The University of Georgia

University Council
Athens, Georgia 30602

March 16, 2011

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Dear Colleagues:

The attached proposal for a new major in Interdisciplinary Biomedical Sciences (Ph.D.) will be an agenda item for the March 23, 2011, Full University Curriculum Committee meeting.

Sincerely,

David E. Shipley, Chair
University Curriculum Committee

cc: Provost Jere W. Morehead
Dr. Laura D. Jolly

The University of Georgia

Harry A. Dailey, Ph.D.
Professor and Director
Email: hdailey@uga.edu

Biomedical and Health Sciences Institute

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October 30, 2010

Maureen Grasso, Graduate Dean
Graduate School

Dear Dean Grasso,

Attached with this letter is a copy of the proposal for consideration by the Graduate School for a doctoral program in Interdisciplinary Biomedical Sciences that will be administered in the Biomedical and Health Sciences Institute (BHSI). This proposal has been developed largely by professor Kojo Mensa-Wilmot, the chair of the division of Basic and Translational Biomedical Sciences in the BHSI, in consultation with numerous faculty and administrators. The proposal was developed over the past few years with input from across campus.

A list of over fifty faculty who have expressed support for the proposed program and have requested to be faculty mentors in the program is attached to the proposal. A list of deans (5) and program directors who have expressed support for the program will be submitted once all signatures have been collected.

Sincerely,

Harry A. Dailey
Director

New Ph.D. Program Proposal

Date:	November 2010
Institution:	University of Georgia
School/Division:	Biomedical and Health Sciences Institute
Name of Program:	Interdisciplinary Biomedical Sciences
Degree:	Ph.D.
Major:	Interdisciplinary Biomedical Sciences
Starting Date:	August 2011

TABLE OF CONTENTS

1. Abstract

Over the past decade the State of Georgia, the University System of Georgia Board of Regents, and the University of Georgia (UGA) have made significant financial and programmatic commitments to the development of biomedical instruction and research at UGA. Major developments have included the formation of the Biomedical and Health Sciences Institute (BHSI), the special funding initiative between UGA and the Medical College of Georgia (MCG), construction of the Paul D. Coverdell Center for Biomedical and Health Sciences and enhancement of other preexisting facilities, funding of seven faculty positions in infectious diseases, the creation of the College of Public Health at UGA, and the MCG/UGA Medical Partnership in Athens. To facilitate the agenda of promoting biomedical instruction and research, one of the stated missions of the BHSI was to provide an administrative home for new initiatives in education and research. To date, the BHSI has championed this agenda by partnering with the Center for Undergraduate Research Opportunities (CURO) to support undergraduate research in biomedically-oriented research laboratories, by the creation of a Master of Public Health (MPH) degree which was the first step towards the formation of the College of Public Health, and more recently a doctoral degree program in neuroscience whose faculty span a dozen different departments at UGA.

The BHSI now proposes the creation of a broadly interdisciplinary and cross-unit doctoral program entitled the **Interdisciplinary Biomedical Sciences (IBS)**. Creation of the IBS is part of the core academic and research training mission of the BHSI, as stated in the founding documents that were approved by the University Council, UGA senior administration and the Board of Regents. In addition, the IBS responds to the recommendations of the UGA Provost's **Task Force on Graduate Education**, which included specific recommendations on interdisciplinary education, and is consistent with *Strategic Priority II (e)* of the **UGA Strategic 2020 Plan**: "To provide further opportunities for Interdisciplinary Graduate Education." Because the program will provide students with the training necessary for careers in the rapidly expanding biotechnology and pharmaceutical industries as well as in translational medicine in and out of traditional academic careers, it will benefit the people and economy of the State of Georgia.

Most importantly, the IBS will support cross-campus initiatives in health-related sciences that take advantage of UGA's unique research strengths and facilities and will attract a new cadre of outstanding graduate students. *The program is designed to expand and enhance the available interdisciplinary training of graduate students at UGA and does not compete with academic units currently in existence since any acceptable IBS Program of Study must be one that cannot be supported in an existing graduate program.* While initiated by the BHSI (current membership of 173 faculty), this document's development drew upon the recommendations of faculty from diverse departments and programs, and was reviewed by outside consultants. We have received input from the Faculty of Infectious Diseases, UGA Cancer Center, College of Public Health, College of Veterinary Medicine, School of Ecology, College of Pharmacy, College of Education and several departments in the Franklin College of Arts and Sciences. The degree Tracks proposed below will involve over 70 UGA faculty from many departments across campus.

The IBS graduate program's core mission will be to train the next generation of biomedical scientists. By offering the IBS doctoral degree, and by providing the opportunity for students to select from a large pool of mentors in many departments, the IBS will attract the best and brightest graduate students to UGA, enhancing the research and training capabilities of the institution. These activities complement and extend those of the Interdisciplinary Life Sciences (ILS) portal, a non-degree granting umbrella program for recruitment of graduate students.

The IBS is designed with curriculum flexibility that will enable rapid response to emerging and changing interdisciplinary and convergent fields in the biomedical sciences. Within the IBS program, all students will complete a common core curriculum encompassing basic molecular and cellular biology, communication skills, and exposure to the research of faculty through seminars and laboratory rotations. After that, students will track into one of several specialized curricula, as exemplified by the programs in *Cancer Biology* and *Disease Ecology* that are outlined herein. New Tracks may be developed later by BHSI faculty, as described in the document (see section 5D).

The existence of a strong research faculty at UGA in areas important to the biomedical and health sciences will be a positive factor for the successful development of the IBS graduate program. We believe that the IBS will be attractive to potential graduate students due to the unique assortment of research areas represented at UGA. These include, but are not limited to, programs in veterinary medicine, toxicology, pharmacy, public health, ecology, health communications, behavioral research, bioinformatics, engineering, family and consumer sciences, agricultural and environmental sciences, and the science and math departments within Arts and Sciences. Significantly, several departments provide clinical programs that could support translational research with colleagues and their students outside of their own unit. Add to this list the presence of state-of-the-art research facilities featuring bio-imaging technologies (MEG, EEG, 3.0T fMRI, and small bore animal MRI), x-ray crystallography, NMR, a clean room for nanotech, and BSL3 biocontainment for large animal research, and we believe that it can be argued that UGA possesses a set of strengths that are unique among peer universities.

To leverage these inter-unit strengths, groups of faculty with identified core interests have formed Centers and Faculty, such as the Complex Carbohydrate Research Center, Regenerative Bioscience Center, UGA Cancer Center, Center for Structural Biology, and the Faculty of Infectious Diseases. None of these aggregations of faculty with clear research interests offer degree programs. Unfortunately for graduate students seeking a degree program that reflects these interdisciplinary fields, UGA only offers discipline-specific departmental degrees with the exception of the Interdisciplinary Program in Toxicology. The IBS will facilitate collaborative graduate education and research across UGA departments, schools and colleges by taking advantage of our strengths and thereby enhancing the quality and visibility of biomedical research and educational opportunities. The IBS will stimulate innovative, multidisciplinary proposals for extramural funding and foster an environment needed to compete for extramural Training Grants.

2. Program Objectives

The objective of the IBS is to attract and train a new cadre of highly qualified graduate students in the biomedical sciences. This objective intersects the UGA **"Strategic Visions for UGA in 2020"** in two ways: the recommended investment in research in the biomedical sciences, and the recommended growth in the quality and number of graduate students.

3. Justification and Need for the Program

3A. Societal Need

Recently, the **National Institutes of Health** initiated a **Roadmap** that encourages interdisciplinary research projects. Federal funding of such research is increasing (http://nihroadmap.nih.gov/interdisciplinary/) despite the fact that overall funding for NIH has remained relatively flat over the past five years. It is important that our students are trained to be players in interdisciplinary teams. The pharmaceutical industry and biotechnology companies also continue to invest heavily in developing therapeutics through integrated research in biomedical science.

Data generated from national surveys in the life sciences (National Science Foundation Survey of Doctoral Recipients·2008) show that earned PhDs increased from 8,612 in 1998 to 11,088 in 2008, representing a 13 percent increase in 10 years. More significantly, the number of students that enrolled in interdisciplinary programs increased at a faster rate than those in single discipline fields. Whereas there was a 3.5 percent increase in the number of students enrolling in Biological Sciences between 2007 and 2008, there same period saw a 47.1 percent increase in the number of students matriculating into Interdisciplinary Sciences programs (Science Resources Statistics NSF-320). This data highlights the growing importance and popularity of Interdisciplinary Graduate Education Programs nationwide. Establishment of the IBS will contribute to UGA's efforts to meet a national and statewide student demand for these programs.

