

# Department of Biological Sciences

## Strategic Plan 2017-2022



## SUMMARY

The overarching goal of the Department of Biological Sciences' Strategic Plan 2017-2022 is to achieve a learning and training environment for our students that is second to none and, in doing so, to provide the resources necessary for our faculty and staff to reach their full potential. The Department's Plan aligns with the University's strategic plan with the following aims:

- 1) Enhance the success of our students through educational innovation
- 2) Enhance scholarship and research by investing in faculty and infrastructure
- 3) Enhance organizational excellence by creating a culture of constant improvement
- 4) Enhance local and global engagement through focused strategic partnerships.

Highlights of the Plan include the establishment of a Biological Sciences Center for Educational Excellence. The Center would drive research and innovation for evidence-based teaching and learning, provide opportunities for professional development, and support student and faculty interactions. The Plan identifies the need to provide authentic research experiences for all interested undergrads. That need is addressed by strategies to provide at least one semester of an authentic research experience to all undergraduate students.

National recognition as a leading research institution requires faculty members who are highly innovative, address critical issues facing society, and have a track record of success. The Plan describes a strategy to raise the research conducted in the Department to a new level of prominence. The Department is well-positioned for collaboration with public science institutions such as the NC Museum of Natural Sciences and the NC Zoo along with industry partners. The Plan describes strategies to leverage these relationships to enhance research collaborations, student training, and communication of science to the general public.

The Department plan is largely cost-neutral with one exception: the need for a new building. Presently, the Department is spread among six buildings on two campuses. A new building would serve to coalesce faculty and students, heighten research and education collaboration among faculty, and provide space needed for growth and full realization the goals described within the Plan.

This ambitious plan is the product of the joint efforts of faculty and staff. With this defined roadmap, the Department is destined to become the gold standard for other institutions.

## Introduction

The Department of Biological Sciences was formed on July 1, 2013 as part of the College of Sciences. The Department was populated with faculty formerly in the Departments of Biology, Genetics, Microbiology, and Environmental and Molecular Toxicology. Currently the Department has 45 T/TT faculty, 25 teaching faculty, 11 research faculty, and 1 extension faculty member. The Department currently enrolls ~1700 undergraduate students (including Life Sciences First Year), and ~60 graduate students. The Department has annual research grant expenditures of ~\$9,000,000 with a grant portfolio totaling ~\$76,000,000. The Department is the largest academic department in the College of Sciences and among the largest at NC State.

Faculty participate in seven primary graduate programs: Biology (previously Zoology), Genetics, Microbiology, Toxicology, Bioinformatics, Functional Genomics, and Neuroscience and Comparative Biomedical Sciences, and administer undergraduate degrees in Biological Sciences, Genetics, Microbiology and Zoology.

The Department of Biological Sciences is the linchpin for the College of Sciences and is committed to delivering outstanding research and educational experiences that engage our faculty and students. Our innovative teaching and learning environments and cutting-edge research (that is both integrative and interdisciplinary) stimulate economic development, drive research advances with national and global impact, improve the human condition, and contribute to the scientific literacy of NC State students by inspiring them to become leaders and contributing members of a global society. We are dedicated to diversity, inclusivity, collegiality and respect.

Our strategic plan aligns with the aims of the University's *The Pathway to the Future* plan and is a roadmap for Biological Sciences for the next five years. In it, we describe our goals and actions to attain these goals.

## Mission

The Department of Biological Sciences is dedicated to excellence in research, outstanding teaching, and engagement with public and private partners. We train students to be scientifically literate in the life sciences, prepare the next generation of globally-engaged scientists and leaders, and tackle diverse research challenges that matter to the world.

## Vision

Biological Sciences will emerge as a top, internationally recognized technological research department of the 21<sup>st</sup> century where faculty, staff, and students engage in cutting-edge research and innovative/interactive teaching and learning that transcend traditional boundaries to address pressing scientific problems facing our world. We will be leaders in improving the human condition in North Carolina, the United States, and around the planet.

