2008-09 ANNUAL REPORT
DEPARTMENT OF BIOLOGICAL SCIENCES
August 19, 2009

PART 1: EXECUTIVE SUMMARY

Learning: Undergraduate

The long-term increase in the number of Biological Sciences majors continued in 2008; the total number of majors has risen by 40% since 2002. Coupled with faculty retirements and a slow pace of faculty hiring, this trend continues to place pressures on meeting teaching needs. Despite the pressures, many Biological Sciences majors continue to earn academic honors and awards. A new learning outcomes assessment program has been initiated to improve documentation of student performance and identify opportunities to increase further the quality of instruction. Undergraduate research mentoring and academic advising remain strong points in the Department's undergraduate education.

Learning: Graduate

The diversity of graduate recruiting and training programs increased in 2008-09 relative to previous academic years. Many students were admitted into one of three university recruiting programs before entering the Biological Sciences Major, and some have joined the labs of the Department's faculty under a different major (e.g., Genetics, Bioinformatics and Computational Biology, or Computer Science instead of the Biological Sciences major). The total number of PhD students and ratio of PhD to MS students has grown to the highest levels in recent years. Graduate student research was celebrated by holding the Department's 6th Annual Research Day. In response to suggestions from an external review, the Department underwent a review of the graduate curriculum and has initiated a number of changes, ultimately leading to increased course availability.

Discovery

Despite small declines in the number of tenured and tenure track faculty and increases in teaching loads, the Biological Sciences faculty and students have sustained strong scholarship. Publications and presentations have remained at levels similar to those of previous years, and last year's increase in research funding was sustained in the 2008-09 fiscal year. Excellent scholarship, indicated by the quality and impact of published articles and success in obtaining nationally competitive research grants, occurred across all the major disciplines in the Department, from molecular and computational through organismal and ecological biology.

Engagement

In 2008-09, the Department's new public-private partnership to advance biotech in the Mid-Atlantic region (VT BioSPIRE) developed formal relationships with four corporate partners. Outreach in K-12 Science Education was sustained, with a focus on continuing education for regional K-12 science teachers, kits to help them in the classroom, and special programs targeted to individual primary and secondary schools. Faculty remain highly committed to serving the university. Several faculty have developed outreach programs or service that support education, research, and conservation goals at the national level.

Diversity

To build sensitivity and mutual respect, the Department has incorporated regular diversity-related activities into most of its faculty meetings and has developed an annual international luncheon. The Alumni Advisory Board, with support from the new VT BioSPIRE program, actively recruited undergraduate student prospects from underrepresented groups. Most of the Department's faculty have very diverse graduate student lab groups. Faculty were active in obtaining fellowships or other Virginia Tech support (e.g., MAOP, VT-AMP, IMSD, and VT PREP) to recruit and support minority graduate students. The Department's diversity committee continued its lead role in facilitating progress. The Department and College have scored relatively well in several measures of how faculty perceive the work environment.

Honors and Awards

Biological Sciences undergraduate and graduate students have continued a tradition of proportionally high numbers of students recognized for excellence in scholarship, teaching, and service. Many faculty and staff were recognized by the university or professional organizations for productivity and impact in a variety of dimensions.

Goals for 2009-10

The 2008-09 academic year was a watershed for access to facilities. Fourteen faculty moved to two new research buildings, which is one of the factors underlying recent increases in research productivity. At the same time, however, increases in student enrollment, reductions in the number of tenure track faculty lines, and reductions in operating budgets are putting pressures on the Department's teaching and outreach programs. In the 2009-10 academic year, the Department will focus on restructuring budgets and departmental administration to increase efficiency and active recruiting of external funds to sustain and enhance teaching quality. The Department will also continue its recent progress in developing new learning outcome assessment protocols; enhancing diversity of the student body, faculty, and staff; and enhancing safety and security in the classroom, lab, and office.

PART 2: ACADEMIC ACCOMPLISHMENTS

I. Learning

A. Undergraduate programs

The long-term increase in the number of Biological Sciences majors continued in 2008; the total number of majors has risen by 40% since 2002. Coupled with faculty retirements and a slow pace of faculty hiring, this trend continues to place pressures on meeting teaching needs. Despite the pressures, many Biological Sciences majors continue to earn academic honors and awards. A new learning outcomes assessment program has been initiated to improve documentation of student performance and identify opportunities to increase further the quality of instruction. Undergraduate research mentoring and academic advising remain strong points in the Department's undergraduate education.

- Undergraduate enrollment in the Biological Sciences major has increased substantially since 2002.
- In addition to the 1504 majors in fall 2008, 213 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 106 additional students, then the total enrollment impact in fall 2008 was equivalent to 1610 full-time students.

	Fall 02	Fall 03	Fall 04	Fall 05	Fall 06	Fall 07	Fall 08
Primary Majors	1049	1217	1297	1295	1312	1366	1453
Secondary Majors	24	43	73	58	65	59	51
Total	1073	1260	1370	1353	1377	1425	1504

- Participation in the University Honors Program provides an indicator of the quality of Biological Science majors. In-house fall 2008 data from the Honor's program show:
    - 14.7% of all Biological Sciences majors (221 out of 1504) were enrolled in the University Honors program.
    - Out of the University's 2399 Honors Students, 9.2% (221) were Biological Sciences majors.
- In academic year 2008-09, 288 students graduated (down from 318 last year). This downward turn may be due to normal variation or reduced course availability (caused by increasing enrollments) that is resulting in more time needed to graduate. Many graduates achieved honors, as shown in the following table.

	Dec 2008	May 2009	Total
Total graduates	45	243	288
Magna Cum Laude	9	29	38
Summa Cum Laude	1	32	33
Cum Laude	6	39	45
Commonwealth scholars	0	5	5
In honors	0	1	1
Health scholars	0	7	7
Honors Scholars	0	7	7
Honors Baccalaureate	0	3	3

- Virginia Tech Institutional Research, using its Teaching Load Data Sources, reported that total credit hour delivery (measured by all courses with the BIOL prefix) in calendar 2008 (35,061 hours) was slightly greater than in 2007 (revised numbers = 33,701 hours). Small differences in these estimates occur depending on data sources used.

- According to student perception of teaching (SPOT) assessment, the Department had a high level of quality, and similar to that observed in the past several years. In fall 2008 and spring 2009 semesters, 127 lecture and upper division (junior and senior) laboratory classes were rated by students, with a mean overall SPOT score of 3.4, which lies between "good" and "excellent." In the same semesters, of 150 lower division (freshman and sophomore) laboratories offered by the Department, taught by graduate students, and evaluated by undergraduate students, the mean overall SPOT score was 3.5.
- To begin to evaluate student learning outcomes, the Academic Assessment Committee implemented an online assessment test for senior majors effective spring 2008 and subsequently administered the same test to incoming freshman majors in fall 2008 (and to senior majors again in spring 2009). Questions focused in the following areas: Scientific Method, Data Analysis, Genetics, Cell Biology, Evolutionary Biology, and Ecology. Responses will be analyzed to measure student learning as students advance through the curriculum and to identify any parts of the curriculum requiring modification.
- Many faculty attended training sessions or workshops to build teaching skills.
    - In calendar year 2008, 11 faculty attended a total of 22 teacher training sessions or workshops.
    - **Drs. Mary Lipscomb**, **Jill Sible,** and **Rich Walker** attended the one-week-long National Academies Summer Institute on Undergraduate Education in Biology, held in Madison, WI. The institute seeks to impact science education significantly at a national level through the development of student-centered teaching methods in introductory college biology courses.
- Undergraduate advising activities were extensive in academic year 2008-09. Most academic advising and a large proportion of career advising were provided by the Department's Center for Academic Advising, which is supported by the full-time efforts of two classified staff and one non-tenure track faculty member and the part-time efforts of one tenure track faculty member. In addition to routine advising, the Center focused on improving flow of information to many majors.
- The Department continued its unique freshman advising program in which 12 faculty and staff advisors help students deal with the transition to college life during fall semester.
- Biological Sciences continued to lead the Biological and Life Sciences Learning Community (BLSC), which included 39 students in academic year 2008-09. During this time frame, **Dr. Jill Sible** and **Ms. Cindy Koziol** organized this successful residential learning community for students to develop a sense of community and a focus on academics.
- Significant efforts are being made to enhance diversity within the student body. In spring 2008, Biological Science faculty **Drs. Jill Sible** and **Rich Walker**, and Dr. Karen Sanders from the Provost's Office, received a $485,284 National Science Foundation S-STEM grant titled: "Preparing Economically Challenged Students for Careers in Biotechnology."
- **Dr. Art Buikema** is leading an effort to upgrade significantly the freshman biology laboratory course. Students will be able to design their own experiments; this will enable them to become more involved in the subject and therefore learn and retain more information. In August 2008, **Catherine Webb** our new freshman Lab supervisor and partner in upgrading the labs, and **Chiquita Thomas,** one of our freshman lab technical specialists, visited the University of Wisconsin to learn how this leading institution handles its introductory biology labs.
- **Drs. Mike Rosenzweig** and **Art Buikema** received a $10,000 grant from the Virginia Tech's Institute for Distance and Distributed Learning to develop online versions of the BIOL 1105 and 1106 (Principles of Biology) lecture courses. They plan to offer the courses for the first time in summer 2009.

