

**REQUEST FOR AUTHORIZATION TO PLAN
THE
DOCTOR OF PHILOSOPHY DEGREE
IN
INTEGRATED BIOSCIENCES**

North Carolina Central University

**1801 Fayetteville Street
Durham, NC 27707**

August 30, 2010

APPENDIX B

UNIVERSITY OF NORTH CAROLINA

**REQUEST FOR AUTHORIZATION TO PLAN A NEW DOCTORAL OR
FIRST PROFESSIONAL DEGREE PROGRAM**

THE PURPOSE OF ACADEMIC PROGRAM PLANNING: Planning a new academic degree program provides an opportunity for an institution to make the case for need and demand and for its ability to offer a quality program. Authorization to plan and the planning activity to follow do not guarantee that authorization to establish will be granted. Requests (5 copies) may be submitted in accord with the schedule announced by General Administration. As of January 1, 2010 submission of proposals will be electronic.

Date: August 30, 2010

Constituent Institution: North Carolina Central University

CIP Discipline Specialty Title: Biological and Biomedical Sciences

CIP Discipline Specialty Number: 26.9999 Level: D 1st Prof.

Exact Title of the Proposed Program: Doctor of Philosophy in Integrated Biosciences

Exact Degree Abbreviation (e.g. Ph.D., Ed.D.): Ph.D.

Does the proposed program constitute a substantive change as defined by SACS? Yes No

- a. Is it at a more advanced level than those previously authorized? Yes No
- b. Is the proposed program in a new discipline division? Yes No

Approximate date for submitting the Request to Establish the proposed program (must be within two years of date of authorization to plan): November 15, 2010

Proposed date to establish degree: month August year 2012 (Date should allow at least three months for review of the request to establish, once submitted.)

1. Describe the proposed new degree program.
 - a. **A brief description of the program and a statement of educational objectives:**
North Carolina Central University (NCCU) requests authorization to plan a Doctor of Philosophy in the Integrated Biosciences. This proposed program will be multi-

disciplinary and will utilize expertise and resources from the College of Science and Technology (CST), School of Library and Information Sciences (SLIS), the Julius L. Chambers Biomedical Biotechnology Research Institute (BBRI) and the Biomufacturing Research Institute and Technology Enterprise (BRITE) partially funded by Golden LEAF Foundation. The curriculum will include offerings from the life sciences, mathematics, computation and information sciences, pharmaceutical sciences, and physical sciences.

The educational objectives are to educate graduates who are qualified to:

- (1) Design and conduct high quality multidisciplinary and translational research;
- (2) Understand the relationships and values of multiple disciplines as they relate to their specific area of interest;
- (3) Form collaborations and partnerships and work effectively as members of translational research teams;
- (4) Contribute substantially to scientific discussions and inquiries related to research on health disparities and drug discovery; and,
- (5) Serve as leaders in facilitating community-engaged research focused on health disparities.

The programmatic objectives of the Integrated Biosciences Ph.D. are to:

- (1) Create the next generation of qualified doctoral trained biomedical scientists focused in health disparities and drug discovery research;
- (2) Prepare students to investigate biologically relevant research questions through the mastery of physical, mathematical, computational, informational, and biological sciences; and,
- (3) Enhance career opportunities for graduate students through the development of a multidisciplinary educational program focused in the integrated biological sciences.

b. The relationship of the proposed new program to the institutional mission and how the program fits into the institution's strategic plan and its response to UNC

Tomorrow:

The proposed Ph.D. program in Integrated Biosciences is consistent with the mission of NCCU to provide professional development and access to under-represented minorities as well as first generation students. Furthermore, the proposed Ph.D. program is well aligned with the University's 2020 Strategic Plan with emphasis on the following objectives:

- Objective 3.2- Increase community engagement.
- Objective 3.4- Explore opportunities for fostering economic growth.
- Objective 5.2- Foster student learning through new programs and experiences.
- Objective 5.3- Expand the research agenda for the University.