## AIMS

- I. Enhance the success of our students through educational innovation
- II. Enhance scholarship and research by investing in faculty and infrastructure
- III. Enhance organizational excellence by creating a culture of constant improvement
- IV. Enhance local and global engagement through focused strategic partnerships

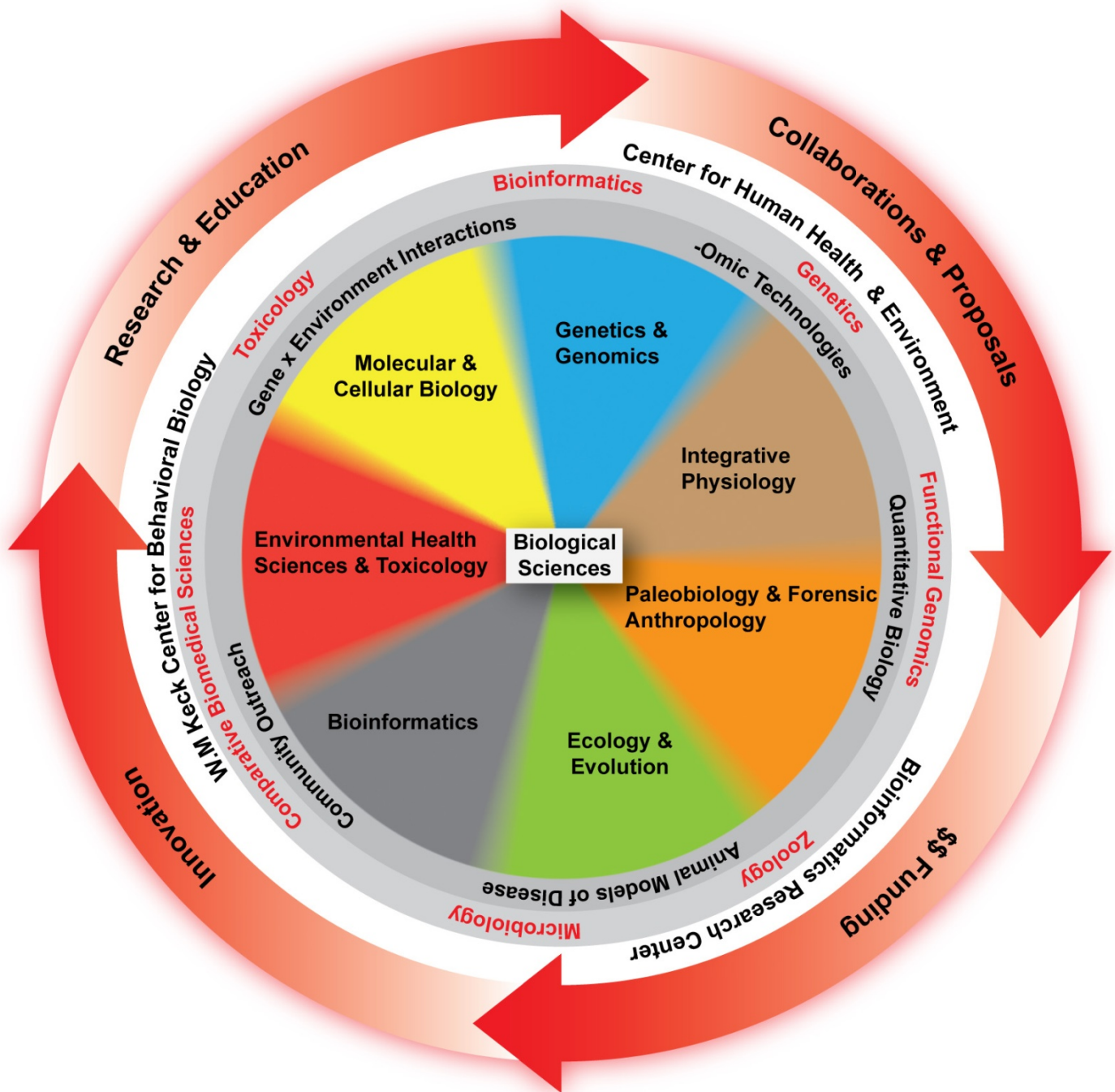


Figure 1. The structure of the Department of Biological Sciences is illustrated above. As a broad-based biological sciences department, we have research specialities in seven distinct areas. However, the boundaries between these areas are ill-defined with several topics such as Omic-Technologies and Quantitative Biology transcending or uniting different research areas. The Department is principally supported by seven Research Programs which are situated across three colleges. Faculty in Biological Sciences are actively involved in three main Centers across the University. This departmental architecture provides a strong platform for integrating education and research, collaborative opportunities under the convergence science theme, extramural funding, and innovation which collectively will facilitate a world-class Department of Biological Sciences.

