

2014 Strategic Plan Department of Biological Sciences

The mission of the Department of Biological Sciences is to create and disseminate knowledge that increases our understanding of living organisms in the contexts of both normal biology and aberrant processes that contribute to disease. This mission is carried out through original research, publication, and teaching students within the discipline, within related scientific fields, and all who benefit from a better understanding of the science of life.

This mission is strongly supported by the scholarly activities of our faculty which focus on the areas of cell biology, developmental biology, genetics, microbiology, molecular biology, neurobiology, and physiology. These disciplines support the translational medical research in cancer, cardiovascular diseases, infectious diseases, ophthalmology and skeletal diseases that are current strengths within the department. This scholarly activity also supports the University of Delaware mission by providing:

- 1) Highly productive scholars who are qualified to deliver the graduate research training necessary for students to complete MS and Ph.D. degrees.
- 2) Support for the university's mission to improve diversity in higher education as our efforts to increase the diversity of our graduate program have led to a higher proportion of under-represented minority graduate students in our program than any other STEM graduate program on campus.
- 3) Scientific collaborations between Biological Sciences faculty and faculty members based in other UD departments and colleges that are critical to numerous university-wide initiatives and the scholarly reputation of the University of Delaware.
- 4) Scientific expertise needed for the University of Delaware to participate in regional research and education initiatives including the Delaware Health Science Alliance, the NIH funded Delaware Center for Translational Research, The Center for Translational Cancer Research, The Helen F. Graham Cancer Center at Christiana Care, The UD Center for Bioinformatics and Computational Biology, The Delaware Cardiovascular Research Center, The Delaware Rehabilitation Institute, The Nemours Biomedical Research Foundation, the Delaware Center for Neuroscience Research, and Delaware INBRE.
- 5) Research active faculty qualified to teach high quality, innovative graduate courses to train workers who will contribute to the biotechnology workforce of Delaware and surrounding states including 1) traditional research graduate students in both our and other life sciences programs 2) graduate students in our growing Professional Science Masters in Biotechnology program and 3) Biological Sciences undergraduate majors taking these courses as their senior capstone requirement.
- 6) Well funded faculty members needed to compete successfully for training grants and undergraduate education grants that, among other things, are critical for the training of the next generation of STEM professionals.
- 7) Scientists qualified to serve as experts for international, national, regional, and local review panels and committees, including: external evaluations of theses/dissertations for graduate and undergraduate

programs throughout the university; peer review of grants submitted to local, national and international research funding agencies; peer review of scientific manuscripts; evaluation of programs and centers that seek to increase scholarly knowledge, provide life sciences education and/or improve human health.

Justification for rebuilding and investing in the Department of Biological Sciences

Over the past 10 years, our MS and Ph.D. graduate programs have become highly interdisciplinary, rendering Biological Sciences as the *de facto* university and regional graduate program in the life sciences. Approximately one half of our graduate students work with thesis/dissertation advisors with primary appointments outside of the Department of Biological Sciences. The Department was also one of the first to develop a PSM degree at the University. This interdisciplinary graduate degree cross trains students in the life sciences, diverse biotechnology related fields and business, and requires a six month industrial internship. In addition, our educational and scholarly activities support the mission of the Delaware Health Sciences Alliance, a consortium between Thomas Jefferson University, AI duPont Hospital for Children, and the Christiana Care Health System which has the goal of furthering translational research in the State of Delaware as well as the health of Delawareans. This high level of interdisciplinary participation also supports the newly NIH-funded Center for Clinical Translational Research, which seeks to increase interdisciplinary training of clinical and biomedical research professionals in Delaware with the intent of building a vibrant community focused on bringing research findings to the bedside to improve patient care.

Our ability to fulfill our mission has been severely compromised by a loss of one quarter of our total faculty (one third of our tenure track faculty) in the past 6 years while the total number of undergraduates taught by our department (as measured by Instructor College of Record (ICOR) reports) has remained stable. Notably, in fall of 2014, the department will have 8 fewer full time faculty than in fall 2010 due to retirements, and faculty leaving for other positions without replacement. Our instructional capability has been further eroded by two other faculty members taking on important administrative assignments based outside of the department. This has negatively affected our mission at every level, including our scholarly output, scientific impact, ability to offer specialized areas of instruction, and the ability to carry out our educational mission in general.

