible** and Emeritus Faculty **Dr. Muriel Lederman**, with participation from graduate student **Dayna Wilhelm**, published a paper on teaching using methods that enhance understanding of issues related to gender in science, the full citation is: **Sible JC, DE Wilhelm, and M Lederman** (2006) Teaching cell and molecular biology for gender equity. *Cell Biology Education* 5:227-238.
- The department continues to participate in minority scholarship programs for undergraduates and graduate students. In 2006:
 - **Dr. Carla Finkielstein** sponsored two high school students from the Escuela Tecnica "Otto Krause," one of the elite public high schools in Buenos Aires, Argentina. This was part of a program to help senior chemistry majors interested in pursuing a career in the area of cellular and molecular biology. Upon completion of its six-year program, students are granted a degree in Chemical Science Technology. Most continue their education in areas of engineering, natural sciences, and biotechnology, becoming highly competitive for higher degrees and professional positions.
 - **Drs. Ann Stevens** and **Dorothea Tholl** each provided an undergraduate research experience for international students from South America.
 - **Dr. Daniela Cimini** sponsored one undergraduate who is part of the Mid-Eastern Atlantic Minority Program (MEAMP).
 - **Drs. Asim Esen, Zhaomin Yang, and Liwu Li** sponsored a total of four students participating in the summer Multicultural Academic Opportunities Program (MAOP).
 - **Dr. Erik Nilsen** sponsored undergraduate research for an African American student using NSF-REU funds.
 - Four African American, one Hispanic, one Native American, and one first generation in college graduate students were enrolled in 2006. Most of these individuals were supported at one time in their academic program by fellowships or scholarships.

V. Honors and Awards (faculty, staff, student) for AY 2007

Members of the Biological Sciences community were recognized at the departmental, college, university, and professional levels for a variety of activities spanning all mission areas.

- *Teaching and Advising*
 - **Dr. Ann Stevens** received a College of Science Certificate for Teaching Excellence.
 - **Dr. Asim Esen** received a Fulbright Senior Teaching Scholar Award from the J. William Fulbright Foreign Scholarship Board. The award covered travel to and from Mugla University in Turkey and teaching there in the fall semester of 2006.
 - **Dr. Art Buikema, Mary Schaeffer** (supervisor of our freshman teaching labs), and **Arya Iranmanesh** (student) received the XCaliber Certificate of Teaching Excellence for their use of technology in the freshman biology laboratory manual.
 - The department's 2007 Outstanding Undergraduate Advisor award was presented to **Mr. Jack Evans**.
 - **Drs. Ann Stevens, Khidir Hilu, and Brenda Winkel** received Department of Biological Sciences Outstanding Teaching Awards.
 - The department's 2007 Most Influential Professor Award, as determined by a vote of the senior class, was presented to **Dr. Richard Walker**.
 - PhD student **Amanda Lentz** received the department's annual Graduate Student Teaching Award.
- *Research and Professional*
 - **Dr. Liwu Li** was appointed as a standing member of the newly chartered National Institute of Health Study Section on Innate Immunity and Inflammation.
 - **Dr. Jack Webster** received the Award of Excellence from the North American Benthological Society (NABS). As part of this honor, he was invited to present the Award of Excellence Lecture at the annual NABS meeting held in Anchorage, Alaska, June 2006. His talk was titled "Spiraling down the river continuum: Stream ecology and the U-shaped curve".
 - **Dr. Art Buikema** was recertified as Senior Ecologist by the Ecological Society of America.
 - Best poster awards for the department's Research Day event, held February 24, 2007, were presented to four of the department's graduate students: **Pamela Lauer, Martha Vaughn, Damon Ely, and Alexandra Class**.
 - The department's Undergraduate Research Award was presented to **Geoffrey Adams**.
 - PhD graduate **Michelle Barthet** received a Virginia Tech Graduate School Outstanding Dissertation Award.
- *Service*
 - **Ms. Betsey Waterman** received the President's Award for Excellence for her work in academic advising and her many contributions to the university and local community. This is one of the highest university honors for classified staff at Virginia Tech.
 - **Dr. Mike Rosenzweig** received the College of Science Outreach Award in recognition of his breadth and impact of outreach activities.

- **Dr. Jill Sible** received the first annual College of Science Diversity Award. Sible supervised the first African American student to complete a PhD degree in the department's graduate program.
- **Dr. Art Buikema** was placed on the ADA Access Honor Roll (Student Disabilities Office) for work with students in need of services.
- Department Outstanding Service Awards were presented to **Dr. Jack Cranford** and **Ms. Laura Link**.
- *Combined*
 - Graduating senior **Alison Smith** was recognized as the College of Science and Virginia Tech Woman of the Year.
 - The Department's Outstanding Senior Awards in 2007 were presented to **Kristin Brugh** and **Alison Smith**.

VI. Future Directions

In AY 2006-07, the department underwent a thorough review of its programs. The reports from a self-analysis (led by an internal committee composed of Drs. Duncan Porter (chair), Brent Opell, Janet Rankin, Jill Sible and Zhaomin Yang) and from an external committee of five scientists will be reviewed and discussed broadly in summer and fall of 2007. From these discussions, an action plan will be developed to improve departmental operations and programs.