The proposed program will address issues of state, national and global health disparities and drug discovery – enhancing the academic distinction and distinctiveness of the University and support its dedication to teaching, learning and research. It will also provide additional professional opportunities for residents of North Carolina and stimulate the state's economic landscape. The proposed program builds upon NCCU's curricular strengths and research capabilities and is a result of collaboration within SLIS, departments of CST, and NCCU's two major research institutes: BBRI and BRITE. In addition to supporting NCCU's mission, the Integrated Biosciences Graduate Program addresses the following strategic priorities outlined in UNC Tomorrow:

- 4.1 Our Global Readiness
 - 4.1.1. UNC should prepare its students for successful professional and personal lives in the 21st century, equipping them with the tools they will need to adapt to the ever-changing world.
 - 4.1.2. UNC programs, especially research programs, should be globally competitive to ensure that they are globally relevant and significant.

The proposed Ph.D. in Integrated Biosciences will prepare students to address comprehensive issues in human health utilizing an integrated approach that will impact state, national and global communities.

- 4.2 Our Citizens and Their Future: Access to Higher Education- UNC should increase access to higher education for all North Carolinians, particularly for underserved regions, underrepresented populations, and non-traditional students.
 - 4.2.5. UNC should increase the educational attainment of all underrepresented populations, especially African-American male and Hispanic students.

NCCU has a proven historical record of providing access to higher education for underrepresented and diverse student populations. The proposed Ph.D. program will continue to serve this traditional clientele as well as all citizens of the State of North Carolina.

- 4.4 Our Communities and Their Economic Transformation- UNC should be more actively engaged in enhancing the economic transformation and community development of North Carolina's region and the state as a whole.
 - 4.4.3. UNC should seek to align appropriate campus programs with the strategic economic plans (including sector and cluster plans) of their regions and the state, recognizing the unique differences and challenges of our state's economic and geographic regions.

The Integrated Biosciences Ph.D. will further enhance NCCU's position as a vibrant contributor to the State's economic development in keeping with the State of North Carolina's significant investment in biotechnology.

- 4.5 Our Health
 - 4.5.1. UNC should lead in improving health and wellness in North Carolina.
 - 4.5.3. UNC should lead in utilizing health information to improve health and wellness in North Carolina.

The Integrated Biosciences Ph.D. will produce professionals and scientific leaders in the fields of health disparities and drug discovery whose work will improve the health and wellness of all North Carolinians, but especially African Americans.

- 4.7 Our University's Outreach and Engagement
 - 4.7.1. UNC should apply, translate, and communicate research and scholarship to broader audiences.
 - 4.7.3. UNC should create a mechanism for applying research and scholarship to addressing significant regional and statewide issues.

The Integrated Biosciences Ph.D. will employ translational and collaborative approaches in the implementation of the Ph.D. program. NCCU will utilize its outreach and academic programs to ensure community engagement.

c. **The relationship of the proposed new program to other existing programs at the institution:**

The Integrated Biosciences Ph.D. program is an outcome of the state's investment and commitment to NCCU's research enterprise: BBRI (1998), Mary M. Townes Science Complex (2004), and BRITE (2006). The current research programs in BBRI focus on areas of health disparities: cancer, neuroscience, and cardio-metabolic disorders. NCCU has funding from the National Institutes of Health/ National Institute of Minority Health and Health Disparities (P20 Grant). NCCU scientists during the current fiscal year have been awarded approximately \$24.0 million in sponsored research and programs; of that, \$14.6 million is directly related to health disparities. The CST is housed in the Mary M. Townes Science Complex, which will serve as the academic home of the doctoral program. Its research efforts are concentrated in biomedical, pharmaceutical, computational, nanotechnology and physical sciences. CST is also home to both National Science Foundation (NSF) funded Center for Research Excellence in Science and Technology (CREST) and NASA Center for Aerospace Research and Education. The research programs in BRITE focus on drug discovery and biopharmaceuticals. Together with NCCU's historical strengths and consistent with the university's strategic plan, NCCU has expanded its infrastructure in the area of science and technology. As a result of strengthening its research, extramural grant activities and educational programs, NCCU is well positioned to offer a strong Ph.D. in Integrated Biosciences.

d. Special features or conditions that make the institution a desirable, unique, or appropriate place to initiate such a degree program:

NCCU is uniquely qualified and appropriate place to initiate this Integrated Biosciences Ph.D. This is based on its historical strengths of cultivating students from under-represented groups in STEM disciplines, the expansion of research programs in health disparities and drug discovery, and NCCU's strategic proximity to the Research Triangle Park. The current Masters degree programs at NCCU have produced graduates currently working in Biotechnology and Pharmaceutical industries.