**Space needs.** Presently, Biological Sciences faculty are dispersed among six buildings situated on two campuses. Fragmentation of the Department continues with the regular loss of critically located lab and office space to the Chancellor's Faculty Excellence hires (aka cluster hires). Future success of the Department will require the physical unification of the Department with sufficient space for expansion. Several goals listed in the strategic plan require space. While efforts will be made to meet the goals under the present space limitation, this limitation will likely hinder some efforts. The acquisition of space is beyond the capability of the Department, however, it is imperative that the College and University recognize this need and seek to remedy this impediment to success. Provided is a goal that upper administration should consider in their strategic planning:

**Construct a new building to centralize Biological Sciences faculty, staff, graduate students and teaching.** To capitalize on the collective expertise and collaborative potential for enhancing the research and educational mission of the Department, it will be essential to consolidate the currently splintered faculty that are scattered over multiple buildings and two separate campuses. Centralizing faculty, staff and students within a single, state-of-the-art building equipped with cutting-edge research resources and innovative teaching/learning facilities will provide cost savings (i.e., economies of scale), cultivate collaboration, and foster a more fluid, interdisciplinary and supportive research and training environment. A committee comprising Biological Sciences faculty representing the breadth of the department's research and teaching expertise will be formed to spearhead this effort and to work with College and University representatives to design a flagship building that meets the needs of a modern Biological Sciences department. Plans should be finalized within 5 years and construction should be completed within 10 years from the current time. In the interim period, every opportunity to consolidate faculty should be exploited. This could include relocating faculty to laboratory or office space that becomes available in or adjacent to Thomas Hall, David Clark Labs or the Toxicology Building through the reorganization of other departments.

### **Departmental Actions**

1. Establish a Departmental Space Committee. This committee will be charged with both making recommendations on the use of existing space and will generate a general plan for a future facility based upon Departmental needs.
2. Collaborate with the University Space Committee on departmental space allocations.
3. Collaborate with either University Architects or College of Design architecture students in the design of a new facility.

## **I. Enhance the success of our students through educational innovation**

### **I.1 Goal: Develop a Biological Sciences Center for Educational Excellence that drives research and innovation for evidence-based teaching and learning, provides opportunities for professional development, and supports student and faculty interactions.**

The establishment of this center provides a long-term departmental commitment to facilitate excellence in education while paving the way for the department and its faculty to gain national and international recognition in the scholarship of teaching and learning; professional development for students, faculty, and advisers; and design of innovative learning spaces. The center will be essential for coordinating all aspects of undergraduate research at the department level: interacting with the Office of Undergraduate Research (OUR), connecting students with

faculty mentors, creating/maintaining a biological sciences undergraduate research webpage, managing a Biological Sciences Undergraduate Research Symposium (BSURS), etc.

## **Strategies**

### **I.1.1. Identify a core group of current teaching faculty charged to work with the Department in creating the center and ensuring its success.**

#### **Actions**

1. Form a committee to create the center and assign individual participants.
2. Identify leadership roles within the Department associated with the ensured long-term success of the center.
3. Organize the Biological Sciences Undergraduate Research Symposium and provide critiques of the student research posters at the symposium.

**I.1.2 Create designated physical spaces that address the specific requirements of the Center for Educational Excellence.** The Center will incorporate “learning spaces” central to our faculty and classes for gathering, tutoring, advising, and other collaborations. This space should be located in a Biological Sciences Building that houses the entire Department so that students, teaching faculty, research faculty, advisors, and staff can interact easily with each other (see “Space needs”, page 5).

#### **Action**

1. Identify and assess the specific requirements for the development and utilization of the learning spaces.

### **I.1.3. Create, implement, integrate, and support new and existing programs for professional development of students, faculty, advisors, and staff, including access to continuing education opportunities, publications, training, and conferences.**

#### **Action**

1. Assess opportunities for professional development and publicize these in departmental publications.

**I.1.4. Implement a Department conference and career fair that will allow students to exercise their learned presentation, communication, and professional skills in a safe and comfortable environment.** Such an event will help build relationships with representatives from industry and professional and post-bac programs that can provide valuable feedback to our students, advisors and faculty and will provide additional opportunities for students to use non-technical skills that were learned in coursework. Collaboration with the University Career Center will be encouraged for these efforts.

#### **Action**

1. Develop a database of potential participants in the career fair.
2. Initiate and hold annual career fairs, possibly in temporal associate with another event that would draw partners to the campus (e.g. Department open house).

**I.1.5. Explore and develop ways to stay connected with our alumni, recognizing their value as members of our departmental community and mentors for current and newly graduated students.** Programs that foster interaction between alumni and current students on campus, faculty and advisors will be established.

## Actions

1. Create and maintain an alumni database with current information.
2. Establish an annual schedule of regular departmental events in which alumni are encouraged to participate and maintain a database of alumni who attend.
3. Maintain a database of alumni that actively participate in departmental activities.

## I.2 Goal: Focus on the development of the well-rounded scientists through an integrated curriculum and diverse learning opportunities.

The Department of Biological Sciences will launch an undergraduate education initiative that defines learning outcomes for each major and maps these outcomes across the curriculum. Core components will be offered in all majors, with an emphasis on scientific thinking and communication using a consistent approach with vertical integration in all majors. Where practical, courses will be offered in multiple types of formats to assist in reaching a diverse group of learners.

