

AY21-17-C

**STATE COUNCIL OF HIGHER EDUCATION FOR VIRGINIA
PROGRAM PROPOSAL COVER SHEET**

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|---|--|
| 1. Institution Old Dominion University | 2. Program action (Check one): New program proposal <u> X </u> Spin-off proposal <u> </u> Certificate proposal <u> </u> |
| 3. Title of proposed program Biology | 4. CIP code 26.0101 |
| 5. Degree designation Doctor of Philosophy | 6. Term and year of initiation Spring 2023 |
| 7a. For a proposed spin-off, title and degree designation of existing degree program 7b. CIP code (existing program) | |
| 8. Term and year of first graduates Spring 2028 | 9. Date approved by Board of Visitors TBD |
| 10. For community colleges: date approved by local board date approved by State Board for Community Colleges | |
| 11. If collaborative or joint program, identify collaborating institution(s) and attach letter(s) of intent/support from corresponding chief academic officers(s) | |
| 12. Location of program within institution (complete for every level, as appropriate). Departments(s) or division of <u> Department of Biological Sciences </u> School(s) or college(s) of <u> College of Sciences </u> Campus(es) or off-campus site(s) <u> Norfolk Campus </u> Distance Delivery (web-based, satellite, etc.) <u> none </u> | |
| 13. Name, title, telephone number, and e-mail address of person(s) other than the institution's chief academic officer who may be contacted by or may be expected to contact Council staff regarding this program proposal. | |

**Proposal for PhD in Biology
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Description of the Proposed Program

Program Background

Old Dominion University in Norfolk, Virginia requests approval to initiate a Doctor of Philosophy (PhD) degree program in Biology. The proposed program will be administered by the Department of Biological Sciences in the College of Sciences and is to be implemented by Spring Semester 2022.

The proposed PhD in Biology is designed to train biologists to conceptualize, coordinate, and supervise interdisciplinary studies of biological phenomena and to direct biological research in industries, governmental agencies, or academic institutions. The program will provide broad training in the biological sciences, pertinent physical sciences, and analytical skills required to interpret biological data and conduct large-scale projects. Graduates will be knowledgeable in the general theoretical principles of biology and in the application of these principles to a variety of terrestrial, aquatic, and marine ecosystems. They will be capable of pursuing a career in the specialized area of his or her in-depth training and clearly understand the rigors and ethics of biological research.

The program is designed to prepare leaders in Biology research. Graduates will develop hands-on research and quantitative analytical skills and competencies across a variety of biological disciplines. The program will prepare graduates to work within academic, federal government (e.g., the National Oceanic Atmospheric Administration, Department of Defense, Fish and Wildlife Service, Army Corps of Engineers), state government (e.g., Department of Health, state Marine and Wildlife agencies), non-profit (e.g., the Nature Conservancy, World Wildlife Fund, Conservation International), and private sector (e.g., Biotech laboratories, Advanced Agricultural Operations) environments. Graduates will fill the demand for senior lead positions such as Research Analyst, Program Manager, Bioinformatician, Senior Biologist, and Wildlife Resource Manager, just to name a few. The program will also prepare graduates to teach Biology courses in private high-schools and 2- and 4-year colleges and universities.

Biological problems are becoming increasingly complex (e.g., anthropogenic impacts, disease outbreaks, climate change) and demand a highly trained workforce capable of interdisciplinary research and analyses. This program directly responds to this need and will provide advanced training in molecular, cellular, ecological, evolutionary, organismal, and integrative biology. The program has notable strengths in a broad range of biological subdisciplines, including biomechanics, botany, conservation biology, comparative and functional morphology, comparative physiology, ecosystem studies, experimental ecology, evolutionary biology, genomics, infectious disease biology, population biology, and systematics. Additionally, technological innovations in molecular biology, small-scale electronics, and data analytics are enabling biological research that was simply not possible before. This program leverages these cutting-edge technologies to provide training to students at the leading-edge of the field, ensuring that graduates will be highly competitive in the workforce.

Biology was traditionally a field-based discipline, requiring long-hours outdoors performing detailed observations and experiments. While this is still true for some disciplines, research has increasingly demanded these field-based studies be combined with technical expertise in laboratory and computational analyses. Students in the proposed program will have access to a variety of excellent on-campus resources that include a high-performance computing facility, scanning electron microscopy lab, genetic sequencing lab, herbarium, aquatics laboratory, water tunnel facility, GIS facilities, greenhouse, and digital imaging facilities.

ODU Mission

The mission of the institution says: “Old Dominion University, located in the City of Norfolk in the metropolitan Hampton Roads region of coastal Virginia, is a dynamic public research institution that serves its students and enriches the Commonwealth of Virginia, the nation and the world through rigorous academic programs, strategic partnerships, and active civic engagement.” The PhD in Biology aligns with this mission by (1) offering a rigorous academic curriculum that will prepare graduates for collaborative careers in biology, (2) providing students with cutting-edge training utilizing advanced diagnostic and analytical equipment and approaches, (3) strengthening ODU’s commitment to contributing to the economy and workforce of the Hampton Roads region and the Commonwealth of Virginia, and (4) enhancing the partnerships that ODU has developed throughout the region, nation, and the world.

Admission Criteria

All students applying to graduate degree programs at Old Dominion University will meet criteria established by the Graduate School. Criteria for acceptance into the PhD in Biology include the following:

- A completed online application via www.odu.edu/admission/graduate and application fee
- An appropriate undergraduate degree from a regionally-accredited university in the U.S. or an equivalent foreign institution and substantial coursework in biology, chemistry, or geology
- Official transcripts from each regionally-accredited undergraduate and graduate program attended
- Overall GPA score of at least 3.0 on a 4.0 scale, and overall GPA in the sciences of at least 3.0
- Three satisfactory letters of recommendation, with one preferably from the applicant's major advisor if coming from a master's program
- A satisfactory statement of professional goals (one to two pages in length) that is written with good diction and reflects a mature individual with well-thought-out and realistic professional goals, including specific research interests
- A test of English as a Foreign Language (TOEFL) score of at least 550 (paper-based test), 213 (computer-based test), or 79 (internet-based test) for applicants whose native language is not English

Students with previously completed graduate work at a regionally-accredited institution may submit a request for a maximum of 12 elective graduate credit hours to be transferred into the

program. Such transfer hours would go through the admission committee for approval, and if approved, be added to the transcript. Transfer courses may be accepted for research course requirements or electives. Core courses cannot be substituted for by transfer courses.

Admission as a graduate student at ODU does not imply acceptance into the PhD in Biology. A program admissions committee will consist of the Program Director, and at least two other faculty members from the program. Acceptance into the PhD in Biology program will be determined by the committee.