Faculty Letters of Support for IBS (see appendix) echo this sentiment from different angles. Duncan Krause (Professor of Microbiology and Director of the Faculty of Infectious Diseases) writes, " .... as noted in a 2007 report of the UGA Task Force on Graduate Education..... more than ever before, major discoveries and scholarly advances involve interdisciplinary teamwork and creative thinking by individuals who are facile with the perspectives, approaches, concepts, and methods of knowledge-base of multiple disciplines. Accordingly, many of the best graduate students are drawn to exciting developments at the interface between established disciplines." Anna Karls (Professor of Microbiology) writes, "In my experience as the Microbiology Graduate Coordinator for four years and serving on the Graduate Affairs Committee for ten years, I have seen that we lose some excellent students to other universities with large interdisciplinary programs in the biomedical sciences. Based on their interests, these students would not really fit in our Microbiology program, but it would be great to have an option at UGA that does fit their interests." Finally, John Maurer (Professor of Population Health and chief author of the new college-wide doctoral program in the College of Veterinary Medicine) writes, "I believe that both programs (the IBS and CVM's new program) serve the needs of the University for

training scientists to meet new challenges facing us in the 21st century and making use of new technologies and approaches to system biology, important in solving many fundamental questions and problems facing us in the biomedical sciences. Each program is unique in its approach to graduate research training. While many of our faculty will train their students through our PhD program, I believe many of our own faculty will also be interested in joining and collaborating with the BHSI and BHSI faculty in tackling important problems affecting global health through this unique graduate research training program."

3B. The Need for a Broad, Flexible and Nimble Interdisciplinary Biomedical Sciences Program at UGA

A major rationale for the establishment of the Biomedical and Health Sciences Institute was to provide a focal point for interdisciplinary biomedical and health research in graduate education that will take advantage of UGA's unique strengths. UGA is home to a large number of biomedical researchers in diverse areas of health and diseases, and already has the physical and human resources to provide a state-of-the-art educational experience in biomedical and health research. Establishment of the IBS would greatly promote the visibility of such research at UGA and offer a type of degree for which there appears to be considerable interest nationwide (see next paragraph).

The IBS emphasizes interdisciplinary training in fields such as diverse as bioinformatics, bioorganic chemistry, bioengineering, cell and developmental biology, chemical biology, genomics, glycobiology, immunology, ecology of infectious disease, medicinal chemistry, proteomics, public health, biostatistics, and structural biology. Thus, the degree programs in the IBS involve faculty in different colleges across campus.

New fields are emerging in the biomedical sciences for which the UGA has no academic departments to provide instruction to interested students. In a time of scarce resources, it may not be feasible to create new departments to handle these new fields (*e.g.,* Systems Biology and Chemical Biology). One solution to this problem is to make it easier for UGA faculty who are in different departments and colleges but share research interests and expertise in a particular interdisciplinary field to come together and offer a new degree "Track" in IBS.

The IBS will promote interactions of faculty in different departments and colleges, and promote the development of training grant applications to support graduate students at UGA. The unwritten agreement is that "Tracks" have a long-term objective of engaging in activities that will facilitate extramural training grant applications within six years of establishment. By seeding activities that might lead to award of training grants, which at the NIH and NSF are increasingly awarded to interdisciplinary activities, IBS will contribute to financial support of graduate students at UGA in the long run.

"Change is constant" in interdisciplinary and convergent studies, as new fields or topics emerge with time. The Track system adopted by the IBS enables it to respond swiftly to these trends by eliminating unproductive Tracks (without a need to close departments), and

also facilitates the creation of new Tracks when a critical mass of faculty come forward with a proposal for a new degree. For example, the new field of "Chemical Biology" has matured in the last few years and it has advocates at UGA. By its nature, "Chemical Biology" is interdisciplinary. Instead of creating a whole new department for UGA to train students in this field, a group of faculty from diverse departments with expertise in Chemical Biology could propose a "Track" within the IBS to begin training graduate students together.

3C. Additional Factors

The proposed program will facilitate multidisciplinary graduate education in the biomedical sciences, help to attract outstanding graduate students, and increase our ability to address complex problems facing society today.

3D. Consultant Reports

Please see Appendix I.

3E. Public and Private Institutions in the State of Georgia with Similar Programs

- Emory University
- Morehouse School of Medicine
- Medical College of Georgia

3F. Public and Private Institutions in the Southeast Region with Similar Programs

- Auburn University
- Clemson University
- Duke University
- East Carolina University
- East Tennessee State University
- Eastern Virginia Medical School
- Florida State University
- Louisiana State University, Baton Rouge
- Louisiana State University Medical Center, New Orleans
- Louisiana State University Health Sciences Center, Shreveport
- Medical University of South Carolina
- North Carolina State University
- Tulane University
- The University of Alabama
- The University of Florida
- The University of Kentucky
- The University of Miami
- The University of North Carolina at Chapel Hill
- The University of South Alabama
- The University of South Carolina
- The University of Tennessee, Memphis
- The University of Virginia
- Wake Forest University
- Vanderbilt University
- Virginia Tech

3G. Impact of IBS on Existing Graduate Programs at UGA

At most prestigious research institutions, graduate students enter cross-departmental graduate programs. Students are attracted by the large number of research laboratories from which to select mentors for their dissertation. Currently UGA is missing the chance to recruit applicants that are looking specifically for this kind of training opportunity. The IBS eliminates this disadvantage by dramatically increasing the number of research labs available to prospective students. It is anticipated that this will attract top applicants seeking a truly interdisciplinary graduate experience who would not have matriculated into the Graduate School at UGA within the current discipline-specific programs.

Existing graduate courses will be use to teach IBS students rather than creating a host of new courses. In fact, only four new courses are proposed: (i) BHSI 8920L, "Research Techniques in Biomedical Sciences"; (ii) BHSI 8030, "Overview of Biomedical Research"; BCMB/CBIO **** "Advanced Topics in Cancer Biology" and BHSI/IDIS **** "Infectious Disease Ecology and Public Health." All of these courses will be voluntarily team-taught by faculty already on campus who are associated with departments (*e.g.*, Cellular Biology, Epidemiology and Biostatistics, and Infectious Diseases) and/or research programs (*e.g.*, the UGA Cancer Center (http://www.uga.edu/cancercenter/people/), and the Faculty of Infectious Diseases (http://fid.uga.edu/directory/). Consequently, there will not be a significant teaching load increase for BHSI faculty.

It is important for us to explain the relationship between the Interdisciplinary Life Sciences (ILS) program (http://ils.uga.edu/) and the IBS. The ILS does not offer a graduate degree: it is a recruitment portal that directs students into departments for degrees in specific disciplines (e.g., Cell Biology, Ecology or Genetics). The IBS offers a Ph.D. degree but only in fields that by their nature are interdisciplinary. Thus, an ILS student could enter the IBS after their first year, just as they might matriculate into any department to obtain a Ph.D. The IBS will not offer a degree that may be obtained in a department. In essence the IBS and ILS complement each other and are both desirable on campus. Lastly, since IBS has no faculty lines of its own, departments will receive credit when their faculty train IBS students making it a "win-win" situation overall.

Differences between the IBS and the graduate program in Pharmaceutical and Biomedical Sciences (PBS) also need to be pointed out. PBS is based in the College of Pharmacy. Consequently that program focuses on pharmaceutics,(drug)-driven translational biology (see *Overview* of PBS Ph.D. program as described at http://pbs.rx.uga.edu/graduate/default.asp). In contrast, the scope of the IBS is significantly broader, encompassing some translational work of a few faculty but focusing on understanding basic/fundamental biology that informs biomedical sciences. Consistent with this ideal, IBS faculty can be found in several Colleges on campus (see appendix of participating faculty). In addition, the Tracks presented in the IBS are faculty-driven and can respond to new developments in all aspects of basic and translational biomedical sciences. Thus the overlap of the two programs is not significant enough to warrant coordination of activities between the IBS and PBS.

We have had extensive interactions with the Dean and also Department Heads in the College of Public Health (CPH) during development of this proposal. With their input and support, 15 courses from the College are listed as part of the curriculum for the *Disease Ecology* Track (see section 5E). Further, several faculty from CPH are included in the List of Faculty that support the IBS (see Appendix). Finally, the Dean of CPH, as well as that of the Heads of Epidemiology and Biostatistics, and Environmental Health Sciences, has signed the face page of this proposal indicating their support for the establishment of IBS.

In summary, the IBS is designed to strengthen the graduate research environment without negatively impacting existing programs at UGA.

3H. Origin of Students who are Likely to Enroll in IBS

The IBS will draw students who are interested in integrated approaches to problems (e.g., cancer) in biomedical science. In addition students interested in emerging new areas of biology (*e.g.,* Chemical Biology or Systems Biology) may be attracted to the program. At recruiting conferences in biomedical sciences, we consistently encounter students interested in cancer research that is very broad and interdisciplinary with basic to translational aspects. Since UGA does not have a Department of Cancer Biology and the Cancer Center cannot award degrees, the students interested in the field *per se* do not apply to UGA if they can go to institutions that offer Cancer Biology programs. Loss of students by this mechanism can be reduced by advertising the *Cancer Biology* Track of IBS to these potential applicants to the UGA programs. Most of our peer and aspirational institutions have such programs, so we will be well served to establish them in order to compete for these students.

