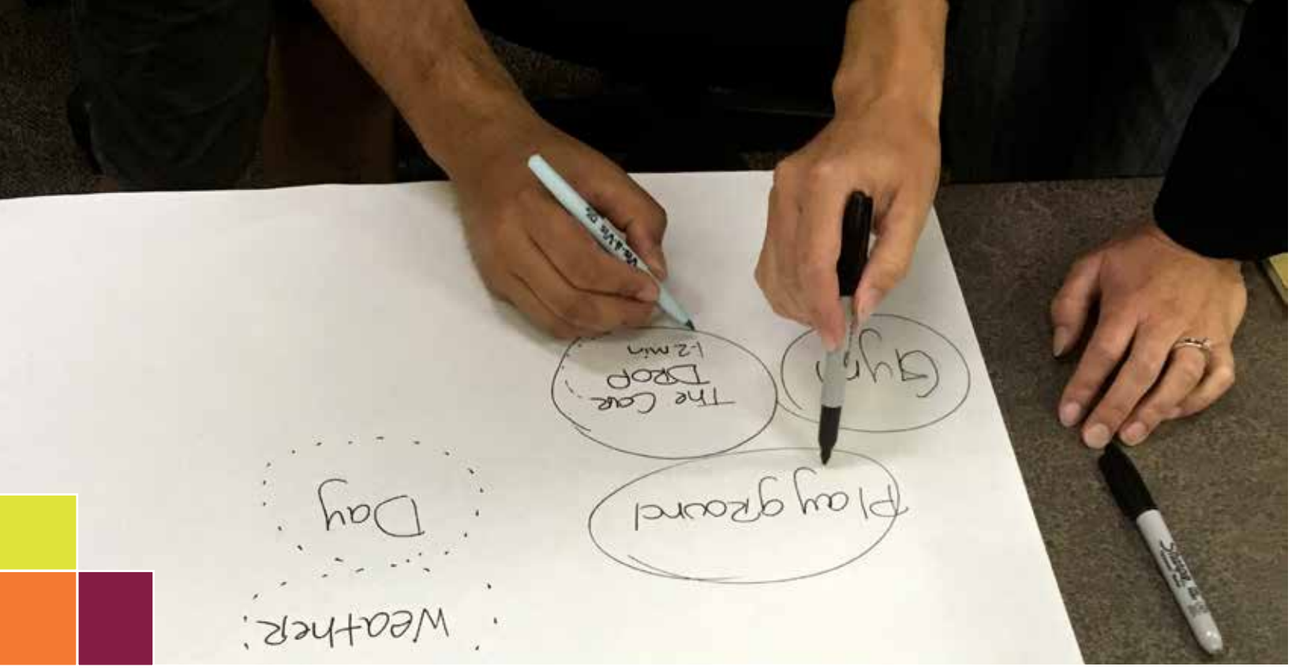
VIRGINIA TECH™

THE GRADUATE SCHOOL

Interdisciplinary Graduate Education



Interdisciplinary Graduate Education Programs (IGEP)

Virginia Tech Graduate School supports Interdisciplinary Graduate Education Programs (IGEPs) to promote and sustain graduate education and research across fields, programs, colleges, and campuses. More than 300 graduate students currently participate in the 14 Graduate School-supported IGEPs.

Each IGEP addresses a major fundamental problem or complex societal issue whose resolution requires the work of an interdisciplinary team of scholars. The programs focus on using innovative and integrative approaches to produce the next generation of global leaders in science, education, and other fields.

Coursework and program-specific activities are designed to develop the four pillars of the university's Transformative Graduate Education Experience: knowledge, leadership, scholarly inquiry, and social responsibility. The programs also aim to help students succeed and stand out in their future academic and professional careers.

In addition to the IGEPs, Virginia Tech has several other transdisciplinary programs for graduate students, and the university recently introduced the Individualized Interdisciplinary Ph.D. program for students whose research goals span multiple fields and do not fit any current graduate programs.

