

Overview

The College of Sciences is home to NC State's people and programs in the biological, mathematical and physical sciences. The college was formed in 2013 and is one of the largest and most research-intensive units at NC State, with more than 4,100 students, 530 active research projects and about \$40 million in annual research expenditures. The college seeks to advance science through groundbreaking research, creative teaching, quality mentoring, strong collaborative partnerships and high-impact public engagement.

The college's vision is 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**

Innovation was important to the college's course delivery activities when the COVID-19 crisis hit North Carolina during the Spring 2020 semester. Many faculty are already well-versed in online education, and so the college was able to move to fully online instruction with relatively few problems. Among the leaders was Maria Gallardo-Williams in the Department of Chemistry, who saw virtual reality organic chemistry labs that she had developed in collaboration with NC State's DELTA online education program adopted nationally and internationally.

Faculty in Biological Sciences and Chemistry were co-coordinators of a new online course, "Wicked Problems, Wolfpack Solutions," that was developed during Summer 2020 for use with incoming first-year students in the fall. The course allowed students to explore the history, biology and societal impacts of pandemics like COVID-19 and offered a primer on what it's like to be an NC State student.

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

Growing our faculty is a top priority. To that end, eight new tenured or tenure-track faculty arrived on campus in 2019-20, and 11 more accepted offers and will start in 2020-21.

Infrastructure improvements included a major renovation to the ground floor of Dabney Hall to house the mass spectrometry laboratory, offices and a conference room for the university's new Molecular Education, Technology, and Research Innovation Center (METRIC). The center makes state-of-the-art scientific infrastructure and instrumentation for mass spectrometry, magnetic resonance and X-ray crystallography available to all departments and faculty. The center's director is David Muddiman in the Department of Chemistry.

A substantial renovation in Partners III created new space for the Organic and Carbon Electronics Labs, which is part of NC State's Carbon Electronics cluster. The lab is equipped with state-of-the-art coating, microscopy, spectroscopy, materials characterization and device testing facilities. The Carbon Electronics cluster was launched by Harald Ade in the Department of Physics. Phil Castellano in the Department of Chemistry is one of its co-leaders.

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 2020, Sciences is home to 16 of these cluster hires, the second-most of any college at NC State.

In research, college faculty landed two large environmental health grants in 2019-20 that address important public health issues and foster interdisciplinary scholarship. One grant was a five-year, \$7.4 million award from the National Institute of Environmental Health Sciences (NIEHS) Superfund Research Program to establish a Center for Environmental and Human Health Effects of Per- and Polyfluoroalkyl Substances (PFAS). Led by Carolyn Mattingly, professor and head of the Department of Biological Sciences, the center brings together collaborators from across NC State and East Carolina University to study PFAS toxicity, bioaccumulation, mechanism of action and remediation.

The other grant was made to the Center for Human Health and the Environment (CHHE), led by Rob Smart in the Department of Biological Sciences. The center was awarded \$7.6 million by NIEHS over five years to continue working to better understand environmental effects on human health. CHHE brings together investigators from 13 departments and six colleges across NC State, as well as investigators from other universities and government agencies, to study how the environment affects health in communities.

Many faculty from both centers are involved in the North Carolina PFAS Testing Network, which seeks to address pollution in the Cape Fear River and across the state.

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

College leadership continued work that began in 2018 to develop a new budget model based on data and cost drivers. Once fully implemented, the model will ensure that resource allocation throughout the college is data-driven, fair and equitable.

Progress continued on consolidating the college's information technology (IT) staffing into a centrally managed unit. As of Summer 2020, 80 percent of the information technology staff reported to the college's central IT director. The college has also begun a collaboration with other campus IT units to develop virtual desktop services to allow access to university resources with low-cost computers from any location.

5. Enhance local and global engagement through focused strategic partnerships

The college has many industry partners and working with the private sector is an important part of its strategy. In the Department of Statistics, the Graduate Industrial Traineeship program is a key component of the department's connection to industry and a provider of real-world research opportunities for students. Current partners include SAS and United Therapeutics. In addition, the Statistical Consulting Core continues to thrive. It provides study design, analytical and programming support, grant preparation and other services for more than 80 clients spanning every NC State college as well as external agencies.

In the Department of Chemistry, Joshua Pierce led the establishment of a new partnership between NC State's Comparative Medicine Institute (CMI) and North Carolina Central University's Biomanufacturing Research Institute and Technology Enterprise.

Progress in 2019-20

1. Changes in service environment

All college operations were significantly impacted by the coronavirus pandemic that began in North Carolina during the Spring 2020 semester. All classes were moved online at that time and faculty and staff began working remotely. Research operations were significantly reduced, though many faculty began to develop research programs that focused on the pandemic and its human health effects. Commencement exercises previously scheduled for May were postponed.

This was a difficult time for students. Almost all students were required to leave campus and learn remotely, and many lost income as their employers reacted to the crisis. Fortunately, the university's Student Emergency Fund was able to provide assistance to many students facing these hardships. Many alumni, faculty and staff in the college contributed to the fund.

2. Initiatives

The new Genetics and Genomics Initiative, which involves seven colleges and more than 150 faculty, connects NC State's unique strengths in life and data sciences through its rich history in genetics. Its Genetics and Genomics Scholars Program is the first umbrella graduate program at NC State and received more than 160 applications for 15 fellowships for its first cohort in Fall 2020. A search for a permanent director is under way.

