The Virginia Tech Carilion Research Institute's mission is to make major scientific advances in understanding and addressing the fundamental processes of human health and disease with development of new approaches to diagnosis, treatments, prevention, and cures.

Goals and Objectives for FY 2011

Complete first two floors and part of third floor to accommodate lab operations for new research teams.

**Goal accomplishment:** The Virginia Tech Carilion Research Institute (VTCRI) opened its doors on September 1, 2010 in a new but incomplete building.

The human neuroimaging laboratory and two functional brain imaging suites on the first floor required restructuring to accommodate two 30,000-pound magnetic resonance imaging (MRI) systems, vibration isolation of floor slabs, and installation of back-up power and cooling systems. The MRIs were operational by late fall 2010.

A data center was installed to coordinate MRIs across the world, serving as the hub for interactive, real-time functional brain imaging research. It provides seamless access to resources on campus and to the national computational grids, including Lambda Rail and Open Science Grid.

The remainder of the first floor laboratory space was modified for an electrophysiology laboratory, laser-based optical imaging, ultrasound research, fruit-fly housing for genetic analysis of human childhood brain disorders, and rodent housing. These modifications were completed in April 2011.

The second floor was modified to accommodate a cryo-electron microscope (EM) for high-resolution visualization of molecules to identify new therapeutic targets for treating cancer, and for additional lab animal housing. The cryo-EM system was operational by February 2011.

A section of the third floor was adapted for research on the causes, effects, and treatments for substance abuse and addiction, including smoking. This work was completed by March 2011.

Recruit nationally recognized research team leaders in biomedical and behavioral research.

**Goal accomplishment:** VTCRI recruited 11 faculty members as research team leaders who relocated their programs to the new Roanoke facility between September 1, 2010 and June 15, 2011. These faculty members’ research emphasis areas are: brain function of children and adults in health as well as in neurological and psychiatric disorders; molecular studies of cancer and heart development; infectious diseases in children; addiction and substance abuse; development of novel neurorehabilitation strategies for traumatic brain injury, PTSD, depression, and seizure disorders; and early life educational interventions for children at risk. Including the VTCRI founding director, the 12 faculty members include five senior faculty members at the full professor level, all with established, well-funded, and internationally regarded biomedical and behavioral health research programs, and seven junior faculty members who are recognized as emerging leaders in their respective sub-disciplines.

Establish a strong, diversified, extramural-funding base with a primary emphasis through the National Institutes of Health (NIH) for VTCRI research programs with at least $5 million in annual funding.

**Goal accomplishment:** In its first year of operation, VTCRI faculty members have an extramural research grant portfolio of 30 grants with an annual value of $7.6 million, of which 18 are from the NIH, three from the Department of Defense, three from the Department of Education, two from the Defense
Establish strong working relationships between VTCRI and departments and colleges at Virginia Tech in Blacksburg.

Goal accomplishment: Each of the 12 faculty members hired in the first year, including the director, holds a faculty appointment in a department at Virginia Tech. In each case, the VTCRI worked closely with the department to coordinate the recruitment. These included biological sciences, physics, and psychology in the College of Science; biomedical sciences and engineering in the College of Engineering; and pathobiology and biomedical science in the Virginia-Maryland Regional College of Veterinary Medicine. In addition, VTCRI established a visiting distinguished scholars’ lecture series to which the faculty and students of the above-listed departments were invited and for which the VTCRI provided transportation between Blacksburg and Roanoke. The VTCRI faculty also provided research opportunities to Virginia Tech graduate and undergraduate students.

Establish VTCRI as a leading research destination to facilitate major discoveries in the largest single health challenge in the world – disorders of the brain and nervous system.

Goal accomplishment: By establishing the worldwide, interactive functional human brain imaging hub in Roanoke; launching the world’s largest longitudinal functional brain study (the Roanoke Brain Study); establishing three major hubs for brain research – the Advanced Recovery Research Center, the Human Neuroimaging Lab, and the Computational Psychiatry Unit; and assembling a team of leading neuroscientists who use structural biology, molecular genetics, bioengineering and computational science, animal models of brain disease, and human studies with functional brain imaging and behavioral analysis, VTCRI has established itself as a major site for brain research, including the development of new diagnostics, therapeutics, and rehabilitative strategies. In addition, to enhance the university’s neuroscience portfolio, VTCRI has been working closely with other Virginia Tech programs to recruit brain researchers in other departments and develop opportunities for students.

CHALLENGES AND OPPORTUNITIES

The Virginia Tech Carilion Research Institute has one of the premiere brain research groups in the world, and now has the opportunity to be one of the leading neuroscience research centers, taking advantage of such major new national initiatives as the “moonshot for the mind” program and the increased emphasis on the integration of engineering and computational and mathematical sciences with the social and life sciences to target human brain disorders. This new focus area in research and training positions Virginia Tech to become a leading educational hub for the neuroscience sciences. Talented VTCRI scientists, present and future, will allow Virginia Tech to successfully compete for a larger share of federal biomedical research dollars, particularly from the NIH. Research at VTCRI related to soldiers’ and veterans’ health issues, such as traumatic brain injury and substance abuse, also provide a strong platform from which Tech can compete for new funding from the Department of Defense and the Veterans Administration. VTCRI’s technological resources make the Institute a highly attractive environment for recruiting additional established scientists as the programs expand as well as a key site for training the next generation of researchers.

Challenges include being able to continue to retain leading investigators, particularly as other leading institutions strive to attract those same individuals. It will be important to continue to be vigilant to facilitate a seamless interaction between the main campus in Blacksburg and the emerging biomedical complex in Roanoke. Such synergies will require efficient transportation and communication and ongoing progress to minimize administrative barriers. Similarly, the growing interaction between the VTCRI and the Carilion Clinic remains an outstanding opportunity for shared resources and cutting edge medical research, but also a challenge to most effectively merge the cultures of discovery and innovation of the university with the clinical setting.

GOALS AND OBJECTIVES FOR FY 2012

Recruit three or four additional faculty as team leaders in research programs related to aging, infectious disease, control of cardiovascular function and cancer. Recruit an additional 10 to 20 postdoctoral fellows.

Increase annual extramural grant funding to $10 million per year.

Complete third floor up-fit for new animal facilities and additional research lab space.

Develop a Ph.D. program in brain and cognitive science. Graduate students, particularly those working in Ph.D. programs in the biomedical and behavioral sciences, are a key component for the intellectual, technological, and creative drive of a vibrant biomedical research program.

Integrate Virginia Tech Carilion School of Medicine students into major research programs within the VTCRI.

Enhance interactions with Virginia Tech departments through shared visiting scholars programs and collaborative research opportunities.

Grow collaborative research programs with Carilion Clinic, specifically to coordinate identification and inclusion of various patient populations.

Facilitate transfer of VTCRI faculty members’ technology and development of partnerships for key areas of technology development with business and industry.

Have at least 10 high-impact publications in the top major biomedical scientific journals.

Develop three new potential disease diagnostic approaches and rehabilitative strategies.