4. The Process Used to Develop the IBS

The concept of an interdepartmental and intercollegiate graduate program in Interdisciplinary Biomedical Sciences emerged at the University of Georgia with the establishment of the Biomedical and Health Sciences Institute (BHSI) in 2001, following approval by the Board of Regents. The BHSI was charged to develop and promote biomedical sciences and human health graduate programs at UGA. Hence, the BHSI provides a highly appropriate administrative home for the implementation of various interdisciplinary programs. This is amply demonstrated by the fact that BHSI fostered the establishment of new graduate degree programs in both neuroscience and public health.

Beginning in 2002, the respective chairs and faculty members of the BHSI Divisions of Molecular Medicine (now Basic and Translational Biomedical Sciences) and Infectious Diseases had a series of meetings that resulted in (i.) the decision to jointly develop a single interdisciplinary graduate program for the two Divisions, and (ii.) the formation of several curriculum committees for the development of model curricula, as well as a program committee charged with integrating the proposed curricula into a coherent interdisciplinary program. A key criterion for the chosen curricula was that they be in interdisciplinary research areas that are not representative of any single academic unit on campus, to avoid duplication of, or competition with, existing programs.

The work of the curriculum committees was largely completed by the spring of 2004, during which time the program committee began its work on integrating the various curricula into a unified doctoral program. As this formal proposal for a new degree program was being developed, the BHSI listserv and other mechanisms were used to solicit the help, input and opinions of the BHSI membership.

The program committee has worked closely with the departments and programs whose faculty will be involved, and which will potentially benefit from access to a new pool of highly qualified graduate students with a professed interest in interdisciplinary biomedical sciences. The proposals for curricula and new courses appropriate to the IBS degree (primarily research credits, lab rotations and seminars within BHSI) were developed in consultation with departments whose existing course offerings form most of the core curriculum. The proposal was also submitted to the UGA Graduate School for review. We have attempted to take into consideration feedback from all of the potentially affected stakeholders for the development of the final program design and its requirements.

5. Curriculum

5A. The Interdisciplinary Biomedical Sciences (IBS) Degree

The ultimate goal of the IBS is the education and training of biomedical and health scientists with a focus on understanding the basic and applied aspects of biomedical phenomena. Within this goal, our mission is to provide students with a wide array of research opportunities in several more focused curricula (specifically outlined in the current document for *Cancer Biology* and *Disease Ecology*), while assuring that all students receive core training in molecular sciences, communication skills and scientific ethics. The program recognizes that the biomedical and health sciences have become very broad in scope and may draw as needed from traditional disciplines as unlikely as journalism and agricultural sciences. The selection of students programs of study may, therefore, draw from a large body of possible courses that will be approved by the Graduate Student Advisory Committee.

5B. Requirements for the Ph.D. Degree in Interdisciplinary Biomedical Sciences

In the first semester, all IBS graduate students are required to take three courses to satisfy a <u>common core requirement</u>:

BHSI 8920L	3 hrs.	Research Techniques in Biomedical Sciences
BHSI 8030	1 hr.	Overview of Biomedical Research
GENE 8650	1 hr.	Responsible Science

Because students will be physically based in laboratories that are located on different parts of the campus, it is important to have several activities that will facilitate the exchange of ideas across disciplines and foster camaraderie between students. Such activities will include attendance at *Research Seminar in Biomedical Sciences* at which students present their findings to peers and faculty. Students will also be required to attend a *Journal Club* where they will discuss influential new publications of interest to a broad audience.

All students will be strongly encouraged to participate in laboratory rotations through at least three different faculty research programs in their first year before selecting a doctoral mentor(s). Students are also required to take core electives from the list of approved courses for their track (*e.g., Cancer Biology* or *Disease Ecology*). All core requirements must be completed within the first two years of enrollment (within four semesters excluding summers).

In addition to the core requirements, students are required to take four hours of courses that teach scientific communication skills from a list of approved courses before their oral examination.

Additional electives are taken to meet all graduate school requirements for the Ph.D. degree, including 16 hours of 8000/9000 level course work (exclusive of doctoral research, independent study courses and dissertation writing) and a minimum 30 hours of course work overall (including at least 3 hrs. of dissertation writing).

The student must form a four-member *Dissertation Advisory Committee* by the end of the fourth semester in the program, in consultation with a faculty mentor(s) in whose group(s) the student's research will be performed. In keeping with the interdisciplinary nature of the IBS, at least two members of the committee must be from different colleges and represent distinct disciplines. The mentor and student will work with the *Dissertation Advisory Committee* to design an appropriate program of study. The Committee could recommend that a student take courses that are not listed in this document.

The BHSI is a degree-granting unit of the Interdisciplinary Life Sciences (ILS) portal (http://www.ils.uga.edu). Students admitted into ILS may join a BHSI program following guidelines agreed to by the two units.

5C. Interdisciplinary Biomedical Sciences Curricula

Cancer Biology Track

First-semester core (All students in the **program** must take these courses in the first semester)

BHSI 8920L	3 hrs.	Research Techniques in Biomedical Sciences
BHSI 8030	1 hr.	Overview of Biomedical Research
GENE 8650	1 hr.	Responsible Science

Curriculum-specific core (All students in this **track** must take four of these courses)

BCMB/CBIO ****	3 hrs.	Advanced Topics in Cancer Biology
CBIO/MIBO 6100 or	3 hrs.	Immunology
IDIS 8300	3 hrs.	Advanced Immunology
GENE 8920	3 hrs.	Nucleic Acids
GENE 8930	3 hrs.	Advanced Molecular Genetics

VPAT 8030	3 hrs.	Tumor Biology
BCMB 8010	4 hrs.	Advanced Biochemistry and Molecular Biology I
CBIO 8010	3 hrs.	Molecular Cell Biology

Flexible core (All students in this **track** must take two of these courses)

BCMB 8020	4 hrs.	Adv. Biochemistry and Molecular Biology II
BCMB/GENE 8120	2 hrs.	Adv. Topics in Gene Expression
BCMB/CBIO ****	2 hrs.	Adv. Topics in Cancer Biology
BCMB 8130	2 hrs.	Adv. Topics in Glycobiology
BCMB 8140	3 hrs.	Adv. Topics in Genomics and Bioinformatics
BCMB 8150	2 hrs.	Adv. Topics in Cellular Communication and Regulation
BCMB 8160	2 hrs.	Adv. Topics in Biochemical Basis of Human Disease
BCMB/CHEM 8190	3 hrs.	NMR Spectroscopy of Biomolecules
BCMB/CHEM 8810	3 hrs.	Mass Spectrometry
BCMB/CHEM 8330	3 hrs	Biomolecular Simulations
BIOS 7010	3 hrs	Biostatistics
CBIO 6730	3 hrs.	Endocrinology
CBIO 8100	3 hrs.	Advanced Immunology
CBIO 8300	3 hrs.	Developmental Biology
CBIO 8400	3 hrs.	Advanced Cell Biology
CHEM 8350	3 hrs	Bioorganic Chemistry
EHSC 8210	3 hrs	Cancer Etiology and Prevention
EPID 8410	3 hrs	Cancer Epidemiology
GENE 8940	3 hrs.	Genome Analysis
GENE 8970	3 hrs.	Metazoan Genetics
VPHY 8460	3 hrs.	Molecular Pharmacology

(All core courses above must be completed by the end of the fourth non-summer semester)

Communication Skills/Seminar requirement. All students in the **program** must take at least six hrs. of courses involving training and experience with verbal communication skills. Courses may be chosen from the following and must involve student presentation of scientific literature or research topic. All students will also present a BHSI seminar on her/his dissertation prior to graduation.

BCMB 8030	3 hrs.	Intro. to Res. in Biochemistry and Molecular Biology
CBIO 8080	2 hrs.	Scientific Communication Skills in Cellular Biology

CHEM 8290	3 hrs.	Scientific Communication Skills
IDIS 8160	3 hrs.	Seminar in Infectious Diseases
MIBO 8160	3 hrs.	Seminar in Microbiology

Disease Ecology Track

First-semester core (All students in the **program** must take these courses in the first semester)

BHSI 8920L	3 hrs.	Research Techniques in Biomedical Sciences
BHSI 8030	1 hr.	Overview of Biomedical Research
GENE 8650	1 hr.	Responsible Science

Curriculum-specific flexible core (All students in this **track** must take at least 6 hours of courses focusing on two of three areas: [i.] ecology, [ii.] infectious diseases, and [iii.] public health.)

