Mission

The mission of the Virginia Tech College of Science is to provide an internationally recognized environment for a synergistic complement of disciplinary and interdisciplinary training, coupled with a culture of intellectual entrepreneurship for learning through research discovery. This mission supports excellence in recruitment, training, and retention of the brightest scientists at all stages of their careers, from within the Commonwealth, United States, and throughout the world. The mission comprises three core components: (i) to conduct fundamental scientific research on the origins of natural and social phenomena that translate into technologies that address the grand challenges of the state, nation, and world; (ii) to provide innovative education and training with learning outcomes that prepare our future scientific leaders for careers in industry, academia, and national laboratories within a society who must readily adapt to rapid changes in technology, globalization, and increasing demands on the world’s resources; and (iii) to bring scientific discovery and curiosity to the community through collaborative programs and effective transdisciplinary communication targeted toward increasing scientific literacy and connecting varied communities for the advancement of scientific education and appreciation.

Introduction

The College of Science recognizes science’s place within a social context, and positions the college’s students and scholars to take advantage of a future marked by rapid advances in technology and globalization. Seminal scientific research is conducted on the causes of natural and social phenomena that underlie problems and issues important to the people of the state, nation and world. Innovative education and training methods prepare the future leaders of scientific research and education, for a society marked by swift changes, and increasing demands on the world’s resources. Scientific discovery is brought to the workplace and home through applications flowing from breakthrough discoveries, and outreach programs targeted toward national and international partners. The College and University, however, face a great challenge, as graphically illustrated in the National Academies’ report Rising Above the Gathering Storm Revisited: Rapidly Approaching Category 5. The United States is rapidly losing ground as an international leader in science and technology and has lost its edge in innovation and competitiveness. The knowledge capital is expanding at an exponential rate in all directions. In contrast, the make-up of human capital is staying constant. The landscape of higher education—the growing variety of higher education institutions, the cultural environment, the competitive ecosystem—is changing quickly, and in some instances, disruptively. Our challenge is to organize the
knowledge capital, to train the next generation and develop the ecosystem and environment to cultivate effective expansion.

The College of Science was formed in 2003 to promote and unite the sciences at Virginia Tech. Since then, the College has fostered the development of interdisciplinary research, education and outreach programs. Now the College of Science has reached the maturity to align the research, educational and outreach missions of the College and the University in such a way to ensure a critical continuum from undergraduates as practitioners of scientific discovery, to graduate students as collaborators across disciplines, and to postgraduates with the ability to transcend fields. Faculty in the College of Science are key to accomplishing this change in culture by applying the same mindsets that drive their research successes to transform the education of undergraduates into one that is founded on evidence-based practices fostering creativity. Faculty members are strategically aligned with the thrusts of the investment institutes to ensure the integration of education in the classroom with discovery and engagement.

**Goal**

It is within the context described above that the College of Science strives to make Virginia Tech “the most attractive setting in which to study and perform research so that we can develop, recruit, train and retain the best and brightest scientists, at all stages of their careers, from within the United States and throughout the world.”

Specifically, the College of Science will aim at being:

- **A world leader** of discovery and education 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 College of Science is addressing the challenges outlined above by establishing leadership in the integrative and interdisciplinary education of our students and the advancement of cutting edge research themes. Tactical underpinnings to achieve this goal include:

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1 Paraphrased from “Rising Above the Gathering Storm,” National Academy of Sciences.
• Conducting scientific research at the highest level and foster interdisciplinary approaches that integrate scientific research with the causes of natural and social phenomena that underlie problems and issues important to the people of the state, nation and world;
• Providing 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;
• Bringing scientific discovery to the workplace and community, both here and abroad, through novel outreach programs that are integrated with research and teaching, that promote national and international partnerships, and that enhance and expand corporate and industrial sponsorships.

These underpinnings serve the strategies outlined below. The College of Science will address the challenges facing the United States in the key areas of knowledge capital, human capital and creative ecosystems that will position Virginia Tech as an international leader in science and technology.