Contact us

Visit the Interdisciplinary Graduate Education blog: blogs.lt.vt.edu/vtige/

Website: graduateschool.vt.edu/academics/programs/interdisciplinary-graduate-education.html

For more information, contact Associate Dean William Huckle (wrhuckle@vt.edu) or the individual programs.

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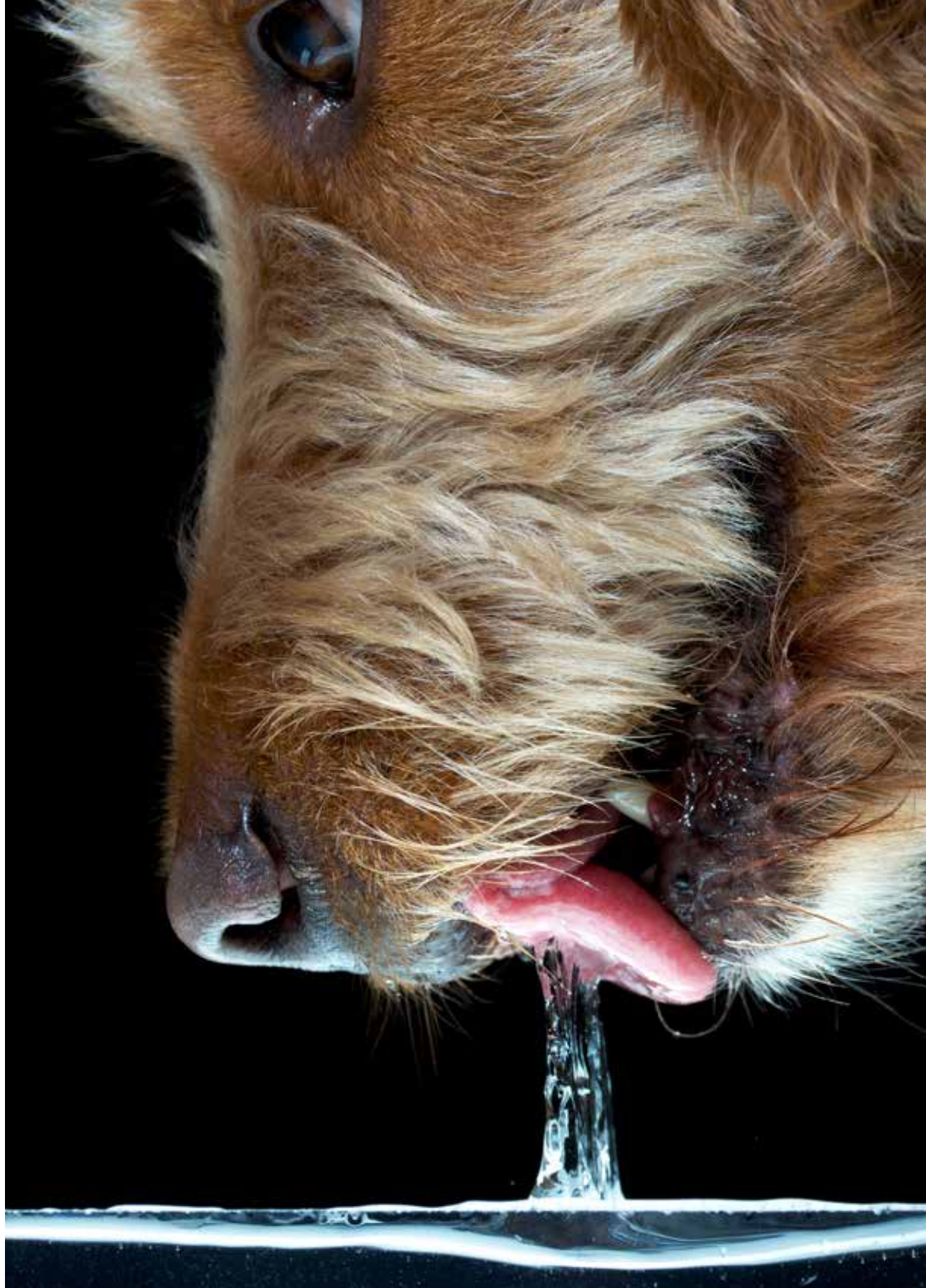