- Undergraduate research (UR) provides a capstone experience for many Virginia Tech students.
    - In calendar year 2008, faculty provided research mentoring for 130 undergraduate students (up from 118 in calendar year 2007).
    - In **Dr. Brent Opell's** lab, undergraduate researchers had four peer-reviewed papers in print or press in 2008; one was featured in "Inside JEB" which "summarizes some of the most intriguing discoveries in the journal" and in a booklet entitled "The Journal of Experimental Zoology, Highlights 2008."
    - A new faculty committee to enhance the quality and impact of undergraduate research and to manage grants funds available to support UR was created in the 2008-09 academic year. Chaired by Dr. Brent Opell, the committee prepared the first annual report and assessment of the program, which is presented below.

Department of Biological Sciences Undergraduate Research Awards
Status Report: April 2009

Objectives: To foster, support, and profile research conducted by the junior and senior Biological Sciences majors with a QCA of 3.0 or greater.

Procedures: Research proposals are solicited during fall and spring semesters to support research conducted during the following semester or summer. Proposals consist of a project description that clearly states the hypothesis to be tested, explains its importance, and describes the methods and specific aim(s) of the study. A successful research project depends on the involvement of a student's faculty research sponsor. Therefore, a cover sheet that confirms the faculty member's commitment to a student's project must also accompany a proposal. A committee comprised of four faculty members and one graduate student reviews these proposals and awards grants to support research proposals.

Outcomes: The following proposals have been funded at $500 each by this program.

Adrianna Ferraioli: **Structural significance and evolutionary importance of domain X.** Research supervisor: Dr. Khidir Hilu. (Research being conducted spring 2009)

Meridith Borza: **Analysis of induced volatile formation in lower land plants.** Research supervisors: Dr. Dorothea Tholl and Dr. Khidir Hilu. (Research being conducted spring 2009)

Kelley L. Miller: **Telomere dysfunction and mitotic chromosome mis-segregation**. Research supervisor: Dr. Daniela Cimini. (Research to be conducted during fall, 2009)

A second proposal to support research during the fall semester is pending as the committee waits for a revised proposal that addresses concerns raised during the review process.

Each student who receives a research grant is expected to prepare a one-page summary of the completed research project that will appear on the Department's web page and to present his or her research findings to the scientific community as a poster or oral paper.

Assessment: The Committee has been pleased by both the quality of the proposals received and by the significance of the research projects that have been proposed. The Committee is eager to see the results of studies that are being conducted this semester. However, the number of proposals has been disappointing. Increasing the amount of support for each project may increase the level of participation in this program. Not only is the cost of research in most areas increasing, but faculty must be engaged with the development of a student's research proposal and the unfolding project. Consequently, the stakes probably need to be higher to encourage faculty to support student involvement in this program.

B. Graduate education and postdoc training programs

The diversity of graduate recruiting and training programs increased in 2008-09 relative to previous academic years. Many students were admitted into one of three university recruiting programs before entering the Biological Sciences Major, and some have joined the labs of the Department's faculty under a different major (e.g., Genetics, Bioinformatics and Computational Biology, or Computer Science instead of the Biological Sciences major). The total number of PhD students and ratio of PhD to MS students has grown to the highest levels in recent years. Graduate student research was celebrated by holding the Department's 6th Annual Research Day. In response to suggestions from an external review, the Department underwent a review of the graduate curriculum and has initiated a number of changes, ultimately leading to increased course availability.

- The number of graduate students in the program was similar in 2008-09 to that of 2007-08. The total number of graduate students seeking degrees in Biological Sciences stood at 81 in spring 2009 (see Table below).
- Four Biological Sciences faculty supervised a total of 11 PhD students in the Genetics, Bioinformatics and Computational Biology graduate degree program, plus 2 students in Computer Science, for a total of 94 full-time graduate students across three majors.
- The number of PhD students in the Biological Sciences degree program and ratio of PhD students to MS students increased in 2008-09 relative to previous years (see Table below).
- The funds expended for Biological Sciences stipends were $1,667,533 in 2008-09, which was an increase of $33,442 (2%) over the previous year (see table below).
- Graduate stipend funding increased substantially in the fellowship category (which includes training fellowships funded through research grants) and GTAs, but declined for GRAs funded through standard research projects. GTA growth was driven by the university's response to increases in freshmen and sophomore laboratory course enrollments.
- The number of postdocs (21) was smaller than in the previous two years (25; see Table below).
- The 6th Annual Biological Sciences Research Day was held on Saturday, February 21, 2009 in Owens Banquet Hall.
    - Co-organized by graduate students **Sunny Crawley**, **Damon Ely**, and **Justin Tanner** and by faculty members **Drs. Maury Valett** (lead organizer), **Daniel Capelluto**, and **Birgit Scharf**.
    - Included 6 invited talks by current graduate students, 38 posters by current graduate students, and an invited plenary talk delivered by **Matthew Latimer,** PhD, JD, who is currently the senior partner in Latimer, Mayberry & Matthews IP Law, LLP. Dr. Latimer obtained his PhD from the Virginia Tech Anaerobic Microbiology Lab. He discussed his career path and reflected on the current status of IP law and patents as they relate to biotechnology.
    - An abstract book was published on the web, and over 130 people attended the meeting, including several from the Biological Sciences Alumni Advisory Board.
    - Also in attendance were 10 graduate student prospects for the Biological Sciences degree program; 7 were subsequently offered positions and 3 accepted their offer.
- Department faculty and graduate students participated in or 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. Dana Hawley** chaired the EEB seminar series committee. Weekly seminars were also held by the Microbiology faculty and graduate students (fall semester) and Cell and Developmental Biology faculty and graduate students (spring semester).

Summary of graduate student enrollment, types of graduate support, graduate stipend payroll, and number of postdocs for FY 2003 through FY 2009.

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
PhD students enrolled[1]	33	38	37	46	52	65	69[5]
MS students enrolled[1]	34	31	40	26	21	15	12
Total students enrolled[1]	67	69	77	72	73	80	81
PhD/MS ratio[1]	0.97	1.23	0.93	1.77	2.48	4.33	5.75
Fellowships/training grants[4]					13	19	17
Funded GRAs[1,2]	26	27.5	27	32	17	24	17
Funded GTAs[1,2]	44	38.5	46.7	39	41	37	46
Active students not funded					2	1	1
(GRA+fellow)/GTA ratio[1,2]	0.59	0.71	0.58	0.82	0.76	1.16	
Fellowship payroll[3,4]					$231,133	$372,438	$419,105
GRA stipend payroll[3]	$416,658	$553,817	$571,061	$614,801	$413,812	$643,863	$510,227
GTA stipend payroll[3]	$511,894	$516,707	$583,192	$528,485	$567,415	$617,790	$738,201
Total Payroll	$928,552	$1,070,524	$1,154,253	$1,143,286	$1,212,360	$1,634,091	$1,667,533
Full-time postdocs[1]	8	9	10	17	25	25	21

[1] Snapshot taken in spring of academic year; roughly half of postdocs are funded outside of Department accounting codes.
[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, Fralin Life Sciences Institute, all GRA support from VBI for Biological Sciences students, various minority fellowships, and training grants.
[5] There were also 11 PhD students advised by Biological Sciences faculty who are in the Genetics, Bioinformatics and Computational Biology Major, and 2 in the Computer Science Major, so true total of PhDs advised is 69+13=82.

- The Department entered the sixth year of supporting the "preparing the future professoriate" project in which graduate students develop skills other than research (e.g., teaching and service) useful for their professional career. In spring 2009, Sunny Crawley, a senior PhD student working with Dr. Khidir Hilu and a participant in this project, taught the plant taxonomy lecture course (BIOL 3204) as part of her preparation for a career in science research and education.
- The number of Biological Sciences graduate degrees conferred in 2008-2009 (20 total) was relatively high compared to the previous two years (see Table below) and reflects the demographic shift toward greater enrollments in the PhD degree program.

Number of Graduate Degrees in Biological Sciences Awarded

Degree	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
MS	14	7	9	8	10	7	11
PhD	5	5	8	8	4	3	10

- 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 continues toward 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).

