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Annual Report Executive Summary, 2007-08

Department of Chemistry

Attainment of Goals for 2007-08

The goals established for this past year were met either fully or partially.

1. The primary goal of attracting outstanding female scientists for our biomaterials program was met with the hiring of Theresa Reineke as Associate Professor. Theresa brings considerable funding with her.
2. With the help of the Provost's office as well as funds generated by royalties on laboratory notebooks, the department was able to meet the high demand for course delivery placed on the department (and achieving excellent student evaluations in the process.)
3. The department was extremely successful in attracting sponsored awards receiving a record of \$10.9 million in sponsored grants.
4. Judy Riffle shepherded a large MRSEC proposal which has had a reverse site visit and is in good standing to receive funding.
5. The number of undergraduates participating in undergraduate research via both summer undergraduate research programs (SURPS) as well as undergraduate research during the academic year also increased.

Learning: Undergraduate

The Virginia Tech Department of Chemistry provides a quality educational experience to our undergraduates while carrying one of the highest WSCH/faculty loads in the university. For Fall of 2007, the chemistry department had a weighted student credit hour to faculty ratio of 596 and a student credit hour to faculty ratio of 506. This latter value is TWICE the university average. Even with that disproportionate teaching load, Chemistry faculty have earned an overall average student evaluation of 3.58 (out of 4.0). Interest in chemistry as a major has increased greatly over the last three years : Fall 2005, 192; Fall 2006, 225; Fall 2008, 257. We provide a solid foundation in chemistry connected to current world problems both to science and non-science majors. Undergraduate research both for credit and for summer experiences is fostered by the department and increased markedly in 2007-2008. The chemistry majors are provided with a well-rounded experience that includes research experiences and the honing of both written and oral communication skills. The department supports student scholarships both through its foundation accounts and through education components of sponsored programs. The latest technology is woven into the undergraduate learning experience with several faculty carrying out pioneering work in the incorporation of technology into the curriculum.

Learning: Graduate

Chemistry awards both M.S. and Ph.D. degrees with the emphasis on the Ph.D. degree. A total of 127 graduate students were enrolled in the chemistry graduate program in 2007-2008, up from 2006-2007. There was also participation by additional students from the MACRO interdisciplinary degree program. During the academic year, due to the need for support for the department's

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undergraduate teaching load, most of those students (72) are funded as GTAs. During the summer, the numbers are reversed with 82 of the total being funded on GRAs. IGERT grants and other innovative approaches to graduate education provide chemistry graduate students with a high-quality graduate experience that prepares them well for academic, industrial or independent careers.

Discovery

The chemistry department leads the College of Science in sponsored awards while having one of the highest WSCH/faculty loads in the university. In NSF rankings, the department consistently ranks between #30 and #40, with a 2003 ranking of 28. The 2005 ranking (the latest available) is 38. The department had a proposal funding success rate in 2006 of 64% for total awards of \$7,262,138. For 2007-2008, the department had a phenomenal increase in proposal funding for total awards of \$10.9 M. There are two major discovery thrusts: energy sufficiency and biomedical materials. International collaborations abound with faculty working directly with scientists on just about every continent (no one in Antarctica, yet). The department is highly prolific in publications in refereed journals, in presentations at national or international meetings and is highly cited. In recognition of their contributions in various areas of chemistry, Professors David Kingston and James McGrath received major awards from the American Chemical Society. Professor Theresa Reineke and Professor Bob Moore were added to the department and each adds to one of the thrust areas mentioned above – Professor Reineke for biomaterials and Professor Moore for energy (specifically fuel cells.)

Engagement

The chemistry department is highly engaged and is very active in transferring knowledge to the private and public sector. A majority of chemistry faculty are involved in some form of outreach to K-12 via demonstrations and programs to elicit excitement for science in young minds. There are also several formal programs funded by various agencies to help in K-12 outreach. The chemistry department has had 7 new faculty win NSF Career awards which all have significant components for K-12 outreach. Engagement with various corporations is a major part of chemistry's engagement and takes many forms. Many faculty have active consulting arrangements with various companies while a significant portion of sponsored research comes from private corporations.