The impact of these losses has been magnified by the launch of the integrated BISC207-208/CHEM103-104 initiative, which seeks to improve the retention and success of freshman pursuing STEM majors by providing innovative interdisciplinary educational experiences. This has led, among other things, to a reduction in the size of some introductory classes from 72 students per section to 48 resulting in an increase in the total sections of introductory biology offered by our department from 36 to 42. The combination of reduced faculty numbers and increased demand for sections has led to the recurrent use of S-contract instructors. The department supported the development of these new approaches to improve biology education when we overwhelmingly approved the hiring of the Director of ISE Lab as a full professor in Biological Sciences. The Department has also made a strong effort to improve retention and persistence of STEM majors by developing the first ever department wide Living and Learning Community, creating nine sections of biology only FYS sections, and submitting an HHMI grant proposal specially designed to increase retention. Our efforts to retain majors are,

however, hampered when classes need to be covered by instructors who do not have a long-term commitment to the department, leading to a lack of continuity. Further, the current high-enrollments (100-150 students) in key, required, upper level core undergraduate courses such as genetics (BISC403), microbiology (BISC300), cell biology (BISC305) and physiology (BISC306) prevent our students from making real connections with the very faculty members who should be influencing their professional development. Finally, this faculty loss has resulted in severe reductions in elective course offerings at both the undergraduate and graduate level. This limitation on graduate level course offerings particularly restricts the possible growth of our PSM degree, which should routinely offer graduate courses at night to optimally serve part-time graduate students.

These changes over the past 6 years have reduced the number of research mentors available to our graduate students to complete MS/Ph.D. degrees and to our undergraduate students interested in completing the BS in Biological Sciences and/or the thesis based Degrees with Distinction. These decreasing faculty levels are projected to become even more acute because several retirements are anticipated by 2019 (we currently have 9 faculty members with over 30 years of service, 5 of whom are currently over the age of 65 and 3 are over the age of 70). All of these trends continue to severely erode our ability to participate as a full partner in the scholarly endeavors of the University of Delaware. Particularly, the reduction of research active faculty within the department has endangered the ability of our graduate program, one of the first Ph.D. programs established at UD, to remain viable and has made it impossible for the program to be competitive for federal graduate training grant support. Further, our department was once the largest producer of undergraduates earning Degrees with Distinction at UD due to our robust undergraduate research program, which was supported by grants from The Howard Hughes Medical Institute, the Department of Defense, Beckman Foundation and the NIH. However, as we have lost research active laboratories, the number of our majors completing Degrees with Distinction has fallen and we are no longer competitive for extramural graduate and undergraduate training grants.

It is critical that we replenish our community of research active scholars who are able to rebuild both the depth and breadth of our research programs which will improve our national reputation in both scholarship and education. These research active faculty are also needed to educate our undergraduate and graduate students, serve as thesis/dissertation committee members for our graduate students who work on diverse life sciences projects based in laboratories spread over Northern Delaware, as well as provide scholarly support/collaborations to the life and health sciences research missions of the university, the Delaware Health Science Alliance and the State of Delaware. *To rebuild the department, we propose to hire three new research active, tenure-track faculty members per year in each of the next five years in the following mission-critical areas. This will allow us to 1) restore the critical mass of research active faculty lost when eight faculty members, including some highly productive scientists, left the university without replacement and 2) will provide replacements for the additional faculty that can be projected to leave the department over the next five years.* This rate of investment is consistent with that which occurred in the late 1990s/early 2000s that resulted in the successful rebuilding of the department after a similar prior period of extreme faculty loss. Overall, this hiring plan will allow us to recover the critical mass of faculty necessary for our department to produce and disseminate excellent scholarship, maintain the viability of our graduate program, and provide the critical staffing needed to ensure that our undergraduates obtain a high quality educational

experience including the exceptional research training opportunities necessary to poise them for success in their future careers. Further, while we successfully expanded the diversity of our graduate student population and developed equitable representation of women on our faculty over the past ten years, we acknowledge that more must be done to actively recruit faculty members from underrepresented minority groups and new hiring would seek to redress this issue.

We would like to emphasize that there is extensive crosstalk among historically separate biology disciplines. This crosstalk has led to major advances in our understanding of living systems as well as more applied areas such as health and technology. The descriptions of proposed faculty hires below will emphasize the scope of the impact that will result from this hiring plan.