Graduate student recruitment into Biological Sciences major (includes CDB students in 2007-08 and 2008-09; does not include small numbers of transfers from other recruitment programs)

Class[1]	No. Applicants	% Accepted	% of Accepted Enrolled	# Enrolled	GRE Verbal[2]	GRE Quanti -tative[2]	GRE Total[2]	GPA[2]
1991	125	46	14	8	530	650	1180	3.1
1992	114	26	11	3	566	654	1220	3.5
1993	99	32	22	7	539	640	1179	3.5
1994	108	56	66	40	550	605	1155	3.45
1995	154	28	72	31	582	626	1208	3.59
1996	121	24	59	17	591	670	1261	3.66
1997	113	25	68	19	517	601	1118	3.43
1998	93	31	69	20	502	635	1137	3.68
1999	102	25	54	14	538	636	1164	3.43
2000	98	33	73	24	540	637	1177	3.46
2001	93	32	90	27	505	639	1144	3.52
2002	115	25	59	17	522	671	1193	3.39
2003	113	31	69	24	490	625	1115	3.42
2004	79	20	80	13	547	652	1199	3.50
2005	105	20	76	16	540	634	1174	3.65
2006	115	29	79	26	544	641	1185	N/A[3]
2007	94	28	69	18	445	681	1126	3.26
2008	120	23	59	16	529	664	1193	3.50
2009	135	17	65	15	529	661	1190	3.59
Mean	**109**	**30**	**61**	**19**	**532**	**642**	**1174**	**3.5**

[1] Students applying for spring and fall semester of indicated year.

[2] Calculated for students entering in regular status; GPA is for latest degree (undergraduate or MS) for domestic students; GRE is for both domestic and international students.

- Biological Sciences faculty maintained leadership in three university-wide graduate recruiting programs.
    - The Interdepartmental Microbiology Graduate Program (IMGP) was initiated in 2003 and includes over 40 faculty participants from across the university. Over its first five years, the program has recruited 25 students. Of these, 5 have left without degree, 3 completed MS degrees, and 17 PhDs are in progress with some of them finishing soon. Six more new students are arriving in August 2009. New recruits 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 (MPS) was initiated in 2005 with 20 participating faculty from 7 Departments; this coming year marks the fifth year of an aggressive recruiting effort at regional schools, followed by students rotating through labs before a decision is made on a major advisor. Over the 5 years, 27 students have been accepted into the program. Four have moved into the Biological Sciences degree program after an initial academic year of common MPS experiences. For details, see http://www.molplantsci.org.vt.edu/INDEX.HTM
    - The Graduate Program in Cell and Developmental Biology (CDB) was initiated in academic year 2007, and now includes 11 participating faculty. In its first 3 years (fall 2007 - fall 2009), 15 students have been recruited, 14 are currently active. Following the model of the Microbiology program, students in the CDB rotate among faculty mentors before being accepted into a particular lab. For details, see http://www.biol.vt.edu/research/cdb/index.html

Graduate Curriculum Review Report
Jeb Barrett, Committee Chair
August 15, 2008

Following the recommendation of the external departmental review in March 2007, the Biological Sciences Curriculum Committee was charged with evaluating the graduate curriculum. Faculty members from the four principal research areas in Biological Sciences met over fall and spring semesters of the 2007-08 academic year to review existing graduate curriculum, identify gaps, and, where necessary, overhaul and reorganize graduate curriculum. A bonus outcome of this process has been the opportunity for faculty to identify strategies for strengthening each of these research areas in the context of developing graduate programs, building moves, and anticipated hires.

An additional issue to bear in mind is that the University Council recently passed a resolution from the Commission on Graduate Studies & Policy that changes the status of 4000 level courses eligible for graduate credit. *Effective Fall 2008, no new 4000 level courses will be granted graduate credit and the existing 4000 level courses with graduate credit will be phased out.* While this change should not affect the PhD program directly (because undergraduate-level courses already cannot be counted toward to the 18 required credit hours), it may present a timely opportunity in light of the ongoing evaluation of graduate curriculum; it is likely that university approval of changes in 4000 level courses to 5000 or joint listing at the 4000/5000 level will be streamlined relative to the normal new course approval process. In effect, this could provide an opportunity to add additional graduate courses without requiring additional resources. Details on how this new policy will unfold and influence the overhaul of the graduate curriculum are still forthcoming. Summaries of activities and resolutions for each of the research areas follow.

<u>Ecology, Evolution and Behavior</u>

Gaps in Curriculum
The following were identified as the most significant gaps in the EEB graduate curriculum:

1. Advanced Evolution:
   an advanced evolution course that incorporates population genetics.
2. Microbial Ecology/Environmental Microbiology
   a graduate-level course that covers contemporary methodologies for studying microorganisms in terrestrial and aquatic environments.
3. Ecological Modeling
   a graduate-level course that covers the development and application of numerical models in ecological and/or evolutionary research.

No current consensus exists for how these courses could be covered with existing resources, but future hires should address these gaps. For example, IBOB has identified a population geneticist as a high priority for future searches. Similarly, a microbial ecology/environmental microbiology course could potentially be taught by future hires from micro and/or ecosystem searches.

Topics in Ecology, Evolution, and Behavior
A new graduate course will be offered starting in the 2008 fall semester and offered each fall thereafter. This course is intended to introduce new students to EEB faculty and build cohesion within the EEB program. This course would be shepherded by a single faculty member, but all participating EEB faculty will share teaching responsibilities by rotating through the course on a weekly basis. Each faculty member in EEB will be expected to attend one class where she/he will present an overview of her/his research. The course will meet twice a week with one meeting for faculty presentations and one meeting for graduate discussion of topical papers. Ignacio Moore has agreed to lead this course for the fall 2008 semester.

Other Issues
The EEB faculty evaluated timing of key course offerings to enhance efficiency of delivery and access for students (www.biol.vt.edu/research/ecolevolbeh/core_graduate_courses_eeb.html).

Microbiology

Gaps in Curriculum

1. First-year graduate courses in Microbial Genetics and Bacterial Pathogenesis

   Solution:

   - Both Biol 4624 (Microbial Genetics) and Biol 4674 (Bacterial Pathogenesis) will be taught as 4000/5000-level crosslisted courses with extra literature review meetings for the graduate students.

2. First-year graduate courses in Immunology, Microbial Ecology/Environmental Microbiology, and Virology

   Possibilities:

   - Convince faculty teaching these courses to crosslist as 4000/5000-level courses.
   - Identify courses within the Vet school that are not too clinically oriented.
     - BMVS 5624 - Molecular Virology – How often is it taught?
   - A future hire in the area of Microbial Ecology/Environmental Microbiology may be needed to develop a course.

3. Bioinformatics
   - As described by the Molecular, Cell, Developmental and Computational Biology group.

4. Research Ethics
   - Should be a graduate school requirement for all students.
   - Chem 5094 might be an appropriate class.

Molecular, Cell, Developmental and Computational Biology

Gaps in Curriculum

1. Bioinformatics

   Possibilities:

   - Designate a faculty member to teach the BIOL 5075-5076 two-semester sequence.
   - Condense BIOL 5075-5076 into semester-long sequence (team-taught?).
   - Develop 1-credit practical methods version for first-semester students (team-taught?).

2. Statistics

   Possibilities:

   - Integrate into existing courses.
   - What does / could Statistics Department offer?

3. Genomics
   - Currently offered as 4000-level course by BCHM - suggest graduate level version.

There is no need to create new laboratory classes since students will receive practical laboratory experience as part of their thesis research.

Plant Biology

The plant biologists used this opportunity to review undergraduate as well as graduate curriculum in light of recent and anticipated retirements of plant scientists. It was emphasized that new and overhauled courses should make a strong effort to focus on exciting new research topics in the field of plant biology such as energy (biofuel), engineering (applied uses of plants), genomics-proteomics, and evo/devo.

Review of curriculum in plant biology is ongoing. The following action items have been identified.

1. Principles of Biology (BIOL 1105 and BIOL 1106) and Plant Biology (BIOL 2304) could use some "freshening up" and modernizing to capture undergraduate interest in plant biology and prepare them more effectively for upper-level and graduate courses. The need to ensure that plant related subjects are given

necessary attention in introductory courses could be achieved by reviewing plant related topics and preparing one or some new labs for the Principles courses.

2. Redesign of Plant Biology (BIOL 2304), possibly into a model similar to Plants and Civilization. The success of Plant and Civilization is a good model to use although the courses should not merge or overlap excessively.

3. Plant Taxonomy (BIOL 3204) could be changed to Plant Biodiversity to incorporate a broader view of plant diversity rather than focusing on learning plant names.

4. Other courses were identified that should/could be taught, including: Plant Developmental Biology, Plant Population Biology, Plant –Animal Interactions, Plant Molecular Biology, Plant Anatomy and Morphology, Plant Evolution, Plant Bioengineering, and Plant Physiological Ecology (although existing and anticipated personnel resources need to be kept in mind).

5. A broader consideration of the whole plant science curriculum in plant biology at the 3000-4000 levels for undergrads and the 5000-6000 levels for grads is necessary. This will involve consideration of courses across the campus (e.g., HORT, PPWS, FOR, CSES) and will have a significant influence on justification for new hires in plant sciences.

