RESOLUTION TO APPROVE THE DOCTOR OF PHILOSOPHY DEGREE IN TRANSLATIONAL BIOLOGY, MEDICINE, AND HEALTH

WHEREAS, the mission of Virginia Tech is to discover and disseminate new knowledge through its foci on teaching and learning, research and discovery, and outreach and engagement; and

WHEREAS, there is a critical and immediate need for interdisciplinary and transdisciplinary training of translational researchers in the biomedical and health sciences to accelerate the transformation of fundamental biological discoveries into prevention, diagnostics, treatments and cures; and

WHEREAS, there is a growing demand, and statewide and national need for, such programs, evidenced by initiatives to integrate translational and clinical topics into biomedical doctoral education, and calls for interdisciplinary and translationally focused research education from the National Institutes of Health, Federation of American Societies for Experimental Biology, and the Association of American Medical Colleges; and

WHEREAS, faculty from across departments, colleges, and disciplinary boundaries at Virginia Tech will instruct in an innovative curriculum to prepare students for research-related careers in translational health science, by providing students with an integrated interdisciplinary knowledge base, methodology, technical skills, critical thinking skills and awareness of major local, statewide and national challenges to improved health of individuals and populations, so that they may lead collaborative and leading edge translational research across a range of biomedical and health-related disciplines; and

WHEREAS, the program will provide breadth of training in translational biology, medicine, and health, while allowing students to specialize in areas that are strengths at Virginia Tech and funding priorities for research and training by the federal government: (a) brain and cognitive sciences; (b) immunology and infectious disease; (c) cancer; (d) metabolism and cardiovascular science; (e) development, aging, and repair; or (f) health implementation science; and

WHEREAS, this will be the only degree program in the Commonwealth of Virginia to cover this range of biomedical and health-related subjects with a focus on translational discoveries and their implementation, with attention to integration of the biological, computational, behavioral, health delivery, and economic underpinnings of health and disease;

NOW, THEREFORE BE IT RESOLVED, that the doctor of philosophy degree in translational biology, medicine and health be established, effective fall 2014, and the proposal be forwarded to the State Council of Higher Education for Virginia (SCHEV) for approval and to the Southern Association of Colleges and Schools – Commission on Colleges (SACS – COC) for notification.

RECOMMENDATION:

That the resolution establishing the doctor of philosophy degree in translational biology, medicine, and health be approved.

June 3, 2013

Ph.D. in Translational Biology, Medicine, and Health
(CIP: 26.0102)

Type of degree action: New

Program description

The proposed Ph.D. program in "Translational Biology, Medicine, and Health" (TBMH) is an integrative, multidisciplinary, and innovative graduate program in the biomedical and health sciences that emphasizes the concept of "translational science," at multiple levels of investigation and across multiple disciplines. Faculty from departments across the College of Science, College of Veterinary Medicine, College of Engineering, College of Agriculture and Life Sciences, College of Natural Resources and Environment, and College of Liberal Arts and Human Sciences, as well as the Virginia Tech Carilion Research Institute, the Virginia Bioinformatics Institute, and the Fralin Life Science Institute, have developed an integrated curriculum that covers the fundamental molecular processes that dictate the development and life-long homeostatic regulatory function of cells, tissues and organs, to the dysfunction of these mechanisms in a wide range of disorders, to adoption, integration and application of translational discoveries, their cost, delivery, effectiveness and related policy issues. The program will develop students as critical and innovative researchers and thought leaders, so they may identify and address the complex interplay of multiple factors that create many challenges for improving human health, make and translate discoveries into innovative approaches to preventing, diagnosing, treating, and curing disease. We expect to begin offering the TBMH Ph.D. program in Fall 2014, with the first students graduating in May 2018. Due to the interdisciplinary nature of the program and the diversity of the faculty instructors, including clinical faculty who will instruct in formal courses and participate on committees, it is expected that formal course instruction will take place at Virginia Tech's Blacksburg and Roanoke facilities, with some utilization of videoconferencing capabilities. Participating faculty will constitute a "Faculty of Health Sciences," which will serve as the academic home for the program. The program will be administered through the Graduate School.