2. List all other public and private institutions of higher education in North Carolina currently operating programs similar to the proposed new degree program.
 - a. North Carolina State University (NCSU) – Comparative Biomedical Sciences Program CIP 51.2501– The Comparative Biomedical Sciences Program at NCSU is offered through the College of Veterinary Medicine. Students select from one of five concentration areas for their graduate research: Cell Biology, Pharmacology, Pathology, Infectious Diseases and Population Medicine. Interdisciplinary opportunities are created to meet the needs of individual students.
 - b. East Carolina University (ECU) – Interdisciplinary Biological Sciences Program CIP 26.9999– The Interdisciplinary Biological Sciences Program at ECU includes a general core curriculum as well as courses in experimental biology, neuroscience, pharmaceutical chemistry, pathology and biomedical sciences depending on the research interest and needs of the student. Following completion of the first semester each student chooses a concentration in Biology, Biomedical Science, or Pharmaceutical Chemistry.
 - c. University of North Carolina at Charlotte (UNCC) – Interdisciplinary Ph.D. in Biology CIP 26.0101– The Interdisciplinary Ph.D. in Biology at UNCC offers students a core curricula in the biological, chemical, physical, and engineering sciences.

The Integrated Biosciences Ph.D. Program is unique in comparison to doctoral programs within the State of North Carolina because of its focus on developing biomedical and pharmaceutical Ph.D. scientists skilled in utilizing a systematic approach to investigate health disparities and identify potential novel drug targets. Research opportunities for

students in the proposed program will be highly focused in defined research disciplines – Cancer Biology, Neuroscience, Cardio-metabolic Biology, Developmental Biology and Genomics. This Integrated Biosciences Program will elucidate the cellular, molecular and genetic basis of health disparities in human disease and targeted drug therapy. The strengths of NCCU’s CST, BBRI, BRITE and SLIS enable the following methodologies to be utilized in an innovative approach to address the complexities of disparate diseases: drug target validation, assay development, high throughput screening, drug and library design, chemoinformatics, virtual screen structural activity relationship analysis (SAR), quantitative SAR (QSAR), bioinformatics, genomics, *in vitro* and *in vivo* testing, pharmacological evaluation, and basic and community-engaged research. This systems approach towards health disparities and drug discovery further distinguishes NCCU’s basic and translational research from other research programs within the UNC-System.

Students in the Integrated Biosciences Ph.D. Program will also have the opportunity to actively engage with external partners of NCCU in academe, industry, government and community-based organizations. These experiences will provide students advantages for network building; enhancing multidisciplinary and translational research efforts in health disparities and drug discovery. As an example, two NIH U54 Cooperative Agreement Grants awarded to NCCU support active research collaborations focused in health disparities. It is expected that doctoral graduates in Integrated Biosciences will be leaders in the fields of biomedical and pharmaceutical sciences with emphasis on health disparities and drug discovery. They will be highly competitive candidates for faculty appointments as well as positions within the dynamic industries of biotechnology and pharmaceutical sciences. The Integrated Biosciences Ph.D. Program will contribute to the amelioration of health disparities benefiting not only the State of North Carolina, but also affirmatively impacting national and global economics as well as human health.

3. Estimate the number of students that would be enrolled in the program during the first year of operation: *Full-Time* 8 *Part-Time* 0; the number of students that would be enrolled in the program when it is fully operational: Full-Time 20 Part-Time 0.