**Research and Innovation**

"Interdisciplinary research is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice."

Today’s complex societal problems demand collaboration among faculty members in which they seamlessly interact in forms of research, teaching and engagement that also necessitate interaction with various communities and at different scales. While there will always be space and demand for traditional bench and laboratory inquiry in individual disciplines, many problems today require the development of an interdisciplinary team of researchers from these established disciplines to address them.

**Strategy 1: Recruit Top Faculty in Strategic Areas through Cluster Hiring**

Cluster hiring was implemented by the College of Science in 2004 to attract the best scholars, to promote diversity and to drive the development of interdisciplinary research teams. The initial hires in the College focused on four cluster areas: *nanoscience, computational science, infectious diseases* and *human development across the lifespan*. The selection of the cluster themes was based on criteria that ensure an inclusive paradigm, where research excellence in the

\[2\] *Ibid.*
interdisciplinary theme would have significant impact beyond the College of Science. Indeed, the initial cluster in nanoscience had College of Engineering participation and human development across the lifespan involved participation from the College of Liberal Arts and Human Sciences. These four themes are evident as overarching to many of the subsequent themes that have emerged. In addition, all clusters in the College of Science align strongly with Virginia Tech’s strategic plan. Nanoscience and computational science are critical components of the University’s discovery domain of Innovative Technologies and Complex Systems while infectious diseases and human development across the lifespan provide critical components within the discovery domain of Health, Food and Nutrition as well as Social and Individual Transformation. In 2006, the college expanded cluster hiring based on proposals from faculty to include visualization and pattern recognition and data analytics (VPR-DA) which aligns with Innovative Technologies and Complex Systems, and integrated studies of earth systems (ISES) which aligns with Energy, Materials and Environment. The Virginia Tech Carilion Research Institute (VTCRI) accelerated growth in the emerging cluster of neuroscience which aligns with Health, Food and Nutrition. These areas build on strengths within the College of Science and help sustain a critical mass from which to establish collaborations with other colleges and institutes within the University.\(^3\) Growing faculty in these areas complement existing programs in biological sciences, chemistry, geosciences, economics, mathematics, psychology, physics, and statistics and will forge strong interactions with programs residing at the National Capital Region. The selection of research thrusts is also consistent with an emerging faculty of health sciences which truly transcends disciplinary boundaries to ensure success. The common thread through all areas is computation. This is the bond that binds research in all disciplines, not only as a tool but also in the way critical thinking will evolve. It is an approach for which the College intends to be a strong champion.

**Strategy 2: Foster and Build Teams of Interdisciplinary Researchers**

One goal of cluster hiring is to nurture teams of researchers and position them to compete for large-scale proposals, which is essential for adjusting to the ever-changing landscape of federal and private funding. The trend toward multiple-award contracting is escalating with more emphasis placed on larger collaborative proposals within government agencies. Multiple award contracts are becoming so prevalent that it is almost a prerequisite to have one or more for partnership with the federal government. Thus, cluster hiring in strategic areas will help position faculty in the College of Science and the University to adapt to this changing landscape.

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\(^3\) The College of Science has collaborative programs with Fralin Life Sciences Institute, Institute for Creativity, Arts & Technology (ICAT), Institute for Critical Technologies and Applied Science (ICTAS), Institute for Society, Culture and Environment (ISCE), Interdisciplinary Center for Applied Mathematics (ICAM), Macromolecular and Interfaces Institute (MII), Virginia Bioinformatics Institute (VBI), Virginia Tech Carilion Research Institute (VTCRI), and the Virginia Tech Transportation Institute (VTTI).
The research investment institutes will play a critical role in attaining and sustaining large-scale proposals.