## Strategies

**I.2.1. Create a comprehensive list of skills and concepts that all students in Biological Sciences should master and understand by completion of the degree.** Evaluate the learning objectives of current courses with respect to these skills and concepts, and revise curricula to ensure these goals are met.

## Actions

1. Survey courses taught in Biological Sciences to determine the skills and concepts currently taught to students in each course.
2. Create a concept map to analyze how courses connect and overlap.
3. Revise existing courses accordingly by sharing concept maps of courses with all faculty to allow for integration of concepts and skills.
4. Evaluate proposed courses to determine their integration into the curriculum by using the overall departmental concept map framework.

**I.2.2. Improve communication and interpersonal skills of our students by including specific interdisciplinary courses that target these skills.** Courses in the Biological Sciences curricula will be revised to include deliverables such as oral and poster presentations, papers, debates, discussion panels, case studies, interviews, etc. to provide opportunities for students to refine their communication and interpersonal skills.

## Actions

1. Revise courses in Biological Sciences such that, where appropriate, a strategy for improving communication skills is incorporated into the curriculum.
2. Ensure that diversity in communication strategies is covered in the curriculum.

**I.2.3. Create or identify flexible learning spaces, such as additional teaching labs, collaboration areas, discussion rooms, and innovative classrooms that serve to increase diverse learning opportunities for students and faculty through both collaborative and independent work.** This space should be housed in a central building that contains the entire

Biological Sciences Department so that it is easily accessible to students and faculty (some of these areas would be housed within the Center for Educational Excellence, see Goal I.1)

#### **Actions**

1. Survey faculty to identify the types and sizes of spaces that are optimal for course and lab offerings based on learning outcomes.
2. Develop and implement strategies to accommodate these space needs where possible.
3. Incorporate these space needs into the plans for a new facility.

***I.2.4. Provide courses in multiple types of formats to reach a diverse group of learners by implementing current and innovative educational technology for active-learning, SCALE-UP, online education strategies, and the traditional lecture format.***

#### **Actions**

1. Survey faculty to determine the availability of course offerings in various formats (SCALE-UP, lecture, flipped, DE, etc.) to determine the need for revision and/or development of varied course formats.
2. Assess the need for faculty professional development to implement diverse teaching and learning formats by surveying faculty who would want to attend workshops and join learning communities (this would be done in conjunction with the Biological Sciences Center for Educational Excellence, see Goal I.1).
3. Establish relevant professional development opportunities as identified in I.1.4.
4. Implement new course formats as deemed appropriate from Action 1.

***I.2.5. Commit to increased student-centered teaching and learning strategies throughout the curriculum and in various course formats by providing professional development and communities of practice such as the Education and Outreach network (EON) for faculty to learn how to develop and implement these strategies.***

#### **Action**

1. Assess the level of student-centered teaching and learning in courses using validated tools such as COPUS.

### **I.3 Goal: Increase student involvement in undergraduate research.**

All students in the Department of Biological Sciences should have a minimum of one semester of research experience. Mentored research where students and faculty work together to discover new knowledge, apply it to their discipline, and present their work is instrumental in preparing our students to think analytically, question critically, and make new discoveries <sup>[1]</sup>. Research training opportunities available to our students include Pack Track (~70 students per year), Advanced Genetics Lab (~24 students per year), Advanced Microbiology Lab (~10 students per year), and Directed Research (~70 students per year). Thus, approximately 95 students receive research experience while ~500 would need to be trained per year to meet the needs of our undergraduate population. Undergraduate research simultaneously strengthens undergraduate education; provides additional outlets for faculty to teach, research, and serve; and fosters the creation of a community of scholars that is essential to the intellectual health of the university <sup>[1]</sup>. It is imperative that Biological Sciences increase opportunities for undergraduate research experiences.

#### **Strategies**



**I.3.1. Establish a one semester authentic undergraduate research experience for all undergraduate students.**

**Actions**

1. Develop a general outline of the common goals of all authentic undergraduate research experiences (e.g.: steps of the scientific method).
2. Establish a minimum required number of undergraduate students that must be trained per PI per semester. Students would receive credit for the research experience and PI's would receive teaching credit.
3. Expand the number of opportunities in Research Pack Track. This might be accomplished by PIs undertaking a Pack Track module in place of Action 2, or research/teaching faculty partnerships.
4. Identify and utilize partners (e.g., industry, public science institutions) that could provide research experiences for our students.

**I.3.2. Connect students with research opportunities that meet authentic undergraduate research experience requirements.** Academic advisors will help students identify appropriate research opportunities to meet their individual career goals; they will discuss opportunities for undergraduate research activities with each student at least once per term. This will include helping students identify the usefulness of research activities for their career goals and how it best fits into their curriculum.