Ecology Courses

ECOL 6000	3 hrs.	Population and Community Ecology
ECOL/BIOL 6150/6150D	4 hrs.	Population Biology of Infectious Diseases
ECOL 6010	3 hrs.	Ecosystem Ecology
ECOL 6020/6020L	4 hrs.	Field Systems Ecology
ECOL6030/6030L	4 hrs.	Mammalogy
ECOL/FORS 6040/6040L	4 hrs.	Herpetology
ECOL 6050/6050L	4 hrs.	Ichthyology
ECOL/GENE 6060/6060L	3 hrs.	Ornithology
ECOL 6070/6070L	4 hrs.	Invertebrate Zoology
ECOL 6100/6100L	4 hrs.	Ecological Biocomplexity
ECOL 6110	4 hrs.	Insect Diversity
ECOL/CRSS/ENGR/ FORS/GEOG/GEOL 6170L	3 hrs.	Hydrology, Geology, and Soils of Georgia
ECOL/ANTH 6210	4 hrs.	Zooarchaeology
ECOL 6240/6240L	3 hrs.	Physiological Ecology
ECOL/ANTH 6290	3 hrs.	Environmental Archaeology
ECOL/FORS 6310/6310L	4 hrs.	Limnology
ECOL/FORS 6360	4 hrs.	Fish Ecology
ECOL/PBIO 6520	3 hrs.	Plant-Animal Interactions
ECOL 6560	4 hrs.	Science and Art of Conservation
ECOL 6570	4 hrs.	Comparative Biodiversity and Land Conservation
ECOL/PBIO 6750	3 hrs.	Tropical Ecology and Conservation

ECOL/ANTH/CRSS/ GEOG/HORT 6930	3 hrs.	Agroecology of Tropical America
ECOL 6130	3 hrs.	Geographic Information Systems for Environmental Planning
EOCL/ANTH/FORS 6140	3 hrs.	Principles of Conservation Ecology and Sustainable Development
ECOL 6400	4 hrs.	Evolution of the Biosphere
ECOL/ANTH 8110	3 hrs.	Tropical Ecological and Cultural Systems
ECOL/PBIO	4 hrs.	Plant Reproductive Ecology
ECOL/ENTO/PBIO 8150/8150L	4 hrs.	Wetland Ecology and laboratory
ECOL 8170	4 hrs.	Natural History of the Hymenoptera
ECOL 8220	2 hrs.	Stream Ecology
ECOL 8230	2 hrs.	Lake Ecology
ECOL 8300	3 hrs.	Behavioral Ecology
ECOL/FORS/PBIO 8310	4 hrs.	Population Ecology
ECOL/FORS 8322	4 hrs.	Concepts and Approaches in Ecosystem Ecology
ECOL/FORS/PBIO 8325/8325L	4 hrs.	Modeling Population Ecology
ECOL/FORS 8330	3 hrs.	Landscape Ecology
ECOL/FORS/PBIO 8410	4 hrs.	Community Ecology
ECOL 8420	3 hrs.	Watershed Conservation
ECOL 8440	3 hrs.	Principles of Agroforestry/Agroecology
ECOL/ENGR 8560	3 hrs.	Systems and Engineering Ecology
ECOL 8580/8580L	4 hrs.	Theory of Systems Ecology
ECOL 8600	3 hrs.	Nuclear Tracers in Ecology
ECOL/CRSS 8650	3 hrs.	Nutrient Cycling Models
ECOL/CRSS 8660/8660L	4 hrs.	Soil Biology and Ecology
ECOL/FORS 8680	3 hrs.	Animal Biodiversity and Conservation
ECOL/AAEC 8700	3 hrs.	Environmental Policy and Management
ECOL 8710	4 hrs.	Environmental Law Practicum
ECOL 8720	3 hrs.	Environmental Law for Scientists
ECOL/FORS/PBIO 8770	3 hrs.	Communities and Ecosystems
ECOL/CRSS/FORS/PBIO 8850/8850L	4 hrs.	Terrestrial Biogeochemical Cycling
EHSC/ECOL/FISH/WASR 8610	3 hrs.	Aquatic Toxicology

Infectious Diseases Courses

BCMB 8010	4 hrs.	Advanced Biochemistry and Molecular Biology I
BCMB 8140	3 hrs.	Adv. Topics in Genomics and Bioinformatics
BCMB/CHEM 8330	3 hrs	Biomolecular Simulations
CBIO 6500	3 hrs.	Medical Parasitology
CBIO 6600/6600L	4 hrs.	Biology of Protists
CBIO 8010	3 hrs.	Molecular Cell Biology
CBIO 8100	3 hrs.	Advanced Immunology
CBIO 8400	3 hrs.	Advanced Cell Biology
CBIO 8500	4 hrs.	Biology of Parasitism
CBIO/BCMB/MIBO 8520	3 hrs.	Biochemistry and Molecular Genetics of Parasites
FORS 8500	3 hrs.	Diseases of Wildlife I
FORS 8510	3 hrs.	Diseases of Wildlife II
GENE 6000	3 hrs.	Evolutionary Biology
GENE 8920	3 hrs.	Nucleic Acids
GENE 8930	3 hrs.	Advanced Molecular Genetics
GENE 8940	3 hrs.	Genome Analysis
GENE 8950	3 hrs.	Molecular Evolution
IDIS 6500	3 hrs.	Virology
IDIS 8010	4 hrs.	Advanced Studies in Infectious Diseases
IDIS 8030	3 hrs.	Helminthology
IDIS 8080/8080L	3 hrs.	Advanced Techniques in Experimental Parasitology
IDIS 8100	3 hrs.	Advanced Infectious Diseases
IDIS 8300	3 hrs.	Advanced Immunology
MIBO 6090	3 hrs.	Prokaryotic Biology
MIBO 6500	3 hrs.	Bacterial Symbioses
MIBO 6700	3 hrs.	Medical Mycology
MIBO 6710L	3 hrs.	Medical Mycology Laboratory
MIBO 8600	3 hrs.	Fundamental Processes of Prokaryotic Cell Biology
MIBO 8610	3 hrs.	Prokaryotic Physiology and Diversity
MIBO/POPH/IDIS 6220	3 hrs.	Pathogenic Bacteriology
PATH/PBIO 6200/6200L	3 hrs.	Introductory Mycology
PBIO/GENE/BCMB 8960	3 hrs.	Genetics of Yeast and Filamentous Fungi
POPH/IDIS/MIBO 8200	3 hrs.	Experimental Design in Molecular Microbiology
POPH/MIBO 6650	3 hrs.	Viral Zoonoses
VPAT 8020	4 hrs.	Cellular Pathology

VPAT 8100	3 hrs.	Microscopic Pathology
VPAT/IDIS 8150	3 hrs.	Virology and Viral Pathogenesis

Public Health courses

BIOS 7010	3 hrs.	Introductory Biostatistics I
BIOS 7020	3 hrs.	Introductory Biostatistics II
BIOS 8100	3 hrs.	Case Studies in Nonlinear Biostatistics
BIOS 8110	3 hrs.	Categorical Data Analysis
EPID 7010	3 hrs.	Introduction to Epidemiology I
EPID 8100	3 hrs	Clinical Epidemiology
EPID (GRNT) 8400	3hrs.	Epidemiology of Chronic Disease
EPID 8500	3 hrs	Infectious Disease Epidemiology
EPID 8515	3 hrs	Modeling Infectious Disease
EPID 8520	3 hrs	Food Safety Epidemiology
EHSC 6310/6310L	3 hrs.	Environmental Microbiology
EHSC/FDST/MIBO 6310-/6310L	4 hrs.	Environmental Microbiology
EHSC 8210	3 hrs	Cancer Etiology and Prevention
HPAM 7400	3 hrs	Public Health Law

5D. Development of New Tracks for IBS

The current document presents two sample degree tracks that have been developed as doctoral programs within the IBS. The IBS doctoral degree is designed to be interdepartmental; groups of faculty who share fields of interests in the biomedical and health sciences can use it to develop an interdisciplinary training environment for doctoral students. Such faculty groups may propose a *training program ("Track")* using the guidelines provided in this document, and submit it to the *BHSI Curriculum Committee* (composed of four faculty representing the four BHSI Divisions and a representative of the Graduate School Curriculum Committee) for evaluation. A positive recommendation by the Curriculum Committee to the *BHSI Executive Committee* may lead to adoption of the training track as part of the IBS. (The BHSI Executive Committee consists of the Director and Division Chairpersons of the BHSI).

The Curriculum Committee will not approve a degree program (i.e., Track) that can be offered within a single department and/or for which there is no need for interdepartmental collaborations. Additionally, Tracks will be reviewed on a seven-year basis to evaluate the continued need for and viability of the program.

5E. Sample Programs of Study

Cancer Biology Track

Year 1

BCMB 8010	Advanced Biochemistry and Molecular Biology I	4 hrs.	
CBIO 8010	Molecular Cell Biology		3 hrs.
BHSI 8920L	Research Techniques in Biomedical Sciences		3 hrs.
BHSI 8030	Overview of Biomedical Sciences		1 hr.
BCMB 8020	Advanced Biochemistry and Molecular Biology II	4 hrs.	
VPHY 8460	Molecular Pharmacology		3 hrs.
GENE 8650	Responsible Science	1 hr.	
BCMB 8140	Advanced Topics in Genomics and Bioinformatics		3 hr.

Year 2

CBIO 6100	Immunology		3 hrs.
GENE 8920	Nucleic Acids	3 hrs.	
BCMB 8150	Adv. Topics in Cell. Communication and Regulation		2 hrs.
CHEM 8290	Scientific Communication Skills		3 hrs.
BHSI xxxx	Research Seminar in Biomedical Sciences		1 hr.

