

Appendix M

Request to Plan a Doctoral Program at the University of North Carolina at Greensboro in Environmental Health Science

Introduction

The University of North Carolina at Greensboro requests approval to plan a doctoral program in Environmental Health Science (CIP: 26.9999).

Program Description

The UNCG Biology Department proposes to develop a Ph. D. program in Environmental Health Science. This program draws together the diverse and collaborative research interests and expertise of the UNCG Biology faculty at the interface between health and the environment. We view environmental health science broadly, spanning research on environmental health issues from the molecular to the global scale, for example from studies of environmental damage on cellular function to the effects of global warming. The goals of the program complement the goals of the National Institute of Environmental Health Sciences (NIEHS), which “focuses on basic science, disease-oriented research, global environmental health, and multidisciplinary training for researchers” (NIEHS webpage) in order to prevent disease and promote human health. Environmental health research includes the identification of causes underlying environmental problems as well as the characterization of consequences of environmental change at multiple biological levels, such as the community, the organism, and the cell. The proposed program will involve a mixture of 1) fundamental biological research that provides the foundation for solving health and environmental problems and 2) applied biological research that has immediate potential for translational applications. The research will encompass the spectrum of biological diversity because many species either create environmental health problems, or manifest the problems, or serve as powerful models for environmentally induced human problems. Although we view the subject of environmental health broadly, the research portion of our doctoral program will focus on a few areas of research that are strongly represented in our department. The six focal areas (described later in more detail) are genomics, gene-environment interactions, mitochondrial function, signal transduction, the integrity and health of freshwater/riparian ecosystems, and environmental forensics.

The proposed Ph. D. program in Environmental Health Science is unique in the UNC system because it provides a cohesive and integrated environmental health program that addresses environmental challenges from a biological perspective and is administered by a single department. The core curriculum will train graduate students to understand the integrative nature of health and the environment at multiple biological scales and teach them the latest technologies needed to conduct research. The research component of the curriculum and associated guidance from advisors and doctoral committee members will train graduate students to conduct unique and insightful research that explores more deeply a special aspect of the environment-health interface. Our approach will produce skilled scientists who can integrate into their research the wide range of ideas coming from different but related areas of study. Such training is particularly important for future leaders who will need to be skilled at addressing regional, state, and national environmental health concerns. Graduates will have a breadth of knowledge unique to Ph. D. level scientists and will be proficient at using emergent technologies to study environmental health issues.

The UNCG Biology Department is in a strong position to develop the proposed Ph. D. program. Research in the Department is strong and largely funded by external grants. Granting agencies include NIH, NSF, USDA, DOD, and EPA. Currently Biology ranks highest among all departments in the UNCG College of Arts and Sciences in externally

supported research funding. In the last five years (2001-05), Biology faculty members have brought \$12,599,547 to the UNCG campus through external funding of their research. Faculty members regularly publish their research in prestigious journals, such as *Genetics*, *Ecology*, *Evolution*, *Journal of Virology*, and *Journal of Biological Chemistry*. Publications have more than doubled from 22 in 2001 to 47 in 2005. Also, the Biology Department has a strong M.S. program with approximately 40 students enrolled for a given year. All faculty members have directed Masters students and are experienced in training graduate students in research. Some have participated in doctoral advisory committees in other UNCG departments or at other institutions.

Research Focal Areas. The twenty-one graduate faculty members in the Department of Biology all conduct basic or applied research relevant to environmental health. There is considerable breadth in faculty research interests. Within this breadth are six core areas of common research interest that will shape the doctoral program. Collaborations among faculty members within these core areas already exist. Below we identify the six research foci for the doctoral program and the faculty members conducting research in each area. We also give some examples of current collaborations within the Biology department.

- **Environmental forensics** (faculty: Adamson, Henrich, Hershey, Remington, Rublee, Schug, Stavn) Research uses biological and chemical specimens as markers to identify organisms and to explore the source, fate, transport, and ecological effects of environmental contamination. Such research is increasingly important in environmental quality monitoring because some contaminants trigger serious diseases in humans and other organisms [Collaborative example: The use of gene array technology for environmental monitoring in aquatic environments (Henrich, Rublee; Funded by EPA)].
- **Integrity and health of freshwater/riparian ecosystems** (faculty: Hershey, Henrich, Kalcounis-Ruppell, O'Brien, Rublee, Stavn): Research addresses aquatic community and ecosystem function, impacts of human activities, and benefits of various restoration and mitigation efforts. Water quality is a concern of all communities because of its potential human-health effects [Collaborative example: Landscape effects on nutrient processing and bi-directional terrestrial-aquatic linkages (Hershey, Kalcounis-Rueppell, O'Brien; partially NSF-funded)].
- **Signal transduction** (faculty: Adamson, Hens, Katula, LaJeunesse, Leise, Patel, Steimle): Research in this area elucidates the pathways by which the environment alters whole organismal, cell, tissue, and gene function. Many of the effects of the environment on human health are known to involve interference of signal transduction pathways [Collaborative example: nitric oxide effects on metamorphosis (Leise, Hens; NSF-funded)].
- **Mitochondrial function** (faculty: Adamson, LaJeunesse, Patel, Rueppell, Steimle) Research examines the impact of the environment on the function of mitochondria, the centers of biochemical conversions in cells. The research has implications for understanding diseases caused by mitochondrial disorder [Collaborative example: The alteration of mitochondrial function and morphology in response to Epstein-Barr virus (Adamson, LaJeunesse, Patel, Steimle; partially NIH-funded)].
- **Genomics** (faculty: Remington, Rublee, Rueppell, Schug, Tomkiel): Research examines the structure and function of gene networks and whole genomes. Such research has direct implications for our understanding of the environmental impacts on human and plant health. Empowered by the human genome project, genomic research has become an integral part of analyses of human health.