BioBuild

BioBuild examines bio-inspired strategies for next-generation engineered components, systems and communities, and bio-integrated approaches to balance natural, constructed, and human systems. For example, we study the echolocation properties of bats to improve the capacity of drones to navigate in urban settings, ultimately allowing them to autonomously deliver freight/parcels. Another project considers how symbiotic green roofs become more than symbolic by serving as space for urban agriculture, animal habitats and bird flyways. Through research, education, and outreach, BioBuild is transforming the relationship between the biosphere and the built environment by exploring the intersections of design, construction, engineering, policy, and science.

Contact us

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Biological Transport (BIOTRANS)

Biological Transport (BIOTRANS) is a community of biologists and engineers that work together to study transport in environmental and physiological systems. BIOTRANS is training the next generation of interdisciplinary biologists and engineers, working on some of the biggest challenges in the world at the nexus of disease, food, energy, and water. The program is based on interdisciplinary coursework, student interaction, community development, and cross-disciplinary research experience, and also includes strong ethics and professional development components. Each cohort of interdisciplinary researchers will be trained as scholars and leaders who are well-grounded and conversant in the fundamentals of both biology and engineering, able to communicate effectively with fellow researchers, policy makers, and the public, both locally and abroad.

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Computational Tissue Engineering (CTE)

Age and disease often result in the deterioration of tissues and organs in humans. Surgical transplantation can provide relief in some cases, but is not scalable due to the scarcity of viable donors, the difficulty in preventing adverse immune responses, and rising medical costs. Tissue engineering attempts to create replacements for living tissues and organs. Our goal is to define a new synthesis between tissue engineering and systems biology, using the computational sciences as a driving force. Our vision is that predictive computational models will drive novel experimental analyses of engineered tissues, while the demands of tissue engineering will inspire novel frameworks of analysis in computational science. We train students at the confluence of tissue engineering, molecular and cell biology, and computational science, with the goal of emerging as leaders in this field, spanning traditional disciplinary boundaries, and using the languages of tissue engineering, molecular and cellular biology, and computational science with ease.

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Disaster Resilience

Concentrations of people, power, technology, education, and knowledge lower our resilience and increase our risks. Every time we add a link or create additional dependency, we generate a node that can fail, adding yet another risk factor. The Disaster Resilience IGEP is working to improve sustainability by changing the interdisciplinary paradigm. This trans-disciplinary approach tackles the three main drivers of vulnerability: the perspectives that lack understanding of the full complexity of risk and resilience, the disregard for the uniqueness of each community and culture, and the preoccupation with symptoms rather than the root causes of risk. Faculty and students in this program share a passion for addressing pressing problems that must be solved from multiple perspectives, and work closely together to accomplish that goal.

Contact us

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Genetics, Bioinformatics, & Computational Biology (GBCB)

The goal of the GBCB program is to provide an educational environment that enables students to apply quantitative methods in computer science, mathematics, and statistics to all areas of the life sciences. To facilitate this experience, students choose a primary program track (life sciences, computer science, mathematics, statistics), with the other areas as secondary tracks, and take courses that provide a breadth of exposure to these related disciplines. Faculty members affiliated with the program have academic appointments in several life science departments (e.g., Biochemistry, Biological Sciences, Plant Pathology, Physiology, and Weed Science), the Departments of Computer Science, Mathematics, and Statistics, as well as the College of Veterinary Medicine and the Virginia Biocomplexity Institute.