Curriculum summary

Students pursuing a TBMH Ph.D. degree must earn a minimum of 100 credit hours beyond the B. S. degree. Students will perform research rotations throughout year 1, while completing most of their core coursework, and will commit to a thesis research lab at the end of year 1. Students will take an intensive "Gateway" course (TBMH 5004, 8 credits) in semester 1, where they will learn the fundamentals of biomedicine, physiological systems, and translational science. They will then select a focus area in semester 2 and take an equally intensive "Fundamentals" course (8 credits) covering in depth the fundamentals of that focus area, with heavy emphasis on translational exemplars and case studies. The six focus areas are: Brain and Cognitive Sciences; Cancer; Health Implementation Science; Metabolism and Cardiovascular Science; Immunity and Infectious Disease; and Development, Aging, and Repair. Students will continue a core curriculum in parallel with their focus-area-specific coursework, which includes professional development, ethics, seminars and scientific analysis, as well as

program retreats and presentations. In total, students will take 31 credits of core coursework, a 3-credit quantitative requirement, a 3-credit free elective, and 63 credits of dissertation research.

Relevance to university mission and strategic planning

Virginia Tech is a public land-grant university dedicated to discovery and the dissemination of new knowledge. The program's focus on "teaching and learning" and "research and discovery" is evident as students embark on a combination of didactic coursework, scientific seminars, group-based educational exercises, and scientific research. The program will produce leaders in translational biological science, medicine and health, who strive to make, translate, integrate, design and implement innovative approaches to discoveries that will improve human health and "quality of life." Students will further fulfill the university's mission to "apply knowledge to expand personal growth and opportunity," as the program will arm them with the tools to succeed along a variety of career paths. The proposed interdepartmental, intercollege, and transdisciplinary program is expected to: enhance the quality and increase the quantity of the graduate student population, in alignment with the Virginia Tech strategic goals of increasing the number of graduate students, particularly in the health sciences and STEMH; facilitate interactions between faculty across disciplines without regard to departmental or college boundaries; enhance Virginia Tech's national and international identity in the biomedical and health sciences; and position Virginia Tech to substantially increase and broaden its extramural funding portfolio in the biomedical and health sciences, including research and training grants.

Justification for the proposed program

Human health represents the single largest challenge and domestic expenditure of our society, and despite the progress and investment in basic biomedical research, the progress in terms of delivering successful new therapies and diagnostics has not kept pace. There is a critical immediate need for transdisciplinary training of translational researchers in the biomedical and health sciences, in order to accelerate the transformation of fundamental biological discoveries into preventions, diagnostics, treatments, cures and healthier behaviors to avoid the costs and consequences of compromised health at the individual and population levels. The growing interest and demand for such programs is evidenced by national initiatives over the past decade to integrate translational and clinical topics into basic biomedical graduate education (such as the Howard Hughes Medical Institute's "Med to Grad" initiative) and recent calls for similar interdisciplinary and translationally focused efforts from the National Institutes of Health, Federation of American Societies for Experimental Biology, and the Association of American Medical Colleges. The proposed TBMH program will incorporate these elements and expand upon them to provide a curriculum that deviates from traditional course structure to one that includes a diverse cohort of students from a wide range of educational backgrounds and fields of study, balances breadth and depth, and prepares students for the new age of biomedical and health research by focusing on how to identify the key challenges, formulate translatable hypotheses and implement the translation of discoveries (at the laboratory bench, at the patient's bedside and in real world settings in which the largest scale chronic health challenges manifest) into meaningful solutions to human health problems. This is the right time to launch such a

program at Virginia Tech, as the university merges strengths in the basic life and chemical sciences, social and behavioral sciences, bioinformatics, computational sciences, and engineering, with an expanding biomedical enterprise, producing an increasing cohort of faculty with federally funded biomedical and health related research programs that provide opportunities and needs for this type of graduate student. Additionally, the Virginia Tech Carilion School of Medicine is attracting a set of students who are interested in pursuing advanced degrees beyond the M.D., and new emerging and expanded partnerships and collaborations with medical centers (e.g., Carilion Clinic, Wake Forest University School of Medicine, and Children's National Medical Center) are providing rich new sources of collaborations, data, samples, and patients to Virginia Tech faculty and graduate students who are primarily interested in health-related research programs.