Year	Number of Full-time Students	Number of Part-time Students	Total Number of Students	Number of Graduates
1	8	0	8	-----
2	16	0	16	-----
3	17	0	17	-----
4	20	0	20	4
5	20	0	20	5

4. Estimate the current and projected demand for graduates of the proposed new degree program. Provide documentation about the sources of data used to estimate demand.

The need for graduates from NCCU’s Integrated Biosciences Ph.D. Program is exemplified by the dearth of African-American scientists in biomedical research. According to recent reports from The White House Initiative on Historically Black Colleges and Universities 2010 (WHI-HBCU), “Although some African Americans are obtaining Ph.D.’s in STEM disciplines, the measure of success in response to the objective to increase participation in NIH biomedical research is not strong.” Findings reported by Dr. Amri Johnson (*The Scientist*, November 7, 2005) showed that at the NIH intramural campuses - the federal institution charged by the US Congress with ending health disparities - African-American scientists comprised only 1% of tenured investigators and 1.5% of tenure-track investigators.

In a recent report published by The National Science Foundation (NSF) entitled, *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2011*, the number of underrepresented minorities earning doctorates in the sciences and engineering have not increased during the years 2000-2008. Furthermore, this report showed that underrepresented minority women between the years 1989 to 2008 represented a dismal percentage of doctoral awardees. While in 2008 African American men were 5.8% and African American women were 6.4% of the population of the United States; they represented 2% and 1%, respectively, of the workforce of scientists and engineers.

According to *NSF's Scientists, and Engineers in Academia Report 2004*, "Compared with whites, blacks tended to be relatively concentrated in the social sciences and psychology and relatively less represented in the physical sciences; earth, atmospheric, ocean sciences; mathematics; and life sciences." The Commission on Professionals in Science and Technology Professional Women and Minorities reported that during 2003-2004 under-represented groups specifically, Native Americans, Latinos and African-Americans accounted for approximately 0.2%, 3% and 3%, respectively for earned doctorates awarded in the sciences.

According to the *2010 NSF Survey of Earned Doctorates* in the biological and biomedical sciences, 192 (3%) African Americans, 312 (6%) Hispanics and 20 (0.4%) American Indians were awarded doctorates in 2008, in comparison to 3822 (74%) Whites and 599 (12%) Asians. A June 2008 report from the Commission on Professionals in Science and Technology (Washington, DC), indicated that limited improvements can be seen over the last decade in the employment of Hispanics in (STEM) occupations. Improvements for African-Americans, however, are less encouraging. Analyzing data on the employment of minorities in STEM occupations from 1994 to 2004, the Commission found that representation by African-Americans in STEM occupations appears to have peaked during the years 1999 to 2001. These data suggests that there is an urgent need to increase the representation and number of minority doctorates in these areas.

The recent transition of the NIH National Center for Minority Health and Health Disparities to an Institute with independent granting authority is a measure of the importance NIH and the US Congress has placed on studying the issue of health disparities. As further evidence for the viability of the proposed degree program, the US Bureau of Labor Statistics projects strong demands in NCCU's proposed program areas: biomedical and pharmaceutical sciences during this decade (2008-2018). This need is especially relevant to the Pharmaceutical Industry, an area pivotal to the economic viability of the State of North Carolina. It is anticipated that an integrated approach focused in the Biological Sciences will best prepare students for emerging technologies such as nanotechnology, new materials and health informatics as these disciplines

continue to converge. The Integrated Biosciences Ph.D. Program would be unique in assuring the preparation of competitive research scientists in areas of high demand by academia, industry and governmental agencies.

5. If there are plans to offer the program away from campus during the first year of operation:

There are no plans to offer the program away from campus.

- a. briefly describe these plans, including potential sites and possible method(s) of delivering instruction. N/A
- b. indicate any similar programs being offered off-campus in North Carolina by other institutions (public or private) N/A
- c. estimate the number of students that would be enrolled in the program during the first year of operation: *Full-Time* N/A *Part-Time* N/A

6. Describe the procedures to be used to plan the proposed program. List the names, titles, e-mail addresses and telephone numbers of the person(s) responsible for planning the proposed program.