Diversity

Intense recruiting efforts were made in 2007-2008 to increase the gender diversity in the chemistry department. The chemistry department was successful in attracting Theresa Reineke from the University of Cincinnati to Virginia Tech. The department will continue and step up efforts to attain better diversity balance in the faculty and student areas. Faculty are actively participating in programs such as Advance, STEP, MAOP, and other activities to improve the multi-cultural climate on campus and within the department. The department chair is on the advisory board of VT-AMP. A staff member in chemistry, Ms. Claudia Brodtkin is active in organizations to address gender and Hispanic issues. She started a chapter of American Association of University Women at Virginia Tech. She won the College of Science diversity award.

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Goals for 2008-09

1. Continue high-level efforts achieve greater diversity in the various faculty and student populations in the department.
2. Continue to support excellence in undergraduate and graduate education while continuing our steep upward trajectory in research awards. This depends on continued support from the Provost's office that will allow chemistry to staff lectures and laboratories at the necessary level.
3. Planning for the Davidson Hall renovation will be a high priority – both for efforts directed toward new building design as well as in accommodating current Davidson occupants while the renovation is being carried out.
4. Increase fund raising efforts from private donors that will allow chemistry to increase its scholarship support and to obtain resources to reward faculty with recognitions such as endowed professorships.

I. Student Information

Student Credit Hours: 19342

Weighted Student Credit Hours: 22655

SCH/faculty: 509

WSCH/faculty: 596

Chemistry majors (F 2007) : 257

Undergraduate researchers: F 2007 – 29

S 2008 - 39

II. Sponsored Awards

FY 08 – \$10.9 M (\$3 M above previous high)

56 active grants in FY 08

Exemplary grants: T. Long MURI grant (\$5M over 5 years.)

K. Brewer – Prosper Corp Grant for Hydrogen production (\$2M over 2 Years)

III. Scholarship

147 papers published in high impact refereed journals

200+ presentations at universities and scientific meetings

45 patents and patent applications

Focus areas in chemistry department scholarship:

- A. Energy research – Jim McGrath, Bob Moore, and Lou Madsen are working on various aspects of fuel cell technology which has great promise for becoming commercialized. Karen Brewer is working on Hydrogen production using sunlight and water. Some of her work has been licensed to companies for development.
- B. Drug Discovery – Paul Carlier in conjunction with a group from entomology has made tremendous progress in developing safe anti-mosquito compounds.
- C. Nanotechnology – Harry Dorn and Harry Gibson are developing a new series of materials based on “Buckyball” technology that have already

demonstrated great promise for MRI imaging and for therapeutic applications. Karen Brewer along with Brenda Winkel have developed a series of supramolecular complexes that have demonstrated anti-cancer applications.

- D. Polymeric materials – the department has a long-standing reputation for excellence in polymeric materials. The addition of Bob Moore and Theresa Reineke to the faculty adds tremendously to the department's capabilities. Judy Riffle has marshaled an impressive team for a proposal for a Materials Research Science and Engineering Center (MRSEC) which has made the final round of competition.
- E. Computational Chemistry – Virginia Tech now has a very strong team of computational chemists in Daniel Crawford, Diego Troya and Edward Valeev.

Honors and Awards:

David Kingston:

Potier Medal awarded by the Institut de Chimie des Substances Naturelles (ICSN), Gif-sur-Yvette, France, June 2007.

Ernest Guenther Award in the Chemistry of Natural Products, American Chemical Society (announced in 2007; award to be made in April 2008). (Copy of the announcement in Chemical and Engineering News in the Appendix)

Two articles by Kingston et al. are included in the list of the twenty most-cited articles published in the Journal of Natural Products from 1996-2007.

#8. E. Baloglu and D. G. I. Kingston “The Taxane Diterpenoids” *J. Nat. Prod.* **1999**, *62*, 1448-1472.

#20. D. G. I. Kingston. “Recent Advances in the Chemistry of Taxol.” *J. Nat. Prod.* **2000**, *63*, 726-734.
(Complete list in the Appendix)

The tree *Taxus kingstonii* (the “Kingston yew”) was named for me by botanist Richard Spjut. (The article by Dr. Spjut assigning the name and a report in the Collegiate Times are in the Appendix).