Nationally, such translational programs are attracting large cohorts of bright students. For example, among the top 20 NIH-funded universities, each has a large and vibrant graduate program in biomedical sciences that trains students in contemporary interdisciplinary approaches to biomedical, translational, and health-related research. Thus, we anticipate that this Ph.D. will assist Virginia Tech in constructively growing its graduate student body. Upon completion of the program, successful graduates will be qualified for a number of positions where a Ph.D. in a biomedical field is required or preferred. These include postdoctoral fellow, instructor, or professor at a college, university, or academic health center; research scientist in the pharmaceutical or biotechnology industry; research scientist or health science administrator in a government or other private non-profit agency, hospital or clinic; or a non-research position where biomedical/health research expertise and excellent communication skills are required, such as science writer, editor, or journalist; patent agent; public policy analyst; or scientific consultant.

Resource Needs

The degree program does not seek any new targeted state resources to initiate and sustain the program. In addition to an investment by the university for initial program development, the on-going financial support for the program will be partially funded by tuition generated by the program. Teaching and dissertation mentoring by faculty will not require any additional financial resources, as they reflect the activities of faculty largely already in place at the university and available to participate in the program (letters of support from department chairs are part of the full degree proposal), and faculty who are already part of planned recruitments in clusters that reflect the university's strategic plan. In future years, we expect to offset some of these student costs through NIH institutional training grants and individual predoctoral fellowships, such as those from NIH and NSF. We also expect that by increasing the quantity of talented graduate students at Virginia Tech, investment in this graduate program will have a direct positive impact on faculty research grant funding and their research productivity by providing increased intellectual and technical capital and talent for faculty to successfully compete for contemporary research grants in a competitive environment with institutions who already have a commitment to interdisciplinary biomedical and health sciences graduate education.

Graduate Assistantships. Thirty graduate students per year will be fully supported in year 1 of their study while they take courses and perform research rotations. They will receive graduate assistantships competitive with the national average for similar degree programs (12 months at step 21), as well as health insurance and full tuition. Support towards assistantships, tuition, and fees will be supplemented by the program in subsequent years on a declining scale ($15,000 in year 2, $10,000 in year 3, and $5,000 in year 4), and the remainder of support will be provided by the student's faculty mentor from grants, contracts, and/or start-up or operating funds available to the faculty member through their home department or institute. Total university funded support for assistantships and tuition is estimated to cost $1,290,000 at initiation year, and $2,190,000 at target enrollment year.

Faculty. The program will require one internally appointed full-time faculty member to serve as Program Director to administer the program. The current duties of the program director will be redistributed to other faculty to the extent necessary. Responsibilities will include coordinating the curriculum, advising students, coordinating student research, seeking external funding opportunities, marketing and recruitment, and chairing the Steering Committee. A full-time program coordinator is required to assist the Program Director in these duties. In addition, the program will hire a part-time webmaster to establish a website and maintain a web presence. Total for salaries and fringe for these positions is approximately $213,900.

Many existing faculty members campus-wide have expressed interest in participating in the program to serve as research mentors, instructors, and committee members. It is expected that the teaching responsibilities of most individual faculty will be minimal, as the new coursework will be team-taught by a collection of faculty with appropriate and complementary expertise. Teaching credit will be assigned to faculty and departments commensurate with their level of involvement in each course. Faculty at the VTCRI are likely to be heavily involved, as they do not have major teaching responsibilities in departments and will be able to focus their graduate teaching efforts in this program, although faculty from many departments and colleges across the entire VT campus will be involved in teaching, mentoring and committee service, as well. Some resources will be required to buy-out time for faculty that will dedicate significant time directing TBMH courses ($120,000). Each of the six focus areas will have a faculty coordinator responsible for the core fundamentals course and other elements specific to that focus area. The six faculty coordinators will receive compensation for the additional time spent in this role (10%), which will total approximately $120,000.

Classified staff. Since the program will not be operated from any single department or college, one administrative assistant will assist with the core operations of the program. The total cost for salary and fringe will be approximately $61,000.