**Actions**

1. Educate advisors on research activities of individual PIs, Pack Track modules, off-campus training opportunities, etc.
2. Develop a departmental speed-dating event, modeled after the event held by the Office of Undergraduate Research where students will have the opportunity to discuss research opportunities with potential mentors.

**I.3.3. Increase diversity of students having an authentic research experience.** We will work with the Initiative for Maximizing Student Diversity (IMSD) to increase student diversity and inclusiveness in research undergraduate experiences, develop special summer research opportunities geared towards serving high-achieving, underrepresented, first generation, or disabled undergraduate students, and structure this opportunity to best serve their career goals and field of interest.

**Actions**

1. Identify diverse students who are not involved in research-related and high impact experiences in their freshman year, and to encourage their involvement in the summer after freshman year, sophomore year and the summer after sophomore year. Document the increase in diverse student involvement as the program proceeds.
2. Maintain a database with the number of students involved in research-related and high impact experiences at each level (Freshman, Sophomore, Junior, Senior) that includes information on diverse student attributes.

**I.4 Goal: Expand existing programs and implement new approaches that result in accessible and inclusive learning for all.**

The Department of Biological Sciences will establish itself as an environment welcoming of diverse perspectives and backgrounds that ensures learning is accessible for all, and serves as a model for inclusion and excellence in STEM education.

## Strategies

**I.4.1. Create learning environments and implement pedagogy that are inclusive of all learners.** We will identify best practices for inclusive learning and barriers to entry and retention of students from underrepresented and marginalized groups, and develop and assess innovative teaching and advising strategies that are inclusive for all students. We will strive to ensure that all faculty and staff are trained in the best educational practices identified and developed through these studies and are provided adequate time to incorporate these practices into their courses.

### Actions

1. Assess the composition of the student body in the Department.
2. Collect data on time-to-graduation and retention for students from diverse backgrounds.
3. Increase retention of all students by identifying specific learning needs of students struggling early in their matriculation and develop an individualized action plan to help ensure student success.
4. Train advisors to both develop the action plan and require that they visit the plan annually with the student and modify as required for success.

**I.4.2. Attract, retain, and support a diverse faculty.** Open faculty positions should be advertised broadly, and diverse individuals should be encouraged to apply. Participation in programs such as the Building Future Faculty Program that allow graduate students and postdocs from diverse backgrounds to interact with the Department of Biological Sciences prior to seeking a faculty position should be encouraged. All new faculty should be provided with a strong mentor and a mentoring team. Faculty will be encouraged to participate in University programs such as the Sciences and Engineering Mentor-Rings Program to gain additional mentoring. Faculty should be encouraged to participate in workshops provided by the Office of Faculty Development that target their specific professional goals.

### Actions

1. Provide training to all faculty members that serve as mentors to new faculty.
2. Review mentoring assignments to all assistant professors to ensure that mentoring relationships have been established.
3. Maximize departmental participation in the Building Future Faculty program.

**I.4.3. Create, maintain, and support an inclusive community for excellence in advising experience for all students.** Advisors will develop relationships with community colleges and other campus partners to improve successful transitions for transfer students and other target populations. Advising initiatives to support our transfer student population (including the peer mentor program, proactive initial advising, and BSC 303) will be continued and expanded.

### Actions

1. Collect data on the retention and time-to-graduation of transfer students and other targeted populations.
2. If warranted, develop strategies to improve upon retention and graduation rates.

**I.5 Goal: Deliver high-quality academic advising to every student by focusing on academic advising as a teaching/learning partnership between an advisor and a student.**

In this partnership, the advisor will be responsible for being accessible and responsive, as well as knowledgeable about University academic policies and procedures, curricula within the department, campus resources, and opportunities for students to enhance their education beyond the traditional classroom. This partnership will support students so they can take ownership of their undergraduate experience; developing and achieving goals and thriving in their field of study. High-quality advising can be proactive, or it can be developmental in nature, depending on the student's background, year of matriculation, and personal situation.

## **Strategies**

**I.5.1. All academic advisors (faculty and primary-role) will receive training in and use developmental and proactive advising strategies, and approaching advising as teaching.**

### **Actions**

1. Identify existing or develop new training modules suited for departmental advisors.
2. Develop and implement a plan for all advisors to enroll in the training.

**I.5.2. Maintain a strong vibrant team of primary role advisors which includes a Coordinator of Advising.** The roles of the advisors will be to: (1) advise large caseloads of students; (2) provide department-wide walk-in advising to increase accessibility for all students; (3) serve as a resource for faculty advisors; (4) oversee advising-related communication to students and faculty/staff, (5) develop programming to help create community, (6) serve on working groups and committees to support the achievement of other goals under "educational innovation;" and (7) participate in at least one form of professional development each academic year.