II. Discovery

Despite small declines in the number of tenured and tenure track faculty and increases in teaching loads, the Biological Sciences faculty and students have sustained strong scholarship. Publications and presentations have remained at levels similar to those of previous years, and last year's increase in research funding was sustained in the 2008-09 fiscal year. Excellent scholarship, indicated by the quality and impact of published articles and success in obtaining nationally competitive research grants, occurred across all the major disciplines in the Department, from molecular and computational through organismal and ecological biology.

Summary of research outputs for the departmental faculty (39-42 FTE research and teaching faculty) for calendar year 2002–2008 (except fiscal year where noted).

Indicator of research/scholarship activity	2004	2005	2006	2007	2008	2009
Books, book chapters, and journal articles in print or press (calendar year)	132	146	187	161	171	NA
Presentations at professional meetings and conferences (calendar year)	103	129	132	137	96	NA
Invited seminars (calendar year)	26	51	58	64	64	NA
Total overhead generated from contracts and grants, source Banner (fiscal year)	555,625	740,544	1,009,565	980,837	1,065,301	1,087,818
Research expenditures, source 2004-05 institutional research; source 2006-09 COS derived from Banner Hyperion-Credit-Total (fiscal year)	3,207,553	3,709,643	4,488,415	4,574,818	4,907,291	4,938,095
New research awards, source COS derived from Banner Hyperion-Credit-Total (fiscal year)	3,505,070	4,444,148	4,786,651	4,285,511	5,233,039	4,644,845

Notes: numbers in this table do not include any double counting; in cases where more than one Biological Sciences faculty member is an author or Co-PI, data are only counted once. Data from Banner sources are subject to retroactive adjustments; therefore, some numbers in this report do not match perfectly with numbers listed in previous annual reports.

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

- In calendar year 2008, 26 individual faculty members were invited to present their research at other institutions.
- The Fourth Annual Conference on Structural Biology, held on March 27, 2009, was hosted by Virginia Tech's Crystallography Lab, with leadership from **Dr. Ross Angel**, a Geosciences faculty member adjunct in Biological Sciences, and assistance from **Drs. Florian Schubot, Carla Finkielstein**,and **Daniel Capelluto**. Co-sponsored by College of Science, 4 Departments, MCBB, and 3 corporations, this event drew over 140 registrants. For more information see: http://www.crystal.vt.edu/sbs/index.html
- **Dr. John (Jeb) Barrett's** polar research and recent publications in *Global Change Ecology* were featured by the European Commission in their periodical: *Science for Environment Policy*, Issue 122.
- **Dr. Christopher Lawrence** organized the symposium "Fungal Genomics in the Post-Genome Era," which was part of the 2008 American Phytopathological Society Meeting, Minneapolis, MN.
- **Dr. Iulia Lazar** organized a Mass Spectrometry Mini-Conference at Virginia Tech, April 24-25, 2008**,** which had 60 registrants. As a prelude to the symposium, she also organized and taught a workshop on Mass Spectrometry and Proteomics.
- **Dr. Liwu Li** was co-organizer for the Inflammation Research Association's 15th International Conference, which focused on Advances in asthma, COPD, and other inflammatory diseases.

- **Dr. Stephen Melville** was co-organizer for Virginia Tech's Dean's Forum on Infectious Disease held September 28-29, 2008. He also presented four invited talks or seminars at UC Los Angeles, Georgia State University, and University of Virginia.
- **Drs. Jackson Webster, Fred Benfield,** and **Maury Valett** are co-PIs for a renewal of a major NSF LTER research award titled: "Southern Appalachia on the Edge—Exurbanization & Climate Interaction in the Southeast." The $6 million grant is active through September 2014, and the Virginia Tech share of the grant is $552,986.
- **Dr. Daniel Capelluto** received an American Heart Association Beginning In-aid Grant of $132,000 for research on a project titled "Structural basis of phosphatidylinositol 3-phosphate recognition by the Tollip C2 domain."
- **Dr. Daniela Cimini** and her co-PI Esma G. Civelekoglu-Scholey obtained a new NSF Award for $944,000 to conduct an Experimental and Computational Analysis of Merotelic Kinetochore Formation, Dynamics, and Correction. Dr. Cimini was also invited to make presentations on her work with mechanisms of chromosome mis-segregation at Columbia University and the Albert Einstein College of Medicine, Bronx, NY.
- **Dr. Carla Finkielstein** received a $300,000 grant (renewable for $150,000 more) from the Avon Foundation for a study titled "Environmental Risk of Breast Cancer Development: Molecular Basis for Prevention." **Dr. Iulia Lazar** is co-PI on the project.
- **Dr. Rick Jensen** received a $600,000 sub-award from the University of Virginia (PI: Steven Rich) to conduct a "Capture-Sequence Analysis of Genomic Regions Associated with Diabetes."
- **Dr. Iulia Lazar** completed two invited, peer-reviewed publications on the state of microfluidics for use of biochemical analyses. The citations are (1) **Lazar, I.M**., "Microfluidic Bioanalytical Platforms with Mass Spectrometry Detection for Biomarker Discovery and Screening," Chapter in "Miniaturization and Mass Spectrometry," Royal Society of Chemistry, Séverine Le Gac and Albert van den Berg, Eds., in press. and (2) Armenta, J.M.; Dawoud, A.A.; **Lazar, I.M**., "Microfluidic Chips for Protein Differential Expression Profiling," *Electrophoresis*, in press.
- **Dr. Liwu Li** provided a guest lecture on the **"**Molecular and cellular signaling network regulating inflammation" at the University of Pennsylvania, School of Medicine, Philadelphia.
- **Dr. Ignacio Moore** obtained $11,460 from NSF to support a symposium at the Society for Integrative and Comparative Biology Conference entitled "Hormonal regulation of whole-animal performance: implications for selection."
- **Dr. Erik Nilsen** gave an invited talk at the International Symposium of Vireya, held in Hilo, Hawaii, October 27, 2008. Vireyas are a special group of rhododendrons that grow in Southeast Asia.
- **Dr. John Phillips** received $304,000 in NSF support to study "Light-dependent magnetoreception: Molecular and biophysical basis." His grant proposal was rated as "transformational" by the spring 2008 program review panel.
- **Drs. John Tyson** and **Jill Sible** were joint authors on a preface to a special edition of *Interface: Journal of the Royal Society* (Volume 5, Supplement 1: S1-S8) focused on biological switches and clocks. Dr. Tyson published two additional review articles in 2008 with his long-time collaborator Bella Novak. The full citations for the latter are (1) **J.J. Tyson** & B. Novak. 2008. Temporal organization of the cell cycle. *Current Biology* 18:R759-768. and (2) B. Novak & **J.J. Tyson.** 2008. Design principles of biochemical oscillators. *Nature Reviews, Molecular Cell Biology* 9:981-991.
- **Dr. Ann Stevens** was an invited participant at an NSF sponsored workshop entitled "Integrate Microbial Ecology into the National Ecological Observatory Network (NEON)," held in Baton Rouge, LA.
- **Dr. Bruce Turner's** scholarship has branched into historical developments in the science of genetics and evolution. A recent example: Turner, B. J. (In press). The anthropologist's annuals: the story of Louis Leakey and fishes of the genus *Nothobranchius*. *Journal of the American Killifish Association.*

