

## APPENDIX M

### **Request to Plan a Doctoral Program in Fisheries and Wildlife Sciences at North Carolina State University**

#### **Introduction**

North Carolina State University requests approval to plan a doctoral program in Fisheries and Wildlife Sciences (CIP: 03.0101).

#### **Program Description**

The Fisheries and Wildlife Sciences program (FWP) will offer doctoral education that integrates the study of wild terrestrial and aquatic organisms, their management as important natural resources, and their conservation. In a world where rapidly expanding human populations place stress on natural and human dominated ecosystems, new knowledge and expertise must be generated at a rapid pace to successfully sustain a balanced biosphere and acceptable lifestyles. The funded research of the Fisheries and Wildlife Program faculty continually generates important new knowledge addressing key environmental issues ranging from advanced technical solutions (pathogen detection, identification of critical habitat, etc.), to novel integrated philosophical and scientific approaches to challenges at the human/wildlife interface. Doctoral students in the Fisheries and Wildlife Sciences will have the opportunity to participate in and gain valuable experience from this research. The Fisheries and Wildlife Sciences Doctorate is designed to prepare creative scholars with a solid foundation in use of the scientific method, and the integration of new knowledge into practical applications to meet the conservation challenges of the 21<sup>st</sup> century. Graduates will have the tools to lead efforts to counter declining biodiversity, the collapse of global fisheries, the spread of invasive exotic species, and the impact of diseases capable of devastating wild populations or spreading to domestic stock, and humans. The successful doctoral candidate will understand the need to integrate human socio-political and economic interests into research and development activities including subsistence and recreational use of fish and wildlife.

The Fisheries and Wildlife Sciences Doctoral Program will expand the frontiers of knowledge through provision of graduates with broad-based expertise in applied ecology, quantitative methods, and human dimensions in the conservation and management of fish and wildlife. Doctoral candidates will also contribute significantly to helping public and private agencies solve complex environmental problems and be good stewards of the land through their teaching and outreach skills.

The Fisheries and Wildlife Sciences Doctoral program will graduate students who are highly qualified to become national leaders in the creation of new knowledge and understanding about ecosystem function, the biota sustained therein and the importance of these natural resources to humans. The doctoral candidates will become the leaders in higher education, natural resources policy and human dimensions of fisheries and wildlife conservation. They will also be leaders in developing strategies to sustain the health and well being of wild populations of all animal species. NCSU Fisheries and Wildlife Sciences Doctorates will be qualified to lead university research and teaching programs, state and federal natural resources management agencies, wildlife health laboratories, non-government research and advocacy groups, and serve as private sector consultants.

## **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 reviewed internally. The concerns from the reviewers were summarized in a letter to the Chancellor prior to the presentation to the Graduate Council. That summary follows:

The readers recognize the strength of the master's program in this area and the other doctoral programs the proposed program will be able to draw on. There was a concern that this program might draw students away from current programs. This is addressed in the proposal and I recognize that the expectation is of additional students who would want this distinct degree program. On the other hand it is an issue that deserves continuing attention.

On the related issue of graduate student support, there is the expectation of some reallocation of support for doctoral students in the new degree. This suggests that there may be some reduction or movement from other programs. It is certainly reasonable to do reallocations as well as seek additional outside funds but the basis of this in relations to bringing in new students could be further clarified.

Another issue is the demand for students with doctorates in this area by governmental and business firms. Since a lot of masters-trained students will also seek these jobs it may be wise to do some more detailed analysis of the demand for doctoral-trained graduates in this field, recognizing that it is not an easy thing to do.

There did not appear to be a reference to the doctoral program in Marine Biology at UNCW. Do the faculty see UNCW's program as unrelated to the kind of work that will be done in the proposed program?

## **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.

## **Response**

Representatives made the case that this is a logical extension of work already being done at NCSU with strong undergraduate and masters programs in place and the cooperative involvement of other departments such as zoology, vet. Medicine, forestry, entomology, toxicology, agricultural economics, and agricultural engineering. In fact, a doctoral program will further strengthen the undergraduate and masters programs. No other campus in UNC offers work in this area, and the proposed doctoral program is much broader than the Marine Biology program at UNCW and includes human-natural environment interactions.

The infrastructure of administrative and research support is in place and with a couple new faculty positions and some additional administrative support the program can be launched. The program has well established relationships with state agencies, federal agencies and private organizations. As in many other fields, the baby boomers are retiring in this and related fields and will need to be replaced. Employment is available at the federal level, state level, in academia, and in private organizations.

**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 North Carolina State University to plan a doctoral program in Fisheries and Wildlife Sciences.

**Issues to Address in Planning**

The proposal should continue to refine the analysis of demand for graduates of this program.

**Recommendation**

The General Administration recommends that the Board of Governors approve the request from North Carolina State University to plan a doctoral program in Fisheries and Wildlife Sciences.

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

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**Acting Senior Vice President for AA Alan Mabe**

**January 4, 2006**

## **Request to Plan a Doctoral Program in Nanoscale Science at the University of North Carolina at Charlotte**

### **Introduction**

The University of North Carolina at Charlotte requests approval to plan a doctoral program in Nanoscale Science (CIP: 40.9999 ).

### **Program Description**

The University of North Carolina at Charlotte requests authorization to plan a Ph.D. program in Nanoscale Science. The program will involve five departments (Chemistry, Physics and Optical Science, Mechanical Engineering and Engineering Science, Electrical and Computer Engineering, and Biology), the Center for Optoelectronics and Optical Communications, and the Center for Precision Metrology. The program will be administered through the Department of Chemistry. Considerable strengths in the above departments are evident to sustain a strong interdisciplinary program in this rapidly emerging field that is vital to the economic prosperity of North Carolina and the nation. Faculty members from the above science and engineering departments who are engaged in research in nanoscale science and engineering will serve as doctoral program faculty. The program connects with existing programs at the institution and is consistent with relevant national priorities. The focus of the Ph.D. program in Nanoscale Science is to educate and train the needed scientists who will broaden our understanding of phenomena at nanometer length scales and applications of nanoscale science, and who will develop the knowledge required to train future generations of workers in the field. The research accomplished by the graduates of this new program will add to the body of scientific knowledge needed for our economy to stay competitive on the national and world stages.

