

Strategic Plan for the College of Science, 2006-2012

May 4, 2006

Vision and Mission

The **vision** for the College of Science is to become—

- ***A world leader*** of learning, discovery, and engagement within strategically targeted areas of science, thereby attracting world-class scholars and students, and developing a reputation in government, industry and the public as the best place to seek solutions to scientific challenges;
- ***An interdisciplinary community of scholars*** that reaches beyond traditional thinking to solve complex problems at the frontiers of knowledge, using fundamental and applied approaches;
- ***A socially and cultural diverse environment*** that recognizes science's place within a social context, and positions the college's scholars to take advantage of a future marked by rapid advances in technology and globalization.

The **mission** for the college is to—

- *Conduct scientific research on the causes of natural and social phenomena that underlie problems and issues important to the people of the state, nation and world;*
- *Provide innovative education and training that will prepare the future leaders of scientific research and education, for a society marked by rapid changes in technology, globalization, and increasing demands on the world's resources;*
- *Bring scientific discovery to the workplace and home through outreach programs targeted toward national and international industry.*

Strategic Initiatives

A set of integrative initiatives has been identified and launched for achieving world-class excellence in discovery: nanoscale science applied to materials and biological systems, computational science, infectious diseases, and developmental science across the lifespan. These initiatives necessarily involve participation and input from all departments within the college, creating an interdisciplinary research environment that will be unique among top-tier research universities. In order to achieve this goal, the College of Science will solicit, support and lead strategies that foster these initiatives, whether it is through existing institutes within the university such as ICTAS and IBPHS or whether it is in the creation of new structures such as a School of Nanoscience and Engineering. The college plans to participate actively in the new institute forming to promote scholarship in Social and Individual Transformation. Our benchmarking exercise indicated that the college's departments are considerably smaller than peer and top-tier departments. In order to pursue academic and research excellence in these and newly emerging areas, the college plans to increase faculty FTEs from ~200 (current) to ~325 by 2012.

Learning: Undergraduate Education

Research is the most important component of the culture within the College of Science. Integrating our undergraduates into this culture, by exposing them to state-of-the art research, is a way that we can make COS a special experience for undergraduates. The college will continue delivering undergraduate programs of high quality, but with increasing emphasis on research and preparation for graduate and professional education through both undergraduate research and capstone courses. The college is also planning new academic programs including:

1. new interdisciplinary options or minors within or across existing majors (e.g., biophysics, forensic science and actuarial science with new tracks in nanoscience and computational science);
2. opportunities in Intellectual Properties Law, offered jointly with the University of Richmond;
3. programs to combat the shortage in secondary math and science teachers.

To meet its high expectations, the college faces several key challenges, including: a) high student-to-faculty ratios and teaching loads relative to peer universities; b) a major university-level responsibility for delivering lower division courses; and c) open,

and therefore potentially increasing, enrollments in all college majors. To address these challenges, the college is planning to—

- Develop a faculty of teaching scholars within and across departments, specializing on delivery of innovative, new lower division (freshman and sophomore) courses and teaching strategies;
- Streamline our undergraduate options by eliminating "out of date" options;
- Develop training programs for advisors and faculty focused on promoting success for our undergraduate students by a) enhancing advising and teaching, and b) fostering a welcoming campus climate for students from underrepresented groups.

Learning: Graduate Education

The College of Science plans to expand graduate enrollments, with an annual growth rate of at least 6%; enhance the quality of existing programs; and enhance recruitment of top quality student prospects. These goals will be achieved by—

- Increasing the quality and reputation of research programs, achieved in part by focusing research on strategic integrative areas through cluster hiring and in part by themes developed within departments;
- Increasing departmental "research days" and other such events that emphasize quality of graduate programs, enhance interdisciplinary thinking, and recruit the best students;
- Increasingly lead, and participate in, interdisciplinary and cross-college graduate programs and recruitment efforts (e.g., the two current NSF IGERT programs within the college);
- Build on current successes in corporate sponsorships and internships for graduate programs; and plan for some graduate students to complete parts of their training at off-campus sites such as Oak Ridge National Laboratories, Georgetown University (including the Lombardi Cancer Center), the Howard Hughes Medical Institute, and USGS;
- Use a Northern Virginia Campus to accommodate some of the off-campus training opportunities mentioned above, as well as develop a potential initiative on Public Science Policy in partnership with the T. C. Williams School of Law at the University of Richmond;
- Conduct internal/external program reviews of all departmental graduate programs;
- Increasingly involve graduate students with undergraduate education through GTA appointments, the Graduate School's Transformative Graduate Education Program, and supervision of undergraduate research.