Cluster hires will be nurtured by implementing an orchestrated mentoring plan, one that ensures more efficient and successful entry into interdisciplinary proposal competitions. These mentoring plans will become part of the mentoring program for newly appointed tenure-track assistant professors initiated by the Office of the Senior Vice President and Provost in 2012. We envisage that there will be a process of interaction that permits would-be collaborators sufficient time and space to develop the relationships and shared understanding to permit them to work collaboratively toward common aims. The College of Science’s Institute for Advanced Study will provide a venue to bring teams together. The collaborators will develop a sense of expectations and self-awareness of potential impediments as their work as a team proceeds. Incentives will be provided to remove impediments to cross-boundary cooperation such as “on campus” sabbaticals. One model of the success of this method is our Integrated Science Curriculum at the undergraduate level in which faculty have formulated initiatives that provide a continuum of higher education with a basis on interdisciplinary discovery.

As part of the College of Science’s expanding presence in emerging interdisciplinary programs and degrees in the cluster areas nanoscience, neuroscience, systems biology, and computational science, the College is seeking new faculty who signify a commitment to the importance of interdisciplinary science to help solve major societal challenges in energy, the environment, and health. New faculty associated with these interdisciplinary programs will form an Integrated Science Faculty (ISF) who will participate in the College of Science’s recently launched Integrated Science Curriculum and interdisciplinary courses, which collectively serve to build strong research and educational partnerships across the sciences. The continuity represented by the passage from the initial cluster areas to the new degree programs exemplifies the College’s vision, and consistency of purpose.

**Strategy 3: Leverage Partnerships with Research Institutes and National Laboratories**

The College seeks to build upon its partnerships with the University research institutes to enhance our efforts to become a top tier research and education institution with global impact. The Associate Dean for Research and International Outreach will investigate key areas for advancement of research and how to utilize its presence in the National Capital Region (NCR) to promote large-scale research initiatives. The College will establish partnerships with national laboratories (ORNL, NETL, PNNL, LANL and others) and other higher education institutions and form collaborative research programs. This will (i) make the College of Science more competitive for acquiring large-scale grants; (ii) broaden research areas; (iii) increase access to research facilities; (iv) enhance training opportunities for graduate students; and (v) distribute cost among institutions.
Learning

The College of Science leads the development and implementation of novel pedagogical approaches that promote and enhance interdisciplinary undergraduate and graduate education.

Strategy 1: Grow the Integrated Science Curriculum and Interdisciplinary Undergraduate Programs

The College of Science has designed an Integrated Science Curriculum: a transformative approach to undergraduate education in science that establishes the foundation of the undergraduate science experience that spans the first two years of higher education learning. Students will then matriculate to undergraduate degree programs in interdisciplinary areas of science. Virginia Tech has particular expertise among four new proposed degree programs—systems biology, computational science, nanoscience, and neuroscience. All programs will require a substantial engagement with computational thinking and undergraduate research, giving students full advantage of attending a Research I university. With an innovative foundational curriculum that supports integrating disciplines, Virginia Tech will provide international leadership in STEM education ensuring an important first step toward meeting the challenge described in the Gathering Storm: Category 5. Rather than experiencing foundational subjects for a science program as segregated canons (e.g., biology, chemistry, math and physics), undergraduates will enroll in an eight-credit course each semester for the first four semesters where students will learn to solve complex real-world problems that require application of multiple subject knowledge areas. The pedagogy for this course will incorporate student-centered, active-learning models such as the SCALE-UP classes that are currently taught in the College of Science. The Integrated Science Curriculum will emphasize learning outcomes in computation and high performance computing, and statistics, which are not part of many of our current programs but have become critical for almost all areas of science. It is the intention that within five years, a good fraction of students will enter the College through this portal. The Integrated Science Curriculum will serve as the main gateway for four new undergraduate degree programs:

