

Overview

The College of Sciences, NC State's home for the biological, mathematical and physical sciences, harnesses the power of creativity and imagination to transform lives. The four-year-old college is one of the largest and most research-intensive units at NC State, with more than 3,500 students, 650 active research projects and nearly \$50 million in annual research expenditures. This annual report reflects the priorities laid out in NC State's strategic plan and supported by the college's leadership.

Responsiveness to University-Wide Strategic Goals

1. Enhance the success of our students through educational innovation

The college continues to see strong results from its innovative educational programs. One of our most successful initiatives, SCALE-UP, was reenergized this year when we opened two new classrooms in Cox Hall to replace those in the recently demolished Harrelson Hall. SCALE-UP is a flipped classroom model in which students solve problems collaboratively, with faculty available to guide them through more complex work. SCALE-UP classrooms incorporate technology and thoughtfully designed space to support this mode of learning.

Beyond NC State's campus, we started and invested in a new STEM study abroad program in Poland that consists of 23 NC State classes, with the full complement of mathematics, physics and chemistry courses taken in fall of sophomore year. The costs of this affordable program — including tuition, travel and food — are the same as a semester at NC State. Forty-six students will participate in the program this fall.

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

Growing our faculty continues to be among our top priorities. To that end, 10 new tenured or tenure-track Sciences faculty were hired in 2016-17, and another five accepted offers and will start in 2017-18.

In infrastructure, the development of an Imagination Corridor on main campus continued. We partnered with the College of Design on two semester-long studios in which architecture students developed designs for a Crossroads Building on the former site of Harrelson Hall and Imagination Labs that will pop up in public areas of campus.

Groundwork for the corridor project further advanced with the renovation of the dean's suite in Broughton Hall, where design and art elements, including the creation of a mural by local artist Sean Kernick, serve as a functional and stylistic demonstration of key aspects of the corridor. Design work also began on the renovation of the Bureau of Mines building, which will serve as the permanent home for the college's administrative units. The building will contain technological and public-science-oriented features that foreshadow those in the larger corridor.

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 16 of these cluster hires, more than any other college at NC State.

The college has made interdisciplinary collaboration a key part of its strategy. In the Department of Statistics, faculty and students worked with NC State Athletics on several projects in the growing field of sports analytics. And our Departments of Statistics and Mathematics have partnered with the Department of Computer Science on a new M.S. in Data Science.

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

In fall 2016, the college contracted with the university's Organization Design Solutions unit on an assessment of our operational activities and infrastructure in terms of workflows, procedures, processes and systems. The areas of emphasis in the report, which is now under review, were information technology, research administration, finance and human resources.

The college has already made several operational improvements. In the research office, pre-award and post-award functions were merged into one unit managed by a new director of

research administration. In the Department of Chemistry, the change from a term-based department chair to department head model will help with stability.

The college also focused on building a supportive community to help students succeed. In 2016-17, this effort included Community Conversations, periodic gatherings in which students shared their college and life experiences with leadership and staff.

5. Enhance local and global engagement through focused strategic partnerships

Expanding and enhancing partnerships continues to be a top priority. NCSU Libraries has been a particularly valuable outreach partner, and in April we welcomed around 800 people to Hunt Library for our annual State of the Sciences event. The family-friendly evening featured talks from prominent alumni, hands-on science demos and rooftop stargazing.

Our Office of Public Science also collaborated with the Libraries on the Wolfpack Citizen Science Challenge to help the community learn more about the wildlife that shares our campus.

Progress in 2016-17

1. Changes in Service Environment

Like many units at NC State, the College of Sciences experienced a challenging fiscal year with significant budget constraints. Several strategies, including the postponement of operating expenditures, have resulted in the necessary expenditure reductions.

But the future looks bright. Areas of emphasis include the expansion of advising to create a more immersive student experience, career development initiatives for faculty and staff, and the establishment of sustainable budget and organizational models.

2. Initiatives

During the past year we laid the groundwork for the Crossroads Speakers Series, which will merge science with other disciplines in ways that we believe will help the series become one of NC State's premier events. These efforts included talks by United Therapeutics CEO Martine Rothblatt and renowned theoretical physicist and author Lawrence Krauss.

We also are intent on showing off the talents of some of the world's most creative problem solvers, our faculty. To that end, we created about a dozen Extraordinary Faculty videos that have been popular on our website and social media. One of the videos, featuring marine scientist Dave Eggleston, won a national marketing award.

3. Diversity

According to the most recent data available from *Diverse: Issues in Higher Education*, the college ranks first and fifth in the nation, respectively, in the awarding of doctoral and master's degrees in mathematics and statistics to African American students. Throughout the college, 56 percent of undergraduates and 40 percent of graduate students are women.

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 about 300 participants this year and plans to add nearly 50 more students in 2017-18.

In February, the college hosted its annual Celebrating Diversity in STEM Dinner, which brought together diverse students with science leaders from among NC State's faculty, alumni and friends. The keynote speaker was Tashni-Ann Dubroy, a chemistry alumna and president of Shaw University. The event was sponsored by BASF.

4. Instructional Program Advances

Advances to instructional programs included a new distance education certificate program for high school teachers in the Department of Biological Sciences. The program will launch in Spring 2018.

In the Department of Mathematics, work continued on an online Master of Mathematics program for high school teachers and working professionals. Another initiative is the establishment of an online track for the Post Baccalaureate Certificate in Mathematics, which is aimed at nontraditional students seeking to boost job prospects or prepare for graduate school.

