Annual Report Executive Summary, 2009-10
Department of Chemistry

Learning: Undergraduate

The Department of Chemistry is committed to the highest level of undergraduate education that it can deliver and applies that commitment to the thousands of students in our "service" courses as well as our own majors. The number of students and total credit hours that the department teaches has increased dramatically over the last 5 years growing from 28,263 undergraduate student credit hours in 2004 to 35,492 in 2009. This is an increase of over 25% over a period of time when the number of faculty has remained constant.

A. Service Courses

We define service courses as those courses, typically at the freshman and sophomore levels, offered to a variety of majors across the university to satisfy their own major requirements. The bulk of our service offerings is found in six courses: Introduction to Chemistry (1015, 1016). Introduction to Chemistry Lab (1025, 106), General Chemistry (1035, 1036), General Chemistry Lab (1045, 1046), Organic Chemistry (2535, 2536) and Organic Chemistry Lab (2545, 2546). Enrollment numbers for these Six courses were:
Fall 2009: Chem 1015 - 394; Chem 1025 - 86 ;Chem 1035 – 2860; Chem 1045 – 2267; Chem 2535 – 1067; Chem 2545 – 959.
Spring 2010: Chem 1016 – 303; Chem 1026 – 58; Chem 1035 - 271; Chem 1036 - 1372; Chem 1045 - 622; Chem 1046 - 1200; Chem 2536 - 857; Chem 2546 – 247.

B. Majors and Upper Division Courses

While the majority of our 3000 and 4000 level courses are for chemistry majors, there are quite a few students who are minoring in chemistry who also need these courses. In addition, a number of engineering and life sciences department require physical chemistry for their majors. With an overall increase in majors along with upper level courses also providing service to many other departments, these students have stressed our upper level offerings greatly. Number of chemistry majors:
Fall 2009: 169 men, 129 women, total of 297
Spring 2010: 161 men, 119 women, total of 280
The department graduated 64 B.S./B.A. majors in 2009-2010.

C. Undergraduate Research

An incredibly important component of the undergraduate education experience is undergraduate research. A

research university has much to offer to students that will enrich their learning far beyond the capabilities of a classroom.
Fall 2009: 42 undergraduates participated in undergraduate research. This is the number who have officially signed in for credit with a number of others participating informally.
Spring 2010: 39

Those students who have signed up for 3 credits or more are required to present their work at an undergraduate research symposium the department holds at the end of each semester.

D. Evaluation

One-on-one exit interviews with graduating seniors underscored the high level of satisfaction that chemistry majors have with their experience in the department. Students commented consistently on the level of concern that faculty show for their achievements and the amount of time that the faculty are willing to devote to office hours and other help activities.

Summary student evaluations for the department show an overall average number for all courses evaluated to be 3.4 out of a possible 4. Given the large number and variety of difficult courses, this is an excellent outcome

E. Notable Achievements.

The **Department of Chemistry** was recognized as an Exemplary Department in 2010 for incorporation of research into the undergraduate curriculum. This is quite an honor and is recognition of the department's commitment to providing an outstanding undergraduate experience including research.

Patricia Amateis received the Wine Award for Outstanding Teaching.

Gordon Yee received a College of Science Certificate of Teaching Excellence.

Kelly M. Daly, a senior Chemistry major, received the James Lewis Howe Award, presented annually to outstanding chemistry graduates of institutions located within the boundaries of the American Chemical Society's Virginia Blue Ridge Local Section.

Prof. Gordon T. Yee has received the 2010 Alan F. Clifford Faculty Service Award.

Dr. Maggie B. Bump has received the 2010 Viers Teaching Award. Alumnus E. Gary Cook established the award in honor of Prof. Jimmy W. Viers to recognize outstanding teaching by a departmental faculty member.

Anna Hawthorne has received the 2010 Harold M. McNair Staff Service Award. Ms. Hawthorne was recognized for her service to the Chemistry Department as Undergraduate Coordinator.

Michael Perfetti, a recent chemistry graduate (MS, 2009) has received the G. Burke Johnston Award for his outstanding contributions to instruction in organic chemistry courses, especially the sophomore SynTech (majors)

lab course.

Martha V. Blakely, a rising CHEM junior and a member of the women's tennis team, has received the 2010 Skelton Award for Academic Excellence in Athletics, given annually to the top female scholar-athlete at VT.

Discovery

The Department of Chemistry is one of the most research active departments on campus in terms of total awards and research expenditures. When placed on a per faculty basis, the Department is arguably the top research department on campus. The Department ranked 39 in the FY 2008 list of chemistry department research expenditures tabulated by the National Science Foundation, a significant jump from 54 in FY 2007. Again, when placed on a per faculty basis, the VT Chemistry Department would consistently rank in the top 10 (actually in the top 5) since most peer institutions ahead of VT have 40-60 faculty compared with 30 for Virginia Tech.

For FY 10, the Chemistry Department has obtained $10.02 million in new awards continuing a high level of awards first seen in FY 08. The FY 10 figure is fully 35% of the College of Science total for new awards. Among those awards are individual awards of note:

Edward Valeev is one of just 14 professors nationwide to receive the 2010 Camille Dreyfus Teacher-Scholar Award. This award recognizes Dr. Valeev's significant accomplishments in the development of computational methods.