- **Systems Biology** – Systems Biology is becoming one of the hottest areas of life science research, as witnessed by the growing number of graduate programs in systems biology at major universities, of new research institutes in systems biology being established worldwide, of new funding opportunities at NIH, NSF, DOE and private foundations, and of employment opportunities for systems biologists at biotech startups and big pharma. Nonetheless, a Google search reveals only a single undergraduate degree program anywhere in the world (UCLA). This gap will soon be filled by colleges and universities that aspire to lead the nation in educating the next generation of systems-thinking life scientists. VT has the expertise on campus to be a strong contender in this arena, if we move quickly.
• **Nanoscience** – Understanding phenomena at the nanometer scale has catalyzed emerging technologies in our society, ranging from biomedical imaging to water desalination. Fundamental advances in this field demand an understanding at the molecular level and self-assembly processes that generate novel structure and morphology. Industrial leaders require future scientists with this interdisciplinary understanding, and future entrepreneurs will benefit from a molecule-to-device perspective. This integrated perspective is achieved only when chemistry, physics, biology, and mathematics uniquely come together to explain phenomena at the nanoscale. Nanoscale technologies will also require a critical assessment of the societal and environmental implications, and correlation of public perception with science is paramount to ensure success.

• **Neuroscience** – While undergraduate neuroscience programs has existed for some time (e.g., Johns Hopkins and Virginia), unmet demand persists. Among the prospective students who visit the COS information sessions, neuroscience is the most frequently requested degree program that we do not offer. Neuroscience is an emerging research cluster at VT bolstered by outstanding faculty at VTCRI led by Dr. Michael Friedlander and the team led by Dr. Seong Ki Mun at the National Capital Region. The integrated approach advocated in Science sets this program apart from others in the country.

• **Computational Science** – As the third pillar of scientific discovery, computational science complements theory and experiment by finding meaningful patterns in massive data sets and by simulating complex phenomena ill-suited to physical experimentation. Data analytics skills and computational thinking are essential at posing the critical questions in all areas of research. Large corporations to government research laboratories to start-up companies rely on computational science for everything from the management of industrial processes, to drug development, to the next innovation in the knowledge economy. Computational science students will learn fundamental programming, and mathematical and statistical principles through solving problems from different disciplines and applications. In coursework, research experiences, and internships, students will experience computational science in the collaborative, problem-driven settings characteristic of the organizations working today to shape the future.

The Integrated Science Curriculum and four new degree programs at the undergraduate level will provide the basis for **graduate programs** and degrees in these areas. There will therefore be a **continuum of learning** from the undergraduate level to the graduate level to postgraduate training. A five-year B.S./M.S. will become part of these programs. A six-year B.S. to Ph.D. will become possible in select programs. Internships and/or international experiences will comprise a component of these programs.
Strategy 2: Grow Interdisciplinary Graduate Programs

The College of Science is a leader in developing interdisciplinary graduate education programs. Indeed, the College has hosted multiple prestigious NSF Integrative Graduate Education and Research Traineeship (IGERT) programs during the past decade. Such programs transcend traditional departmental boundaries and allow students enrolled in a program to study with faculty from many departments and colleges. The pipeline for new interdisciplinary graduate degrees will be explored through the newly established Interdisciplinary Graduate Education Program (IGEP). The College intends to build upon the success of these efforts:

- Judy Riffle (Chemistry) is director of the Macromolecular Science and Engineering graduate degree (MACR) which is a university-based degree program spanning multiple departments and colleges to emphasize fundamental and emerging technological areas in the field of macromolecular science and engineering. MACR was awarded support under the new Interdisciplinary Graduate Education Program (IGEP) in 2011.
- Faculty from Biological Sciences are key members of the interdisciplinary Ph.D. program in Genetics, Bioinformatics, and Computational Biology (GBCB). This exciting program of study encompasses applications of molecular biology, genomics, mathematics, statistics and computer science to all areas of the life sciences. GBCB was also awarded support under the new Interdisciplinary Graduate Education Program (IGEP) in 2011.
- The IGERT “Multi-Scale Transport in Environmental and Physiological Systems” (multiSTEPS) was approved for funding in 2010. Jeffrey Kuhn (Biological Sciences) is a co-PI on this proposal and Brenda Winkel, Jianhua Xing and Zhaomin Yang (all of Biological Sciences) are participants. MultiSTEPS was also awarded support under the new Interdisciplinary Graduate Education Program (IGEP) in 2011.
- Dorothea Tholl and Brenda Winkel (both in Biological Sciences) are participants in the Translational Plant Science (TPS) IGEP and Michael Hochella (Geosciences) is a leader in the Sustainable Nanotechnology (SuN) IGEP, both awarded in 2012.