Target Population

The proposed PhD in Biology targets biologists who have completed an undergraduate or master's degree and who are interested in becoming leaders, teachers, and scholars in their respective fields. This program will attract students from internal, regional, national, and international undergraduate and graduate Biology programs.

Curriculum

A minimum of 48 semester credit hours of post-master's coursework is required or, in the absence of a master's degree, a minimum of 78 semester credit hours beyond the bachelor's degree is required.

Courses are listed below. Each student will work with his or her advisory committee to develop a program of study of the appropriate research and elective courses. Sample curricular plans are provided in Appendix A. Current course descriptions are provided in Appendix B.

Biology Core:

One of the following fundamentals cores:

BIOL859 Foundations and Principles in Ecology (3 credits)

BIOL804 Animal Ecophysiology (3 credits)

BIOL810 Advanced Cellular Biology (3 credits)

BIOL849 Biogeography (3 credits)

One of the following quantitative cores:

BIOL801 Practical Computing for Biologists (3 credits)

BIOL803 Advanced Genomics Data Analysis (3 credits)

BIOL832 GIS in Life Sciences (4 credits)

BIOL872 Modeling and Simulation in Life Sciences (4 credits)

Plus:

BIOL857 Biometry (4 credits)

BIOL847 Responsible Conduct of Research (3 credits)

BIOL802/808 Biological/Ecological Sciences Seminar (one credit per year on average, at least 4 credits)

Dissertation Research:

BIOL898 Research (18+ credits; 12 credits for Master's degree holding students)

BIOL899 Dissertation (3+ credits)

Written and Oral Examinations

The candidacy examinations (written and oral) must be completed by the end of the third year in the program. The examinations qualifying a student for candidacy for the degree of Doctor of Philosophy are comprehensive in nature and consist of both oral and written components (see below for descriptions). Before taking the candidacy examinations, the student must meet the program's requirements and have the recommendation of the Advisory Committee. The research skills requirement must be met at least 60 days in advance of the examinations. The candidacy examinations are usually taken no sooner than the semester in which the last formal graduate courses listed in the program of study are being taken. To be eligible to take the candidacy examinations, students must have achieved a grade point average of at least 3.0 on all coursework completed. In addition, this average must be attained on all graduate residence units as well as on all combined transferred and residence units. When the student and Advisory Committee have determined that the time is right for taking the examination, the student's advisor should contact the Graduate Program Director, who will verify that the student has met the prerequisites for the candidacy examination. The Graduate Program Director must be consulted on the schedule of this examination. Once permission has been granted, postponement of the examination must have the approval of the Graduate Program Director.

All advisory committee members must participate in the written and oral candidacy exams; participation generally involves the electronic submission of questions for the written component and 'in person' participation for the oral component, although remote participation (e.g., conference call, Zoom, WebEx, etc.) is also acceptable. After successful completion of the written examination, an oral examination, which must be taken prior to the end of the next semester, is given addressing topics discussed in the written examination and possible additional materials. The oral examination is a serious and integral part of the qualifying procedure.

A student must pass both the written and oral candidacy examinations. The written examination must be passed before the oral examination may be taken. For either the written or oral examination, more than one negative vote from the examining committee will result in a failure. A failed written examination must be retaken successfully within one year. A student who passes the written examination on the first attempt need not repeat the written exam in the event of failing the oral exam. A failed oral exam, which also may be attempted a second time, must be retaken prior to the end of the next semester.

Neither the written nor the oral examination can be passed conditionally. A pass cannot be made contingent upon doing extra courses, additional projects, etc.

The examination committee will report, in writing, to the graduate program director the results of the examinations.

Dissertation Research

Once the written and oral candidacy examinations have been passed, a dissertation committee will be formed to supervise dissertation research. This committee will be formed by the student in consultation with his or her advisor and approved by the Graduate Program Director. It will be comprised of the student's advisor as committee chair, at least one other faculty member active in the Biology program, and a third faculty member who is outside the Department. The third faculty member may be from Old Dominion University or external to the University. Additional committee members are permitted, but not required, with at least 2/3rds of the committee being from the Department of Biological Sciences.

In consultation with the dissertation committee, the student will prepare a dissertation prospectus for presentation to and approval by the committee. After approval of the dissertation prospectus, the chair of the dissertation committee shall recommend the student's admission to candidacy to the Graduate Program Director. Each student will complete a minimum of 3 credit hours of BIOL 899: Dissertation and 18 credit hours (12 for Master's degree holding students) of BIOL 898: Research, during which major work will result in development of a doctoral dissertation that represents original research efforts by the student. Upon completion of the dissertation, the student's dissertation committee will conduct a public examination and defense of the dissertation. Final approval is the responsibility of the dissertation committee chair, the Graduate Program Director, and ultimately the Dean of the College of Sciences, who together certify the candidate for graduation.

Time to Degree

The University will attract a mix of students, with 10-16 enrolled full-time and 2-4 part-time. Full-time students will complete coursework in this proposed doctoral program over three full years. It is estimated that most full-time students will take an additional 1 to 3 years to complete and defend their dissertation, making time to degree 4 to 6 years. ODU does not have a residency requirement for PhD students.

Student Retention and Continuation Plan

All Biology PhD students will attend an orientation session at the beginning of their course of study to meet program faculty, review the general policies and procedures for continuance, discuss program requirements and ask questions. Each student will also meet with his or her faculty advisor prior to registering for classes each semester. At the time of the semester meeting, the student and advisor will review the student's academic performance. The advisor will make sure the student understands that his or her grade point average after 12 credits must be at least 3.0 in order to continue in the program in good standing.

If a student is struggling academically, the advisor will work with the student to put a plan of action in place to improve academic performance. This may include such things as recommending a tutor, recommending a change of study habits, additional resources for a difficult topic, or referral to the University's Student Success Center or the Writing Center. The Writing Center in the Learning Commons area of the Perry Library offers free writing assistance for graduate and undergraduate students. Writing tutors are graduate teaching assistants in the

Department of English's master's and doctoral programs. Students can schedule appointments once per week for up to four weeks at a time. They can also work on their papers in the writing lab, where a tutor is available to help with quick questions on grammar, mechanics or citations. A link to Writing Center frequently asked questions is here: <http://al.odu.edu/writingcenter/students/FAQ.shtml>

If a student's GPA falls below 3.0, that student will be placed on academic probation. At that time the student will meet with both his or her advisor and the Graduate Program Director. If the Graduate Program Director is the student's advisor, an additional Biology program faculty member will attend the meeting with the student. At that meeting the participating faculty will make sure that the student understands that if the grade point average is not raised to 3.0 or above within the next 12 credit hours the student will be dismissed from the program. The student will be asked to present a plan of action to ensure success in subsequent courses.