Five year hiring plan for The Department of Biological Sciences

2014-2015- Genetics: Genetics, the study of how information is transmitted from one generation to the next, is a core discipline of biology that touches all aspects of our mission, both in regards to scholarship and education as well as applied areas such as biotechnology, biomedical engineering, agriculture and health sciences. We currently have two faculty members whose scholarship focuses on genetics, Drs. Erica Selva and Patricia DeLeon. We also extensively collaborate with the human geneticists based at the AI duPont Hospital for Children and Christiana Care to provide graduate mentors/education in this area. Both retirements and the non-renewal of the contract for an assistant professor trained in genetics, without replacement, have left us critically short of faculty with expertise in this area. The dearth of research active geneticists in the department has led to sharp reductions in the number of graduate students working on genetics projects with faculty members in Biological Sciences, and has made it very challenging to adequately cover the dissertation/thesis committees of graduate students who are working under the direction of researchers based at other members of the Delaware Health Science Alliance.

Genetics is also a critical, required core subject in our undergraduate curriculum. BISC403- *Genetics*, has a yearly enrollment of approximately 310 students. Two thirds of these students are majoring in Biological Sciences, while the remainder major in a diversity of disciplines, both within and outside CAS, most particularly agriculture and health sciences. To provide additional training in this area, we offer a three credit inquiry-based Genetics laboratory course, BISC413, which fulfills the inquiry-based laboratory requirement for our majors. We also offer three graduate level genetics courses, BISC654, *Biochemical Genetics*, the required first year genetics course for our graduate students; as well as BISC656, *Evolutionary Genetics*, and BISC693, *Human Genetics*, popular capstone courses for our undergraduate majors and graduate level electives for our MS, Ph.D. and PSM students. The dearth of research active geneticists in the department has also led to difficulties staffing our required undergraduate genetics course, leading to a collapse of sections so that our spring 2014 enrollment in one section of BISC403 is 122 students. Such high enrollments are far from desirable for an upper level, required majors course of this importance.

We propose to cover our current shortage of faculty focusing on genetics by a three faculty member “cluster hire” in this area. Cluster hiring is an efficient way to recruit faculty as the search committee can cast a wide net, and focus on recruiting the best and brightest in the field. Further, cluster hires are known to increase the success rate of new faculty as they provide a group of scientists

that can interact with and support each other as they develop their careers. As genetics is a broad discipline that also has great relevance to the animal developmental biology and translational research foci of our department (normal development, infertility, birth defects, skeletal biology, cancer biology, cardiovascular biology, infectious diseases, and ophthalmology), the ideal candidates will either use genetic methods to study these problems or will investigate basic genetic mechanisms. These new faculty hires will be expected to 1) perform independent research in the field of genetics and/or extensively use genetic tools in their research, 2) teach undergraduate and graduate level genetics courses, 3) collaborate both within and outside the department with other investigators with genetic interests, and 4) serve on comprehensive examination and thesis/dissertation committees of graduate students who are studying genetic questions.

Hiring faculty members with expertise in genetics who use genetic tools in their research will provide much needed expertise in this area within the university and will provide numerous opportunities for scholarly collaboration-among members of the department, scholars in other departments interested in life science questions such as the Center for Bioinformatics and Computational Biology, the College of Earth Ocean and Environment and the College of Agriculture, in addition to cancer biologists centered at the Helen F. Graham Cancer Center and human geneticists centered at Nemours Biomedical Research.

2016-2017-Microbiology: Microbiology is the study of single cell organisms and viruses. This is a core discipline of biology that touches on all others, as microbes are fundamental to life on earth. Indeed the essential role microbes play in human health led to the NIH human microbiome initiative which seeks to determine the diversity and composition of microbes living with us, on us, and in us, and their role in preventing disease. Further, microbiology knowledge has been essential in the development of the methodologies that underpin Biotechnology and is thus essential knowledge for those pursuing careers in this area. Microbiology is a core research strength of the University of Delaware, and a recent microbiology research symposium organized by Dr. Fidelma Boyd, a microbiologist in the Biological Sciences Department, had over 70 attendees with primary academic affiliations spread among five of the seven colleges of the University. Our graduate program routinely recruits students with interests in microbiology and currently has 15 graduate students pursuing their thesis/dissertation work in this area, seven of whom are working with investigators with appointments outside of the Biological Sciences. This level of interest in microbiology training and the strength of the university microbiology community has led us to explore the idea of establishing a graduate concentration in microbiology. However, we have dropped below a critical mass of microbiologists to support such a concentration, as the department will only have three research active microbiologists in fall 2014 including Dr. Diane Herson who is completing her 46th year in the department, Dr. Fidelma Boyd, a highly productive full professor, and Dr. Ramona Neunuebel, a newly hired assistant professor. Overall, the department needs additional research active faculty whose research focuses on microbiology in order to continue our prior high level of cross college collaboration with microbiologists from across the university in both scholarship and graduate training.