A planning committee will be established to develop policies, procedures, and the curriculum for the Integrated Biosciences Ph.D. Program. The members consist of the following:

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Planning Steps for the creation of the proposed Integrated Biosciences Ph.D. Program

- a. Develop courses for the proposed Integrated Biosciences Ph.D. degree at the 7000 level;
 - b. Enhance literature resource access and improve technology capabilities;
 - c. Develop and gain approval for five-year budget for the Integrated Biosciences Ph.D. program;
 - d. Complete proposed program plan and prepare presentation to the NCCU Graduate Council, the Academic Planning Council, the Board of Trustees and the Board of Governors for approval to offer the Ph.D. program;
 - e. Prepare materials including a student handbook and design recruitment webpage for internet presence advertising this unique research educational opportunity interfacing nationally; and,
 - f. Submit required documents to SACS concerning the substantive changes in the curricula.
7. Describe the method of financing the proposed new program (e.g., potential sources of funding) and indicate the extent to which additional state funding may be required.

During the last ten years NCCU has made significant investments in strengthening its research activities by recruiting and hiring additional exemplary faculty and staff that have the credentials to conduct doctoral level training and secure external funding for research grants and contracts. As of FY 2011, NCCU has approximately 30 principal or co-investigators with external funding engaged in research projects directly related to biomedical and pharmaceutical sciences. In FY 2008 NCCU's research scientists produced \$9.3 million in contracts and grants, while in FY 2009 and FY 2010 its scientists exceeded \$21.0 million in sponsored research and programs each year. During

the current FY 2011, NCCU scientists have been awarded approximately \$24.0 million in sponsored research and programs. The acquisition of these contracts and grants speaks highly of NCCU's capacity to support a competitive Integrated Ph.D. program. This capability will be utilized to provide the research and financial base for the program. Therefore, funding to implement the Ph.D. program will be obtained through budget reallocations and extramural funding. Below is the estimated proposed budget for the first five years:

- (1) 2012-13 \$385,000
- (2) 2013-14 \$733,150
- (3) 2014-15 \$764,248
- (4) 2015-16 \$840,411
- (5) 2016-17 \$849,423

This intent to plan a new program has been reviewed and approved by the appropriate campus committees and authorities.

Chancellor _____

Appendix 1.1 Proposed Integrated Biosciences Curriculum

Program Requirements

A total of 31 credit hours of didactic course work will be required in the program. Of these, 16 credit hours will be core curricula and 12 credit hours dedicated to domain courses (see below). In addition, six (6) hours of elective courses may be chosen from the non-domain list below with the permission of faculty within the domain area.

Research requirement

Students must complete a minimum of 32 credit hours but not to exceed 54 credit hours of research and a minimum of two (2) credit hours of dissertation to fulfill the requirement for the degree.

Core Curriculum

Health Disparities in Human Diseases (3 credit hours)

Responsible Conduct of Research (3 credit hours)

Integrated Biosciences in Communication and Problem Solving (3 credit hours)

Research Techniques in Integrated Bioscience I (2 credit hours)

Research Techniques in Integrated Bioscience II (2 credit hours)

Biostatistics (3 credit hours)

Total credit hours in the Core: 16

Two Ph.D. Tracks (Domains)

Biomedical Sciences Track

Pharmaceutical Sciences Track

Sample Ph.D. Curriculum

Year	Course	Fall Sem (Cr Hrs)	Course	Spr Sem (Cr Hrs)	Course	Sum (Cr Hrs)	Program milestones
1	Integrated Biosciences	3	Health Disparities and	3	Research	3	Choose Research Mentor by Summer of Year 1
	Res Techniques I	2	Human Diseases	2			
	Biostatistics	3	Res Techniques II	2			
	Seminar	1	Responsible Conduct of Research Seminar	3			
	Total Credits	9	Total Credits	9			
2	Domain Course I	3	Domain Course III	3	Research	3	Established Advisory committee by Fall of year two and Graduate School approves program Take qualifying exam at end of Year 2
	Domain Course II	3	Domain Course IV	3			
	Research	2	Research	2			
	Seminar	1	Seminar	1			
	Total Credits	9	Total Credits	9			
3	Elective Course I	3	Elective Course II	3	Research	4	Take oral defense of proposal by Oct 1 of year 3
	Research	6	Research	6			
	Total Credits	9	Total Credits	9			
4	Research	3	Research	3			Dissertation Seminar and Dissertation Defense
	Dissertation	1	Dissertation	1			
	Total Credits	4	Total Credits	4			
		31		31		10	