The faculty advisor is expected to be the student's research mentor during the program, although it is possible for the student to change mentors if the area of study is more aligned with another advisor.

Faculty

An inter-professional group of 15 faculty will work in collaboration to mentor students in the program in Biology. Among these 15 faculty, seven will teach the core coursework. These include two full professors, three associate professors, and two assistant professors. Their brief CVs are found in Appendix C. Combined, the seven, core coursework faculty have an extensive record of scholarship with over 86 publications in peer-reviewed journals since 2018 and approximately 17 internally and externally funded active grants. Appendix D provides data on these grants.

Collectively, these faculty members have both breadth and depth in a variety of areas of Biology. Ornithology faculty member Eric Walters is engaged in studies of population ecology, evolution of mating systems, and conservation biology. John Whiteman is an ecophysiologicalist studying the interactions between the environment and animal nutrition and energy use, using organismal-scale measurements such as tissue metabolite assays, stable isotope tracers, and respirometry. Marine Molecular Ecologist Daniel Barshis studies the environmental and evolutionary drivers of stress tolerance in reef-building corals using a combination of ecological, physiological, and genomic approaches. Holly Gaff uses mathematical modeling and active surveillance work to study the ecology and epidemiology of ticks and tick-borne diseases. Wayne Hynes, Microbiologist, studies vector (tick)-borne pathogens in particular *Rickettsia* and *Borrelia* species and the role of the microbiome in ticks, using molecular methodologies in a One Health approach to understanding tick-borne diseases. Lisa Wallace is an evolutionary biologist specializing in systematics and biogeographical patterns of vascular plants. Pengwei Zhang is an immunologist who studies viral-host interactions and anti-viral immune responses.

The primary teaching responsibilities of all listed faculty will be in the Biology PhD program. They will maintain secondary teaching responsibilities in the Master of Sciences in Biology program as well as the Bachelor of Science in Biology, where they will teach one course each

per year. Faculty with expertise in Ecology (Eric Walters), Physiology (John Whiteman), Cellular and Molecular Biology (Pengwei Zhang), Computational Biology (Daniel Barshis), Geographic Information Systems and Modeling (Holly Gaff), Statistics (Eric Walters, Holly Gaff), Biogeography (Lisa Wallace), and Research Ethics (Wayne Hynes) will teach core courses. In addition to their participation in the core curriculum, the faculty listed will also teach a rotating Biology Graduate Seminar Course as well as mentor students and supervise student research.

Program Administration

The proposed program will be housed in the Department of Biological Sciences within the College of Sciences. A full-time faculty member from the Department will serve as the Graduate Program Director (GPD). The GPD will teach in the program, serve on committees, and provide administrative oversight for the program. The GPD will also serve on the College of Sciences Graduate Committee and will ensure program compliance with University policies and procedures.

The Biology degree program faculty will meet at least three times per year: (1) just prior to or during the fall semester to review policies and procedures and update them as necessary; (2) at the beginning of the spring semester to evaluate all program students and discuss admissions, and (3) at the end of the spring semester to discuss program assessment and finalize assistantships and fellowships for the coming year. The GPD may call additional faculty meetings as needed.

Student Assessment

Students will be evaluated throughout the program using formative assessments such as quizzes, exams, papers, research projects, presentations, and a research prospectus as they complete the respective core, research, and elective components of the academic program. Additionally, students are required to participate in an Annual Evaluation interview to assess their progress in the program. These experiences will culminate in a summative assessment of student learning in written and oral comprehensive examinations and a final summative assessment of their dissertation document and dissertation oral defense. The expectation is that as a result of completion of the academic program, students will achieve the following learning outcomes:

1. Independently create a scientific hypothesis and research questions that lead to original research
2. Demonstrate adherence to principles of responsible conduct of research
3. Collect, analyze, present, and defend original research data
4. Synthesize information and write effectively at the levels found in relevant peer reviewed journals, conference proceedings, posters and other written formats
5. Present their research as primary author at national/international conferences

These student learning outcomes (SLO) are provided in the following assessment map.

Map of Biology Program Competencies onto Core Courses

| Learning Outcomes | Core or Required Courses | Assessment Measures |
|---|---|--|
| <p>Scientific Inquiry Independently create a scientific hypothesis and research questions that lead to original research</p> | <p>BIOL859, Foundations and Principles in Ecology Assessment: discussion leading, oral presentation</p> <p>BIOL804 Animal Ecophysiology Assessment: exams</p> <p>BIOL523 Cellular and Molecular Biology Assessment: exams, research paper</p> <p>BIOL857 Biometry Assessment: Independent research project and presentation</p> | <p>BIOL 898 Research Assessment: Completion of measurable objective defined at beginning of semester</p> <p>Pass Comprehensive Exam in content area of scientific inquiry</p> <p>BIOL 899 Dissertation Research Dissertation Defense</p> |
| <p>Ethics Demonstrate adherence to principles of responsible conduct of research</p> | <p>BIOL 847 Responsible Conduct of Research Assessment: class participation, written assignments, presentation, and completion of online training modules</p> | <p>BIOL 898 Research Assessment: Completion of measurable objective defined at beginning of semester</p> <p>BIOL 899 Dissertation Research Dissertation Defense</p> |

| | | |
|--|--|---|
| <p>Research methods Collect, analyze, present, and defend original research data</p> | <p>BIOL857 Biometry Assessment: in class assignment, exam, independent research project, paper, and presentation</p> <p>BIOL801 Practical Computing for Biologists Assessment: assignments, group presentation/hackathon</p> <p>BIOL832 GIS in Life Sciences Assessment: assignments, presentation, research project, report, and presentation</p> <p>BIOL872 Modeling and Simulation in Life Sciences Assessment: exam, case studies, group research project</p> <p>BIOL803 Advanced Genomics Data Analysis Assessment: assignments, individual discussion presentation</p> | <p>BIOL 898 Research Assessment: Completion of measurable objective defined at beginning of semester</p> <p>Pass Comprehensive Exam in area of Research Methods</p> <p>BIOL 899 Dissertation Research</p> <p>Dissertation Defense</p> |
| <p>Written communication Synthesize information and write effectively at the levels found in relevant peer reviewed journals, conference proceedings, posters and other written formats</p> | <p>BIOL 847 Responsible Conduct of Research Assessment: written assignments</p> <p>BIOL832 GIS in Life Sciences Assessment: research project report</p> <p>BIOL857 Biometry Assessment: independent research project paper</p> | <p>BIOL 898 Research Assessment: Completion of measurable objective defined at beginning of semester</p> <p>BIOL 899 Dissertation Research</p> <p>Dissertation Defense</p> |

| | | |
|--|---|-----------------------------|
| <p>Oral Communication Present their research as primary author at national/international conferences</p> | <p>BIOL801 Practical Computing for Biologists Assessment: group presentation/hackathon</p> <p>BIOL 847 Responsible Conduct of Research Assessment: presentation</p> <p>BIOL 803 Advanced Genomics Data Analysis Assessment: individual discussion presentation</p> | <p>Dissertation Defense</p> |
|--|---|-----------------------------|

Employment Skills/Workplace Competencies

Graduates of the proposed program will have the skills and expertise in biology relevant to several career opportunities.