### **Actions**

1. Perform annual performance evaluations by the supervisor of the advising team.
2. Generate and utilize student survey data, focus group recommendations, etc. as part of the Advising Assessment Plan (see I.5.4).
3. Survey Department members annually on performance of the advising team.
4. Implement strategies to address any deficiencies identified in Actions 1-3.

**I.5.3. Partner with Academic Advising Services to find innovative ways to ensure that all assigned Academic Advisors can obtain an Advising Development Institute certification.** Current challenges for meeting these goals include advisor interest, the time commitment, the timing of delivery of training, and the mode of delivery of training.

### **Action**

1. Incentivise all advisors to attain certification.

**I.5.4. Create an Advising Assessment Plan.** The Advising Assessment Plan will evaluate how well and effectively advisors are meeting their responsibilities (advisor evaluation) and will assess what students are learning from advising.

### **Actions**

1. Develop and adopt an advising mission statement and set of goals for the department that includes both process and delivery goals but also student learning goals, objectives and outcomes.
2. Develop metrics to assess each learning outcome.
3. Implement an assessment plan.

## II. Enhance scholarship and research by investing in faculty and infrastructure

### II.1 Goal: Build a critical mass of nationally recognized faculty and research programs in focus areas.

As a broad-based Biological Sciences Department, we have research specialities in seven distinct areas (see Figure 1). However, the boundaries between these areas are ill-defined with several topics such as Omic-Technologies and Quantitative Biology transcending or uniting different research areas. Faculty in Biological Sciences are actively involved in three main Centers across the University. This departmental architecture provides a strong platform for integrating education and research, collaborative opportunities under the convergence science theme, extramural funding, and innovation which collectively will facilitate a world-class Department of Biological Sciences.

#### Strategies

**II.1.1. Expand the number of research-active faculty.** In order to increase our visibility and impact as a nationally recognized, highly competitive program, we need to hire at least 35 research-active, tenure-track faculty. At least 10 new faculty should be hired over the next 5 years. This is essential to maintain research excellence and to accommodate the anticipated increased undergraduate and graduate student enrollment. Faculty representatives of different research areas must be involved in hiring prioritization.

This level of hiring will directly affect:

1. Scholastic Impact - The national recognition of a scientific department is a direct reflection of its funding base, publication record, award history, teaching excellence, and placement of its graduates. Increasing the number of faculty in key areas will increase the Department's depth of expertise, collaborative potential, and ultimately, opportunities for leveraging its intellectual and scientific resources to conduct successful research programs. This will lead to increased publications, extramural funding, and research opportunities for graduate and undergraduate students.
2. Graduate Program Quality - Our research-active faculty presently consists of 35 individuals that support 62 PhD students within seven graduate programs. In order to increase the number of high-quality graduate students, an expressed goal of the University, investment must be made into expanding the research-active tenure-track faculty to: a) enable graduate programs to compete for extramural programmatic support for students such as training grants, b) ensure sufficient numbers of funded, high-quality faculty to provide training opportunities, and c) create a vibrant research environment for graduate students. NC State recognizes itself as the premier STEM institution in North Carolina; maintenance of this title requires significant investment by the University and its research-active faculty.
3. Undergraduate Program Quality - The number of undergraduate students coupled with the need to provide authentic research experiences exceeds the capacity of the current research-active faculty resulting in a student to faculty ratio of 48:1. As a comparison, peer-institutions with similar broad-based biological science departments have undergraduate:faculty ratios of 20:1 (Purdue with 60 research faculty and ~1,200 undergraduates) and 22:1 (Clemson with 45 research faculty and ~1,000 undergraduates). This situation has negatively impacted undergraduate education in the Department of

Biological Sciences. For example, class sizes of advanced undergraduate courses are too large, with many of these classes having over 200 students per section, making it virtually impossible to integrate writing and problem-solving outcomes typically associated with advanced undergraduate courses. Equally important, the opportunities for authentic research experiences are not currently sufficient to meet the needs of our students. To provide the educational experience expected at a Research I institution, there should be no more than a 25:1 student to research-active faculty ratio. This specific need does not exclude the importance of providing robust teaching essential for delivering outstanding academic programs for a growing number of students.

#### **Actions**

1. Develop a faculty hiring plan during the first year by a committee comprising faculty from different research areas.
2. Hire ten research-active, tenure-track faculty hired within the next five years.
3. Enhance the diversity of departmental faculty.