Contact us

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Human Centered Design (HCD)

Human Centered Design is an approach to design charged with understanding the needs, wants, and limitations of people. This is accomplished through methodologies and practices where these considerations are integrated at every stage of the design process. The program creates novel learning and discovery opportunities to train the future professoriate, workforce, professionals, and civic leaders. It is built around competencies in four core areas: Understanding People, Interdisciplinary Research, Design Studies, and Design Realization. The program reaches across the fields of Industrial Design, the School of Visual Art, Computer Science, Electrical and Computer Engineering, Engineering Education, Industrial Systems Engineering, Mechanical Engineering, English, Human Development, Learning Sciences and Technology, Science and Technology in Society, Music, Theater and Cinema, Geography, Forest Resources, and the Institute for Creativity, Art, and Technology.

Contact us

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INTERFACES of GLOBAL CHANGE

Interfaces of Global Change

This program is designed to address the multidimensional aspects of global change. IGC provides participants with a unique intellectual focus and training. Our objective is for each IGC Fellow to gain depth in their specific scientific area of expertise, while simultaneously gaining breadth in the multifaceted realm of global change and the science-policy interface. The program provides students with training that will enable them to be effective in interdisciplinary and multidisciplinary research, translating science into policy, and communicating science.

Program goals are to provide students with a broad perspective on: how the five major global changes (habitat loss, introduction of non-native species, pollution, disease, and climate change) interact to influence biodiversity and environmental health; the societal causes and consequences of these ecological problems; and the role that scientists can play in resolving these issues through effective communication and formulation of sound environmental policy.

Contact us

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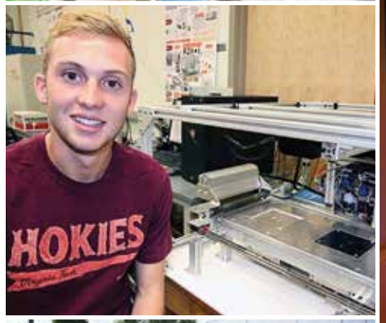

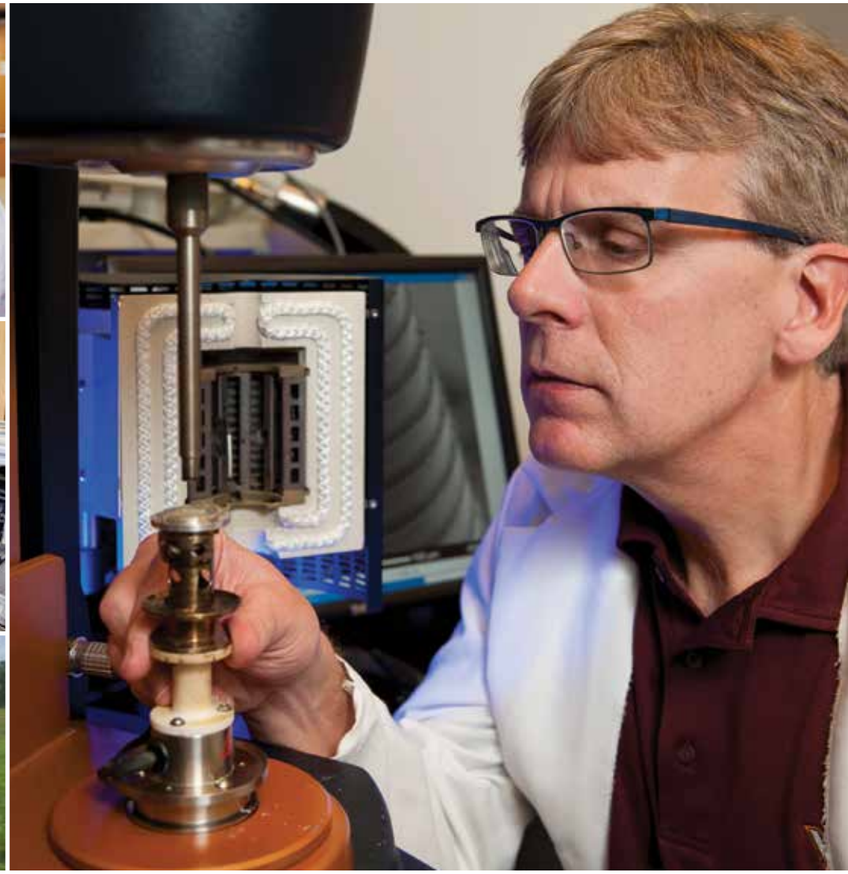

Macromolecular Science and Engineering (MACR)

The degree program spans multiple departments and colleges to emphasize fundamental and emerging technological areas in the fields of Macromolecular Science and Engineering. The interdisciplinary curriculum is comprised of core requirements with a modular approach to coursework. A key feature of the program is the flexible integration of cutting-edge research coupled with graduate training.