Serving as faculty members, graduates will be able to:

- Develop and deliver effective instruction in an undergraduate or graduate college or university program. Such instruction would include topics in biology, evolution, ecology, physiology, and research methods in biology;
- Collaborate with colleagues in different but related fields for education, research and publications;
- Advise and mentor undergraduate and graduate students in their courses of study;
- Participate in professional service activities locally, state-wide, nationally and internationally; and
- Expand the body of knowledge in biology through research and dissemination of original scholarly work.

Working as a researcher in a non-academic institution, graduates will be able to:

- Develop original research related to biology;
- Publish findings related to research efforts;
- Apply knowledge and understanding of biology in research and development of laboratory diagnostics, assessment and evaluation of resource management/conservation policies and strategies, and for best-practice guidance in applications that bridge scientific knowledge with applied actions;
- Effectively communicate with other professionals, policy makers and the general public about topics in the biology.

Program Assessment

The program will be assessed by faculty and administrators in the Department of Biological Sciences, the College of Sciences, the Graduate School, and Old Dominion University. The review will be completed annually in the fall of each year starting from the second year after the program is approved, and will consist of:

- Analyzing retention and attrition rates in order to maximize the positive influences and ameliorate the negative ones that affect program completion
- Analyzing the results of the Old Dominion University Graduate Student Satisfaction Survey for areas where additional student support is needed
- Analyzing graduate job placement to assess if the program is preparing students with the knowledge, skills and abilities for jobs in the field and evaluate the program's ability to meet market demands (following initial graduates' completion)

- Analyzing the dissemination of graduate student related works (dissertation, abstracts, case-studies, research manuscripts)

Results of these assessments will be used to evaluate the quality of the program, to stimulate program development, and to assess the role of the program in fulfilling Old Dominion University's institutional mission. The program review may (a) result in strategic decisions about the program, (b) identify areas of improvement, (c) make resource recommendations, (d) articulate considerations for expansion or consolidation, and/or (e) consider other aspects of programmatic quality with respect to policies and practices relative to:

- Student recruitment, admissions, advising, and retention;
- Enrollment projections including consideration of the context of the SCHEV 5-year benchmark and other on-going enrollment targets;
- Course descriptions and implementation;
- Approved curricular changes and development;
- Faculty development and research activities;
- Facilities;
- Internal and external funding; and
- Description of strengths and weaknesses with attention to points of action for the future.

The dean and associate dean of the Graduate School will read the program review each year to ensure that benchmarks are met and excellence is maintained. The Graduate School's annual evaluation of the program will be sent each year to the vice provost for review. The vice provost will offer guidance, as needed, for improvement, and will provide updates about the review to the provost.

Old Dominion University maintains a robust program review process for graduate programs; as such, this PhD program will have review after five years (i.e., in fall of year 6 or 2029). This review will include a self-study, a visit from faculty external to the program but in related disciplines, and an action plan developed in concert with the graduate program director, program faculty, and dean and associate dean of the Graduate School.

Benchmarks of Success

Benchmarks of success for the PhD in Biology will include the following student enrollment and graduate goals:

- 3 – 5 new students will be admitted annually
- 75% of students will successfully pass the comprehensive exam
- 75% of the graduating students will be an author on abstracts submitted for publication and presentation at the national level
- 75% of the graduating students will present research at a regional or national conference before they graduate
- 75% of the graduating students will submit a manuscript in conjunction with their research mentor or advisor for peer review before they graduate
- The program will graduate at least 3 students annually by the completion of the fifth year

- 75% of graduates will have obtained jobs utilizing their advanced degree within six months of program completion
- 75% of students will be satisfied with the program as determined by the University's Graduate Student Satisfaction Survey;

After the first year and subsequent years, periodic evaluations of the success of the program in meeting these benchmarks will be undertaken. If program benchmarks are not achieved, the graduate program director and the program faculty will examine the program's admissions policies, curriculum, instructional methods, advising practices, and course evaluations to determine where changes need to be made.

Expansion of an Existing Program

This program is not an expansion of an existing program.

Relationship to Existing ODU Degree Programs

The proposed PhD in Biology is a new program offered in the Department of Biological Sciences and the College of Sciences. One degree program in the Department of Biological Sciences, the PhD in Ecological Sciences, may offer some comparable content, but is focused specifically on Ecological Sciences and does not encompass many of the focal areas of this proposed program in Biology.

Compromising Existing Programs

No degree programs will be compromised or closed as a result of the initiation and operation of the proposed degree program.

Collaboration or Standalone

This is a standalone program. No other organization was involved in its development, and no other organization will collaborate in its operation.

Justification for the Proposed Program

Response to Current Needs (Specific Demand)

While a large fraction of Biology has historically been connected to the more field oriented, conservation and resource management disciplines, the profession has evolved to include an increasingly interdisciplinary variety of laboratory and computational focal areas. Additionally, there is a growing realization that programs focused only on preparing graduates for tenure-track faculty positions at research-focused institutions are inadequately serving a large number of post graduation careers in Biology outside traditional tenure-track faculty positions^{[1][2]}. The new Biology PhD program proposed herein is aligned with this shift and will be suited to the full diversity of careers and research topics in current day Biology.

The proposed degree will include participation of faculty and students from a variety of educational backgrounds to integrate a core curriculum in conjunction with a parallel research program that is common to the relevant subdisciplines within Biology. There is strong demand for PhD-educated faculty in each of the subdisciplines and the proposed program in Biology will produce graduates who will help bridge traditional disciplinary boundaries and who are trained in cutting edge techniques and research approaches.

The vision of the new PhD program in Biology is to fill these critical training gaps, by creating an interdisciplinary program that not just spans traditional disciplines, but focuses on a core curriculum of fundamental and quantitative skills, research ethics, and statistical inference that can be applied to a multitude of career paths and pressing problems in society today. The program will provide a wide umbrella for a diverse array of faculty research interests with demonstrated success in both academic and industry and provide an opportunity to train future science leaders with a broad toolset that attempts to keep as many career options open to graduates as possible.

