

**Overview**

The College of Sciences, NC State's home for the biological, mathematical and physical sciences, advances science through groundbreaking research, creative teaching, quality mentoring, strong collaborative partnerships and high-impact public engagement. The six-year-old college is one of the largest and most research-intensive units at NC State, with more than 4,000 students, 430 active research projects and \$43 million in annual research expenditures.

The college aspires to be the world's most trusted, innovative and inclusive scientific community. This annual report reflects the priorities laid out in NC State's strategic plan and supported by the college's leadership.

**Responsiveness to Universitywide Strategic Goals****1. Enhance the success of our students through educational innovation**

The college continues to expand and enhance its degree program, certificate and course offerings. One example is in the Department of Biological Sciences, which, in coordination with the College of Education and funded by NC State's Distance Education and Learning Technology Applications (DELTA) group, launched a new online graduate certificate called Biology for Educators. The program helps K-12 science teachers and other science professionals stay current with advances in the field of biology.

In the Department of Mathematics, faculty are developing an undergraduate capstone course in which students tackle real-world problems with faculty and scientists from industry and government laboratories. The course will be offered for the first time in Fall 2019 with three projects, including modeling in environmental science and modeling in plant biology.

Another example is in the Department of Chemistry, in which faculty worked with DELTA to create five virtual organic chemistry lab experiences that transport users into the lab as if they

were there in person. The department also implemented “flipped” classrooms and the THINK program for general and organic chemistry. THINK is an NC State initiative that cultivates students’ higher-order skills in critical and creative thinking.

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

Growing our faculty is among our top priorities. To that end, eight new tenured or tenure-track faculty arrived on campus in 2018-19, and eight more accepted offers and will start in 2019-20.

The university’s new Molecular Education, Technology, and Research Innovation Center (METRIC) — which makes state-of-the-art scientific infrastructure and instrumentation for mass spectrometry, magnetic resonance and X-ray crystallography available to all departments and faculty — completed its first year of operation. Construction continued on METRIC’s permanent mass spectrometry facility in Dabney Hall, which will complement the newly implemented METRIC facilities in Polk Hall. The center’s director is David Muddiman, Jacob and Betty Belin Distinguished Professor of Chemistry.

Two classrooms in SAS Hall are being renovated into recording studios to grow the Master of Data Science program — an interdisciplinary initiative between the Departments of Mathematics and Statistics, as well as the Department of Computer Science in the College of Engineering — that will begin in Fall 2020. The program aims to help the next generation of professionals harness the power of data for many types of careers.

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

The college continues to be a leader in the Chancellor’s Faculty Excellence Program cluster hiring initiative. As of summer 2019, Sciences is home to 16 of these cluster hires, the second-most of any college at NC State.

Faculty and students continue to build off the interdisciplinary success of Invisible Worlds, a 2018 semester-long collaboration between our scientists and their counterparts in the

College of Design that aimed to help the public understand scientific research in new ways. Two projects from that exhibit, featuring faculty and students from the Departments of Chemistry and Mathematics, were showcased at the second ACCelerate: ACC Smithsonian Creativity and Innovation Festival in April 2019 in Washington, D.C.

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

The college continues to work toward enhancing organizational excellence in a number of areas, including its finance and human resources functions. These include budget development and financial management, creating and implementing standard operating procedures, and evaluating and strengthening internal controls.

The leadership of the college has also been working on a budget model based on data and cost drivers. The project, which began in 2018 and is slated for completion in 2020, should help the college improve efficiency and identify which units are under-resourced. Developing this model has been a collaborative effort between college and departmental leadership.

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

Working with industry is an important part of the college's partnership strategy. To that end, the Graduate Industrial Traineeship program in the Department of Statistics continues to be a key component of the department's connection to its industrial partners and a provider of real-world research opportunities for students. Current partners include SAS and United Therapeutics. In addition, the Statistical Consulting Core, now in its second full year, continues to grow. It provides study design, analytical and programming support, grant preparation and other services for more than 150 clients spanning every NC State college and eight external agencies.

The college also continues to expand its international footprint. One example is in the Department of Mathematics, which this year launched a 3+X master's program with Nanjing Normal University in China. The program allows talented senior undergraduates from China to get an accelerated M.S. degree in mathematics from NC State.

## **Progress in 2018-19**

### **1. Changes in service environment**

The college's leadership team held a retreat in Fall 2018 to begin the process of developing a collegewide strategic plan. Following the meeting, a group of leadership team members began to draft mission and vision statements, as well as a set of core values for the college, that would help kick off the strategic planning process.

Draft versions of those statements and values were approved by the leadership team in Spring 2019 and will aid the college in choosing a consultant to help develop the plan. The college hopes to hire the consultant in Fall 2019.