### **II.2 Goal: Provide modern infrastructure to support and inspire cutting-edge research and teaching/learning efforts.**

#### **Strategies**

#### **II.2.1. Invest in the evolving technological needs of departmental research and teaching.**

To ensure infrastructure and facilities meet the evolving research and teaching requirements of an internationally recognized Biological Sciences department, it is essential that a committee is formed to oversee the management, maintenance and replacement of shared instrumentation. This committee should be formed of research and teaching faculty representing the breadth of expertise in the Department. The committee should identify priorities for investment. This includes developing a list of existing instrumentation that needs repair or replacement, and a list of new instrument needs. The University and College should provide the necessary funding to ensure expenditures in the most appropriate manner to benefit and enhance the cutting-edge research and teaching in the Department. The committee should coordinate with the University to ensure that new instruments are located in accessible spaces, both in the existing buildings that house the Department and in the proposed new Biological Sciences building (Space Needs, page 5). In addition, the Department should petition the College/University to establish a small grants program for the purchase of medium-priced instrumentation, which may be too large to justify on a research grant and too small for a dedicated instrumentation grant.

#### **Actions**

1. Establish an instrumentation needs committee.
2. Charge the committee to annually inventory shared equipment, generate a list of equipment needs (repairs, new purchases, etc.), and prioritize the needs.
3. Petition the College and University to establish a small instrumentation grants program.

### **III. Enhance organizational excellence by creating a culture of constant improvement**

#### **III.1. Goal: Establish a transparent, efficient, and stable operational structure and function for Biological Sciences.**

Biological Sciences should have an organizational and administrative structure consistent with the breadth of research and educational activities in which faculty participate. Administrative activities should be performed transparently and administrative responsibilities should be clearly communicated.

## **Strategies**

### **III.1.1. Create and disseminate regularly updated standard operating procedures (SOPs) for the Department.**

Standard operating procedures should be written to facilitate the administrative functions performed by faculty, staff, and students. SOPs should give sufficient detail in order to guide someone through a given process without staff support. In this way, the envisioned SOPs are distinctly different than a set of rules or policies. Some SOPs may have multiple versions, e.g. one each for supervisors and employees. If SOPs already exist at the college or university level, those should be annotated if necessary and shared along with department-specific SOPs. In the case that additional support is needed, each SOP should clearly list the appropriate departmental staff contact. These SOPs will have an added benefit in that the content will be appropriate for a “New Employee Handbook.” An essential element of establishing SOPs is to ensure that up to date versions are readily available from a central repository such as the departmental intranet. Examples of SOPs that should be established include:

- Hiring new employees
- Timekeeping and vacation requests
- Performance review
- Accounts administration
- Purchasing and P-Cards
- Summer salary requests
- Travel policies and reimbursements
- Request student support (TA or RA)
- Submitting a grant proposal
- Faculty Activity reporting
- Peer-teaching evaluations

## **Actions**

1. Assign the preparation of SOPs to appropriate individuals.
2. Publish SOPs on the Department intranet and reviewed annually for potential updating.
3. Assign a contact person who is responsible for each SOP for rapid resolution of difficulties with the procedure.

### **III.1.2. Enhance faculty governance by establishing transparent standing committees.**

Committee work can give diverse faculty a means to serve the Department by working collaboratively on matters of common interest. Committees can also facilitate communication throughout the Department, and build consensus for departmental actions. All committees should be formed with a mind toward diversity, including faculty of various rank and research and teaching focus. This will be especially important in the near-term, as Biological Sciences is currently spread out among six buildings on two campuses.

An executive committee with diverse representation should be formed to support the Department Head on any and all matters, with an emphasis on connecting the varied constituencies within the Department. Membership should be set at eight members for 2-year terms, and rotate after initial appointment.

In addition, there is a need for coordination between the  $\geq 6$  graduate programs to which our departmental faculty members belong. Graduate students are an important part of our departmental mission. Though graduate programs exist across departments and colleges, resources for graduate programs (student support, administrative support) reside within the Department. In practice, the relationship between graduate programs, faculty, and departmental resources have been a major topic of discussion and concern of the faculty since the Department was formed. As such, we shall establish a graduate program coordinating committee to address concerns and make recommendations to the Department, college, graduate school, and university. Ideally, each graduate program represented in the Department has representation on this committee.

Other standing committees will address areas of specific departmental concern that require faculty input or expertise.