Year 3

BCMB 8130	Adv. Topics in Glycobiology	2 hrs.	

Taken over the course of residency at the University of Georgia

BHSI 9000	Doctoral Research		10-30 hrs.
BHSI 9300	Doctoral Dissertation	3 hrs.	

Disease Ecology Track (emphasis in ecology/infectious diseases)

Year 1

ECOL 6150	Population Biology of Infectious Diseases	4 hrs.	
ECOL 8310	Population Ecology		4 hrs.
BCMB 8010	Advanced Biochemistry and Molecular Biology I	4 hrs.	
BHSI 8920L	Research Techniques in Biomedical Sciences		3 hrs.
BHSI 8030	Overview of Biomedical Sciences		1 hr.
GENE 8650	Responsible Science	1 hr.	
IDIS 8010	Advanced Studies in Infectious Diseases	3 hrs.	

Year 2

ECOL 8325L	Modeling Population Ecology		4 hrs.
CBIO 8500	Biology of Parasitism	4 hrs.	
CBIO 6100	Immunology		3 hrs.
EPID 7010	Introduction to Epidemiology I		3 hrs.
POPH 8310L	Population Health Statistics I		3 hrs.
CHEM 8290	Scientific Communication Skills		3 hrs.

Year 3

IDIS 8300	Advanced Immunology		3 hrs.

POPH 8200 Pathogenic and Molecular Microbiology 3 hrs.
EHSC 6310/6310L Environmental Microbiology 3 hrs.

Taken over the course of residency at the University of Georgia
BHSI 9000 Doctoral Research 10-30 hrs.
BHSI 9300 Doctoral Dissertation 3 hrs.

5F. Course Descriptions

Existing Courses (Core)

BCMB 8010 (4 hrs.) Advanced Biochemistry and Molecular Biology I
Advanced biochemistry and molecular biology stressing thermodynamic principles in biochemistry, structural biology, enzymology, and aspects of metabolism and bioenergetics.

CBIO 8010 (3 hrs.) *Molecular Cell Biology*
Molecular cell biology emphasizing experimental approaches that have led to our current understanding of cellular architecture, macromolecular components and how they influence cell function.

GENE 8650 (1 hr.) *Responsible Science*
The course is designed for first-year graduate students on how to conduct scientific research responsibly.

New Courses

BHSI 8920L (3 hrs.) *Research Techniques in Biomedical Sciences*
This course involves three rotations in the laboratories of BHSI members.

BHSI 8030 (1 hr.) *Overview of Biomedical Research*
This course comprises one to two lectures on scientific ethics, then two concurrent sessions (one for each curriculum) in which faculty in Cancer Biology or Disease Ecology present an overview of research in their laboratories. All students sign up for the same course, but are only required to attend one of the weekly sessions. Students are given the flexibility to decide which session to attend in any given week. Students can attend more than one session as their interests dictate.

BCMB/CBIO/GENE **** (3 hrs.) *Advanced Topics in Cancer Biology*
Advanced Topics in Cancer Biology will provide an in-depth analysis of selected topics that are at the forefront of cancer biology research. Discussions of research papers will be designed to enhance appreciation of rigorous research. Topics will include: cell cycle regulation, growth factor receptor signaling, cell surface tumor markers, efficacy of diagnostic assays, immuno-chemotherapy, and therapeutic drug discovery and targeting.

BHSI/IDIS **** (3 hrs.) *Infectious Disease Ecology and Public Health*
This interdisciplinary course will address issues at the heart of the OneHealth initiative, broadly exploring the interface of animal, human and ecosystem health. Topics to be

introduced will include zoonotic diseases, infectious disease modeling, infectious disease ecology, and principles of epidemiology and public health.

6. Inventory of Faculty Directly Involved

Please see Appendix 1

7. Three Outstanding Programs of this Nature in Other Institutions

Ohio State University
"Integrated Biomedical Science Graduate Program" (IBGP)
Room 1190 Graves Hall, 333 West 10th Avenue
Columbus, Ohio 43210
Director: Allan J. Yates, M.D., Ph.D.
Telephone: 614-292-0857
FAX: 614-292-6226
Email: info@ibgp.org
Web: http://www.ibgp.org/index.htm
The IBGP, with the theme "The Biology of Human Disease," is a unique graduate program that since 2001 has replaced all of the departmental graduate programs within the OSU College of Medicine. The program has an extremely strong Graduate Faculty composed of over 170 members from 19 departments. The curriculum starts with the biochemical and cellular aspects, then on through development and systems-based approaches. Students initially track through laboratory rotations with different advisers. The curriculum includes a planned course in problem-solving.

The University of Virginia
"Biomedical Sciences Program" (BIMS)
There are seven different program areas, each with different primary contacts listed on this link:
Biomedical Sciences Group Director Contact Information
(http://www.healthsystem.virginia.edu/internet/bims/directors.cfm)
Graduate Programs Office (http://www.healthsystem.virginia.edu/internet/gpo/home.cfm)
University of Virginia, School of Medicine
1102 Jordan Hall, PO Box 800738
Charlottesville, VA 22908
Phone: 434-924-2181
Email: bims@virginia.edu
URL: http://www.healthsystem.virginia.edu/internet/bims/
The goal of the University of Virginia BIMS Program is "to provide students with the requisite knowledge and skills with which to pioneer major advances in our understanding of the complex biology of cells and tissues, and to lead efforts to cure and/or better treat human disease in the 21st Century... To help meet the challenges of modern biological/biomedical research training, the University of Virginia faculty have adopted an interdepartmental structure for graduate training that optimizes the research training opportunities available" (BIMS website). Significantly, students are initially admitted as members of the BIMS Graduate Program Group to which they first applied, rather than to home departments, analogous to how the BHSI program in IBS will be structured.

University of Alabama at Birmingham (UAB)
"Integrative Biomedical Sciences" (IBS) Graduate Program

845 19th Street South
Birmingham, AL 35294-2170
Phone (program office): (205) 934-4303 or (205) 934-0676
Director: Dr. Kevin Kirk
Phone: (205) 934-3122
E-mail: kirk@physiology.uab.edu
URL: http://www.ibs.uab.edu
Participating departments are Environmental Health Sciences, Pathology, Pharmacology and Toxicology, and Physiology and Biophysics. More than 150 UAB faculty members are affiliated with the IBS program. All IBS graduate students receive full fellowship support through either the Graduate School or an IBS training grant. IBS integrates principles of biochemistry and molecular biology with those of physiology, pathophysiology and therapy. Involvement in laboratory training through research rotations, and the acquisition of skills in reading, writing and speaking are also emphasized.

8. Inventory of Pertinent Library Resources

The University of Georgia has the largest library in the state with more than 3.8 million volumes. The UGA Libraries are members of the Association of Research Libraries and ranked 35th in total volumes held and 9th in current periodicals owned in 2000. Moreover, UGA is a Regional Depository library to the U.S. Superintendent of Documents and U.S. Government Printing Office.

8A. Print Materials

The University of Georgia Libraries possess an impressive print collection in the sciences and rank very high for a research university that does not have a medical school. The Science Library contains approximately 750,000 total volumes, owns 1044 periodical titles in medicine and 1326 periodical titles in basic life sciences. There are additional titles located in the Main Library that are relevant to some research areas.

8B. Electronic Materials

Like the print materials, the University of Georgia Libraries offers very impressive access to electronic resources, including full text journal articles. Among these resources are the *Web of Science* from the Institute of Scientific Information, *Science Citation Index* with back files to 1945 and *Journal Citation Reports*. Hundreds of additional databases are available via the statewide GALILEO system. Among these are CABI, Agricola, BIOSIS, Biological and Agricultural Index, MEDLINE, Cambridge Scientific Abstracts, PsychInfo, Sport DISCUS, and Chemical Abstracts SciFinder Scholar. Important to the IBS program is the electronic access to full-text journal articles via Elsevier's ScienceDirect (over 900 titles), Springer-Verlag, Academic Press, Lippincott/Williams and Wilkins, Cell Press and several individual bioscience related titles, such as Annual Reviews. GALILEO also allows access to other full-text resources such as *AHFS Drug Information*, *CRC Handbook of Chemistry and Physics*, *Stedman's Medical Dictionary*, and *USP/DI Drug Information*. In summary, no new library support will be needed to implement the IBS degree.

9. Facilities

The Biomedical and Health Sciences Institute will house the administrative offices for the IBS Graduate Program.

All faculty involved in the IBS, located throughout the UGA campus, have well equipped laboratories to sustain their current research load. It is expected that students will be trained in these existing facilities. These include laboratories for genomics, proteomics, molecular biology, molecular genetics, medicinal chemistry, pharmacology, toxicology, microbiology, virology and immunology. Hence, there are ample existing research facilities for the program.