### **2. Initiatives**

Work continued on the Genetics and Genomics initiative, which involves six colleges and more than 140 faculty and is backed by the university's central administration. The immediate goals: boost research funding, grow graduate programs and establish NC State as a world leader in this important area in human health. College faculty are working on another exciting interdisciplinary initiative called Chemistry of Life that should gain momentum in 2019-20.

The college has made substantial progress on bringing all of its digital platforms into compliance with the university's branding initiative. New, on-brand websites for the Department of Physics and the Department of Chemistry launched this year, and a new site for the Department of Statistics launched in July 2019. All six of the college's departmental websites now fully comply with the university's brand standards.

The college continues to hold events that bring dynamic speakers to campus. Our State of the Sciences lecture, held in April, featured creativity experts and Michigan State University faculty members Michele and Robert Root-Bernstein, the latter of whom is a MacArthur Genius Grant recipient. The event was sponsored by alumnus Joe Bridger.

The college also continued its Networking Lunch Program, which pairs students with alumni who have professional experience in their respective fields. Nearly 80 students and 26 alumni participated in the program in 2018-19.

### **3. Diversity**

In 2018, *Diverse: Issues in Higher Education* magazine recognized programs in the college on its list of “Top Producers of Minority Degrees.” NC State ranked sixth nationally for master’s degrees conferred to Hispanic students in mathematics and statistics. The university ranked 13th in graduating all minority students with master’s degrees in these disciplines and 15th for graduating African American students with those degrees.

In November, 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 Nora Gardner, an NC State alumna who is a managing partner with the global management consulting firm McKinsey and Co. The event was sponsored by BASF, which also hosted a student recruiting mixer prior to the event.

Sciences staff continue to lead NC State’s Women in Science and Engineering program, which brings together first-and-second-year female students and upper-class mentors in Lee Hall. The program has grown from 56 students in 2003 to about 380 students in 2019.

### **4. Instructional program advances**

Advances to instructional programs include work by the Department of Biological Sciences on a new minor in paleobiology to take advantage of NC State’s unique strengths in this area. The Department of Mathematics revised its bachelor of science program in applied mathematics with a concentration in financial mathematics.

And in the Department of Marine, Earth, and Atmospheric Sciences, the Climate Change and Society professional science master’s program had its curriculum revised, a new advisory board established, and new internship experiences developed with agency and corporate

stakeholders. The department also approved a marine science minor and added several new classes with interdisciplinary and global focus.

## 5. Research

Between July 1, 2018, and June 30, 2019, Sciences faculty received 312 awards totaling \$40 million. Seventy-seven percent of faculty engage externally supported research. Some research highlights from the academic departments:

Biological Sciences: Lindsay Zanno led a group that unearthed *Moros intrepidus*, a diminutive – by *T. rex* standards – relative of the tyrant dinosaur king whose discovery revealed crucial new information about when and how *T. rex* came to rule the North American roost.

Chemistry: Three faculty — Phil Castellano, Joshua Pierce and Gavin Williams — launched startups based on their NC State research. The startups — New Fusion, Synoxa Sciences and Omega Organisms, respectively — hold promise in the areas of technology development and human health.

MEAS: Atmospheric scientist Sandra Yuter and her team described rapid and dramatic clearing of low cloud cover off the southwest coast of Africa. This newly observed phenomenon, published in *Science*, could help climatologists understand how clouds affect Earth's heating and cooling.

Mathematics: A team of faculty led by Pierre Gremaud earned a \$2.1 million research grant from the National Science Foundation to study how to improve scientific computing methods using randomized algorithms. The project could open the door for new generations of numerical tools well-adapted to 21st-century problems in a range of areas.

Physics: Lex Kemper and others published research noting that electrons in materials in a non-equilibrium state don't necessarily behave in the same way that materials in equilibrium do, which could affect experimental results.

Statistics: Ryan Martin and a colleague developed *Researchers.One*, an open-access peer review publication platform designed to promote academic freedom, broaden dissemination and even help improve the quality of scientific research.

## **6. Extension**

Hurricane Florence came ashore near Wilmington, N.C. in September, and coastal North Carolina suffered extensive damage. Students and faculty from across the college shared their knowledge and mobilized efforts to assist with predicting the storm's track in national media, housing evacuees at CMAST in Morehead City, and assessing the storm's long-term environmental impacts.

The Science House outreach program supported STEM-related activities across the state that directly reached more than 4,000 teachers and 20,000 students. Indirectly, more than 210,000 students from across North Carolina were impacted by the program's professional development, community engagement and equipment loan activities.