- **Gene-environment interactions** (faculty: Adamson, Kirchoff, Lacey, Remington, Rueppell, Schug, Steimle, Tomkiel) Research addresses the effects of the environment on genes and the heritable transmission of traits with a focus on specific genes and traits. Studies provide a basic understanding of genetically based diseases and economically important quantitative traits. Many human diseases manifest themselves because of genetically based responses to specific environmental factors [Collaborative example: The genetic basis of thermoregulatory ability in *Plantago lanceolata* (Lacey, Remington; partially NSF-funded)].

The six research foci are themselves interconnected. For example, some collaborative research being conducted by Biology faculty members concerns both aquatic ecosystem integrity and environmental forensics. Collaborative research on mitochondrial function also involves signal transduction pathways. Genomics and studies of gene-environment interactions and signal transduction are conceptually closely linked. The research areas that have been chosen as foci for the proposed doctoral program help to strengthen each other from both research and teaching perspectives. The foci embrace both fundamental and applied research.

Program Review

The review process for requests to plan is designed to determine if the proposal is developed to the stage appropriate for taking to the Graduate Council and if so what are the issues that may need further attention. Proposals to plan doctoral programs are typically reviewed internally, and in this case we secured an external review as well. The concerns from the reviewers were summarized in a letter to the Chancellor prior to the presentation to the Graduate Council. That summary follows:

Some of the internal comments were directed at the lack of clarity in the description of the exact focus of the proposed program. For example, it was commented that "The planning document refers to a Ph.D. degree in Environmental Health Sciences, a Ph.D. in Biology and a Ph.D. in Biology with an 'emphasis' on environmental health sciences. The document is confusing in its description of the program and waivers between justifying a Ph.D. in Biology with that of the Health Sciences request." That reader also was concerned that the attempt to distinguish the program from others in the state was drawing the program too narrowly and cutting it off from needed discipline and interdisciplinary partners. The sense of the internal reviews was that more information was needed to evaluate the proposal.

The outside reviewer has positive things to say about the program but also raises a number of issues that need further attention and development. Foremost is the need to have a clear statement of the mission and goals of the program and then the development of the proposal in accord with those. The reviewer's comments are attached.

The reviewer identified a number of components of the program and provides advice and suggestions for further development of them. The reviewer provided some follow up comments as well which I have also attached for your consideration.

Graduate Council

The Graduate Council had, as a basis for its consideration, the proposal to plan the program, the summary letter to the Chancellor, and a presentation to the Council by representatives of the program. In addition to the issues raised previously, the following concerns were

expressed by Council members: provide clarity regarding campus commitment to the program, relation to industry, and the extent the curriculum will be interdisciplinary.

Response

The representative of the program focused on a clear statement of the mission of the program which is to prepare students to take leadership roles in design and implementation of advanced biological studies exploring environmental-health interface. The outside reviewer summarized this as follows: "the primary purpose is develop a doctoral program that draws together department faculty with diverse research interests relevant to the interface between health and the environment at the molecular, cellular, organismal, community and physical environment (e.g. water) levels to train research scientists with the type of interdisciplinary training needed to address current and future environmental problems." The campus has made a commitment of a head of this proposed program and five additional faculty members. Over four years the campus will reallocate \$400,000 for the support of graduate students. The presentation emphasized the various ways the program will be interdisciplinary including drawing on opportunities for internships at a variety of industries in the region.

Need for the Program

The role of the environmental impact on health is an important and growing area of focus. UNCG has a number of faculty doing research in a range of areas falling under environment and health, and this will bring this expertise into a more focused format for the training of students. The outside reviewer indicated that the broad interdisciplinary training will prepare the graduates for a marketplace that will welcome breadth of training combined with in depth understanding and strong technical skills.

Recommendation by the Graduate Council

After consideration of the issues raised by previous reviewers and Council members, the Graduate Council voted, without dissent, to recommend approval for the University of North Carolina at Greensboro to plan a doctoral program in Environmental Health Science.

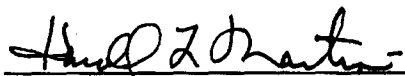
Issues to Address in Planning

The proposal should continue to focus on making the mission of the program as precise as possible both to guide students who might seek out the program and to position the program in relations to other doctoral programs with related focuses. Collaborative opportunities should continue to be explored with other degree programs and with industry.

Recommendation

The staff of the General Administration recommends that the Board of Governors approve the request from the University of North Carolina at Greensboro to plan a doctoral program in Environmental Health Science.

Approved to be Recommended for Planning to the Committee on Educational Planning, Policies, and Programs



Senior Vice President for Academic Affairs

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