10. Administration of IBS, and Evaluation of Tracks in the Program

A five-member *Graduate Affairs Committee* will be appointed by the BHSI Executive Committee to manage the IBS. The Graduate Affairs Committee will include faculty that are very active as mentors or instructors in the IBS PhD program as well as Graduate Coordinators from Departments with members in IBS. A Graduate Coordinator will be appointed to oversee the IBS program. The Graduate Coordinator will be assisted by a *BHSI administrative staff* shared with other academic programs based at the BHSI. Partial funding for the administrative staff position in addition to compensation for the Graduate Coordinator is requested in the budget.

The *Graduate Affairs Committee* will oversee many aspects of the IBS, including student recruiting and admissions, monitoring of student progress and student support. The committee will provide guidelines for student admission (based mainly on undergraduate GPA, GRE scores, letters of recommendation and interviews) and fulfillment of degree requirements (*e.g.*, research rotations, dissertation prospectus, two seminars, written and oral comprehensive exams). They will also be responsible for developing detailed policies concerning financial support for students.

All procedures governing IBS will meet guidelines and policies established by the UGA Graduate School.

One important aspect of IBS is the use of *Tracks*, which are formed as a result of grassroots faculty interest in an interdisciplinary area. Tracks will be reviewed every seven years by the BHSI Executive Committee together with the Graduate Affairs Committee. Tracks found to be underperforming will be terminated.

To be in good standing a Track (i) must have at least three students in the entire program, (ii) should have had at least 10 applications from prospective students per year, and (iii) the training faculty should have submitted (or be close to submitting) a Training Grant application for extramural funding by NIH or NSF.

11. Assessment

11A. Direct Student Assessment

Students admitted to the program will be evaluated by their advisory committees a minimum of once per year. These evaluations will include a self-assessment by the student as well as assessments by the faculty research advisor and advisory committee. The advisory committee will submit annual reports containing their appraisal of each student's progress and recommendation for continuance or termination to the IBS Graduate Affairs Committee. A written evaluation will be provided to the student and copies maintained for program review. Upon receipt and consideration of this input, the Graduate Affairs Committee will render a final decision regarding continuation or termination of the student in the program. All requirements for candidacy, comprehensive examinations, preparation of dissertation, and defense of the dissertation will be in accordance with existing Graduate School policies.

The experience of students who complete the program will be gathered using Web-based exit questionnaires at graduation, and at 5-years and 10-years post-graduation. The Graduate Coordinator will be responsible for administering the questionnaire, which will be designed in consultation with the Graduate School and the Graduate Affairs Committee to assess the effectiveness of the IBS program. Examples of specific topics on which information will be gathered include the following: 1) learning experiences and climate; 2) the effectiveness the Dissertation Advisory Committee; 3) mentoring for professional development; 4) adequacy of resources for research; and 5) the effectiveness of the Ph.D. program in preparing students for the workplace. Graduates will also be asked about their pre- and post-academic successes including: 1) research grants as primary investigator/co-investigator, 2) research publications, 3) other publications; and 4) awards, honors and other noteworthy achievements. Responses will be compiled and reviewed by the Graduate Affairs Committee and the BHSI Executive Committee who will make recommendations to improve the IBS program based on these findings.

11B. Learning Outcomes Assessment

Outcomes assessment will be based on the University of Georgia Graduate School document "Graduate Program Assessments: A Guide for Deans, Graduate Coordinators and Department Heads (http://www.gradsch.uga.edu/For_Faculty/forum/assessment.pdf). The Graduate Affairs Committee will establish criteria to judge the quality and effectiveness of the IBS program. Factors to be used in assessing the program include (but are not limited to):

- Ability of the program to recruit top applicants.
- Publication record of students
- Graduate student success at obtaining extramural fellowships/awards/funding
- Monitoring of the placement of graduates in postdoctoral, industrial or faculty positions.
- Time to degree completion, and percent of students completing the Ph.D.

Data collected by the Graduate Affairs Committee will be reviewed and a report forwarded to the Director of the BHSI for consideration by the Executive Committee.

Weaknesses identified in the program will be brought to the attention of the Graduate Affairs Committee who will meet with faculty involved in the Track in question. The faculty and Graduate Affairs Committee will devise and implement a plan to address any problems in the IBS program.

12. Accreditation

There is no accreditation agency for non-M.D. biomedical programs.

13. Affirmative Action Impact

The IBS will be a major contributor to initiatives to increase the diversity of faculty and students participating in biomedical sciences research and teaching at UGA. The BHSI will promote and facilitate these efforts in collaboration with: (i) all *Departments*, (ii) the *Graduate School*, and (iii) the *Office of Institutional Diversity*.

IBS faculty members attend meetings of (i) the Society for Advancement of Chicanos and Native Americans in Science (SACNAS), and (ii) the Annual Biomedical Research Conference for Minority Students (ABRCMS). IBS takes a leadership role in this endeavor, encouraging as many departments as possible to send faculty and students to these national meetings for minority student scientists. In the past, the Departments of Genetics, Cellular Biology, and Biochemistry and Molecular Biology have been partners in these efforts. Our experience indicates that presence of faculty at the recruiting desk of UGA at these conferences helps provide students with information that would otherwise not be forthcoming from representatives of the Graduate School, because of their technical nature. IBS faculty members have mentored students who performed research in the apprentice program of the *Center for Undergraduate Research Opportunities*. Our efforts will be maintained and enhanced in coming years. In particular, IBS faculty will be encouraged to send students who have trained with them to these national meetings to give some visibility to UGA efforts at enhancing diversity in the biomedical sciences. Professor Kojo Mensa-Wilmot will coordinate these activities with support from Dean Garnett Stokes (Franklin College) and Dr. David Lee, Vice President for Research.

Members of IBS will participate in recently initiated joint programs between UGA and Historically Black Colleges and Universities (HBCUs) (e.g., Graduate School Feeder Program (http://www.uga.edu/gradschool/outreach&diversity/feeder.html). Our faculty will host visits during the summer from faculty from HBCUs within the state and around the country. Efforts to institutionalize these initiatives are being discussed with the Office of the Vice President for Research. Our faculty have visited several predominantly minority institutions, specifically for the purpose of recruiting students. Institutions visited include Morehouse College (Georgia), Meharry Medical College (Tennessee), Albany State University (Georgia), Spelman College (Georgia), University of Maryland Baltimore County (Maryland), and Grambling State University (Louisiana).

14. Fiscal and Enrollment Impact and Estimated Budget

The BHSI's operating budget that is received from OVPR will cover the cost of the IBS program administration personnel. It is anticipated that IBS graduate student will receive stipends in their first year and subsequent years will have their Research Assistantships covered by grants from their mentors as is done for most graduate students in UGA science departments. Assistantships/fellowships to cover the first year are anticipated to come from the ILS program, of which the IBS will be a participant, the Graduate School in the form of Presidential or University-Wide competitive awards, or the University via the newly created awards for outstanding graduate students. Given that the IBS is intended to attract and accept only the most outstanding applicants, IBS students will be highly competitive for these awards.

Appendix 1

Name	Academic Unit	Role
Alan Darvill	Complex Carbohydrates Research Center	Student Mentor/Lecturer
Amy Medlock	Biochemistry and Mol. Biol.	Student Mentor/Lecturer
Andreas Handel	College of Public Health	Student Mentor/Lecturer
Anna Karls	Microbiology	Student Mentor/Lecturer
Bi-Cheng Wang	Biochemistry and Mol. Biol.	Student Mentor/Lecturer
Biao He	College of Veterinary Medicine	Student Mentor/Lecturer
Brent Clementz	Psychology	Student Mentor/Lecturer
Cordula Schulz	Cellular Biology	Student Mentor/Lecturer
David Garfinkel	Biochemistry and Mol. Biol.	Student Mentor/Lecturer
Duncan Krause	Microbiology	Student Mentor/Lecturer
Edward Kipreos	Cellular Biology	Student Mentor/Lecturer
Elizabeth Howerth	College of Veterinary Medicine	Student Mentor/Lecturer
Geer Jan-Boons	Chemistry	Student Mentor/Lecturer
J.S. Wang	College of Public Health	Student Mentor/Lecturer
Jeff Urbauer	Chemistry	Student Mentor/Lecturer
Jennifer McDowell	Psychology	Student Mentor/Lecturer
John Vena	College of Public Health	Student Mentor/Lecturer
John Maurer	Population Health	Student Mentor/Lecturer
Julie Cofield	Physiology and Pharmacology	Student Mentor/Lecturer
Kannan Natarajan	Bioinformatics Institute	Student Mentor/Lecturer
Kevin Dobbin	College of Public Health	Student Mentor/Lecturer
Kojo Mensa-Wilmot	Cellular Biology	Director of Grad. Studies
Lance Wells	Cancer Center	Student Mentor/Lecturer
Maor Peled	Complex Carbohydrates Research Center	Student Mentor/Lecturer
Marcus Fechheimer	Cellular Biology	Student Mentor/Lecturer
Marguerite Madden	Geography/Center for Remote Sensing	Student Mentor/Lecturer
Mark Farmer	Cellular Biology	Student Mentor/Lecturer
Melissa Davis	Genetics	Student Mentor/Lecturer
Michael Pierce	Cancer Center	Student Mentor/Lecturer
Michael Terns	Biochemistry and Mol. Biol.	Student Mentor/Lecturer
Michael Yabsley	College of Veterinary Medicine	Student Mentor/Lecturer
Pat Miller	Psychology	Student Mentor/Lecturer
Phillip Holmes	Psychology	Student Mentor/Lecturer
Ping Shen	Cellular Biology	Student Mentor/Lecturer
Qun Zhao	Cancer Center	Student Mentor/Lecturer
Rebecca Terns	Biochemistry and Mol. Biol.	Student Mentor/Lecturer
Richard Steet	Complex Carbohydrates Research Center	Student Mentor/Lecturer
Rob Maier	Microbiology	Student Mentor/Lecturer
Rob Woods	Chemistry	Student Mentor/Lecturer
Robert Arnold	Cancer Center	Student Mentor/Lecturer
Ron Orlando	Complex Carbohydrates Research Center	Student Mentor/Lecturer
Robert Phillips	Chemistry	Student Mentor/Lecturer
Scott Dougan	Cellular Biology	Student Mentor/Lecturer
Shaying Zhao	Biochemistry and Mol. Biol.	Student Mentor/Lecturer
Shelley Hooks	College of Pharmacy	Student Mentor/Lecturer
Shiyou Chen	College of Veterinary Medicine	Student Mentor/Lecturer

