

## Overview

The College of Sciences, NC State's home for the biological, mathematical and physical sciences, is a center of creativity fueled by the power of scientific imagination. The three-year-old college is one of the largest and most research-intensive units at NC State, with more than 3,600 students, 600 active research projects and \$50 million in annual research expenditures. This annual report reflects the priorities laid out in NC State's strategic plan, the college's 2013-16 launch plan, and the college's new leadership.

## Responsiveness to University-Wide Strategic Goals

### 1. Enhance the success of our students through educational innovation

College leadership, faculty and staff are seeing strong results from new and innovative educational programs. Among the most successful is the Life Sciences First Year Program in which students take a common set of first-year courses that prepare them for life sciences programs across our college and the College of Agriculture and Life Sciences. The first-year retention rate for the program's first cohort of students was 96 percent, and 87 percent of students have already matriculated into degree programs.

Another innovation is the transformation of the COS 100 introductory course, which previously focused on the transition from high school to this college, into one that focuses on the distinct modes of inquiry within the sciences and lays the foundation for the enhancement of our students' critical and creative thinking skills. The transition element has been maintained, but this new focus gives our students the strategies they need to succeed academically. The transformed COS 100 begins in fall 2016.

The college also continues to enhance its efforts in undergraduate research, an effective experiential learning strategy. Initiatives in 2015-16 included a partnership with the Office of the Provost that supported 15 undergraduate researchers, the development of plans for a summer

research program involving industry, and a new web-based system in the Department of Biological Sciences that pairs students with research opportunities.

## **2. Enhance scholarship and research by investing in faculty and infrastructure**

Growing our faculty continues to be among our top priorities. To that end, 14 new tenured or tenure-track Sciences faculty joined the college in 2015-16, and another 10 accepted offers and will start next year. We are in negotiations with several other prospective faculty.

In infrastructure, the college and university worked together on the design and construction of two new SCALE-UP active learning classrooms in Cox Hall to replace those classrooms in Harrelson Hall, which was demolished in summer 2016. Other infrastructure improvements included renovations to David Clark Labs that created new space for faculty shared with the NC Museum of Natural Sciences. There were also classroom, laboratory and office renovations to Bostian and Dabney Halls. In Partners III, a service center housing 11 pieces of scientific instrumentation was launched.

## **3. Enhance interdisciplinary scholarship to address the grand challenges of society**

The college continues to be a leading player in the Chancellor's Faculty Excellence Program (CFEP) cluster hiring program. Sciences is home to more of these cluster hires, 14, than any other college at NC State. The college also has many faculty participating on cluster search committees, including Carbon Electronics and Public Science clusters that were part of the most recent batch of clusters announced in 2015.

A new B.A. in Biological Sciences — a multidisciplinary companion program to the Life Sciences First Year Program — was approved by the UNC General Administration this year. This umbrella degree for undergraduates in the life sciences will provide an enhanced opportunity for students to take an interdisciplinary approach to their undergraduate studies.

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

The college worked with the Graduate School to develop a series of mentoring workshops for new junior faculty across campus that will launch in fall 2016. The workshops focus on mentoring doctoral students.

The new assistant deans for business operations and culture, talent and human resources have set up regular training sessions for SHRA employees with human resources, business and finance responsibilities to support professional development.

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

In an effort to boost study abroad participation, we worked with the Study Abroad Office and our undergraduate program directors to develop department-specific study abroad fliers for the majors within the college.

Expanding and enhancing partnerships continues to be a top priority. In spring 2016, the college launched [sciences.ncsu.edu/partnerships](http://sciences.ncsu.edu/partnerships), which features industry-focused profiles of more than 50 faculty members interested in forming research collaborations with businesses.

The college's deep-rooted partnership with the NC Museum of Natural Sciences continues to benefit both organizations. This year, more than 600 of our alumni, faculty, staff, students and friends attended the annual State of the Sciences event, which was held at the museum for the first time. And thanks to a \$7 million National Science Foundation Math and Science Partnership grant, the college and the museum, along with the Science House, the Kenan Fellows Program, the Friday Institute and three core partner school districts, continue to improve the integration of scientific research and educational programming.

## **Progress in 2015-16**

### **1. Changes in Service Environment**

The college underwent a significant leadership change in 2015-16 when Dean William Ditto joined NC State in September. Ditto is an internationally recognized physicist with a rich background in research, innovation and academic administration. Among his goals is to build a culture that makes studying and working in the college the experience of a lifetime.