The poster “Biodiversity Conservation and Drug Discovery: Can they be Combined? The Suriname and Madagascar Experiences” by D. G. I. Kingston, S. Cao, Y. P. Hou, and B. T. Murphy Deans’ received a “First Place Faculty Award” in the Deans’ Forum on the Environment, February 2007.

Jim McGrath:

American Chemical Society Award for Excellence in Polymer Chemistry.

Paul Carlier:

Appointed as Adjunct Professor of Chemistry at the Hong Kong University of Science and Technology (9/2007).

Daniel Crawford :

Certificate of Teaching Excellence, 2007.

Paul Deck:

The 2007 Alan F. Clifford Faculty Service Award in the Chemistry Department.

Harry Dorn:

John Schug Research Award, Department of Chemistry, Blacksburg, VA, May, 2007.

Alan Esker supervised student awards:

Ufuk Karabiyik was a recipient of a \$10,000 2007-2008 Eastman Fellowship.

Jonathan Conyers was a recipient of an \$8500 Virginia Space Grant Consortium Aerospace Undergraduate Research Scholarship for the 2007-2008 Academic Year to carry out research on Polyhedral Oligomeric Silsesquioxanes as Adhesives in Aerospace Applications.

Suolong Ni was awarded a Sigma Xi Ph.D. Research Award, 2007.

Bingbing Li was awarded a Sigma Xi Ph.D. Research Award, 2007.

Sarah M. Huffer was a recipient of a pre-doctoral NSF Graduate Research Fellowship, 2007.

Bingbing Li was a finalist for the American Physical Society Frank J. Padden Award, 2007.

Rich Gandour:

Editorial Board for *Medicinal Chemistry* (2004–

Harry Gibson:

Appointed Guest Professor of Chemistry, Zhejiang University, Hangzhou, China.

Editorial Boards (2):

1. *Macromolecular Chemistry and Physics*, a Wiley-VCH journal.
2. *Macromolecular Chemistry, Rapid Communications*, a Wiley-VCH journal.

Herve Marand:

Received the **Jimmy Viers Teaching Award** from the Chemistry Dept. for 2007
Editorial Board of European Polymer Journal and Journal of Polymer Science,
Polymer Physics Editions.

Jim Tanko:

Chair, 2007 Gordon Research Conference on Radicals and Radical Ions in Chemistry
and Biology

Featured Speaker at the Inaugural Rohm & Haas Chemistry Seminar at the University
of Maryland, Baltimore County, Sept 25 2007.

Tim Long:

- *Chair-elect*, 2009 Polymers (East) Gordon Research Conference (2005)
- *IRTF Interdisciplinary Research Team Fellowship Award*, with Profs. Duncan and
Thatcher
- *Collano Innovation Award*, Lucerne, Switzerland - September 2006

Student Awards and Honors – Sharlene Williams

- Chemistry Department Outstanding Doctoral Student 2008
- Chevron-Phillips Chemical Professional Excellence Travel Award 2008
- ACS Division of Polymer Chemistry Graduate Student Travel Award 2007
- Interned at Virginia-Maryland Regional College of Veterinary Medicine June-
September 2007

Student Awards and Honors – Andrew Duncan

- **Graduate Internship**, *Weapons and Materials Research Directorate* –
Multifunctional Materials Branch, U.S. Army Research Laboratory – Aberdeen
Proving Ground, Aberdeen, Maryland April 2007 – June 2007

Student Awards and Honors – Emily Anderson

- **Kodak Internship** – Rochester, NY May – August 2008
Emily worked with Dr. Doug Robello and synthesized novel branched and
crosslinked polymers for organic thin film transistors.

Diego Troya:

- Award Title: Cottrell Scholar Award: Making progress toward the theoretical
description of the dynamics of gas-organic surface chemical reactions
Source of Support: Research Corporation
Total Award amount: \$100,000
Period covered: 06/01/2007-05/31/2012

Richard Turner:

***Will receive the Industrial Polymer Scientist Award for Outstanding Industrial Innovations in August 2008—presented by the ACS Division of Polymer Chemistry.**

Edward Valeev:

2007 Wiley International Journal of Quantum Chemistry Young Investigator Award