Strategy 3: Create Pathways to Success

There are clearly multiple pathways to success. The College has explored some, and will build upon these to create others, always around the theme of integration. The College has embraced the Quality Enhancement Plan (QEP) devised as part of VT’s reaffirmation of accreditation through SACS. The QEP, called Pathways to Success, is a plan to provide a first-year experience (FYE) for every incoming student at Virginia Tech. An FYE meets learning outcomes in problem solving, inquiry, and integration, essential for every undergraduate and certainly tailor-made for a student in the College of Science. Since the Pathways program began, four FYEs have been funded in the College of Science: a Life Sciences program led by Biological Sciences and new
programs starting in Fall 2012 for incoming freshmen in the Departments of Psychology and Physics.

The College of Science has also made a substantial commitment to supporting the success of community college transfer students. All incoming transfer students are enrolled in a first-year experience called Zip-line to Success. The program emphasizes the learning outcomes of problem solving, information literacy, integration, teamwork and community. The small and full-scale versions of this program have resulted in measurable academic success, halving the number of transfer students who go on academic probation and increasing their engagement with leadership and research opportunities.

The Colleges of Science and Engineering have forged new partnerships in cross-disciplinary training for undergraduates. These include the Scieneering program funded by the Howard Hughes Medical Institute and a new project funded by the NSF to create a STEM residential community. The College of Science has initiated a unique minor in Science and Law. This minor will train students in intellectual property law, ethics, and lay the foundation for public science policy.

**Engagement**

The College of Science will advance the land-grant ideals of putting science, technology and human creativity to work by leveraging its people, infrastructure and resources to promote the visibility and impact of Virginia Tech within the Commonwealth and beyond. We will produce a socially and culturally 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.

**Strategy 1:** Create networks of Scholarship, Innovation and Economic Development by Forming Domestic and International Partnerships

The College will maintain and establish collaborative and mutually beneficial relationships with our partner academic institutions, private organizations, community leaders, industry sponsors and alumni in Virginia, around the country, and around the world. Such a global network will include centers, academic partners, corporations, research parks, and communities to better the quality of life for citizens both here and abroad, the basis of the global land-grant mission.

- The next generation science entrepreneurs will be fostered in courses such as Bringing Science to Market (BS2M) that partners the College of Science with the College of Business.
- Partnerships in the National Capital Region will be explored. The new VT facility in the NCR will also provide a venue to highlight science programs and to influence public policy.
• The College seeks to expand existing partnerships and build new networks with private and public-sector partners. Strong alliances with companies such as Agilent Technologies Inc. will be forged.
• The College will encourage and reward national and international editorships, leadership positions, policy group memberships, and corporate board memberships.

**Strategy 2: Enhance K-12 Science, Technology, Engineering, and Mathematics (STEM) Education**

The College of Science recognizes that science, technology, engineering, and math education (STEM) is at the forefront of our nation’s agenda. The College facilitates and creates networks within the University and across K-12 communities to enhance the effectiveness of integrated STEM education with the goal to improve the scientific and technological literacy of our students and to increase the competitiveness of students in the Commonwealth.

In partnership with VT-STEM, the College of Science:

• Serves as a bridge with the K-12 community;
• Partners with the K-12 community to prepare university students and faculty to participate in outreach efforts;
• Facilitates the quality K-12 STEM education experiences; and
• Collaborates with the K-12 community to enhance teacher preparation and professional development.