Library. Reading assignments from the primary research literature will be critical to most of the core coursework, and access to specific key journals will be important for the students' dissertation research and education. The cost of subscriptions to important

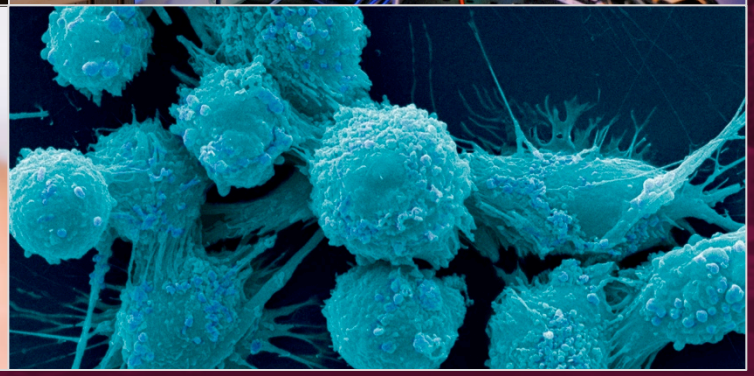
biomedical titles currently missing from the library is $95,000. These additional titles will also be of great benefit to many faculty and other researchers at Virginia Tech. These resources will be provided through the normal library budgetary process.

Space. No new resources are requested. The new TBMH courses will require space for approximately 30–36 students and multiple spaces for 5–10 students. The physical resources for this program exist in current Virginia Tech facilities, including four existing seminar rooms equipped with projectors, whiteboards, wireless internet, and interactive videoconferencing technology at the university's Virginia Tech Carilion Research Institute.

Other. Some additional categories of funds are also requested to operate the program, as indicated below. Some funds for computers, software, and IT support for program administrative personnel will be required ($30,000). Additionally, resources for marketing the program ($10,000) and supporting student recruitment and travel to campus for interviews in order to achieve and maintain an entering class size of 30 students/year, will be essential to the success of the program ($90,000). In the core curriculum, a course is offered each semester (TBMH 5204) that includes a series of visiting scholar speakers who meet with the students and for whom the students have studied and presented their research papers ($22,500 total). Finally, an important component of the TBMH program is the inclusion of clinical lectures, clinical case studies and presentation of patients in the core coursework (the "Gateway" course, and the six track-specific "Fundamentals" courses). Annual costs for Carilion Clinic faculty lecture time (approximately 100 hrs), as well as time and travel for visiting clinician lecturers (6 per year) from other academic health centers in the region, is $50,000.

RESOURCE	ESTIMATED COSTS (use NA if not applicable)
Faculty	$453,900
Administrative Staff	$61,900
Graduate Teaching/ Graduate Research Assistants	$1,290,000 (year 1) $2,190,000 (year 4)
Space	NA
Library	$95,000
Equipment	NA
Clinician Lecturers (Carilion Clinic and other regional medical centers)	$50,000
Graduate student visiting/recruiting travel expenses, program advertisement & marketing	$100,000
Computers, software, & IT (administrative)	$30,000
Visiting scholar speaker series	$22,500

Proposed Ph.D. Program in Translational Biology, Medicine and Health (TBMH)



By: Mike Friedlander
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Executive Director, VTCRI
Sr. Dean for Research, VTCSoM

June 2-3, 2013

Virginia Tech
Invent the Future

Background

- National need for accelerating pace of translation of biomedical discoveries for diagnostics, treatments, cures and their implementation;
- Major national organizations (e.g., NIH, FASEB, AAMC) call for new approaches to train biomedical and health scientists;
- Leading institutions (e.g. BCM, UCSF, Vanderbilt, U Pitt, JHU) implementing new approaches to train biomedical and health scientists
- Interdisciplinary approaches, communication across levels, effective discovery and translation, preparation for diverse careers in industry, academia, government; incorporating technology for timely completion;
- VT's growth in the biomedical and health sciences – STEMH – faculty and student demand

Goals

- Attract new cohort of highly qualified graduate students;
- Offer an integrated translational research program in biomedical and health sciences;
- Provide innovative education for multiple career paths;
- Enhance overall intellectual environment in the biomedical and health sciences;
- Grow extramural funding for research and training in biomedical and health sciences;
- Leverage investments in biomedical and health sciences;
- Enhance faculty recruitment and retention.