The N.C. Science Olympiad, which is part of The Science House, saw 18,000 students from across the state participate in its tournaments. A new initiative, the Rural Participation Project, helped the Olympiad expand to 75 of the state's 100 counties. In 2020, the National Science Olympiad tournament will be hosted at NC State with The Science House and Kim Gervase, the N.C. Science Olympiad director, leading the tournament.

The State Climate Office, which is part of the college, expanded its ECONet statewide observing network, most notably to take temperature readings at multiple heights above the ground. The office is also seeing growth through its collaboration with NC State Cooperative Extension and a new project to provide climate information to U.S. Fish & Wildlife Service biologists to support them in preparing species status assessments.

## 7. Faculty

Faculty in the college received many prestigious awards this year. Four faculty members recognized by NC State at the 2019 Celebration of Faculty Excellence, an annual event that honors faculty who have won prestigious state, national and international awards and created new knowledge in their fields. In addition, five of the 22 faculty honored in 2019 by the NC State Alumni Association were from the College of Sciences. Among our faculty award highlights:

Biological Sciences: Ann Ross, Expert Roster Member, Justice Rapid Response

Chemistry: Wei-chen Chang, NSF CAREER Award; Thomas Theis, Ralph E. Powe Junior Faculty Enhancement Award, Oak Ridge Associated Universities

MEAS: Gary Lackmann, Elected Fellow, American Meteorological Society; Helena Mitsova, Lifetime Achievement Award, International Society for GeoMorphometry

Mathematics: Lorena Bociu, Presidential Early Career Award for Scientists and Engineers, National Science Foundation and The White House; Ilse Ipsen, Fellow, American Association for the Advancement of Science; Tim Kelley, Fellow, American Association for the Advancement of Science; David Papp, NSF CAREER Award; Arvind Saibaba, NSF CAREER Award

Physics: Katie Mack, List of 100 Inspirational Women, Create & Cultivate

Statistics: Marie Davidian, Honorary Life Membership, International Biometric Society; Eric Laber, Fellow, American Statistical Association; Brian Reich, Fellow, American Statistical Association

## 8. Students

The college's total student population in Fall 2018 was 4,070, with 3,026 undergraduates and 1,044 graduate students. The first-year class had a weighted high school grade point average of 4.7 and an average SAT score of 1329. Fifty-five percent of the freshmen were in the top 10% of their high school classes.

Rachel Chen, a sophomore in statistics; Nikhil Milind, a sophomore in genetics and computer science; and Ana Sofia Uzsoy, a sophomore in physics and computer science, won prestigious Goldwater Scholarships, placing them among the nation's most promising young scientists and engineers.

Alexander Wall, a senior in biological sciences, received a Fulbright U.S. Student Program grant to conduct research in Germany at the Center for Regenerative Therapies Dresden, which is associated with the Technische Universität Dresden. Noah Riley, a senior in biological sciences, received NC State's Mathews Medal, which honors graduating seniors who are leaving the university a better place because of their leadership.

## **9. Fundraising**

The college enjoyed another outstanding fundraising year. Gifts and new commitments totaled \$11.5 million, the second-highest annual fundraising total in the college's history. Highlights included a substantial estate commitment from an alumna to fund three endowed professorships and an experiential learning endowment.

Annual giving was also successful, with 66 new members added to the college's Dean's Circle leadership giving program. During Day of Giving, a daylong fundraising event held on March 27, the college received 587 gifts totaling \$722,928, including support from 190 first-time donors. With two-and-a-half years remaining in the university's Think and Do the Extraordinary campaign, the college has raised \$55.4 million of its \$60 million goal.

The college also held an event to recognize three Goodnight Innovation Distinguished Professors and one Goodnight Innovation Distinguished Chair. The November 2018 ceremony was attended by the professorship donors, Jim and Ann Goodnight.

## **10. Administration**

The college experienced several leadership changes. Maria Oliver-Hoyo, a professor of chemistry, was named associate dean for academic affairs. Heather Patisaul, a professor of biological sciences, was announced as the next associate dean for research.

In the departments and units, Lewis Owen, who had been a department head at the University of Cincinnati, agreed to become the next head of the Department of Marine, Earth, and Atmospheric Sciences. Kathie Dello, who had been serving as associate director of the Oregon Climate Change Research Institute and as deputy director of the Oregon Climate Service, was named the new director of the State Climate Office and as the state climatologist for North Carolina.

## **11. Recommendations and concerns for the future**

Among the most pressing issues continuing to face many college units are low levels of tenured and tenure-track faculty, as well as staff. Hiring more faculty and staff is among the college's highest priorities, pending the availability of resources. In addition, graduate student stipends across the college are low, relative to our peers, and hinder recruiting efforts.

Aging infrastructure in several buildings also continues to be a concern, as is limited space for laboratories and offices and a lack of IT support and resources to support our activities. As our faculty becomes more research-intensive, more laboratory space will be needed.