Further, The Department of Biological Sciences has traditionally offered non-majors courses in this area, a sophomore level course (BISC300, *Microbiology*) taken by hundreds of students per year, senior level second writing courses, three graduate courses and regular graduate seminars in this area.

These courses have been taken by a diversity of students beyond those majoring in Biological Sciences (the enrollments represent students pursuing majors in five different colleges). However, our robust faculty of microbiologists capable of teaching these classes has been decreasing (Drs. Dan Simmons and Dave Smith retired this year, while two of our other microbiology instructors have 46 and 36 years of service respectively). This seriously impedes our ability to offer most of the non-majors courses, two of our three graduate courses and 1-2 sections of undergraduate microbiology into the future). While we hired one research active tenure track assistant professor in this area to start fall 2014, she is projected to cover only a portion of the teaching needs in this area already lost, and will not come close to filling all of our direct instructional needs projected to arise into the future.

We propose to cover our current shortage of faculty focusing on microbiology by a three faculty member “cluster hire” in this area. As stated earlier, cluster hiring will allow the search committee to cast a wide net, and focus on recruiting the best and the brightest in the field. Cluster hires as a group will also interact with and support each other better while developing their careers which will increase their potential for success. As microbiology is a broad discipline that also has great relevance to the biotechnology and translational research foci of our department, the ideal candidates will either study the basic biology or infectious disease mechanisms used by microbes or viruses in areas that complement existing research strengths of the department and the university. These new faculty hires will be expected to 1) perform independent research in the field of microbiology, 2) collaborate both within and outside the department with other investigators with microbiology interests, 3) teach undergraduate and graduate level microbiology courses, and 4) serve on comprehensive examination and thesis/dissertation committees of graduate students who are studying microbiology questions.

Further development of the microbiology research programs centered in the Department of Biological Sciences will allow us to take further leadership roles in building collaborations among microbiologists spread over the university and will give us the critical mass of faculty needed to institute a graduate concentration in microbiology within our MS and Ph.D. programs in Biological Sciences which will better serve the educational needs of our student body.

2016-2017- Cell Biology: Cell biology is a core discipline of biology that focuses on the collaborations between cellular elements (plasma membrane, nucleus, protein trafficking organelles, mitochondria, etc.) and among groups of cells (e.g. tissues and organs) that are necessary for life. As such, it impinges on all aspects of our department’s mission in regard to scholarship and education as well as many applied areas including health sciences, biomedical engineering and agriculture. We currently are very short staffed in regard to faculty members who are experts in cell biology which limits the ability of the Department of Biological Sciences to contribute to interdisciplinary collaborations in this area both within the department and university wide, particularly those focused on translating basic science knowledge to patient care.

In addition, this dearth of faculty with expertise in cell biology has led to the collapse of our cell biology offerings to one section of undergraduate and one section of graduate cell biology per year, and our inability to offer advanced laboratory classes in this area which were particularly popular with

graduate students enrolled in our Professional Science Masters program. This state of affairs cannot continue into the future without majorly impacting our department's scholarship and educational mission. A curriculum revision put in place this year has moved cell biology from an optional class to a required class for both the BA and BS in Biological Sciences which reflects its importance as a central discipline in biology required for both those staying in the field and those pursuing medical school. It is not viable to have a required course taught only once per year for majors with our level of enrollment. Further, cell biology is an important course for biomedical engineers and other majors as this discipline underpins tissue engineering and other aspects of regenerative biology. Finally, our current dearth of cell biologists directly impacts graduate students in our MS/Ph.D. in Cell and Organ Systems Concentration as well as our PSM in Biotechnology students as due to lack of graduate level course offerings, suitable research mentors and thesis/dissertation committee members in this area. The lack of courses in this area (even one of those required for the MS/Ph.D. in Cell and Organ Systems) has led us to do numerous course substitutions in our established graduate curricula and eroded the depth of our graduate students' education.