### **2. Initiatives**

This past fall, the college and the University Career Development Center co-hosted the Sciences, Sustainability and Environmental Career Fair in collaboration with partners in the College of Natural Resources. Our plan is to expand the collaboration next year to include the

Colleges of Veterinary Medicine and Agriculture and Life Sciences. The college also began the second year of its Faculty in Action Seminar Series, which featured five faculty who spoke to students about their lives and careers.

### **3. Diversity**

According to the most recent data available from *Diverse: Issues in Higher Education*, the college ranks second nationally in the awarding of master's degrees in mathematics and statistics to African American students and eighth in the awarding of doctoral degrees in the physical sciences to Hispanic students. Throughout the college, 55 percent of undergraduates and 42 percent of graduate students are female. College staff also lead the Women in Science and Engineering (WISE) program, which gives first- and second-year female STEM students the opportunity to live and work with other women in STEM majors. The program had nearly 300 participants this year.

In February, the college hosted its second Women in STEM Dinner, which brought together some of our top female students with leading women in the sciences. The keynote speaker was Christina Koch, a newly minted astronaut and college alumna.

### **4. Instructional Program Advances**

The college's Honors Committee began creating a set of basic requirements that honors programs in the college must meet or exceed. The committee has also been working with Registration and Records to create an honors "audit" function in SIS similar to the minor audit.

The Department of Mathematics will be launching a new online graduate certificate program in January 2017. The program is aimed at high school teachers or working professionals who are unable to attend classes in person. In the Department of Marine, Earth and Atmospheric Sciences, a new graduate certificate in climate adaptation has been developed to help boost enrollment in the Climate Change and Society master's program. The certificate will be offered for online students, as well as on-campus students.

### **5. Research**

Between July 1, 2015, and June 30, 2016, Sciences faculty received 363 awards totaling

\$40.3 million. Some highlights of our research activities:

Biological Sciences: Two new studies by Biological Sciences researchers Cynthia Grondin, Allan Peter Davis, Carolyn Mattingly and others highlighted the unique capabilities of NC State's one-of-a-kind Comparative Toxicogenomics Database (CTD) by giving scientists new strategies for connecting environmental exposures to human health. The CTD is a public database that manually curates and codes data from scientific literature describing how environmental chemicals interact with genes to affect human health.

Chemistry: Research led by Phil Castellano and published in the prestigious journal *Science* demonstrated the transfer of triplet exciton energy from semiconductor nanocrystals to surface-bound molecular acceptors, extending the lifetime of the originally prepared excited state by six orders of magnitude. The finding has implications for fields ranging from solar energy conversion to light therapy for cancer treatment.

MEAS: The department has been performing groundbreaking research on marine soundscapes. This is a new field of science, begun in MEAS, that arose from a collaboration between geophysicist Del Bohnenstiehl and marine ecologist Dave Eggleston. A former graduate student made the discovery that spurred the development of the new field.

Mathematics: The department hosted 12 undergraduates from around the country in its Research Experience for Undergraduates summer program in Modeling and Industrial Applied Mathematics. These top-notch mathematics majors worked in three research groups mentored by research scientists from government and industry.

Physics: NC State physicist Keith Weninger and others helped discover how two important proofreader proteins know where to look for errors during DNA replication and how they work together to signal the body's repair mechanism. Mutations in these proteins are associated with certain types of cancers.

Statistics: The Graduate Industrial Traineeship (GIT) Program continues to be a key component of the department's connection to its industrial partners and provide real-world

research opportunities for students. Current GIT partners include Bioventus, GSK, IPAC-RS, Quintiles, Red Hat, SAS and United Therapeutics.

## **6. Extension**

The Office of Public Science facilitated the participation of faculty, students, and staff in a number of on- and off-campus outreach events (including several affiliated with the NC Science Festival) that engaged over 7,000 people in hands-on science activities and dialogue.

The Science House K-12 outreach program supported hundreds of STEM-related activities across North Carolina that reached more than 1,300 administrators, 7,000 teachers and 95,000 students during 2015-16. The Science House also runs the giant N.C. Science Olympiad, which saw nearly 1,000 teams with more than 16,000 students participate.

Direct requests for services from the State Climate Office (SCO) grew by 8 percent over the previous year, and web traffic grew by 12 percent. SCO also hosted 32,000 direct educational contact hours, hosted 18 visitor groups and provided 50 invited presentations.