Professor T. Daniel Crawford has been selected to receive the 2010 Dirac Medal for the outstanding computational chemist in the world under the age of 40. The award is given annually by the World Association of Theoretical and Computational Chemists (WATOC). Dr. Crawford was cited "for a range of outstanding advances in theoretical chemistry, including reduced-scaling coupled-cluster methods for computing optical rotation and CD spectra of large chiral molecules."

Prof. Theresa M. Reineke is one of 54 scholars nationwide to receive the 2009 NIH Director's New Innovator Award, which recognizes "investigators of exceptional creativity who propose bold and highly innovative new research approaches that have the potential to produce a major impact on broad, important problems in biomedical and behavioral research."

Prof. Timothy Long has received the Virginia Tech Alumni Award for Research Excellence for 2010. The ARE award

specifically cited fundamental advances in the design of macromolecules and their impact on emerging biomedical and membrane technologies.

Profs. James E. McGrath, Robert B. Moore, S. Richard Turner, and Thomas C. Ward have been elected Fellows of the ACS Polymer Division. The honor recognizes their contributions to the diverse research frontiers of synthetic and physical polymer chemistry, and to education within the university setting and through countless short courses spanning over thirty years.

Prof. Edward F. Valeev has received the 2010 Schug Research Award. Alumnus E. Gary Cook established the award in honor of Prof. John Schug to recognize a departmental faculty member who has demonstrated exceptional creativity and productivity in research.

Prof. Judy S. Riffle has been elected a Fellow of the ACS Polymeric Materials Science and Engineering (PMSE) division. The honor recognizes her contributions to polymer chemistry, which have led to new materials for heart transplants, arterial grafts, and contact lenses.

Professor Emeritus Harold McNair has been featured in the "Icons of Chromatography" series in LC-GC Europe, a leading trade journal for separation technology. The article recognizes Dr. McNair as one of the world's "foremost authorities on the theory and application of virtually all mainstream separation techniques."

Professors Alan R. Esker and Richard D. Gandour have received $431,000 as part of a $1,512,000 grant from NSF for Cyber-Engineering Functional Nanoparticles for Targeted Drug Delivery.

Profs. Robert B. Moore and Herve Marand have received a $510,000 grant from NSF (plus $220,000 in matching support from VT) to purchase an instrument for small-angle X-ray scattering (SAXS) and wide-angle X-ray diffraction (WAXD). These techniques enable nanoscale morphological characterization of solid materials and liquid dispersions.

Taylor Mach, a first-year chemistry graduate student, was one of six VT students selected to receive an ICTAS Doctoral Scholarship.

Engagement

The Department of Chemistry is highly engaged especially with respect to economic development activities but also with K-12 education and professional service. Examples of activities:

1. Nearly every member of the faculty visits local schools to put on chemical demonstrations to develop an interest in

science in the students.
2. Members of the polymer group in the department are very active in presenting short courses (under the auspices of the American Chemical Society) on various aspects of polymer chemistry
3. Over 40% of the department's research funding comes from industry.
4. Each Career Awardee has put in place a plan for "broader impacts" which includes educational outreach among other activities.
5. The department makes available (for a fee) its vast analytical capabilities that are of particular service to the companies in the Corporate Research Center.
6. Several faculty members are advisors to student organizations.

Diversity

Achieving diversity across the board in the Chemistry Department is a major goal. The department wishes to achieve diversity in the undergraduate population, the graduate population and faculty and staff. Multiple members of the department are very active with ADVANCE-VT.

John Morris has assumed the role of graduate recruiter and is very active in the MAOP program and recruiting a diverse graduate population is a major thrust of those programs.

Joseph S. Merola served on the Virginia Tech/NC Alliance for Minority Participation Advisory Board as well as the overall Virginia/NC Alliance for Minority Participation Advisory Board. He is also very active in Advance-VT.

Judy Riffle was recently awarded the College of Science Diversity Award for 2010.

Diego Troya is active on the Hispanic Caucus as well as Advance-VT.

Webster Santos is advisor to the Filipino American Student Association

Goals for 2010-11

Goals for 2010-2011.

The department will undergo a change of leadership in the Fall of 2010 with James Tanko assuming the role of department chair. The goals for the upcoming year can be summarized as:

1. Continue the excellent research activity for which the department is known. Work to expand those activities via strategic partnerships and alliances.
2. Design and construction of Davidson Hall project will continue to be a large effort in 2010-2011. The final design has been approved by the Board of Visitors and is awaiting funding by the state. A particular challenge to maintaining the excellence of the department in all of its dimensions will be the actual demolition and construction period of Davidson Hall. During that time, swing space in the Corporate Research Center will be used for research while the surge building will house departmental offices.
3. Recruit a faculty member who will add to our energy thrust and also add to the faculty diversity.
4. Expand the number of students engaged in undergraduate research.
5. Expand undergraduate and graduate student recruiting efforts with a special eye toward improving diversity.
6. Develop a more robust assessment program at all levels: faculty, staff, graduate student, undergraduate student.
7. Develop a new Department of Chemistry strategic plan ensuring that it aligns with the College of Science and University Plans.