- **Dr. Zhaomin Yang** was an invited speaker at the Gordon Conference on Signal Transduction in Microorganisms, held in Ventura, CA. He also chaired the 2nd Regulation Session at the 35th International Conference on the Biology of Myxobacteria held in Rohnert Park, CA.
- **Drs. Maury Valett** and **Jackson Webster** are co-authors on a paper published in *Nature* (452:202-206) entitled "Stream denitrification across biomes and its response to anthropogenic nitrate loading."
- **Dr. Maury Valett's** graduate student **Damon Ely** received a prestigious NSF Doctoral Dissertation Improvement Grant to investigate the role of anthropogenic acidification in stream nitrogen cycling. **Dr. Valett** is also co-PI on a new $798,430 NSF award to study the interactive effects of chronic N deposition, acidification, and phosphorus limitation on coupled elemental cycling in streams.
- **Dr. Jeff Walters** is the PI on a new $2 million Department of Defense grant to continue monitoring endangered species at the Eglin Air Force Base, Florida. He is also co-PI on a new $1.3 million DOD grant to develop reference models and a decision support framework for managing longleaf pine sandhill ecosystems.
- Biological Sciences Assistant Professors **Drs. Iulia Lazar** and **Ignacio Moore** hold active NSF CAREER awards, and Assistant Professor **Dr. Jeffrey Kuhn** holds an active Burroughs Wellcome Fund, Interfaces in Science Career Award.
- **Dr. Brenda Winkel** is the PI on a new $1.1 million NSF grant to model biological networks in *Arabidopsis* through integration of genomic, proteomic, and metabolomic data.
- **Dr. Jianhua Xing** was invited to present a talk on nonequilibrium dynamic model for allosteric regulation at the Annual Conference of the Society for Industrial and Applied Mathematics, held in San Diego, CA.
- **Dr. Khidir Hilu** chaired the Molecular Evolution III session at the Annual Evolution Meeting held in Minneapolis, MN.
- **Dr. Birgit Scharf**, who joined the Department in late fall 2008, was invited to write a meeting report together with three colleagues. The full citation is Scharf, B.E., P.D. Aldrige, J.R. Kirby, and B.R. Crane. Upward mobility and alternative lifestyles: a report from the 10th biennial meeting on Bacterial Locomotion and Signal Transduction. *Molecular Microbiology* 73: 5-19.
- In September 2008, **Dr. Carla Finkielstein** presented two invited talks (1) "Circadian Regulation of Cellular Homeostasis" presented September, 2008 at Virginia Commonwealth University, Department of Biochemistry and Molecular Biology, Richmond, VA; and (2) "A Novel Heme Regulatory Motif Mediates Heme-Dependent Degradation of the Circadian Factor Period 2" presented at the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), Heme Regulation During Erythropoiesis Workshop, Bethesda, MD.
- **Dr. Iulia Lazar** received an NIH award of $317,000 to develop and study applications for a Microfluidic MALDI-MS device that can be used for high-throughput biomarker discovery. **Dr. Carla Finkielstein** is a collaborator for this grant.
- **Dr. Dorothea Tholl** was invited to present a talk on "Plant Volatiles in above and belowground plant-insect interactions: understanding pathways and molecular regulation" at the Rank Prize Funds Mini-Symposium on Chemical and Visual Ecology of Arthropods: From Genes to Pest Management in September 2008 in Windermere, UK.

III. Engagement

In 2008-09, the Department's new public-private partnership to advance biotech in the Mid-Atlantic region (VT BioSPIRE) developed formal relationships with four corporate partners. Outreach in K-12 Science Education was sustained, with a focus on continuing education for regional K-12 science teachers, kits to help them in the classroom, and special programs targeted to individual primary and secondary schools. Faculty remain highly committed to serving the university. Several faculty have developed outreach programs or service that support education, research, and conservation goals at the national level.

A. Outreach

- Corporate partnerships
  - In 2008, VT BioSPIRE (Virginia Tech Biological Sciences Strategic Partners in Research and Education) recruited four partners: PPD, Merck, Novozymes, and Revivicor (see http://www.biol.vt.edu/BioSPIRE/index.html). Two meetings with the partners, faculty, and students were held, and a BioSPIRE sponsored program to support undergraduate research was launched.
  - The partnership between Virginia Tech and Oxford Diffraction Limited (now Varian) took a new step forward with the establishment of a new lab in the Integrated Life Sciences Building.
- 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) included:
  - Partnerships with PIs on three NSF funded grants and one Carter Academic Service Entrepreneur (CASE) providing educational components to research projects.
  - Served 4,225 teachers and students directly in fall 2007 through spring 2008 via outreach programs and kit loans.
  - Made six presentations to educational and research professionals in the region on topics such as freshwater resources in Virginia, integration of educational components in research grants, and STEM education.
  - Completed a two-day workshop serving 47 teachers at the Virginia Tech Southwest Regional Center in Abingdon.
  - Brought Biological Sciences' activities to 100 Blacksburg High School students and their four teachers and 125 children, parents, and teachers at Blacksburg Middle School through the Civics and Science classes. In addition to K-12 tours, on-campus tours were available for visiting parents, alumni, and teachers who brought students interested in applying to Virginia Tech.
  - **Dr. Rosenzweig** and **Llyn Sharp** (Geosciences) continued to serve as co-coordinators of the VT-STEM initiative. This statewide leadership role involves the main campus and all Virginia Tech geographic centers. It is a three-year appointment with a Aug 06–May 09 term, with some salary funding and support from the Outreach Division.
- Massey Herbarium activities:
  - This was the first full year in which **Dr. Khidir Hilu** served as Director and **Tom Wieboldt** as Curator. Two undergraduate students were hired part time to help with specimen mounting and data management.
  - **Tom Wieboldt:**
    - provided assistance for the laboratory portion of the Plant Taxonomy course.
    - was an instructor of botany in the New River Valley Master Naturalist Program.
    - gave an invited talk at the Virginia Native Plant Society Workshop in Richmond.
    - reviewed plant identification and classification portions of manuscripts written by Virginia Tech faculty.
  - Work has continued on the Digital Atlas of the Virginia Flora. The latest version of the Atlas can be seen at: http://www.biol.vt.edu/digital_atlas/.
  - Between June 2008 and May 2009, the herbarium added 754 specimens to its collection and had 19 visitors using the collection, the majority from outside the university community.

- Requests for plant identification totaled 578 specimens from Extension personnel and for various research purposes. Much progress has been made on 300 additional determinations for specimens that came from a benefactor.
- Wieboldt provides other types of information about plant science for about 10 requests per month.
- 4 loans comprising 125 plant, fungal, and lichen specimens were made to researchers at other institutions. At present, about 1111 vascular plant specimens are out on loan to 17 institutions.
- 14 loans comprising 1313 specimens were borrowed from other institutions for research purposes; 6 of these loans totaling 411 specimens were returned.

- The Alumni Advisory Board met in Blacksburg on September 6, 2008 and on February 21, 2009 (the latter coinciding with the graduate research day event).
  - The Alumni Advisory Board assisted the Department in recruiting high quality undergraduate student prospects from underrepresented groups and in providing the Department advice on how to work through budget reductions associated with the current economic climate.
  - Edward Goyette, President of American Biosystems and a member of the Advisory Board since 2005, gave the keynote address at the Department's commencement on May 16, 2009.
- The OWLS, the 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). The group is co-led by **Drs. Bruce Parker** and **Ernie Stout**. Specific activities include:
  - **Dr. Bruce Parker** continued his assistance in building scholarship funds toward endowment status.
  - **Dr. Robert Benoit** taught an honors section of general microbiology.
  - **Dr. Noel Krieg** taught prokaryote diversity.
  - From July 2008 through June 2009, the OWLS met approximately once per month for lunch; each time, Biological Sciences faculty made presentations on the latest in research and departmental activities.
- The significant outreach of Biological Sciences faculty and students to local schools continued in 2008. For example, **Dr. Ann Stevens** was co-chair of the Gilbert Linkous Elementary School Science Fair 2007-2008 and chair in 2008-2009. The latter Fair involved ~50-80 K-5 student poster presenters, >5 Virginia Tech science clubs, and >12 graduate student judges as active participants.
- International aspects of the undergraduate curriculum in the 2008-09 academic year included:
  - Plants and Civilization (BIOL 2204; fall 2008, 67 students enrolled), taught by **Dr. Khidir Hilu.** This is an Area 7 course within the university's Curriculum for Liberal Education.
  - Study abroad course in tropical ecology during winter, co-taught by (among others) **Drs. Ignacio Moore** and **Jerry Via**.
- International aspects of discovery are a strong element of the Department of Biological Sciences. Twelve of the Department's faculty had substantive research interactions with researchers or field sites outside of the United States in a total of 15 different counties.

B. Service

- The following table of committee assignments for academic year 2008-09 shows that the faculty and staff in Biological Sciences are very committed to serving the Department, College, and University. In addition to the assignments listed in this table, there were many short-term activities that staff and faculty participated in to deal with faculty and staff searches, reviews of policies and procedures, studies of research needs, proposal writing to bring in new support for teaching or administration, etc.
- Some examples of significant activities for the university and profession included:
  - 7 faculty participated in a total of 8 national grant review panels for the National Institutes of Health (2 panels), National Science Foundation (4 panels), American Heart Association (1 panel), and USDA (1 panel).