Contact us

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Regenerative Medicine

Regenerative medicine is a rapidly growing field focused on restoring tissue structure and function following injury or disease. This program brings together faculty from the Colleges of Veterinary Medicine, Engineering, Business, and Liberal Arts & Human Sciences, combining their expertise into a cohesive learning environment for students with the aim of providing them with unique perspectives and skill sets. The field necessitates consideration of ethical and societal impacts alongside advances in biology and medicine. The desire for swift translation of novel therapies from bench to bedside creates a need for consideration of impacts on public policy and the economic feasibility of technologic advances. The program seeks to employ innovative approaches that develop both a diverse understanding and training portfolio to prepare graduates for the many career paths open to them upon completion of the program.

Contact us

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Remote Sensing

In today's changing world, Earth systems research, ranging from terrestrial ecosystem processes to ionosphere dynamics, requires an integrative and broad-scale perspective. At Virginia Tech we address this need through the Remote Sensing program, preparing students not only in the science of the Earth system, but also in the engineering, data analytics, and social science disciplines required for the next generation of scientists to work at the cutting edge of scientific inquiry. The Remote Sensing IGEP prepares scientists who work together to design sensors, analyze data, and engage critical social and policy questions of our time.

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Sustainable Nanotechnology

The Sustainable Nanotechnology (SuN) program brings together faculty and students from across the campus with interests in both the sustainable development of nanotechnology as well as the applications of nanotechnology to meet the needs of a sustainable future. SuN is an integral part of the nanotechnology community at Virginia Tech, drawing from Environmental Engineering, Green Engineering, Sustainable Biomaterials, Computer Science, Biochemistry, and Earth Sciences, among other fields. Our goal is to holistically develop the critical thinking skills of program participants through coursework and research experiences that provide exposure not only to the science and engineering of nanotechnology, but also the ethical and social issues associated with its use and development.

Contact us

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Translational Obesity

Obesity is one of the most complex public health problems facing the nation and world today. Significant progress has been made in the understanding of biochemical regulation of energy balance. However, there is little information available regarding the clinical relevance of many basic science discoveries. Furthermore, little progress has been made in implementing effective obesity prevention and treatment programs on a broad scale to have a positive public health impact. Thus, this innovative interdisciplinary graduate training program was created to equip the next generation of scientists with the skills and knowledge needed to tackle the complex societal problem of obesity. Faculty and students from Industrial and Systems Engineering, Psychology, and Carilion Clinic are involved in the program.

Contact us

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Translational Plant Sciences

We are a group of faculty and students in seven departments in the Colleges of Agriculture, Science, and Natural Resources & Environment. Our program uses molecular approaches to understand how plants grow and interact with their environments and to translate that understanding into new strategies for crop improvement.. The diversity in the TPS program is evident in the breadth of the federal sponsors that fund our research. Moreover, many laboratories are also supported by various Virginia and national grower organizations and the agricultural industry. Students work in a wide variety of research areas ranging from plant genomics to disease resistance, metabolic engineering, bio-production and bioprocessing, and forest biotechnology. Our program also has a graduate student organization in which students plan events such as our monthly discussion group, retreats, and industry tours.