Below, we highlight some of the main focal areas of our program and the need for PhD level training in each:

Ecology and Conservation Biology

There is a growing realization that many PhD programs focus on preparing their ecology students primarily for tenure-track careers, but less than 20% of PhDs in ecology actually secure an academic position^{[1][2]}. However, despite a very low voluntary unemployment rate for ecology Ph.D. recipients (3.3%), job satisfaction remains high^[2]. Thus, demand remains high for PhD-level training in the discipline, though programs need to provide better career guidance and broader and more interdisciplinary approaches to best serve student needs and future career paths. Additionally, environmental degradation is progressing at an increasingly accelerating rate, with detrimental impacts of climate change, pollution, overharvesting, land development, sea level rise, and a multitude of others, creating critical demand for highly trained students in industry, nongovernmental organizations, and governments in leadership roles for active conservation biology projects, ecological research, and environmental monitoring. There is also a growing number of long-term ecological research projects, or ecological “observatories,” which require staffing at all levels, including senior level research scientists^[3]. The PhD program in Biology will prepare students to assume senior, leadership roles in a variety of industry, nongovernmental, governmental, and traditional academic positions through comprehensive training in a broad suite of fundamental skills.

Bioinformatics and Computational Biology

One of the fastest growing segments of the workforce in Biology is in Bioinformatics and Computational Biology: the interdisciplinary field of processing and analysis of complex biological and molecular datasets. According to the Bureau of Labor Statistics, employment of computer and information research scientists is projected to grow 22 percent from 2020 to 2030, much faster than the average for all occupations^[4]. Jobs in bioinformatics and biotechnology fields span industries from academia to pharmaceuticals, biotechnology, and healthcare; yet comprehensive educational training programs are not as abundant as needed, and primarily focus

on computational training at the M.S. level, with advanced level PhD training required for more senior and leadership positions. With only two other Biology PhD programs in the commonwealth of Virginia (UVA and Virginia Tech), no focused programs in Eastern Virginia, and a wealth of biomedical employers and other industries in the tidewater region, the PhD in Biology at ODU will fill a critical gap in advanced training for high-level employment in Bioinformatics and Computational Biology.

Infectious Disease Research

The Department of Biological Sciences has long been a leader in world-class research on the ecology and epidemiology of tick-borne illnesses. The incidence of infectious disease is on the rise globally, often associated with climate change^[5-12]. Tick-borne disease is increasing and pathogen carrying organisms are expanding their ranges, particularly in the Mid-Atlantic region^[13]. ODU and the proposed program is poised to continue leadership in training the next generation of public health leaders in this sector.

NOTE: We will also be soliciting letters of support from industry leaders attesting to the need for professionals with the specific knowledge, skills, and abilities of graduates of the proposed degree program. These will include local and regional leaders in federal government (e.g., the National Oceanic Atmospheric Administration, Department of Defense, Fish and Wildlife Service, Army Corps of Engineers), state government (e.g., Department of Health, state Marine and Wildlife agencies), non-profit (e.g., the Nature Conservancy, World Wildlife Fund, Conservation International), and industry sectors (e.g., Nobilis, Beanstalk, Sunny Farms), as well as neighboring colleges and universities. SCHEV requires these letters be dated within twelve (12) months of submitting the proposal to SCHEV, so we are waiting for the final timeline to be established prior to compiling these materials.

^[1] Cid, C. R., and M. W. Brunson. 2020. Engaging faculty in preparing students for non-academic environmental careers. *Frontiers in Ecology and the Environment*, 18(1), 52-53.
<https://esajournals.onlinelibrary.wiley.com/doi/10.1002/fee.2158>

^[2] Hampton, S. E., and S. G. Labou. 2017. Careers in ecology: a fine-scale investigation of national data from the U.S. Survey of Doctorate Recipients. *Ecosphere* 8(12):e02031. 10.1002/ecs2.2031
<https://esajournals.onlinelibrary.wiley.com/doi/epdf/10.1002/ecs2.2031>

^[3] SanClements, M.D. and Thibault, K.M., 2019. NEON scientist: a new career choice in ecology. *Frontiers in Ecology and the Environment*, 17(2), pp.126-127.
<https://esajournals-onlinelibrary-wiley-com.proxy.lib.odu.edu/doi/10.1002/fee.2008>

^[4] Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, Computer and Information Research Scientists

^[5] Burdon JJ, Zhan Z. 2020. Climate change and disease in plant communities. *PLoS Biol* 18(11):e3000949.

^[6] Byers JE. 2020. Effects of climate change on parasites and disease in estuarine and nearshore environments. *PLoS Biol* 18(11):e3000743.

^[7] Harvell CD, Mitchell CE, Ward JR, Altizer S, Dobson AP, Ostfeld RS, et al. 2002. Climate warming and disease risks for terrestrial and marine biota. *Science* 296(5576):2158–62.

^[8] Lafferty KD. The ecology of climate change and infectious diseases. *Ecology*. 2009;90(4):888–900.

^[9]Lafferty KD, Mordecai EA. 2015. The rise and fall of infectious disease in a warmer world. F1000Research 5.

^[10]Paaijmans KP, Thomas MB. 2011. Health: Wealth versus warming. Nature Climate Change Oct 1;1(7):349.

^[11]Parham PE, Waldo J, Christophides GK, Hemming D, Augusto F, Evans KJ, et al. 2015. Climate, environmental and socio-economic change: weighing up the balance in vector-borne disease transmission. Philosophical Transactions of the Royal Society of London, Series B: Biological Sciences Feb 16;370(1665).

^[12]Rohr JR, Cohen JM. 2020. Understanding how temperature shifts could impact infectious disease. PLoS Biol. 18(11):e3000938.

^[13]Madison-Antenucci, S., Kramer, L.D., Gebhardt, L.L. and Kauffman, E., 2020. Emerging tick-borne diseases. Clinical microbiology reviews, 33(2), pp.e00083-18.

Employment Demand

The job market for students completing a PhD in Biology has evolved from a direct link to academic jobs at universities to the ever expanding jobs in government and the private sector working in natural systems, biotech, and healthcare industries.

There is a projected need for the traditional job of postsecondary educator in biological sciences at both the national (13% projected growth) and Virginia (10.6%) levels. These jobs require a PhD in Biology, and so this program will produce individuals who meet this need.

NOTE: We will be collating current position announcements as well as letters of support from prospective employers for the final SCHEV proposal submission. SCHEV requires these announcements and letters be dated within twelve (12) months of submitting the proposal to SCHEV, so we are waiting for the final timeline to be established prior to compiling these materials.