**Strategy 3: Strengthen and Expand International Programs**

The research agenda and new degree programs outlined elsewhere in this document span the interests of scholars in other parts of the globe. For example, ongoing research in the neuroscience area involves collaborations with scientists in the UK and South Korea, as well as other parts of the world, through secure cyber-networks. Some of these same networks are also used in high performance computing, in which large data sets are transferred for analysis among many universities. The College has been instrumental in establishing Virginia Tech’s participation in the Open Science Grid, which has nodes in several national labs in this country, as well as those in Europe. A notable example is CERN, the European Center for Nuclear Research. The goal is to establish a well-recognized presence in these areas globally. To this end, the College will expand its ongoing commitment to international affairs by leveraging these existing international programs, and by creating new international opportunities, such as the potential presented through the Faculty of Health Sciences currently being set up on campus. The College will increase usage at the Virginia Tech centers abroad (e.g., Chile, Dominican Republic, Egypt, India, and Switzerland) to promote exchange of students and faculty. The College will also strengthen tools that enhance mobility (e.g., short- and medium-term exchanges) of students and faculty (e.g., between the campus and the National Capital Region,
VT centers abroad, and between partner universities elsewhere). Study abroad opportunities will play a key role in this strategy, and the College will explore ways to make the program more accessible and affordable for students with the goal to grow participation at the B.S., M.S., and Ph.D. levels. Departments will be encouraged to explore and establish international research exchange partnerships.

**Strategy 4: Mechanisms for Integrated Engagement**

Several tactical approaches have been considered and implemented for such mechanisms. It is the aim of these mechanisms to promote better appreciation across science disciplines. At the same time, the College also intends to promote the role that science is playing in the arts, humanities and social sciences arena. The necessary inter-relationships will be explored through a series of lectures by prominent scholars working at the interface, which will create the awareness among students and faculty of these connections. For the past few years, we have had lectures delivered by Nobel Laureates, such as Sir Anthony Leggett (Physics, 2003), who spoke on perceptions of time, and Mark Davis (Caltech faculty), an expert working at the interface of science and biomedicine. This will be followed up by putting in place a scholars-in-residence program, which will explore how the influence from the two broad pursuits can be put to mutually beneficial use. This initiative will occur in alignment with the vision of the Institute for Advanced Study. This new initiative in the College serves to validate our initiatives in both research and teaching, and external validation ensures international impact of research efforts and the success of our graduates to pursue new opportunities upon graduation.

The College has also fostered a new partnership with the Institute for Creativity, Arts, and Technology (ICAT) and initial efforts involve the relationship of molecular structure and the arts. For example, Robert Lang, a world renowned origami artist, detailed the integration of mathematics and physics on the design of novel origami. The implications for novel smart materials, chemistry, and physics are tremendous. The College will continue this initiative with a second scholar in the series with a focus on the sounds of science, and future plans involve the visit of a science museum curator to present the relationship of art preservation and identification with emerging analytical tools.

**Strategy 5: Industrial Alliances and Engagement**

The College currently maintains 4 percent of its funding portfolio from industrial contracts and partnerships; however, this percentage is mostly attributed to key groups in the College with MII being a prime example of industrial partnership and relevance. The last four years have led to a decrease in industrial funding for the College, while all current indicators suggest resurgence in partnerships and funding. This will have several impacts including student internship, graduate employment, research impact validation, scholars in residence, faculty leaves, and research funding. The College will construct a unified plan for industrial partnering in collaboration with VTIP, and this plan will strive to facilitate interactions for research partnership. Moreover, the program will strive to assemble a leading cadre of industries as
partners to the College. An educational element also serves an engagement mission where faculty contribute short courses either at the industrial site or on campus.