Organization and implementation

- Academic program and content oversight home in Faculty of Health Sciences;
- Administered through Graduate School;
- Team teaching;
- Joint dissertation mentoring;
- Personal career development plans;
- Students “undifferentiated” in first year – may chose research mentor from across multiple departments/colleges.

50 core faculty; over 100 participating faculty (17 departments; 7 colleges)

Attachment I

Department:	College:
• Animal and Poultry Sciences	CALS
• Biochemistry	CALS
• Biological Sciences	CoS
• Biomedical Engineering and Sciences	CVM
• Chemistry	CoS
• *Clinical departments	SoM
• Economics	CoS
• Electrical and Computer Engineering	CoE
• Entomology	CALS
• Fish and Wildlife Conservation	CNRE
• Human Development	CLAHS
• Human Nutrition, Food and Exercise Science	CALS
• Large Animal Clinical Sciences	CVM
• Physics	CoS
• Population Health Sciences	CVM
• Psychology	CoS

Centers and Institutes:

VTCDD, CG, FLSI, ICAT, VBI, VTCRI

Translational Biology, Medicine, and Health Program (30 students/year)

Attachment I

Students from Biological Sciences, Biochemistry, Chemistry, Computer Science, Economics, Engineering, Mathematics, Physics, Psychology, Social Sciences

Year 1

Gateway Introductory Course:
Experimental design & analysis, from molecules to systems to patients to populations to policy (8 credits)

Select a focus area:

***Brain & Cognitive Sciences**
***Development, Aging, & Repair**
*** Immunity & Infectious Disease**
***Health Implementation Science**
***Metabolic & Cardiovascular Sciences**
***Cancer**

Focus Area Fundamentals Course (8 credits)

Qualifying Exam
Select Mentor

Research Rotation

Research Rotation

Research Rotation

Additional Core Courses:
- Seminars
- Professional Development & Ethics

Year 2 & beyond

Dissertation Proposal

Advanced Electives & Dissertation Research

Dissertation Defense

Additional Core Courses:
- Statistics/Computation
- Seminars
- Journal Club

Academic Health Centers, Colleges, Pharmaceutical & Biotechnology Industry, Government Agencies & Public Policy, Hospitals & Health Care, Non-Profit Organizations

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Questions?

Example curriculum for a student with a brain and cognitive science focus

Year One

	Fall			Spring	
TBMH 5004	Translational Biology, Medicine, & Health	8cr	TBMH 5014	Fundamentals of Neuroscience	8cr
TBMH 5105	Professional Development & Ethics	2cr	TBMH 5106	Professional Development & Ethics	2cr
TBMH 5204	Seminar in TBMH	1cr (P/F)	TBMH 5204	Seminar in TBMH	1cr (P/F)
TBMH 5304	Research Experience in TBMH	3cr (P/F)	TBMH 5304	Research Experience in TBMH	3cr (P/F)
		14			14

Year Two

	Fall			Spring	
STAT 5674	Methods in Biostatistics (*Quantitative Elective*)	3cr	PSYC 5344	Cognitive Psychology (*Free Elective*)	3cr
TBMH 5204	Seminar in TBMH	1cr (P/F)	TBMH 5204	Seminar in TBMH	1cr (P/F)
TBMH 5404	Scientific Logic and Analysis	1cr	TBMH 7994	Research and Dissertation	8cr
TBMH 7994	Research and Dissertation	7cr			
		12			12

Year Three

	Fall			Spring	
TBMH 5204	Seminar in TBMH	0cr	TBMH 5204	Seminar in TBMH	0cr
TBMH 7994	Research and Dissertation	12cr	TBMH 7994	Research and Dissertation	12cr
		12			12

Year Four

	Fall			Spring	
TBMH 5204	Seminar in TBMH	0cr	TBMH 5204	Seminar in TBMH	0cr
TBMH 7994	Research and Dissertation	12cr	TBMH 7994	Research and Dissertation	12cr
		12			12
				Total Credits	100