Labor Market Information: Bureau of Labor Statistics, 2020-2030 (10-Yr)

| Occupation Title | Base Year Employment | Projected Employment | Total % Change | Typical entry level education |
|--|-------------------------|-------------------------|----------------------|---------------------------------|
| Life Scientist | 94,000 | 106,900 | 13% | Doctoral or professional degree |
| Medical Scientist | 133,900 | 156,600 | 17% | Doctoral or professional degree |
| Conservation Scientist/Forester | 39,000 | 41,900 | 7% | Bachelors |
| Postsecondary Teachers, Biological Sciences | 60,500 | 68,200 | 13% | Doctoral or professional degree |

Labor Market Information: Virginia Employment Commission, 2020-2030 (10-Yr)

| Occupation Title | Base Year Employment | Projected Employment | Total % Change | Annual Change # | Education |
|---|----------------------|----------------------|----------------|-----------------|---------------------------------|
| Microbiologist | 389 | 407 | 4% | 2 | Bachelor's degree |
| Wildlife Biologist | 271 | 281 | 4% | 1 | Bachelor's degree |
| Postsecondary Teachers, Biological Sciences | 1814 | 2007 | 11% | 19 | Doctoral or professional degree |
| Biochemist and Biophysicists | 451 | 484 | 7% | 3 | Doctoral or professional degree |

Student Demand

Our draft student demand survey is attached as Appendix G which will be sent out to ODU Biology majors with Junior or Senior standing (i.e., those likely already thinking about potential graduate programs). SCHEV requires these surveys be conducted within twelve (12) months of submitting the proposal to SCHEV, so we are waiting for the final timeline to be established prior to initiating these efforts.

SUMMARY OF PROJECTED ENROLLMENTS IN PROPOSED PROGRAM

Projected enrollment:

| Year 1 | | Year 2 | | Year 3 | | Year 4 | | | Year 5 | | |
|------------------|------------|------------------|------------|------------------|-------------|------------------|-------------|----------|------------------|-----------|----------|
| <u>2023-2024</u> | | <u>2024-2025</u> | | <u>2025-2026</u> | | <u>2026-2027</u> | | | <u>2027-2028</u> | | |
| HDCT | FTES | HDCT | FTES | HDCT | FTES | HDCT | FTES | GRAD | HDCT | FTES | GRAD |
| <u>6</u> | <u>4.3</u> | <u>12</u> | <u>8.5</u> | <u>16</u> | <u>11.3</u> | <u>19</u> | <u>13.3</u> | <u>0</u> | <u>23</u> | <u>16</u> | <u>4</u> |

Assumptions:

Retention percentage: 80%

Part-time students: 20%; Full-time students: 80%

Expected time to graduation for full-time: 5 years; and part-time: 7 years

Number of credit hours per semester for full-time: 9; and for part-time: 3-6

Duplication

Two public institutions offer similar or related degree programs. The following universities offer dedicated doctoral degrees in the field of Biology/Biological Sciences: The University of Virginia (UVA) and Virginia Tech (VT).

The University of Virginia (UVA)

The University of Virginia offers a Ph.D. program in Biology. The 72 credit-hour program, with a 10-credit hour core, aims to train scientists and scholars to perceive fundamental biological problems and to investigate them successfully.

Similarities to ODU

One of the five required courses of the Ph.D. program in Biology at UVA is BIMS 7100, Research Ethics. The content of the course includes several areas covered in a core course in the proposed program, BIOL 847 Responsible Conduct of Research.

Differences from ODU

The UVA program requires 72 credit-hours with a 10 credit-hour core while the ODU program requires 78 credit-hours (or 48 with an existing MS) with a 13-14 credit-hour core. The UVA program does not have fundamental's, quantitative, or statistics core courses. The UVA program also requires laboratory rotations, while students would matriculate directly into the lab of their major advisor for the ODU program.

Virginia Tech (VT)

The Virginia Polytechnic Institute and State University offers a Ph.D. program in Biological Sciences. The 90 credit-hour program, with a 1 credit-hour core, aims to teach both research skills and the ability to communicate effectively with professional colleagues and undergraduate students in an effort to foster individually tailored programs that lead to successful careers in research and education.

Similarities to ODU

The only required core course of Virginia Tech's program is a 1 credit orientation course BIOL 5174: Introduction to Graduate Studies in Biological Sciences. This course provides new students with critical information about the graduate program, requirements for degrees and the level of performance that constitutes normal progress, and required training. As this course is institution and program specific, there really are no similarities to the proposed program at ODU.

Differences from ODU

The Virginia Tech program requires 90 credit-hours with a 1 credit-hour core while the ODU program requires 78 credit-hours (or 48 with an existing MS) with a 13-14 credit-hour core. The Virginia Tech program does not have fundamental's, quantitative, or statistics core courses. As such, there is very little similarity between the VA Tech program and the proposed program at ODU.

The following data, supplied by SCHEV, show trends at these two institutions.

| Institution/Year | 2016 | 2017 | 2018 | 2019 | 2020 |
|-------------------------|-------------|-------------|-------------|-------------|-------------|
| UVA Headcount | 51 | 55 | 52 | 53 | 56 |
| UVA Graduates | 4 | 8 | 5 | 10 | 5 |
| VT Headcount | 67 | 67 | 63 | 76 | 75 |
| VT Graduates | 11 | 5 | 8 | 14 | 11 |

Projected Resource Needs for the Proposed Program

Projected Resource Needs

Old Dominion University and the Department of Biological Sciences have sufficient resources to launch and sustain the proposed program. Specifically, faculty, staff, equipment, space, and library resources are available to launch and maintain the proposed program.

Full-time Faculty

Seven full-time faculty members who are either tenured or on a tenure track will teach the core course curriculum in the PhD in Biology program, with an additional 7 faculty teaching associated electives and advising students for a total of 14 full-time program faculty.

Part-Time Faculty

No part-time faculty members are required to launch and sustain the proposed program.

Adjunct Faculty

No adjunct faculty members are required to initiate and sustain the proposed program.

Graduate Assistants

No graduate assistants are required to initiate and sustain the proposed program.

Classified Positions

No classified position is requested to initiate and sustain the proposed program.

Targeted Financial Aid

No targeted financial aid is required to launch and sustain the proposed program.

Library

No new library resources are required to launch and sustain the proposed program. The University Libraries has a strong collection in the life sciences. Many current journals are found in the online databases, and the library has a responsive interlibrary loan program for resources outside of the current collection. The Department of Biological Sciences has an annual allowance for books or journals.

Telecommunications

No new telecommunication resources are needed to initiate and sustain the proposed program.

Space

No additional space is required to initiate and sustain the proposed program.