- 4 faculty conducted reviews for tenure and promotion of 6 faculty outside of Virginia Tech.
- **Dr. Fred Benfield** has continued his service to the US EPA Science Advisory Board, conducting two major reviews of EPA 5-year research plans in 2008.
- **Dr. Art Buikema** served on 8 University, College, or Department committees; participated in over 10 workshops, panels or panel series, provided peer reviews of two courses, and coordinated the freshman biology lecture and lab programs for the Department. In 2008, he became a member of the Advisory Board, Science Museum of Western Virginia.
- **Dr. Don Cherry** provided research presentations and tours of the Department's Ecosystem Simulation Laboratory (ESL) for the Virginia Tech Office of the VP for Research as a special emphasis of research support to industry in the State of Virginia. He also presented displays of the ESL to officials from American Electric Power Company in Columbus, Ohio; ARCH Coal Company in Charleston, WVA; US Fish and Wildlife (USFW) Service from Gloucester Point, VA; and US Geological Survey (USGS) from Columbus, MO and Knoxville, TN.
- **Dr. Daniela Cimini** served on the inaugural Faculty Advisory Committee of the Virginia Tech Postdoctoral Association (VTPDA)
- **Dr. Jack Evans** was asked to provide advice on creating a freshman seminar course similar to our BIOL 1004 for Virginia Commonwealth University, University of Colorado, and the Virginia Tech Department of Human Nutrition Foods and Exercise.
- **Drs. Carla Finkielstein** and **Daniel Capelluto** continued their exchange program with colleagues in the Department of Human Biochemistry, School of Medicine, University of Buenos Aires. The rationale behind this project it is to help scientists from developing countries acquire the necessary expertise in one particular area of research and establish collaborations with faculty at Virginia Tech. Last year, Nuria Zabalia, an Argentine PhD student, spent 8 weeks at Virginia Tech.
- **Dr. Khidir Hilu** is part of an international committee that is advising Iraq on strategies to rebuild its higher education system; he visited Iraq in spring 2009.
- **Dr. Christopher Lawrence** is organizer and leader of the national Alternaria Genome Consortium, and he also serves as a member of the Biochemistry, Physiology, and Molecular Biology Committee of the American Phytopathological Society.
- **Dr. Anne McNabb** continued to serve ½ time as Associate Dean in the Graduate School, where she leads (among other things) the annual GTA workshop, a training session to enhance student engagement with teaching. Also, each fall she selects and works with six Virginia Tech graduate student participants for the Research Forum in Richmond for educating VA Legislators about graduate education in Virginia.
- **Dr. Ignacio Moore** was head judge and organizer for the Division of Comparative Endocrinology student presentation competition for the annual Society for Integrative and Comparative Biology Conference held in Boston, MA.
- **Dr. David Popham** served at Life Science I's first faculty building manager, which included significant efforts in planning space allocation, equipment ordering, building maintenance, and site preparation for the specific needs of 9 faculty from 3 different Virginia Tech colleges. He arranged an open house celebration and provided tours for numerous campus groups, including the Department of Biological Sciences Advisory Board, the College of Science Alumni Advisory Board, the Old Guard, and the Carilion Research Institute Planning Committee. Dr. Popham was also chaired the Interdepartmental Microbiology Graduate Recruiting Program Steering Committee.
- **Dr. Mike Rosenzweig** served as co-coordinator of the University's VT-STEM K12 Outreach Initiative, which has been charged by the Virginia Tech Division of Outreach and International Affairs to build community to demonstrate STEM education initiatives that support the University Strategic Plan. Dr. Rosenzweig also has extensive educational and research interactions with the Town of Blacksburg, and in 2008, he was named to fill a vacant position on the Town Council. He directs SEEDS, a non-profit organization dedicated to education, and

has developed a partnership between SEEDS and the Town of Blacksburg to provide environmental education programming housed in a historic home owned by the Town.

- **Dr. Dorothea Tholl** has a research outreach project in partnership with the Roanoke Valley Governor's School, participating in the pre-college education program, Partnership for Research and Education in Plants (PREP). In fall 2008, students did volatile collections from *Arabidopsis* roots and samples were analyzed in Dr. Tholl's lab. Dr. Tholl also prepared video and audio components for a PowerPoint presentation on GC-MS analysis; both presentations were placed on YouTube. **Dr. Brenda Winkel** is also very active in PREP and sits on its Advisory Board.
- **Dr. John Tyson** serves on the Board of Governors, National Resource for Cell Analysis and Modeling, University of Connecticut Health Center, Framingham, CT, and on the Board of Advisors, National Institute for Mathematical and Biological Synthesis, University of Tennessee, Knoxville TN.
- In 2008, **Dr. Rich Walker** became Associate Department Head, replacing **Dr. Jack Cranford**, who retired. Rich assumed a major role in curriculum and advising and in human resource activities (supervision, performance evaluations, and hiring) for the Department's classified and university staff.
- **Dr. Jeff Walters** served as member of seven panels, commissions, or review teams involved with nationally/internationally important conservation challenges. One example: He served as Chair of the American Ornithologists' Union (AOU) California Condor Blue Ribbon Panel. This panel was formed as the result of a request from the California Audubon Society to the AOU to evaluate the status of the California Condor and its progress toward recovery. In 2008 the Panel visited release sites and captive breeding facilities in the western US, wrote a report that was released in August of 2008, and completed a monograph based on the report that was submitted for publication.
- A number of the faculty are editors or on the editorial board of professional journals:
  - Fred Benfield – *J. North Amer. Benthological Society*
  - Joe Falkinham – *Applied and Environmental Microbiology, International Journal of Microbiology, Standard Methods for the Examination of Water and Wastewater*
  - Khidir Hilu - *Kurtziana, Journal of Systematics and Evolution, Annals of Botany*
  - Bob Jones – *J. Ecology*
  - Iulia Lazar – *The Open Proteomics Journal, The Open Spectroscopy Journal*
  - Liwu Li – *J. Immunology*
  - Anne McNabb – *J. Experimental Zoology, Poultry & Avian Biology Reviews*
  - Erik Nilsen – *J. American Rhododendron Society*
  - Brent Opell – *J. Arachnology*
  - David Popham – *J. Bacteriology*
  - John Tyson – *J. Theoretical Biology, J. Nonlinear Science,* and *Experimental Biology and Medicine*
  - Maury Valett – *J. Limnology and Oceanography*
  - Jack Webster - *Freshwater Biology*

2008-09 GOVERNANCE & SERVICE SCHEDULE
Department of Biological Sciences

Ad Hoc Committee on Assessment
Walker, Chair / Buikema / Evans / Lipscomb / Stevens

Computing and IT committee
Tyson, Chair / Andrews / Gunter / Kuhn / Schubot
Walker / Webster / Xing

Curriculum Committee
Barrett, Chair / Benfield / Cimini / Evans / Hawley / Lazar
Opell / Walker / Seyler

Diversity Committee
McNabb, Chair / J. Moore / Phillips / Surace / Tholl

Executive/Personnel Committee
Jones, Chair / Andrews / Buikema / Cimini / Hilu / Phillips
Schubot / Stevens / Walters / Yang

Faculty Recognition Committee
Moore, Chair / Buikema / Hawley / Li / J. Moore

Faculty Search (bio members only)
College Cluster Committee rep: Melville

Graduate Evaluation Committee
Walters, Chair / Cherry / Lawrence / Nilsen
Schubot / Xing

Graduate Selection Committee
Andrews, Chair / Barrett / Kuhn / Moore
Rasmussen / Yang

Honors Advisors
Buikema / Simmons / Jones

Research Day Committee
Valett, chair / Capelluto / Scharf / Jensen / Ely
Crawley / Tanner

Student Recognition Committee
Lipscomb, Chair / Elgert / Evans / Perez / Rosenzweig
Tholl / Tyson / Via

Department Programs and Technical Functions
Alumni: Blanc / Falkinham / Finkielstein / Jones / Winkel
Animal Care: Elgert / Jarrett
BGSA President: Pam Widder
Collections: Hilu / Wieboldt / Rosenzweig
Facilities: Benfield / Waller
Freshman Labs: Buikema / Webb
Dept Greenhouse: Nilsen / Wiley
Micro/immuno labs: Stevens / Link
Research in Progress Seminar: Banerjee / Surace

Undergrad Research Committee
Opell, chair / Kuhn / Seyler / Walker / Jusino

University/College Reps
Biology-VBI Greenhouse: Nilsen (chair) / Hilu / Wiley
College Curriculum: Opell
College Faculty Association President: Nilsen
College Grad Affairs: Andrews
College Honorifics: Winkel
College P&T: Popham
College Research: Tyson
College Scholarship: Falkinham / Nilsen / Tyson
EEB Seminar: Belden / Hawley / Northington
Faculty Senate: Jensen
ILSB Faculty Stakeholders Committee: Banerjee
Library: Cherry
Life Sciences I Building Manager: Popham
Life Sciences Learning Community: Sible
MCBB Seminar: Banerjee / Schubot
Phi Sigma advisor: Popham
Sigma Xi: McNabb
Staff Senate: unfilled position
Structural Biology Symposium: Schubot
University Animal Care Comm.: Turner
University Biotech Oversight Committee: Walker
Univ. Comm. Undergrad Studies & Policies: Finkielstein
University Honorifics: Buikema
Univ. Intellectual Properties: Falkinham
Univ. CDB Grad program: Banerjee / Kuhn
Univ. Inflammation Grad Program: Li
Univ. Micro Grad Program: Popham (chair)
Univ. Plant Mol Bio Grad Program: Winkel / Tholl
VT Postdoc Association: Cimini

OWLS / EMERITUS (organization of retired faculty)
Bruce Parker and Ernie Stout, Co-chairs
Curt Adkisson / Bob Benoit / John Cairns
Bill Claus / Joe Cowles / Jack Cranford
Asim Esen / Al Heath / Al Hendricks
Buck Holliman / Tom Jenssen / Noel Krieg
Muriel Lederman /Duncan Porter / Charles Rutherford
Steve Scheckler / George Simmons / Harry Steeves
David Stetler / Bruce Wallace / David West / Al Yousten

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
Jianhua Xing: John Tyson
Birgit Scharf: Ann Stevens

Club Advisors
Biology: Evans / BGSA: Rosenzweig
Clogging: Zwolack / Microbiology: Stevens
Optometry: Evans / Pharmacy: Evans
Phi Sigma Honor Society: Popham / Scuba: Waller
SEEDS: Rosenzweig

IV. Diversity (faculty, staff, student)

To build sensitivity and mutual respect, the Department has incorporated regular diversity-related activities into most of its faculty meetings and has developed an annual international luncheon. The Alumni Advisory Board, with support from the new VT BioSPIRE program, actively recruited undergraduate student prospects from underrepresented groups. Most of the Department's faculty have very diverse graduate student lab groups. Faculty were active in obtaining fellowships or other Virginia Tech support (e.g., MAOP, VT-AMP, IMSD, and VT PREP) to recruit and support minority graduate students. The Department's diversity committee continued its lead role in facilitating progress. The Department and College have scored relatively well in several measures of how faculty perceive the work environment.