## **7. Faculty**

Some of the most prestigious awards received by college faculty are listed below. One honor deserving of special mention was awarded to Trudy Mackay, William Neal Reynolds and University Distinguished Professor in the Department of Biological Sciences. She received the Wolf Prize in Agriculture, one of the world's most prestigious awards for academic achievement and often a harbinger for Nobel Prizes.

Biological Sciences: Robert Anholt, Alexander Quarles Holladay Medal for Excellence; David Buchwalter, Fulbright Scholars fellowship; Trudy Mackay, Wolf Prize in Agriculture

Chemistry: Phil Castellano, Fellow, Royal Society of Chemistry; Elena Jakubikova, NSF CAREER Award; Stefan Franzen, Fulbright Scholars fellowship

MEAS: Dave Genereux, Chair of Board of Directors, Consortium of Universities for the Advancement of Hydrologic Science; David McConnell, Fellow, Geological Society of America

Mathematics: Lorena Bociu, NSF CAREER Award; Loek Helminck, Distinguished Public Service Award, American Mathematical Society (AMS); Patricia Hersh, Fellow, AMS

Physics: Bob Beichner, Excellence in Physics Education Award, American Physical Society (APS); Hans Hallen, Fellow, APS; Chris Gould and Albert Young, Breakthrough Prize in Fundamental Physics

Statistics: Eric Laber, NSF CAREER Award; Rui Song, NSF CAREER Award; Alyson Wilson, Fellow, American Association for the Advancement of Science

## **8. Students**

The college's total student population in fall 2015 was 3,647, with 2,714 undergraduates and 933 graduate students. The first-year class had a weighted high school grade point average of 4.5 and an average SAT score of 1254. Fifty-one percent of the freshmen were in the top 10 percent of their high school classes. The class hailed from 68 of North Carolina's 100 counties, as well as 24 other states and 12 countries.

We are also proud to report that recently graduated physics and mathematics student Mia de Los Reyes was named NC State's first Churchill Scholar. She will use the scholarship – which covers all university and college fees, plus other expenses – to pursue a one-year master's degree in astronomy from the University of Cambridge beginning in fall 2016.

And Vishwas Rao, a junior majoring in chemistry and biochemistry, was among the 252 nationwide winners of the prestigious Goldwater Scholarship this year. Named for the late Sen. Barry Goldwater, the scholarship is a highly competitive award established to enhance academic opportunities for the nation's top students in science, mathematics and engineering.

## **9. Fundraising**

The college enjoyed another excellent fundraising year. Gifts and new commitments exceeded \$13.6 million, up 95 percent from last year's record total. Highlights included a substantial gift that created two endowed chairs and three endowed professorships.

First-time membership in our leadership annual giving society continues to grow rapidly; we more than doubled our goal for the year. With the university-wide campaign's public launch approaching, the College has raised \$32 million, more than half of its \$60 million goal.

## **10. Administration**

In addition to the arrival of the new dean, the college experienced several other leadership changes. John Blondin, the former head of the Department of Physics, was named associate dean for research. He replaced Ray Fornes, who was holding the position in an interim capacity.

At the department level, Alina Chertock was named head of the Department of Mathematics, Jerry LeBlanc was named head of the Department of Biological Sciences, and Ed Bowden was named interim chair of the Department of Chemistry. At the start of 2016-17, Paul Huffman was named interim head of the Department of Physics.

Montse Fuentes stepped down as head of the Department of Statistics to become dean of the College of Sciences and Humanities at Virginia Commonwealth University; she was replaced on an interim basis by Len Stefanski. Walt Robinson is stepping down as head of the Department of Marine, Earth and Atmospheric Sciences. An interim head will be named soon.

#### **11. Recommendations and Concerns for the Future**

A primary concern is the relative size of faculty startup packages, which seems to grow annually. The usual methods of funding startups are not sustainable under current budget models and the return on these investments is questionable. In addition, a more accurate method of accounting for research expenditures is needed. Short of making this change, the college has no way of ascertaining the extent of its institutional investment in research, making it impossible to determine the return on that investment.

The college is also critically short on space, including research facilities. Progress on fundraising and construction of the proposed Imagination Corridor, including the Crossroads building and renovations to other buildings, would help alleviate these concerns.

Another area of concern is graduate student stipends. The availability of first-year stipends alone is not sufficient for recruiting and retaining outstanding doctoral students, and stipend levels in many areas of the college are not competitive. Over the next several years, we intend to raise stipend levels through a variety of methods.