Equipment (including computers)

No new equipment resources are needed to initiate and sustain this proposed program.

Other Resources

No new resources will be required to launch or operate the proposed PhD in Biology.

Funds to Initiate and Operate the Degree Program

| Cost and Funding Sources to Initiate and Operate the Program | | | |
|---|---|--|---|
| Informational Category | | Program Initiation Year 2023-2024 | Program Full Enrollment Year 2027-2028 |
| 1 | Projected Enrollment (Headcount) | 6 | 23 |
| 2 | Projected Enrollment (FTE) | 4.2 | 16 |
| 3 | Projected Enrollment Headcount of In- State Students | 4 | 19 |
| 4 | Projected Enrollment Headcount of Out- of-State Students | 2 | 4 |
| 5 | Estimated Annual Tuition and E&G Fees for In-state Students in the Proposed Program | \$41,112 | \$164,448 |
| 6 | Estimated Annual Tuition and E&G Fees for Out-of-State Students in the Proposed Program | \$50,652 | \$101,304 |
| 7 | Projected Total Revenue from Tuition and E&G Fees Due to the Proposed Program | \$91,764 | \$265,752 |
| 8 | Other Funding Sources Dedicated to the Proposed Program (e.g., grant, business entity, private sources) | \$0.00 | \$0.00 |

RESOURCE NEEDS: PARTS A - D

Part A: Answer the following questions about general budget information.

- Has the institution submitted or will it submit an addendum budget request to cover one-time costs? Yes_____ No_ X _
- Has the institution submitted or will it submit an addendum budget request to cover operating costs? Yes_____ No_ X _
- Will there be any operating budget requests for this program that would exceed normal operating budget guidelines (for example, unusual faculty mix, faculty salaries, or resources)? Yes_____ No_ X _
- Will each type of space for the proposed program be within projected guidelines? Yes_ X _ No_____
- Will a capital outlay request in support of this program be forthcoming? Yes_____ No_ X _

Part D: Certification Statement(s)

The institution will require additional state funding to initiate and sustain this program.

 Yes _____
Signature of Chief Academic Officer

 X No _____
Signature of Chief Academic Officer

Secondary Certification.

If resources are reallocated from another unit to support this proposal, the institution will **not** subsequently request additional state funding to restore those resources for their original purpose.

 X Agree _____
Signature of Chief Academic Officer

 Disagree _____
Signature of Chief Academic Officer

Appendix A—Sample Plans of Study

Sample plan of student for full-time student with a prior MS

| Course | Credits | Category |
|---|---------|----------|
| Fall I | | |
| BIOL 847 Responsible Conduct of Research | 2 | Core |
| BIOL 857 Biometry | 4 | Core |
| BIOL 808 Seminar | 1 | Core |
| BIOL 898 Research | 2 | Core |
| TOTAL 9 credits | | |
| Spring I | | |
| BIOL 801 Practical Computing | 3 | Core |
| BIOL 804 Animal Ecophysiology | 3 | Core |
| BIOL 898 Research | 3 | Core |
| TOTAL 9 credits | | |
| Fall II | | |
| BIOL 859 Foundations and Principles in Ecology | 3 | Core |
| BIOL 898 Research | 6 | Core |
| TOTAL 9 credits | | |
| Spring II | | |
| BIOL 808 Seminar | 1 | Core |
| BIOL 898 Research | 8 | Core |
| TOTAL 9 credits | | |
| Fall III | | |
| BIOL 808 Seminar | 1 | Core |
| BIOL 898 Research | 8 | Core |
| TOTAL 9 credits | | |
| Spring III | | |
| BIOL 899 Dissertation | 1 | Core |
| TOTAL 1 credit All But Dissertation (ABD) status | | |
| Fall IV | | |
| BIOL 899 Dissertation | 1 | Core |
| TOTAL 1 credit All But Dissertation (ABD) status | | |
| Spring IV | | |
| BIOL 899 Dissertation | 1 | Core |
| TOTAL 1 credits All But Dissertation (ABD) status | | |

Total required for degree - 48 credits

Sample plan of student for full-time student with no prior MS

| Course | Credits | Category |
|---|----------------|-----------------|
| Fall I | | |
| BIOL 847 Responsible Conduct of Research | 2 | Core |
| BIOL 857 Biometry | 4 | Core |
| BIOL 808 Seminar | 1 | Core |
| BIOL 898 Research | 2 | Core |
| TOTAL 9 credits | | |
| Spring I | | |
| BIOL 801 Practical Computing | 3 | Core |
| Structured Elective | 3 | Elective |
| BIOL 804 Animal Ecophysiology | 3 | Core |
| TOTAL 9 credits | | |
| Fall II | | |
| BIOL 859 Foundations and Principles in Ecology | 3 | Core |
| BIOL 898 Research | 6 | Core |
| TOTAL 9 credits | | |
| Spring II | | |
| BIOL 808 Seminar | 1 | Core |
| BIOL 898 Research | 8 | Core |
| TOTAL 9 credits | | |
| Fall III | | |
| BIOL 808 Seminar | 1 | Core |
| BIOL 898 Research | 8 | Core |
| TOTAL 9 credits | | |
| Spring III | | |
| BIOL 898 Research | 9 | Core |
| TOTAL 9 credits | | |
| Fall IV | | |
| BIOL 808 Seminar | 1 | Core |
| BIOL 898 Research | 5 | Core |
| TOTAL 6 credit All But Dissertation (ABD) status | | |
| Spring IV | | |
| BIOL 898 Research | 6 | Core |
| TOTAL 6 credits All But Dissertation (ABD) status | | |
| Fall V | | |
| BIOL 898 Research | 5 | Core |
| BIOL 808 Seminar | 1 | Core |

| | | |
|---|---|------|
| TOTAL 6 credit All But Dissertation (ABD) status | | |
| Spring V | | |
| BIOL 899 Dissertation | 6 | Core |
| TOTAL 6 credits All But Dissertation (ABD) status | | |

Total required for degree - 78 credits

Appendix B—Course Descriptions

BIOL 801. Practical Computing for Biology. 3 Credits.

This hands-on training course emphasizes the use of general computing tools to work more effectively in the biological sciences. It integrates a broad range of powerful and flexible tools that are applicable to ecologists, molecular biologists, physiologists, and anyone who has struggled analyzing large or complex data sets. Text file manipulation with regular expressions, basic shell scripting, programming in Python and R, interaction with remote devices, and basic graphical concepts will be reviewed.

BIOL 803. Advanced Genomics Data Analysis. 3 Credits.

This course is designed to teach students the various steps involved in analyzing next-generation sequencing data for gene expression profiling and polymorphism identification and analyses. The class will follow a workshop setting with a combination of lectures, paper discussions, and instructor and student led programming sessions.