We propose to cover our current shortage of faculty focusing on cell biology by a three faculty member "cluster hire" in this area. As cell biology is a broad discipline that also has great relevance to the animal developmental biology and translational research foci of our department (normal development, birth defects, bone biology, cancer biology, cardiovascular biology, infectious diseases, infertility and ophthalmology as well as tissue engineering and other biomedical engineering areas), the ideal candidates will be well trained cell biologists whose research areas complement the existing areas of research excellence within the department and university. These new faculty hires will be expected to 1) perform independent research in the field of cell biology, 2) teach undergraduate and graduate level cell biology courses, 3) collaborate both within and outside the department with other investigators with cell biology interests, and 4) serve on comprehensive examination and thesis/dissertation committees of graduate students whose projects require expertise in different aspects of cell biology.

In the end, additional research active scholars in cell biology will make important contributions to nearly all areas of life science research currently pursued at the University of Delaware and beyond at our partners in the Center for Translational Research (Nemours Biomedical Research and Christiana Care). Most human diseases arise from defects in/co-option of normal cellular processes. In addition, tissue engineering is fundamentally the study of cellular processes and its architecture in three dimensions. Rebuilding our cell biology research team will enable continuation of our vigorous scholarly research activities in cancer, cardiovascular diseases, infectious diseases, ophthalmic disorders, skeletal disorders into the future.

2017-2018- Physiology: Physiology is a core discipline in biology that focuses on how cells collaborate to form tissues/organs and how tissues/organisms work in concert to achieve multicellular life. Since physiology is fundamentally the study of functioning organisms, it has wide applicability to most life science disciplines ranging from health sciences, biomedical engineering, biomechanics, animal sciences etc. Traditionally, faculty in the Department of Biological Sciences have provided strong leadership in this area, collaborating with scientists and engineers throughout the university to provide a "real-world" context for their investigations which has made a particularly strong contribution to

UD's ability to carry out cutting edge biomedical research. In the past, the department was well supplied with physiologists who had expertise in a wide variety of subfields. However, in recent years, many of these faculty have retired or left for other positions, which has compromised our pool of expertise in this area.

Further, all students majoring in the biological sciences are required to take physiology, and this course is recommended for any student considering medical school. In the past, the department was well staffed with physiologists with expertise in a wide variety of subfields, allowing us to offer multiple sections of the required undergraduate physiology course each semester, a year-long graduate physiology course sequence and diverse undergraduate and graduate electives in this area. We have had several physiologists retire leading to our core graduate physiology sequence now being primarily staffed by physiologists based in the College of Health Sciences. Further, we are unable to offer any undergraduate physiology electives with our current staffing while only one section of the required core course is offered per semester with enrollments regularly ranging from 120-150 students. As previously mentioned, these faculty retirements have also limited our ability to fully participate in the human health initiatives ongoing within both the University and State of Delaware since we just do not have a critical mass of research active physiologists who can collaborate with these efforts.

We propose to cover our current shortage of faculty focusing on physiology by a three faculty member "cluster hire" in this area. As physiology is a broad discipline with great relevance to the animal developmental biology and translational research foci of our department (normal development, birth defects, bone biology, cancer biology, cardiovascular biology, infectious diseases, infertility and ophthalmology as well as tissue engineering and other biomedical engineering areas), the ideal candidates will be well trained animal physiologists whose research areas complement the existing areas of research excellence within the department and university. These new faculty hires will be expected to 1) perform independent research in the field of physiology, 2) collaborate both within and outside the department with other investigators with Physiology interests, 3) teach undergraduate and graduate level physiology courses, and 4) serve on comprehensive examination and thesis/dissertation committees of graduate students who are studying Physiology questions

In the end, rebuilding our research strengths in physiology is absolutely crucial for us to participate as a full partner in diverse interdisciplinary initiatives ongoing at the University and it is mission critical that we rebuild our strengths in this area.

2019-2020- Molecular Biology: Molecular Biology can be considered to be the interface between chemistry and biology as it is the study of how molecules collaborate to create living systems. Students studying all facets of the Biological Sciences need a strong grounding in this discipline because it underpins everything else that occurs at higher levels of organization including genetics, cell biology, microbiology and physiology. We offer MS and Ph.D. degrees with a Concentration in Molecular Biology and Genetics, and this is the most popular concentration in our graduate program, attracting about 2/3 of our graduate student population. Molecular biology underpins most of the tools we use to answer broader scientific questions in the life sciences including transgenic/knockout mice, cell transfections and mechanisms of infectious diseases. Finally, molecular biology is largely responsible for facilitating the biotechnology and biomedical revolution that has occurred over the past 30 years

leading to the production of protein based pharmaceuticals such as insulin, many modern vaccines, regenerative medical procedures, as well as engineering microbes to generate products such as alternative fuels.