Appendix 1

Somanath Shenoy	Cancer Center	Student Mentor/Lecturer
Sonia Hernandez	College of Veterinary Medicine	Student Mentor/Lecturer
Stephen Rathbun	College of Public Health	Student Mentor/Lecturer
Steve Dalton	Biochemistry and Mol. Biol.	Student Mentor/ Instructor
Steven Beach	Institute for Behavioral Research	Student Mentor/Lecturer
Steven Stice	Animal and Dairy Science/CAES	Student Mentor/Lecture
Steven Hajduk	Biochemistry and Mol. Biol.	Student Mentor/Lecturer
Tamas Nagy	Cancer Center	Student Mentor/Lecturer
Timothy Dore	Chemistry	Student Mentor/Lecturer
Todd Harrop	Chemistry	Student Mentor/Lecturer
Walter Schmidt	Cancer Center	Student Mentor/Lecturer
William Lanzillota	Biochemistry and Mol. Biol.	Student Mentor/Lecturer
Woncheol Jang	College of Public Health	Student Mentor/Lecturer
Xiaoqin Ye	College of Veterinary Medicine	Student Mentor/Lecturer
Ying Xu	Bioinformatics Institute	Student Mentor/Lecturer

The University of Georgia

Office of Vice President for Research

January 24, 2011

Dr. Harry A. Dailey, Director
Biomedical & Health Sciences Institute
S150 Paul D. Coverdell Center
Athens, GA 30602

Dr. Kojo Mensa-Wilmot
Department Head
Cellular Biology
701 Biological Sciences Building
Athens, GA 30602

Dear Harry and Kojo:

We have reviewed the latest revision of the proposal to establish a Ph.D. program in Interdisciplinary Biomedical Sciences (IBS) to be housed in the Biomedical & Health Sciences Institute. The Office of the Vice President for Research supports this important initiative to establish interdisciplinary training opportunities for graduate students at UGA, beginning with the initial tracks in Cancer Biology and Disease Ecology. I agree with your assessment that if established, IBS will complement the umbrella Interdisciplinary Life Sciences admissions portal and that both are desirable on campus. It is my strong hope that through the combination of these programs, UGA will be in a better position to attract the pool of graduate students who have elected such options at other institutions in recent years. Thank you for your efforts towards this important goal.

Sincerely,

David Lee
Vice President for Research
University of Georgia

609 Boyd Graduate Studies Research Center
Athens, Georgia 30602-7411 • Telephone 706-542-5969 • Fax 706-542-5978

The University of Georgia

Franklin College of Arts and Sciences
Office of the Dean

December 2, 2010

Dr. Kojo Mensa-Wilmot
Cellular Biology
Biological Sciences Dept.
UGA CAMPUS

Dear Dr. Mensa-Wilmot,

The Franklin College Faculty Senate and Curriculum Committee have reviewed the proposal for an interdisciplinary Ph.D. program in Biomedical Sciences. Both units were in favor of the graduate program and the Franklin College supports the proposal.

Sincerely,

Garnett S. Stokes
Dean

c: Dr. Harry Dailey

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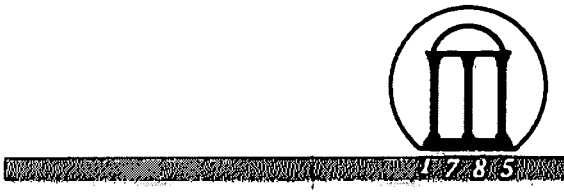


The University of Georgia

Harry Dailey, PhD; Director
Biomedical Health Science Institute (BHSI)
The University of Georgia
0150b Coverdell Center
500 D. W. Brooks drive
Athens, GA 30602
Phone: 706-542-2690; e-mail: hdailey@uga.edu

Cc: Maureen Grasso, PhD; Dean Academic of the University of Georgia Graduate School
e-mail: mgrasso@uga.edu

August 29, 2010

Dear Dr. Dailey,

This letter is in support of your new university-wide PhD program in Interdisciplinary Biomedical Sciences. I am currently a member of the Graduate Affairs committee for the College of Veterinary Medicine (CVM), past chair and author of the current CVM PhD program in Veterinary Biomedical Sciences (VBS).

The goal of our VBS PhD program is to train a new generation of interdisciplinary and multidisciplinary translational scientists. Students enrolled in the program will vary considerably in their academic background and knowledge base. These will include veterinarians, who possess a broad animal disease background, and non-veterinarians who may possess bachelor's degrees in dissimilar disciplines including computational, basic, and applied science. This program is designed to train a new cadre of veterinarians and veterinary scientists, strong in basic biomedical sciences and capable of translating this experience to their clinical experience in providing the best, modern veterinary care to patients and clientele at the university. While this program sounds similar to the proposed, BHSI Interdisciplinary Biomedical Sciences PhD program, ours is very specific to the training of veterinary clinicians in research.

The impetus for our proposed PhD program was two recent reports from the National Research Council ("Critical Needs for Research in Veterinary Science" in 2001 and "National Need and Priorities for Veterinarians in Biomedical Research" in 2004) have precisely summarized the critical nature of the emerging deficit of veterinary clinician

scientists. The distinction of the veterinary clinician scientist is that they use their Doctor of Veterinary Medicine (DVM) degree to diagnose, manage, and treat patients in a clinical setting while simultaneously utilizing their PhD degree and basic science to investigate the very same diseases that affect their patients. Ph.D. programs in the UGA College of Veterinary Medicine ideally should serve several purposes, namely: to train scientists who understand the pathogenesis, treatment and assessment of diseases, as well as the normal biological and physiological functions of animals; to prepare clinical researchers who bring rigorous scientific methods to the assessment of clinical problems and their solution; to teach research professionals who are knowledgeable in epidemiology and ecology; and finally, to educate scientists who can integrate bench and clinical scientific methods and translate discoveries efficiently into new diagnostics and therapies. The global mission of the College of Veterinary Medicine is to promote the art and science of veterinary medicine through the acquisition, application, and dissemination of scientific advances that help diagnose and treat disease and maintain health of animals and humans through scholarly inquiry into the nature of health and disease. Successful pursuit of our mission requires more effective and efficient translation of bench-top discoveries into diagnostic and patient-care tools, which are the goal of the VBS PhD program and the mission of the College of Veterinary Medicine.

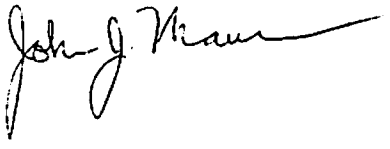
The program itself is flexible towards the training of students in two areas of emphasis: population health and applied clinical sciences. The basic core class requirements for students in our program are courses in ethics, scientific writing, and seminar. All additional course requirements follow standards set by the university graduate school and suggestions of the student and their PhD advisory committee to allow students to match the curricula with their specific training and research. The program is designed to address the unique requirements of the CVM in clinical research training.

I believe that both program serve the needs of the University for training scientists to meet new challenges facing us in the 21st century and making use of new technologies and approaches to system biology, important in solving many fundamental questions and problems facing us in the biomedical sciences. Each program is unique in its approach to graduate research training. While many of our faculty will train their students through our PhD program, I believe many of our own faculty will also be interested in joining and collaborating with the BHSI and BHSI faculty in tackling important problems affecting global health through this unique graduate research training program.