Examples of standing committees that should be established include:

- Executive committee
- Graduate program coordinating committee
- Space
- RPT / Faculty development /Awards (e.g., develop clear expectations and guidelines for promotion, tenure, sabbatical for research faculty as well as individuals involved in the scholarship of teaching)
- Research /infrastructure/shared equipment
- Committee for the establishment of teaching equity

#### **Actions**

1. Identify, establish, and charge departmental committees.

**III.1.3. *Develop and implement a model of teaching equity.*** Teaching loads for all faculty should be equitable and consistent with the faculty members' SME. There should be recognition that teaching occurs and student credit hours are generated in different forms including classroom delivery, on-line delivery, course labs, research experiences for undergraduates, and graduate student mentoring. Formal advising loads should be established that include research-intensive faculty once majors matriculate into a degree program. Finally, a formal mechanism to "buy-out" teaching responsibilities is needed for faculty who wish to reduce their teaching responsibilities.

#### **Actions**

1. Establish a faculty committee charged with developing a strategy for teaching equity.
2. Implement teaching requirements and modify SMEs where necessary.
3. Establish clear mechanisms for assigning students to faculty advisors (e.g., should students be assigned to faculty advisors? how are students assigned to faculty advisors? how many students should be assigned to faculty advisors? when should students be assigned to faculty advisors?).
4. Develop a formal mechanism for faculty to "buy-out" of teaching.

## **IV. Enhance local and global engagement through focused strategic partnerships**

As a land-grant institution, NC State has a long history of excellence in extension and outreach. Core to the land-grant mission is the connection between researchers at the University and

stakeholders in the community -- historically, those stakeholders were affiliated with agriculture and forestry. Today, our stakeholder audience has broadened to society at large, and the grand challenges we face require scientific input and an understanding of how the process of science works. Now, more than ever, we need our scientists -- and especially the next generation of scientists we train -- to be prepared to engage public audiences directly. Moreover, the highly competitive science funding landscape requires researchers to demonstrate the broader impacts of their research in creative, impactful ways. Strategic partnerships with public science institutions provide both a means and an opportunity for our researchers to learn best practices in science communication and public engagement and to directly engage diverse, public audiences in innovative ways.

#### **IV.1 Goal: Strengthen and build upon the Department's partnerships with North Carolina public science institutions, including the NC Museum of Natural Sciences and the NC Zoo, through strategic investments in people, courses, and programs.**

The Department of Biological Sciences is well-positioned for success in achieving this goal, given that four research scientists are jointly appointed between the Department and the NC Museum of Natural Sciences. Further, a Department faculty member coordinates public engagement activities and training in collaboration with the Museum and other public science partners. Faculty and students frequently participate in Museum-hosted outreach events; and, the Department has a track record of successful student internship experiences with public science institutions. The partnership with the NC Zoo includes a formalized research internship program for undergraduates, currently serving students year-round, that allows students to work with zoo staff to research and problem solve animal welfare issues.

#### **Strategies**

**IV.1.1. Strengthen the Department partnership with the NC Museum of Natural Sciences and other public science institutions.** Several faculty members have successfully incorporated activities, conducted at or in partnership with the Museum and the NC Zoo, into their structured coursework. Effort should be made to increase faculty awareness of opportunities at public science institutions. Further, faculty and students should be encouraged to engage with partners at public science institutions.

#### **Actions**

1. Hold an annual meet-and-greet at the NC Natural Sciences Museum, perhaps in conjunction with a departmental Science Café presentation, where on-campus departmental faculty can meet museum faculty and staff, tour labs, and discuss possible activities with museum departmental faculty.
2. Explore the possibility of holding similar events at other public science institutions.

**IV.1.2. Better coordinate and formalize undergraduate learning opportunities at public science institutions, including internships, research, science communication, and public engagement activities.**

#### **Actions**

1. Establish a course in public science that includes participation in museum activities (e.g., Brain Night, Darwin Day, Science Cafe).
2. Establish teaching collaborations between departmental on-campus faculty and departmental museum faculty to generate courses that blend various disciplines with public outreach.



3. Integrate faculty-run museum labs into authentic research experiences for undergraduates.

**IV.1.3. Improve faculty access to broader impact/public engagement opportunities available through the NC Museum of Natural Sciences and other public science institutions.** The Department will streamline the process for working with Museum partners and offer faculty a “menu” of opportunities that can be tailored to researcher and instructor interests, resources, and goals.

#### **Actions**

1. Hold regular-interval workshops/lunch-and-learns on public science *broader impacts* that can be used in grant proposals.
2. Generate a menu of broader impact strategies that would be maintained on the Department intranet.

#### **Finale**

Develop a strategy and timeline to attain the goals described in this Plan.

#### **Citations**

1. Reasoner, K. 2016. The Benefits of Undergraduate Research. [Internet]. University of Oregon. [Cited 2017 May 10] Available from

<https://uop.uoregon.edu/for-faculty/considering-undergraduate-research-and-creative-scholarship/benefits-of-ugr/>