BIOL 804. Animal Ecophysiology. 3 Credits.

This course integrates the physiological and biochemical function of wild animals with population-scale and community-scale ecological patterns. Both organismal mechanisms and comprehensive theories will be included. The course primarily draws on peer-reviewed literature and includes lecture and discussion.

BIOL 808. Ecological Sciences Seminar. 1 Credit.

A graduate seminar course in the ecological sciences. The format of the course depends on the faculty running the seminar, but most seminars involve student-led discussions on current research articles.

BIOL 810. Advanced Cell Biology. 3 Credits.

This course will cover selected current topics in cell biology that reflect recent advances in the field. Major topics include membranes and transport, signal transduction, cell adhesion and motility, cell cycle, apoptosis, and specialized cell functions. Students will read current research papers that describe the latest innovations in microscopic and molecular analysis of cellular function. This course is built on previous coursework in cell biology by reinforcing key fundamental concepts and performing a more in-depth examination of cellular mechanisms.

Prerequisite: Course background in cell biology is recommended.

BIOL 832. GIS in the Life Sciences. 3 Credits.

This course is designed to introduce students to geographic information systems through examples and applications in the life sciences.

BIOL 847. Responsible Conduct of Research. 2 Credits.

Required of all graduate students admitted to Biology programs. The course will introduce students to the responsible conduct of science and scientific research.

BIOL 849. Biogeography. 3 Credits.

Emphasis on historical biogeography, utilizing both dispersal and vicariance models for explanations of the geographic distribution of organisms. Ecological explanations are also considered. Useful techniques for biogeographic analyses, such as comparison of area cladograms are discussed at length.

BIOL 857. Biometry. 4 Credits.

A first course, or a refresher course, in statistical methods and experimental design for graduate students in biology and the natural sciences. The focus is on application and hypothesis testing with examples drawn from the field of biology. The course requires a significant amount of work outside of class on homework exercises and an independent project. Prerequisite: course background in statistics.

BIOL 859. Foundations and Principles in Ecology. 3 Credits.

A survey of the seminal ideas and perspectives in historical and contemporary ecology. The course is designed to provide a broad overview of the important theoretical and conceptual paradigms in ecology.

BIOL 872. Modeling and Simulation in Life Sciences. 4 Credits.

Course is designed to introduce students to modeling and simulation techniques using examples and applications in the life sciences.

Appendix C—Abbreviated CVs For Faculty

Barshis, Daniel, PhD, 2009, Zoology with concentration in Ecology, Evolution, and Conservation Biology, University of Hawai‘i at Mānoa. Associate Professor of Biological Sciences. Specialization Areas: ecophysiology, genomics, coral reef biology.

Gaff, Holly, PhD, 1999, Mathematics with emphasis in Mathematical Ecology, University of Tennessee Knoxville. Professor and Associate Chair of Biological Sciences. Specialization areas: Ecology and epidemiology of ticks and tick-borne diseases.

Hynes, Wayne, PhD, 1985, Microbiology, Otago University, Dunedin, New Zealand. Professor of Biological Sciences. Specialization areas: Epidemiology of tick-borne diseases and innate immune responses of ticks.

Wallace, Lisa, PhD, 2002, Evolution, Ecology, and Organismal Biology, The Ohio State University. Associate Professor of Biological Sciences and J. Robert Stiffler Professor of Botany. Specialization Areas: biogeography, botany, evolutionary biology, molecular ecology, systematics.

Walters, Eric, PhD, 2004, Ecology and Evolution, Florida State University. Associate Professor of Biological Sciences. Specialization Areas: quantitative ecology, community ecology, behavioral ecology, conservation biology

Whiteman, John, PhD, 2014, Ecology, University of Wyoming. Assistant Professor of Biological Sciences. Specialization Areas: animal physiology, ecology, conservation.

Zhang, Pengwei, PhD, 2015, Biology, Rensselaer Polytechnic Institute. Assistant Professor of Biological Sciences. Specialization Areas: viral-host interactions, anti-viral immune responses.

Appendix D – Externally Funded Grants
(To be filled in for final SCHEV proposal)

Appendix E - Journal Articles

Appendix F—Employment Demand
(To be filled in for final SCHEV proposal)

2021_Template_Graduate

Start of Block: Default Question Block

Old Dominion University (ODU) is proposing a PhD in Biology. We are contacting you to determine the level of interest in this program among potential students. Your participation is voluntary and your responses are anonymous.

The proposed PhD in Biology would be a 78 credit hour program beyond the bachelor's degree (48 credit hours post master's). The program is designed to prepare future leaders in biological research. Graduates will develop hands-on research and quantitative analytical skills and competencies across a variety of biological disciplines. Graduates will fill the demand for senior lead positions such as Research Analyst, Program Manager, Bioinformatician, Senior Biologist, and Wildlife Resource Manager within academic, federal government, state government, non-profit, and private sector environments. The program will also prepare graduates to teach Biology courses in private high-schools and 2- and 4-year colleges and universities.

What is your level of interest in the Biology PhD program described above?

- Very interested
 - Somewhat interested
 - Not very interested
 - Not at all interested
-

What is the likelihood that you would enroll in the Biology PhD program at Old Dominion University described above?

- Very likely
- Somewhat Likely
- Not very likely
- Not at all likely

Display This Question:

If What is your level of interest in the Biology PhD program described above? = Not very interested

Or What is your level of interest in the Biology PhD program described above? = Not at all interested

And If

What is the likelihood that you would enroll in Biology PhD program at Old Dominion University describe... = Not very likely

Or What is the likelihood that you would enroll in [DEGREE NAME] at Old Dominion University describe... = Not at all likely

Thank you for your time. Please click "Next" to submit your survey responses.

Skip To: End of Survey If Thank you for your time. Please click "Next" to submit your survey responses.() Is Displayed

If you enrolled in the Biology PhD program would you expect to be:

- A full-time student
 - A part-time student
-

What is your class rank?

- Freshman
 - Sophomore
 - Junior
 - Senior
 - Other, please specify: _____
-

Which of the following would influence your decision to pursue a Biology PhD program at ODU?

- Opportunity to achieve professional goals
 - Opportunity to work in the film industry
 - Proximity of the campus to where I work/live
 - Reputation of faculty
 - Availability of night courses
 - Opportunity to expand working knowledge of film production/screenwriting/film studies
 - Other: _____
-

Could you please comment on how this PhD program in Biology would fit with current or future career goals?

Thank you for your time. Please click "Next" to submit your survey responses.

End of Block: Default Question Block

APPENDIX H—LIBRARY HOLDINGS