Requirements Credit Hours

Core Courses: **16**

Domain Courses: **16**

Minimum Research: **32**

Dissertation: **2**

Electives: **6**

Total Program: **72**

Currently, NCCU's Masters is the terminal degree; therefore, all graduate courses in inventory are delivered at the 5000 level. All courses for the proposed Integrated Biosciences Ph.D. degree will be developed at the 7000 level.

Proposed courses for the Biomedical Sciences Track:

BIOG 7XXX Advanced Molecular Biology (3)

BIOG 7XXX Molecular Genetics (3)

BIOG 7XXX Toxicology (3)

BIOG 7XXX Advanced Neuroscience (3)

BIOG 7XXX Advanced Physiology (3)

PHRMG 7XXX Advanced Pharmacology (3)

BIOG 7XXX Advanced Immunology (3)

Proposed courses for the Pharmaceutical Sciences Track:

PHRMG 7XXX Drug Discovery (3)

PHRMG 7XXX Biopharmaceutical Manufacturing (3)

PHRMG 7XXX Enzyme Kinetics (3)

PHRMG 7XXX Advanced Methods in Protein Chemistry (3)

BIOG 7XXX Advanced Physiology (3)

PHRMG 7XXX Advanced Pharmacology (3)

CHEG 7XXX Advanced Biochemistry (3)

Elective Courses: 6 credit hours

Students can select six (6) credit hours from the following list of courses. The elective courses must be in consultation with the student's research advisor and approved by the dissertation committee.

PHRMG 7XXX Biosensor Technology (3)

PHRMG 7XXX Physical Biochemistry (3)

PHRMG 7XXX Bioinformatics: Protein Structure Modeling and Drug Design (3)

PHRMG 7XXX Chemoinformatics: Small Molecule Modeling for Drug Discovery (3)

PHRMG 7XXX Plant Genomics (3)

PHRMG 7XXX Neurodegenerative Diseases (3)

CISG 7XXX Algorithms for Computational Biology and Bioinformatics (3)

PHRMG 7XXX Organic Chemistry of Drug Design and Drug Action (3)

PHRMG 7XXX Assay Technologies (3)

PHRMG 7XXX Metabolic Diseases (3)

CHEG 7XXX Protein and Enzyme Biochemistry (3)

LISG 7XXX Health Informatics (3)

Appendix 1.2 SUMMARY OF ESTIMATED ADDITIONAL COST FOR PROPOSED PROGRAM

North Carolina Central University
 Integrated Biosciences Ph.D. Degree
 Projected 5 –Year Budget
 AY 2012-2016

	%FTE	AY 2012	AY 2013	AY 2014	AY 2015	AY 2016
Administration						
Director Integrated Biosciences Ph.D.	1.0	125,000	128,750	132,612	136,591	140,689
Executive Assistant	1.0	45,000	46,350	47,741	49,173	50,648
Subtotal Administration	2.0	170,000	175,100	180,353	185,764	191,337
Academic Core Areas						
Graduate Student Fellows (GTAs /GRAs 20@22,500.00)	20.00	180,000	360,000	382,500	450,000	450,000
Support Staff						
Instrumentation Specialist Core Facilities	1.0	60,000	61,800	63,654	65,474	67,438
Laboratory Technician Core Facilities	1.0	45,000	46,350	47,741	49,173	50,648
Subtotal Staff	2.0	105,000	108,150	111,395	114,647	118,086
Operating						
Printing						
Institutional Dues						
Laboratory Supplies						
Office Supplies						
Admissions/Student Recruitment						
Library						
Subtotal Operating		100,000	90,000	90,000	90,000	90,000
Total Budget		385,000	733,150	764,248	840,411	849,423