We have lost two faculty members whose research programs focused in molecular biology in the past four years and have thus reassigned faculty members with core expertise in other areas to take on the instruction of our undergraduate and graduate molecular biology offerings. However, our current dearth of faculty whose research is focused on basic questions of molecular biology, how molecular events contribute to life, or on how molecular defects result in disease, has limited the scientific questions that our existing faculty with expertise in cell biology and other areas can pursue. It also limits the possibilities for our faculty to collaborate with scientists based in our local biotechnology companies in areas such as increasing the efficiency of protein expression in a recombinant model or new approaches to the assay of biomolecules.

The loss of cutting edge expertise in molecular biology will also impact our undergraduate program in the near future as well. We recently revised our BA in Biological Sciences curriculum to require all students to take at least an introduction to this area (BISC401), due to the central importance of this material to the Biological Sciences. This is projected to increase the enrollments in this class sharply over the next three to four years, which increases the need for additional course instructors in this area.

We propose to cover our current shortage of faculty focusing on molecular biology by a three faculty member “cluster hire” in this area. As molecular biology is a broad discipline that also has great relevance to literally all of the current research strengths of our department and many of the broader STEM initiatives at the University of Delaware, the ideal candidates will be a well-trained molecular biologist whose research area is complementary to the existing areas of research excellence within the department and university. These new faculty hires will be expected to 1) perform independent research in the field of molecular biology or make extensive use of molecular biology tools in their research, 2) collaborate both within and outside the department with other investigators to provide molecular biology expertise to their investigations, 3) teach undergraduate and graduate level molecular biology courses, and 4) serve on comprehensive examination and thesis/dissertation committees of graduate students who are pursuing the Concentration in Molecular Biology and Genetics.

In the end, rebuilding our research strengths in Molecular Biology is absolutely essential if we are to continue to participate as a full partner in diverse interdisciplinary initiatives ongoing at the University and it is critical that we rebuild our strengths in this area.

In conclusion:

The plan presented above to hire 15 new research-active faculty members over the next five years will rebuild the department's research productivity by replacing the faculty lost over the past five years (8 faculty members net have left the department) and by anticipating further decreases in personnel as other long-serving biology faculty members retire or leave for other positions (for instance, we have 9 faculty members with over 30 years of service and 5 who are over the age of 65). These hires will allow us to regain the ground lost by the department in regard to scholarship and impact, as well as providing research opportunities to our undergraduate and graduate populations. It will increase our sponsored research activity which will bring revenue into the university, allow us to offer upper level majors courses at enrollment levels that will allow our students to actually connect with their professors (as opposed to the current class sizes of 100 or more), provide courses that support the large diversity of life sciences focused degrees offered at UD, and will allow our department to participate as a full partner in the diverse life sciences initiatives ongoing at the university that seek to build the University's reputation as a strong research university that makes an impact on biotechnology and human health.

As we implement this plan, it should be recognized that the traditional disciplinary lines between core areas of the Biological Sciences have been disappearing and that it is expected that any new hires will have expertise across the disciplinary boundaries described in this strategic plan and thus will be able to contribute to the department in multiple areas. For instance, a cell biologist focused on cardiovascular disease is likely to also study cardiovascular physiology and participate in the Delaware Cardiovascular Research Center. A scientist who uses genetic tools to study animal physiology relevant to skeletal diseases would interact with the Delaware Rehabilitation Institute. A microbiologist who uses genetic tools to study how viral infections reprogram cells to become cancerous would likely collaborate with research scientists in the Center for Translational Cancer Research, the Department of Animal and Food Sciences, The Helen F. Graham Cancer Center and/or the Nemours Center for Childhood Cancer. A tissue engineer who combines cell biology, animal physiology and molecular biology to create functional cartilage replacements would have strong collaborative ties with the Department of Biomedical Engineering and the Delaware Rehabilitation Institute and would be likely to interface with the Delaware Center for Bioinformatics and Computational Biology as well. Thus, in the end, our focus will be on hiring the very best scientists possible within a broad disciplinary area whose research complements existing strengths within the Department and University. This will allow us to participate as a full partner in University and State-wide initiatives in the life sciences and will further build the scholarly reputation of the University of Delaware.