We have recently received NIH funding on a grant relating to Disease Ecology, one of your emphasis areas, that examines the interplay of geography, environmental and ecology on human infections with *Salmonella enterica*. South Georgia has one of the highest incidents of human *Salmonella* infections in the US. Water appears to be a key source, although recently we've also found a connection between human infections and possible wildlife reservoir, songbirds. Erin Lipp, an environmental microbiologist affiliated with the College of Public Health, heads this research team along with Sonia Hernandez, a wildlife biologist and ecologist; Susan Sanchez, a clinical microbiologist; Steve Valeika, an epidemiologist in the College of Public Health; Marguerite Madden, a biogeographer; and myself, a molecular bacteriologist. This provides a perfect example how a student working on this project would benefit from participating in this interdisciplinary endeavor AND training through the BHSI Interdisciplinary Biomedical

Sciences PhD program. We have many other faculty at the college: veterinarians, wildlife biologists, ecologists and microbiologists who will benefit from working with other faculty with different backgrounds: bioinformatics, biochemistry, epidemiology, genetics, and toxicology from similar collaborations through BHSI and the Interdisciplinary Biomedical Sciences PhD program. The end result will be scientists with strong interdisciplinary training. Your program will set UGA apart from other academic institutions by playing on strengths of university faculty and the strong research programs at the university. I wish you the best with the development and approval of your PhD program. Let me know if there is anything else I can do to help support your program. I look forward to its approval and opportunity to also participate in such an exciting research-training program.

Sincerely,



John J. Maurer, PhD
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1785
The University of Georgia

College of Public Health
Epidemiology and Biostatistics

September 1, 2010

Harry A. Dailey, Ph.D.
Professor
Biomedical and Health Sciences Institute
University of Georgia
Coverdell center
Athens, GA 30602

Dear Dr. Dailey,

I am pleased to confirm my enthusiastic support for the Doctoral Program in Interdisciplinary Biomedical Sciences being proposed by the Biomedical and Health Sciences Institute. The program is well designed and unique by emphasizing formal interdisciplinary course work and intensive and mentored research that must involve at least three of the core disciplines. I am enthusiastic to serve as faculty member for the program and to facilitate cross-disciplinary collaboration and involvement of faculty members of this department.

Further, I pledge the commitment of this department's faculty to help meet the goals of the program. The objectives will help strengthen the research and training environment and are in line with this department's strategic plan to strengthen and grow in this field. Your proposed program will complement the graduate degree programs in this department. The proposed program will be exposing graduate students at UGA to unique research and training opportunities. The faculty and students will take advantage of unique features of the scientific environment and the valuable collaborative arrangements. You have assembled a highly experienced faculty and structured an exceptional program.

I look forward to assisting the program in recruiting the best possible students.

Sincerely,

John E. Vena, Ph.D.
UGA Foundation Professor of Public Health
Head, Department of Epidemiology and Biostatistics

132 Paul D. Coverdell Center for Biomedical and Health Sciences • Athens, Georgia 30602-7398
Telephone 706-542-7480 • Fax 706-583-0695

The University of Georgia

Stephen L. Hajduk
Professor & Head

Department of Biochemistry and Molecular Biology

Fred C. Davison
Life Sciences Building, B129
120 Green Street
Athens, Georgia 30602-7229

May 11, 2010

Russell Malmberg, Associate Dean
Franklin College of Arts and Sciences
University of Georgia

Dear Russell,

The faculty of the Department of Biochemistry and Molecular Biology met yesterday, May 10th, 2010 at its regularly scheduled faculty meeting and discussed in detail the revised proposal from Drs. Kojo Mensa-Wilmot and Harry Dailey to establish an "Interdisciplinary Biomedical Sciences" graduate program. Dr. Dailey provided some background on the proposed program and answered questions concerning the current status of the proposal including the overall goals and expectations. The Department of Biochemistry and Molecular Biology continues to be supportive of the development of interdisciplinary graduate programs and voted overwhelming in favor of endorsing the proposal with the following assurances. 1) Funding for this program will come from newly identified resources and will not adversely affect departmental graduate programs or competitive University-wide graduate or teaching assistantships. 2) Departments with participating faculty will not be expected to contribute to the funding of this program.

Please let me know if you need my signature of endorsement for BMB on the proposal and hope to hear more about this program in the future.

Sincerely,

Stephen L. Hajduk
Professor and Head

Telephone (706) 542-1676 • Fax (706) 542-0182 • shajduk@bmb.uga.edu • http://www.bmb.uga.edu

The University of Georgia

Anna C. Karls, Ph.D.
Associate Professor

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Department of Microbiology
http://www.uga.edu/mib/

Biological Sciences Building
Athens, Georgia 30602-2605
(706) 583-0822
FAX:(706) 542-2674

24 September, 2010

To Whom It May Concern:

The Biomedical and Health Sciences Institute has put together the Interdisciplinary Program in Biomedical Sciences in response to the need for a PhD program that focuses on biomedical research. The two tracks within this program in Cancer Biology and Disease Ecology take advantage of strong contingents working in these areas from multiple schools and departments. In my experience as the Microbiology Graduate Coordinator for four years and serving on the Graduate Affairs Committee for ten years, I have seen that we lose some excellent students to other universities with large interdisciplinary programs in the biomedical sciences. Based on their interests, these students would not really fit in our Microbiology program but it would be great to have an option at UGA that does fit their interests. I think that the proposed BHSI-IBS is an excellent option.

Sincerely,

Dr. Anna C. Karls
Associate Professor and Graduate Coordinator

The University of Georgia

Department of Cellular Biology

Tel.: (706)-543-1686
Fax: (706)-542-4271
e-mail: jgaertig@cb.uga.edu
web: http://www.uga.edu/cellbio/gaertig.html

October 7, 2010.

To Whom It May Concern:

We are writing to express our support of the initiative for an interdepartmental Ph.D. graduate program in "Interdisciplinary Biomedical Sciences". There is a nationwide trend of building campus-wide graduate programs, that in many institutions have already replaced traditional programs offered by individual departments. Such integrated programs offer diverse research opportunities and a better training environment for graduate students. From this perspective, UGA has lagged behind other comparable institutions. The proposed program would have the ability to attract top graduate students. Thus, we strongly support the IBS program initiative.

Your Sincerely

Jacek Gaertig

Edard T. Kipreos

Professors and Interim Department Co-Heads

The University of Georgia

Department of Microbiology
527 Biological Sciences Building
Athens, Georgia 30602-2605

Franklin College of Arts and Sciences

Tel 706 542-1434
Fax 706 542-2674

November 10, 2010

Harry A. Dailey, PhD
Professor and Director
Biomedical and Health Sciences Institute
University of Georgia
Athens, GA 30602

Dear Harry,

I am pleased to provide my enthusiastic support for the proposed PhD program in Interdisciplinary Biomedical Sciences through the BHSI. The initial training tracks in Cancer Biology and Disease Ecology represent multi-departmental, cross-disciplinary strengths at the University of Georgia that can be further enhanced by this doctoral program. As noted in the 2007 report of the UGA Task Force on Graduate Education, which I co-chaired, "...more than ever before major discoveries and scholarly advances involve interdisciplinary teamwork and creative thinking by individuals who are facile with the perspectives, approaches, concepts, methods, and knowledge-base of multiple disciplines. Accordingly, many of the best graduate students are drawn to exciting new developments at the interface between established disciplines...." The program you describe will accomplish just that, providing unique training opportunities in important fields of study that will complement existing departmental programs. Moreover, the Disease Ecology training track in particular aligns well with the mission statement of the Faculty of Infectious Diseases, embracing an integrated vision of human, animal, and ecosystem health. I look forward to the approval of this important new initiative.

Sincerely yours,

Duncan C. Krause, PhD
Professor and Director
Faculty of Infectious Diseases

Deans and program Directors supporting the participation of their faculty in the Interdisciplinary Biomedical Sciences doctoral program:

Dean Garnett S. Stokes _____
College of Arts & Sciences (Franklin College)

Dean Phillip L. Williams _____
College of Public Health

Dean Arthur M. Horne See appendix
College of Education

Dean Sheila W. Allen _____
College of Veterinary Medicine

Dean John L. Gittleman _____
Odum School of Ecology

Harry A. Dailey, Director _____
Biomedical and Health Sciences Institute

Steven R. H. Beach, Director _____
Institute of Behavioral Research

Alan Darvill, Director _____
Center for Complex Carbohydrates Research

Michael Pierce, Director _____
UGA Cancer Center

Duncan C. Krause, Director See letter in appendix.
Faculty of Infectious Diseases

New Program Proposal

Date:	January 2010
Institution:	University of Georgia
School/Division:	Biomedical and Health Sciences Institute
Name of Proposed Program:	Interdisciplinary Biomedical Sciences
Degree:	Ph.D.
Major:	Interdisciplinary Biomedical Sciences
Starting Date:	August 2010

***Signatures*:**

Department Heads

Biochemistry & Molecular Biology	Cellular Biology	Chemistry
Kinesiology	Environmental Health Sciences	Epidemiology and Biostatistics
Infectious Diseases	Physiology & Pharmacology	Psychology

Institute/Program Directors

Biomedical and Health Sciences Institute	Faculty of Infectious Diseases	Cancer Center
Integrated Life Sciences	Institute for Behavioral Research	

Deans

Franklin, Arts and Sciences	Education	Public Health
Veterinary Medicine	Graduate School	Ecology

Office of Vice-President for Research

Vice-President for Research