5. Research

Between July 1, 2016, and June 8, 2017, Sciences faculty received 301 awards totaling \$37 million. The college also had a successful year in technology commercialization, with 28 invention disclosures, 20 filed patents and three startup companies.

Some highlights of our research activities:

Biological Sciences: Utilizing the most rigorous testing methods to date, Mary Schweitzer and other researchers isolated additional collagen peptides from an 80-million-year-old *Brachylophosaurus*. The work has implications for our ability to study the fossil record on the molecular level.

Chemistry: Computational chemist Denis Fourches was among a team of researchers who released the first chemical “map” of dyes from NC State’s Max A. Weaver Dye Library, which contains almost 100,000 samples of unique dyes and fabrics. The information could assist researchers in developing dyes with desirable properties.

MEAS: A new model prediction tool created by oceanographer Roy He and his team provides users with daily and 72-hour of marine weather forecasts including wind speed, air temperature and sea-level air pressure; wave height and direction; and ocean circulation. It operates on NC State’s High Performance Computing System.

Mathematics: Ruian Ke is leading a team that received a \$5 million grant from the Defense Advanced Research Projects Agency to study new approaches to fighting the flu. The team is creating and testing therapeutic interfering particles that could ultimately yield a low-cost and resistance-proof treatment for this widespread and deadly threat.

Physics: A nanoprobe developed by Shuang Lim and her team could allow researchers to trace the movements of different proteins along DNA – without the drawbacks of current methods. The group hopes to use the probe to build a library that characterizes all of these proteins to help determine their function.

Statistics: The department's Graduate Industrial Traineeship program continues to be an important research component for many industrial partners and a source of real-world research opportunities for students. Partners include GSK, Maxpoint, 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 more than 15,000 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 4,000 teachers and 67,000 students during 2016-17. The Science House also runs the North Carolina Science Olympiad, the second-largest Science Olympiad program in the country. In April, NC State announced that it will host the 2020 Science Olympiad National Tournament, which will bring more than 2,000 of the country's brightest middle and high school science students to Raleigh.

Climate data queries made through the online retrieval system for the State Climate Office (SCO) grew by 21 percent over the previous year, and web traffic grew by 15 percent. SCO also conducted 24 research projects involving health, agriculture, transportation and ecology.

7. Faculty

Faculty in the college received many prestigious awards in 2016-17.

Biological Sciences: John Meitzen, Next Generation Award, Society for Neuroscience; Nadia Singh, NSF CAREER Award

Chemistry: Lucian Lucia, Fellow, American Chemical Society; Maria Oliver-Hoyo, UNC Board of Governors Award for Excellence in Teaching

MEAS: Walt Robinson, Fellow, American Meteorological Society; Sandra Yuter, Fellow, American Meteorological Society

Mathematics: Tim Kelley, Board of Trustees reelection, Society for Industrial and Applied Mathematics; Ralph Smith, Smart Structures and Materials Lifetime Achievement Award, SPIE

Physics: John Blondin, Fellow, American Association for the Advancement of Science; Carla Frohlich, Cottrell Scholar Collaborative Award

Statistics: Howard Bondell, Fellow, American Statistical Association; Wenbin Lu, Fellow, American Statistical Association; Anastasios Tsiatis, Fellow, American Association for the Advancement of Science

8. Students

The college's total student population in fall 2016 was 3,522, with 2,549 undergraduates and 973 graduate students. The first-year class had a weighted high school grade point average of 4.58 and an average SAT score of 1263. Fifty percent of the freshmen were in the top 10 percent of their high school classes. The class hailed from 89 of North Carolina's 100 counties, as well as 34 other states and 18 countries.

Vishwas Rao, an undergraduate in the Department of Chemistry, was one of seven NC State students and alumni to receive a Fulbright U.S. Student Program award. Award winners receive funding to either conduct research or support the teaching of English in their host country for up to a year. And genetics student Connor McKenney was named one of 240 winners of the Goldwater Scholarship, a competitive national award established to enhance academic opportunities for the nation's top students in science, mathematics and engineering.

9. Fundraising

The college enjoyed a strong fundraising year. Gifts and new commitments totaled nearly \$2.7 million, and more than \$4 million in outstanding proposals are expected to close in 2017-18. Membership in the college's leadership annual giving society set a new record with 213 members, and unrestricted giving was up 19 percent over the previous record. With more

than four-and-a-half years remaining in the university-wide Think and Do the Extraordinary campaign, the college has already raised \$35 million of its \$60 million goal.

The college also filled five new professorships that were created by donors, including three from longtime NC State supporters Jim and Ann Goodnight. The ability to recruit and retain faculty through the creation of endowed positions is one of NC State's campaign priorities.

10. Administration

The college experienced several leadership changes this year. David Bristol retired as senior associate dean for administration. Jo-Ann Cohen, associate dean for academic affairs, returned to the Department of Mathematics. Brock Matthews was promoted to assistant dean for advancement and Jamila Simpson was promoted to assistant dean for academic programs, student diversity and engagement.

At the department level, Ed Bowden was named head of the Department of Chemistry and Paul Huffman was named head of the Department of Physics. Jay Levine was named interim head of the Department of Marine, Earth and Atmospheric Sciences.

11. Recommendations and Concerns for the Future

Short-term budget considerations have slowed the pace of our faculty hiring, but even given those constraints, we have continued to recruit strong talent into our faculty. Next year, we will continue our work to develop a budget model that facilitates addressing strategic initiatives such as faculty hiring. We have a great team now in the college, and the future looks very bright to recruit the very best faculty, students and staff and continue to focus on organizational excellence as the foundation of a world-class College of Sciences.