Discovery

The college will enhance its world-class reputation by building capacity in strategic areas of research, resulting in enhanced levels of scholarly output and funding. This will be accomplished by developing:

1. new mechanisms for choosing research focus areas;
2. new faculty hiring strategies;
3. new avenues to gain resources.

New Mechanisms for Choosing Focus Areas:

The college has established strategic initiatives in *Innovative Technologies & Complex Systems* (nanoscale science, computational science), *Health, Food, & Nutrition* (infectious disease, developmental science). The college has substantial existing strengths in *Energy, Materials, and Environment* and *Social & Individual Transformation*. To select and develop new research thrust areas that complement the college's current initiatives and faculty expertise, the college will rely on advice from faculty and alumni, and from the college's nascent Institute for Advanced Study, a special faculty think tank.

New Faculty Hiring Strategies:

Cluster hiring within and across colleges has been the main method for developing strength in chosen research thrust areas. Future cluster areas that will take advantage of emerging opportunities for science leadership (e.g., energy and environmental science), are being planned today by administrative and faculty leaders, including a newly-created faculty cluster committee. In the future, the college will continue cluster hiring at around 50% of all faculty hires (with departments directing hiring to fill key research areas with the remaining 50%). Cluster hiring in recent years has been correlated with increased diversity (particularly in gender) among new faculty hires.

Strategies for Increasing Resources to Support Research:

- ▶ Develop large, multi-million dollar extramural research grants. The Institute for Advanced Study will be one mechanism to foster preparation of proposals of such magnitude in collaboration with ICTAS and IBPHS. In addition, the college will participate in building grant writing support teams within its staff, and departments will seek ways to provide release time for faculty willing to lead large proposals.
- ▶ Develop strategic partnerships with industry, other private groups, and government. Already, the nano-bio emphasis is beginning to foster corporate partnerships that will increase private contributions to the college. Likewise, the IP law initiative is anticipated to lead to more private giving and opportunities for partnerships with companies for science policy initiatives. Clusters that would draw upon collaborations with Oak Ridge, Georgetown University (and the Lombardi Cancer Institute), the University of Richmond Law School, TIGR, Hughes Institute, and USGS will be investigated.

- ▶ Increase research space, which has become one of the most limiting factors for ongoing research, and will grow in importance as the scope of research increases. To this end, research space has been proposed and is now part of the University's six-year capital projects.
- ▶ Increase faculty size by ~125 within the next six to seven years to reach a competitive level with our peers with similar ambitions. Without a substantial increase in the number of faculty, the college's proposals for research, teaching, and outreach will not be possible. This timetable is aggressive, but by the college's analysis, it is doable, and consistent with the strategic plans laid out so far. The final scope and make-up of the college are not at all unreasonable, and indeed are essential to the task we have set for ourselves, as we play our role in elevating Virginia Tech to the lofty goal it aspires to reach.

Engagement

The college intends to enhance and focus its outreach efforts, and strengthen its international programs in education and research. Specific plans are to:

- Expand the benefits of discovery world wide by enhancing applied aspects of research and technology and international aspects of training within the college.
- Expand on existing international outreach programs in South Africa, Dominican Republic, Peru, Switzerland, Korea, and elsewhere.
- Become a partner with other efforts at Virginia Tech to strengthen K-12 education in Science, Technology, Engineering and Math fields. This may be enhanced by involving the new cadre of teaching scholars planned for undergraduate programs, and by acquiring supplementary funding from agencies such as the NSF to support research experiences for teachers.
- In conjunction with our research mission, develop strategic partnerships with industry, other private groups, and government that promote economic vitality.
- Organize "research showcases" in appropriate locations that highlight and inform industries, funding agencies, and private foundations about the capabilities and advances made by researchers within the college.
- Offer a rich array of continuing education and study-abroad courses while identifying new areas where courses are needed; investigate and implement distributed learning opportunities.
- Develop programs that reach out to our local community and enhance the region of SW Virginia, such as the psychology clinical program and the seismic observatory.
- Invite and sponsor lectures that attract and engage the general public about science issues in the 21st Century.