Introduction

The Department has adopted the University's philosophy of **Inclusive Excellence**, which is a set of principles and approaches aimed at enhancing scholarship at Virginia Tech through the diversification of people and ideas and the creation of an environment where all scholars can be productive (see http://www.oeo.vt.edu/excellence/).

Much of our progress toward inclusive excellence is spearheaded by the Department's Diversity Committee, which is chaired by **Dr. Anne McNabb**. Dr. McNabb also chairs the College of Science Diversity Committee and coordinates with the diversity committees in other colleges. In academic year 2008-09, the departmental committee:

- Integrated scenarios, theater presentations, and general discussions into most of the faculty meetings, including the annual fall retreat held at Mountain Lake Hotel on August 21, 2008. The purpose of the exercises was to build sensitivity by making faculty and staff aware of the significant challenges Virginia Tech still faces as it works toward creating a fully welcoming and supportive environment.
- Sponsored the fourth annual international potluck lunch for the Department's faculty, staff, and graduate students, held April 1, 2009. This event is aimed at building stronger cross-cultural community ties within the graduate student and postdoc populations.

Access and Equity

- Drs. E. J. Smith, **Anne McNabb**, and R. Avery are co-PIs on a $1,606,467, four-year National Institute of General Medical Sciences grant titled "Virginia Tech Initiative for Maximizing Student Diversity" (IMSD). This project is providing increased access to PhD science degree programs for people from underrepresented groups, including minorities and first generation college students. Using this program as a vehicle, two graduate students were recruited (one by **Dr. David Popham** into the Interdepartmental Microbiology Graduate Program and one by **Dr. Zhaomin Yang** who will serve as the student's initial mentor). **Dr. Brenda Winkel** served as a program area coordinator for IMSD.
- **Drs. Daniel Capelluto** and **Carla Finkielstein** interviewed potential graduate students currently attending the University of Buenos Aires who are interested in attending Virginia Tech.
- **Drs. Jill Sible, Rich Walker**, and Karen Sanders are PIs on an S-STEM, NSF-funded scholarship and training program to prepare economically challenged students for careers in biotechnology. Target counties include those with large minority or rural Appalachian populations. **Dr. Sible** also presented a seminar at the Virginia Tech Afternoon Chat Series on Recruiting and Retaining Students of Color.
- **Dr. Mike Rosenzweig** worked (as advisor and summer contact) with program leaders of VT-STARS (outreach/pipeline project for Southside VA) to assist in the integration of students into campus academic units.

- **Dr. Bob Jones** and **T. Howland** are co-leaders of VT BioSPIRE, a program to both recruit underrepresented groups into the Biological Sciences undergraduate degree program and also to provide undergraduate research opportunities (see undergraduate research section of report). In 2008-09, phone calls and letters and/or emails were made from our Alumni Advisory Board to 103 high quality undergraduate prospects from underrepresented groups. Seventeen of these students committed to enroll at Virginia Tech in fall 2009.
- During 2008, 4 African American, 4 Hispanic, 1 Native American, and 21 foreign graduate students (in total representing 37% of graduate population) were enrolled in the Biological Sciences major.

Campus Climate

- The Department has developed a peer mentoring system for pre-tenure assistant professors. In academic year 2008-09, the group met three times to discuss expectations for tenure, mentoring practices for graduate students, and scenarios that help build sensitivity.
- The Department received the results of the faculty campus survey, conducted by the AdvanceVT program in fall 2008. While it appears that the College of Science is providing a favorable work environment in many dimensions and that the Department's faculty perceptions of departmental work environment were about average for the College, there are some weak points (particularly in mentoring beyond the pre-tenure period) that the Department has decided to work on in academic year 2009-10.
- Many in the Department have been active in Advance VT Programs to enhance the success of women faculty in sciences and engineering, largely through transforming the campus climate at Virginia Tech. Examples include:
    - **Dr. Daniela Cimini** was a Speaker at Advance VT panel on "Your first year as a professor." March 17, 2008. Many female graduate students and postdocs attended the meeting.
    - **Dr. John Phillips** served on a panel to discuss dual career hiring issues with Virginia Tech graduate students.
- **Dr. Anne McNabb** served as a member of the Board of Directors of the Organization of Women Faculty.
- In keeping with tradition, several Department faculty and staff attended the annual university diversity summit and annual Advance VT Workshop.
- Virtually all faculty in the Department attended sessions on sensitivity presented at departmental faculty meetings. Many also attended university information or training sessions including the Virginia Tech Harassment Prevention Workshop, Advance VT Pre-Tenure Faculty Workshop, and Advance VT Leadership Program Luncheon.

Diversity in the Curriculum

- **Drs. Mary Lipscomb, Jill Sible,** and **Rich Walker** attended workshop sessions on diversity and group work sessions on how to incorporate diversity into teaching at the National Academy Summer Institute for teaching biological sciences, held in Madison, Wisconsin.
- In an effort to build a more balanced and inclusive view of how science is conducted, nine faculty members have reported that they are increasing the use of images and examples of non-Caucasian, non-male scientists during lectures and in the lab.

Learning and Development

- Each year, several faculty express interest in accepting MAOP, VT-AMP, and International Association for the Exchange of Students for Technical Experience (IAESTE) students. Since

a match must be found between student interest and faculty expertise, the Department was unable to fill all requests. To be ready to accept matches when they occur, many faculty attend training sessions (e.g., the VT-AMP mentoring workshop).

- **Dr. Art Buikema** studied and applied Neuro-Linguistic Programming techniques to identify learning and recall strategies of freshman taking Principles of Biology. He then worked with about 20 auditory and kinesthetic learners. Several went from failing the first examination to receiving a B in the class; for others, it reduced the time it took to complete the online mind-map from 4+ hours to less than an hour, and, after four attempts, they increased their maximum scores from the 70s to 100.
- **Dr. Anne McNabb**, largely through her role as ½ time Associate Dean of the Graduate School, has incorporated many elements of diversity into the annual GTA Workshop (about 609 students participated in 2008), including:
    - special sessions for international GTAs to help them learn about cultural and academic aspects of Virginia Tech.
    - a panel discussion on "Diversity in the Learning Environment".
    - three sessions on how understanding students influences teaching.
    - a theatre troupe reading of the words of undergraduate students who had experienced discrimination followed by a discussion of the experiences and reaction of those who attended.
- **Dr. Erik Nilsen** advised one student supported by the University's Alliance for Minority Participation (VT-AMP) program.
- **Dr. Jill Sible** is a member of the University Human Diversity and Community Implementation Committee to incorporate this theme into the CLE.
- Engagement with the University's Multicultural Academic Opportunities Program (MAOP) included one graduate student advised (by **Dr. Erik Nilsen**) and two undergraduate intern participants (supervised by **Drs. Ann Stevens** and **Daniela Cimini**).
- **Drs. Carla Finkielstein and Stephen Melville** each mentored a VT PREP student in 2008. This program, which is funded by an NIH grant to Virginia Tech, uses "developmental and experiential learning activities to prepare post-baccalaureate scholars from ethnic groups who have been historically underrepresented in the biomedical and behavioral sciences for the successful pursuit of a Ph.D and a research career."

V. Honors and Awards (faculty, staff, student) for AY 2008-2009

Biological Sciences undergraduate and graduate students have continued a tradition of proportionally high numbers of students recognized for excellence in scholarship, teaching, and service. Many faculty and staff were recognized by the university or professional organizations for productivity and impact in a variety of dimensions.