Nanoscale science is a field of scientific investigation that addresses the development, manipulation and use of materials and devices on the scale of roughly 1-100 nanometers in length, as well as the study of phenomena that occur at this size scale (one nanometer equals one billionth of a meter). This size range encompasses the smallest man-made and naturally derived devices known. One can gain a perspective of the nanometer scale by considering the sizes of some familiar objects. For example, a sheet of paper is roughly 100,000 nanometers thick, critical dimensions in integrated circuits are less than 10 nanometers, while large polymers and proteins are just a couple of nanometers in size.

The field of nanoscale science was conceptually born out of Richard Feynman's famous 1959 lecture, "There's Plenty of Room at the Bottom." In this presentation Feynman pondered radical notions such as writing an entire set of the Encyclopedia Britannica on the head of a pin through the manipulation of individual atoms. At that time, the tools required to fabricate materials and devices at the atomic/molecular scale and to measure their properties were not available. The advent of scanning probe microscopes and their ability to measure and manipulate matter at the nanoscale, microelectronic and optoelectronic device manufacturing technology, as well as developments in macro-scale molecular modeling and powerful computational capability, are all enabling the ideas of exploiting the benefits of nanoscale manufacturing to be realized. These tools allow scientists to observe objects at the nanoscale, to discover new phenomena at these small dimensions systematically rather than by accident, and to synthesize and manipulate nanoscopic particles by rational design rather than serendipity.

Nanoscale science offers many challenges and opportunities for scientific understanding and potential technological advances. It is predicted that nanoscale science will change the nature of almost every human-made product this century. This field has great potential applications in materials, medicine, electronics, optics, data storage, advanced manufacturing, environment, energy, and national security. Some specific applications include: lightweight new materials with greatly improved strength and wear characteristics; ultradense computer memory; better drug design and better drug and gene delivery; sensing applications for agricultural, biological, chemical and homeland security applications; improved catalysts for the chemical and automotive industries; new materials to improve fuel economy and carbon dioxide emissions; and improved batteries and energy efficient processes for energy technologies. Nanoscale materials already find use in numerous pharmaceutical, catalytic, electronic, magnetic, optoelectronic, biomedical, cosmetic and energy applications. Specific applications reporting the highest revenues include sunscreens, automotive catalyst supports, chemical mechanical polishing, magnetic recording tapes, biolabeling, electroconductive coatings, and optical fibers. Other applications include dental-bonding agents, protective and glare-reducing coatings for eyeglasses and cars, stain-free clothing and mattresses, paints and coatings to protect against corrosion, scratches and radiation, burn and wound dressings, and automobile catalytic converters.

### **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 reviewed internally. The concerns from the reviewers were summarized in a letter to the Chancellor prior to the presentation to the Graduate Council. That summary follows:

While it is clear this program will be situated among a set of masters and doctoral programs, it is less clear what the expected training at the masters level is expected to be for participating in the Nanoscale Science doctoral program. Is chemistry expected to be the primary route to this doctoral program since the program is to be located in the Chemistry department? The expected background for successful applicants for the program will be helpful for students at UNCC or elsewhere to know if they fit the expectations of the program.

One reader recommends that more attention be given in the planning process to any commonalities emerging in other nanoscale doctoral programs and the likely sources of funding and the equipment needs for this program. That reader also comments that the proposal makes a strong case for the national need for such a program but a less strong institutional justification for being ready for students to transition from master's level to doctoral level work in this field.

While this is conceived as an interdisciplinary program with wide collaboration within the institution, there is little mention of any collaborative activity or involvement of other academic institutions or business or industry. Since it is a field still in the process of defining itself for academic programs, it might be wise to connect with researchers at other constituent institutions who are doing significant work in this field.

### **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: Questions were raised about whether the area had yet evolved to disciplinary status.

### **Response**

The representatives provided information about the National Nanotechnology Initiative which supports research in the field, facilitates transfer of new technologies into products, develops an educated, skilled workforce in this area, and supports responsible development of nanotechnology. UNCC's proposed doctoral program is in response to this national initiative. Federal investment in nanoscale science exceeded one billion dollars in FY 2005. It is an area of state priority as well, and the Governor's Task Force on Nanotechnology and the Economy has been quoted that, "Nanotechnology will be as important to the future of North Carolina as biotechnology is to its present."

Many other nanotechnology programs add a nanoscale dimension to already existing disciplinary degree programs, while UNCC proposes to design a new truly interdisciplinary program in nanoscale technology. UNCC faculty are already involved in collaborative research in nanoscale science within and beyond the campus. UNCC has extensive industry contacts that will be valuable for the further development of research and new technologies.

Candidates for the program are expected to have at least a bachelor's or equivalent in chemistry, physics, mechanical engineering, or electrical engineering.

### **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 to plan a doctoral program in Nanoscale Science at the University of North Carolina at Charlotte.

### **Issues to Address in Planning**

Since nanoscale science is a rapidly growing area, careful attention will need to be given to how other degree programs are being structured and how the goals of UNCC are to be realized through this doctoral program.

### **Recommendation**

The General Administration recommends that the Board of Governors approve the request from UNCC to plan a doctoral program in Nanoscale Science.

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

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Acting Senior Vice President for AA Alan Mabe

January 4, 2006