Contact us

Website: translationalplantscience.org

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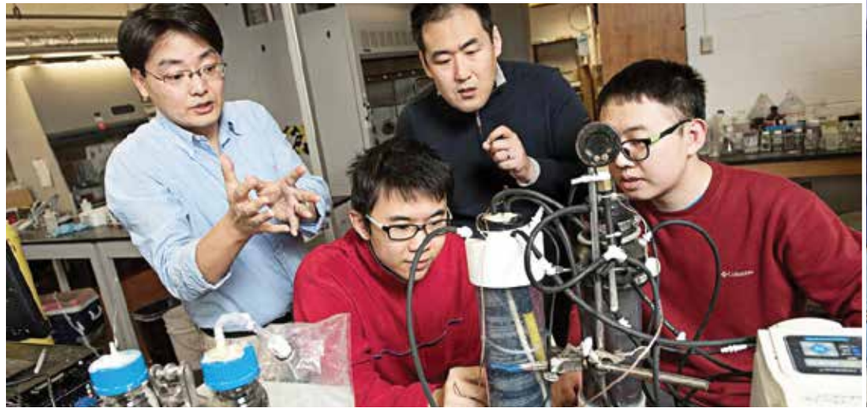

Water INTERface

The Water INTERface program unites graduate students and faculty across colleges and departments in addressing technical and societal challenges of transforming low-quality water resources into clean water for healthy living. Our goal is to create a community of doctoral students and faculty members who will integrate knowledge of potable water treatment processes with the implications of those processes on water quality, safety, and health. Coursework and research experiences will develop professional skills and engage in ethical thinking and action in relation to the practice of engineering, science, public policy, and human health pertaining to water.

Contact us

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Individualized Interdisciplinary Ph.D.

The Virginia Tech Graduate School offers an interdisciplinary Ph.D. for students whose goals cannot be met by a single discipline from a degree-granting academic unit at the university. The program was launched in 2015, aimed at enabling students to accomplish their specialized educational and professional goals.

"Real world problems don't fit nicely into boxes, specific fields, departments or programs," said Professor of Civil and Environmental Engineering Amy Pruden, who, as Associate Dean of the Graduate School, supervised the program from its inception through 2017. "We need to have the opportunity for students so inclined to tackle these problems."

Students seeking an interdisciplinary Ph.D. design an individualized coursework plan and research project, providing an explanation of how their proposed work will not fit into any single existing program. The student's advisory committee must include members from at least two disciplinary fields. Applicants submit their degree proposals, along with a planned schedule for exams and articulation of research focus and goals, to the Commission on Graduate Studies and Policies for review and approval.

Contact us

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ADDITIONAL
Interdisciplinary Graduate Education Programs

Alliance for Social, Political, Ethical, and Cultural Thought (ASPECT)

The ASPECT Ph.D. program fosters a critical engagement betweenn domains of inquiry in the humanities, the social sciences, and the arts.

Website: liberalarts.vt.edu/departments-and-schools/alliance-for-social-political-ethical-and-cultural-thought.html

Geospatial and Environmental Analysis

This doctoral program combines cutting-edge training and research in the theory and application of geospatial science with environmental analysis to enhance research on a broad range of contemporary natural resource and environmental issues.

Website: geography.vt.edu/students/graduate/gea.html

Molecular and Cellular Biology

The Molecular and Cellular Biology program is an opportunity for PhD-seeking students to obtain interdisciplinary training in the molecular mechanisms that underpin life, while pursuing research projects in Cell Signaling and Cancer, Inflammation and Immunity, Microbiology, and Neurobiology.

Website: mcb.vt.edu/

Science and Technology Studies

Science and Technology Studies draws on the full range of disciplines in the social sciences and humanities to examine the ways that science and technology shape, and are shaped by, our society, politics, and culture.

Website: liberalarts.vt.edu/departments-and-schools/department-of-science-and-technology-in-society.html

Translational Biology, Medicine, and Health

The TBMH program emphasizes the concept of "translational science" across multiple levels of inquiry, bringing together students from the life, behavioral, physical, engineering, and computational sciences to address today's major health challenges.

Website: tbmh.vt.edu/index.html

VIRGINIA TECH™

Contact the Graduate School

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