**Investment in the Path Forward**

The National Academies have summarized the challenges to the nation that must be addressed. Virginia Tech is well-positioned to meet this challenge and the College of Science must be a key part of the response. Yet, the College of Science faces a unique set of circumstances because of our dual responsibilities of core and service teaching versus the mission of the College. The opportunity is here for Virginia Tech to be the leader in areas that address the National Academies challenge. The strategies presented above are a means to reach this objective. Implementing the strategies requires investment in the path forward, now, before it is too late:

- Increasing faculty strength to a number of new faculty that will make us competitive with peer institutions, particularly those who thrive at the intersection of disciplines, including core faculty for the new programs in nanoscience, neuroscience, computation, and systems biology (ISF). Currently, the College is at least 100 short.
- An equivalent number of new Ph.D. students to accompany this growth; our aim is to have each faculty sponsor at least three Ph.D. students.
- Integrated Science facilities for training the next generation of international leaders (construction of an Integrated Science Education and Research Training Center).
- Research investment including infrastructure to support research for continued and sustained growth in research expenditures.
- New structure for charging tuition and fees (lab fees).
- Aggressive student recruitment plan globally with international training opportunities.

**Outcome Measures and Benchmarks**

Measures of success will include growth in the number of research awards, growth in the value of research expenditures, growth in the number of Ph.D. students, growth in the number of undergraduates participating in research, an increase in the number of cited publications, success in placing graduates in positions of prominence and leadership, increased participation on prestigious panels, commissions, or national committees, and an elevated position in our national rankings.

Measures will also include targets such as: students internationally engaged; universities, companies, and agencies engaged; industry and international funding; students in REU-style programs; and fellows, editors, national officers, and NAS and board members. Student internationalization will be assessed by established tools (e.g., IDI) and by initial jobs with global aspects.
Summary

This Strategic Plan outlines an approach to higher education that emphasizes integration of disparate disciplines to solve the large critical problems we may be asked to deal with. It covers a means to answer the grand challenge of global competition in an environment that is at the same time becoming ever more inter-connected. It sketches a pathway for Virginia Tech to be a leader in this reality and positions our faculty, staff and students to be sought after as the crucial resource in addressing and resolving critical issues that emerge in the coming decade.
Epilogue

The College of Science Strategic Plan for 2012-2018 hews closely to the objectives in the University’s plan. In particular, the themes of integration and interdisciplinary work, resiliency, and computation thinking as keys to leadership roles are woven into the fabric of both. The following defines a map of the strategies described in the College’s Strategic Plan to those described in the University’s A Plan for a New Horizon. The strategies in the College’s plan will be coded in blue. Those in the New Horizon will be in red. The headings below are the section headings in the College Strategic Plan.

Research and Innovation

The strategies in red are those listed under the same heading of Research and Innovation in the New Horizon.


Strategy 2: Integrative large research teams → Strategy 1: Maintaining research expenditures; Strategy 2: Increase graduate enrollment; Strategy 3: Use Ballston facility to promote security and resiliency; Strategy 5: New faculties; Strategy 6: Strategic partnerships with governments and industry; Strategy 7: Strategic global investment.

Strategy 3: Partnerships with National Labs and Medical Centers → Same as above.

Learning

The strategies in red are those listed under Life of the Mind and The Virginia Tech Experience.


Strategy 2: Interdisciplinary Graduate Programs → Strategy 5: Employ new technologies and distance learning; Strategies 2 & 5: (from Research and Innovation).

Strategy 3: New Pathways to Success → Strategy 1: (from VT Experience) Quality of Life initiatives; Strategy 2: (from VT Experience) Climate/Sustainability Plan.
**Engagement**

The strategies in red are those listed under Research and Innovation.

- **Strategy 1:** Economic Development via Partnerships  ➔ Strategy 7: Strategic global investment.
- **Strategy 2:** K-12 STEM  ➔ Strategy 2: STEM entrepreneurship, science and technology policy, and ethics.
- **Strategy 3:** International partnerships in R&D  ➔ Strategy 7: Strategic global investment.
- **Strategy 4:** Integrated engagement/IAS  ➔ Strategy 6: Strategic partnerships with governments and industry; Strategy 7: Strategic global investment.
- **Strategy 5:** Industrial alliances  ➔ Strategies 6 & 7.