- **Teaching and Advising**
  - **Dr. Ann Stevens** received the 2009 Alumni Award for Excellence in Teaching.
  - **Drs. Robin Andrews, Klaus Elgert**, and **Richard Walker** received 2009 Department of Biological Sciences Outstanding Teaching Awards.
  - The 2009 Outstanding Undergraduate Advisor Award from the Department was presented to **Dr. Art Buikema**.
  - The 2009 Most Influential Professor Award from the Department, as determined by a vote of the senior class, was presented to **Dr. Art Buikema.**
  - **Dr. Ann Stevens** was recognized as the Advisor of the Year through the University Student Leadership Awards sponsored by the Virginia Tech Department of Student Activities.
  - **Dr. Richard Walker** was recognized as a 2008 Favorite Faculty Member by the Office of Residence Hall Life.
  - **Drs. Mary Lipscomb, Jill Sible,** and **Richard Walker** were elected as National Academies Education Fellows in the Life Sciences for 2008-2009.
  - PhD student **Sunny Crawley**, from **Dr. Khidir Hilu's** lab, received the 2009 Graduate School Graduate Teaching Assistant Award and the 2009 Graduate Student Teaching Award from the Department.
- **Research and Professional**
  - **Dr. John Tyson** was elected Associate Member, Royal Belgium Academy of Science.
  - The College of Science Roundtable Award was presented to **Brandi Echols**, who is working in **Dr. Don Cherry's** lab.
  - **R. Travis Belote**, from **Dr. Robert Jones'** lab, received a Graduate School Commendation for an Outstanding Dissertation in Science & Engineering.
  - **Drs. Robin Andrews**, **Khidir Hilu,** and **Zhaomin Yang** were recognized as "Scholars of the Week" by the Research Division of Virginia Tech.
  - Best Poster Awards for the Annual Research Day, held February 21, 2009, were presented to **Erin Hewett** (1^{st}), **Gayatri Ankem** (1^{st}), **Mauri Liberati** (2^{nd}), **John Herbert** (2^{nd}), **Emily Lambert** (2^{nd}), **Camille Harris** (3^{rd}), and **Benjamin Orsburn** (3^{rd}). The award for the Best Oral Presentation was presented to **Kevin Crosby**.
  - The 2009 Undergraduate Research Award from the Department was presented to **Andrew Lucas**.
- **Service**
  - **Dr. Anne McNabb** received the 2009 College of Science Diversity Award.
  - 2009 Department Outstanding Service Awards were presented to **Drs. Jack Evans** and **Jeff Walters.**
  - **Dr. Joe Falkinham** received a US Army Freedom Team Salute Commendation for service to members of the US Army community on the Virginia Tech campus.
  - **Dr. Anne McNabb** was presented with the 2008 Most Valuable Faculty Member Award from the Muslim Student Association.
  - **Renee Irvin,** a lab specialist in the microbiology/immunology labs, was presented with a 2008 Outstanding Performance in a Lab Award.
  - **Christina Tisdale** was recognized as the 2009 Outstanding Senior from the Department.

VI. Goals for 2009-10

The 2008-09 academic year was a watershed for access to facilities. Fourteen faculty moved to two new research buildings, which is one of the factors underlying recent increases in research productivity. At the same time, however, increases in student enrollment, reductions in the number of tenure track faculty lines, and reductions in operating budgets are putting pressures on the Department's teaching and outreach programs. In the 2009-10 academic year, the Department will focus on restructuring budgets and departmental administration to increase efficiency and active recruiting of external funds to sustain and enhance teaching quality. The Department will also continue its recent progress in developing new learning outcome assessment protocols; enhancing diversity of the student body, faculty, and staff; and enhancing safety and security in the classroom, lab, and office.

A. Facilities

- Eight Biological Sciences faculty moved into Life Sciences I (plus one additional was recruited into the space), and six moved to the Integrated Life Sciences Buildings in 2008-09 (see building details in following table).
- For the first time in many years, the quantity of space available for research and teaching is no longer a limiting factor to Department goals for excellence (except for availability of large lecture halls); however, the quality of the space remaining in Derring Hall is still relatively low.
- STRATEGIES FOR COMING YEAR:
    - Develop a new space plan for small renovations to Derring Hall and move some programs into the translational medicine (Life Sciences II) building now being planned.
    - Continue to seek teaching funds to add lab teaching capacity in Fralin Hall.

Information on Two New Virginia Tech Buildings where Biological Sciences Faculty Reside

Building Aspect/Element		Integrated Life Sciences Building	Life Sciences I
Research Themes		Infectious Disease Obesity, Cancer Virology, Cell Biology Crystallography	Infectious Disease Microbiology Immunology Proteomics
Occupied		Fall 2008 – Ongoing	Spring 2008
Number of Faculty at Full Capacity (number in parentheses is current or identified to move in soon)		25 (20)	13 (11)
Current Number of Biological Sciences Faculty		9	6
A/E Consultant		Ward/Hall Associates	SBRA
Construction Manager		EDC	Whiting Turner
Capital Costs	Construction	$20,578,000 = $267/sq ft	$28,309,000 = $394/sq ft
	Furniture/Equipment	$1,774,732	$4,987,000
Space	Gross sq ft	77,000	71,800
	Total Net Assignable	57,085	39,500
	Lab	38,680	21,748
	Vivarium	4,000	11,112
	Other	14,405	6,640
	Lab Space by Program		
	CALS	13,829	2,112
	CNR	1,515	-------
	COS	15,147	15,091
	CVM	8,189	2,162
	University proteomics/BSL3	-------	2,383
Base Maintenance	Utilities, housecleaning, painting, light bulbs, etc.	CRC is responsible	VT Physical Plant is responsible
Technical Maintenance	Annual Personnel Costs	~$80,000	~$32,000
	Annual Equipment Maintenance	~$50,000	~$80,000
Management	Key Personnel	• Faculty coordinator • 1 FTE staff building manager • 1 FTE staff admin support • Part-time glassware washer • 1 FTE vivarium manager	• Faculty manager • Part-time staff maintenance • Part-time staff admin • Vivarium & BSL3 supervised by central VT offices
	Written Charter	• Stakeholders and staffing • Policies, including rules for: o Moving in or out of building o Allocating lab space o Covering operating costs (see cost estimates above)	

B. Undergraduate Learning Programs

- Large class enrollments and a shrinking number of tenure track and tenured faculty are putting pressures on the quality of education that can be offered. The annual senior survey conducted for the Class of 2009 indicated that students perceive the Biological Sciences program as strong in learning scientific reasoning, but concerns were raised over the negative impacts of large class sizes on the individual attention that students receive from faculty.
- STRATEGIES FOR THE COMING YEAR AND BEYOND:
    - Larger class sizes for freshmen and sophomore courses, allowing the Department to add teaching capacity in upper division courses.
    - Use of more temporary and full time instructors in lower division courses, which will permit tenured and tenure track faculty to focus more on upper division teaching.
    - Continue pursuing strategies to reduce enrollment in the Biological Sciences major.
    - Partner with other life science colleges to accept more upper division courses as automatic substitutes for BIOL electives.

C. Graduate Learning Programs

- Much progress has been made on developing more cohesive graduate course curricula.
- Graduate funding opportunities remain strong, but student fees are eroding the value of the assistantships, which could lead to reduced capacity to recruit high quality students.
- Record keeping and evaluation are done largely by paper, missing opportunities for efficiency in operations and for enhancing assessment.
- STRATEGIES FOR THE COMING YEAR:
    - Continue to seek training grants and develop endowments for graduate fellowships; this will add to the resource pool, which may permit some increases in stipends to keep recruitment competitive.
    - Develop an ePortfolio system to increase efficiency and provide more potential for student assessment.
    - Consider the centralization of the graduate program under one faculty leader to enhance further efficiency and provide focus for seeking additional funds that could strengthen recruitment.

D. Faculty Recruiting

- As predicted in last year's external review of the Department, the greater proportion of faculty retirements is hitting in organismal biology, which, if continued indefinitely, may bias learning programs and reduce some faculty groups to levels below "critical mass" for both research and teaching programs.
- STRATEGIES FOR THE COMING YEAR:
    - Engage the IBOB faculty in an interdepartmental planning session that leads to a proposal for a cluster hire in the College of Science. This might be linked to the new campus-wide study of potential for growing in neurosciences.
    - Nurture and participate in the current college cluster in Integrated Studies of Earth Systems.

E. Budgets, Staffing, and Administration

- The Department suffered a permanent reduction in operating funds of over $100,000 in fiscal year 2008-09.
- Pressures continue for higher levels of accountability in employment and financial records/procedures, safety practices and training, and planning to sustain continuity of operations. So, at the same time that operating funds decline, workloads may increase.
- STRATEGIES FOR THE COMING YEAR:
    - Continue to push an initiative started in 2008 to build fees into undergraduate laboratory courses.
    - Delay equipment maintenance in cases where the delays will not increase safety risks.
    - Increase the proportion of transactions that are paperless and reduce the complexity of procedures wherever possible. We should strive for no net increases in administrative workloads for faculty and staff.