Another interdisciplinary initiative, Chemistry of Life, which aims to break down barriers between chemistry and the life sciences at NC State, gained momentum during the past year and launched in July 2020. The program, unique in the UNC System, involves more than 40 faculty across four colleges at NC State and provides graduate and undergraduate student training at the intersection of chemistry and biology. Chemistry of Life is part of NC State's Comparative Medicine

Institute (CMI), which involves six colleges at NC State and three other universities. Chemistry of Life's program director is Joshua Pierce, who was also recently appointed as the CMI's co-director.

Work continued on developing a college-wide strategic plan, and the college is close to hiring a consultant to guide the process. Creating a culture that welcomes and celebrates diversity, equity and inclusion is among the most important goals.

3. Diversity

The college is committed to diversifying its student, faculty and staff communities. In Summer 2020, the college's leadership team embarked on a four-part diversity training program in an effort to further this goal. This training will also serve as a jumping-off point for the upcoming strategic planning process.

In 2019, *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 doctoral degrees conferred to minority students in mathematics and statistics. The university ranked 11th and 15th in graduating African American students with master's degrees in mathematics and statistics and in biological and biomedical science, respectively.

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 Kevin Clark, an NC State alumnus who is a professor at George Mason University. The following day, about 300 people from across NC State and the Triangle attended the college's second Diversity in STEM Symposium. The theme of the day was "Creating Inclusive Spaces." Both events were sponsored by BASF.

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 390 students in 2020. A new assistant director for the program, Bri Hart, was hired in 2019-20.

In the areas of advancement and alumni relations, the college nominated and had 11 alumni and friends recognized with the Black Alumni Society's 40-for-40 Awards, which honored Black alumni for their leadership, service and commitment to NC State and the community at large. The college also announced a new Diversity Program Endowment that will provide permanent funding for diversity and inclusion initiatives.

4. Instructional program advances

Advances to instructional programs include work on a new minor in paleobiology that takes advantage of NC State's unique strengths in this area. The minor will launch in Spring 2021 and will integrate cross-departmental courses in the Departments of Biological Sciences and Marine, Earth, and Atmospheric Sciences.

A new master of science in data science offered by the Departments of Mathematics, Statistics and Computer Science was approved. The program aims to help the next generation of professionals harness the power of data for many types of careers.

Programs in the college continue to rank highly among their peers. The statistics program was ranked 20th in the Academic Ranking of World Universities published by Shanghai Jiao Tong University. The master's program in financial mathematics ranked 10th nationally in the Quant Finance Master's Guide.

5. Research

Between July 1, 2019, and June 30, 2020, Sciences faculty received 320 research awards totaling \$45 million. Some research highlights from the academic departments and units:

Biological Sciences: Research from Michael Bereman and others showed that high-throughput analysis of blood plasma could aid in identification of diagnostic and prognostic biomarkers for amyotrophic lateral sclerosis (ALS).

Chemistry: A team led by David Shultz earned a \$1.5 million research grant from the U.S. Department of Energy to study next-generation quantum systems that have potential impacts on computing, networking and sensing.

MEAS: An analysis by Paul Byrne described how volcanic activity on planets in our solar system could help humans find other Earth-like worlds.

Mathematics: Alun Lloyd, who studies the epidemiology of infectious diseases, made several media appearances to discuss the coronavirus. Outlets included *PBS NewsHour* and *The News & Observer*.

Physics: A team led by Mary Elting was awarded \$1.2 million from the National Science Foundation (NSF) to build synthetic cytoskeletons inside of living cells. This award is part of the “Understanding the Rules of Life” portion of NSF’s 10 Big Ideas for Future Investments Initiative.

Statistics: Eric Chi received a \$700,000 grant from the National Institutes of Health to address the mathematical, statistical and computational challenges of imputing single-cell RNA sequencing data.

State Climate Office: The office, led by its new director, Kathie Dello, received a \$350,000 grant from the North Carolina Department of Transportation to develop tools to predict future precipitation extremes to inform resilient design of roads and other key infrastructure.

6. Extension

College staff and faculty played a key role in preparing for and holding the August 2019 downlink event featuring NASA astronaut Christina Koch, a physics and electrical engineering alumna. The event, held in Talley Student Union, was attended by more than 1,000 people, including hundreds of K-12 students, and watched by thousands more online. Clubs and organizations from NC State and the North Carolina School of Science and Mathematics, which Koch also attended, shared interactive activities and demonstrations in the Talley lobby.

The Science House outreach program supported STEM-related activities across the state that served more than 4,000 teachers and administrators and 150,000 students. The Science House responded to the pandemic by creating The Science House Express, a weekly virtual learning program that covers a wide variety of STEM subjects for K-12 students.

This year was also a significant year for the North Carolina Science Olympiad, which became the largest Science Olympiad program in the nation. NC State had been scheduled to host the National Science Olympiad Tournament in May 2020, but the event was canceled due to COVID-19. Throughout the year, staff across the college worked with N.C. Science Olympiad staff to transition the program from an independent organization that worked closely with NC State to an official university program. This successful transition occurred on July 1, 2020.

Our departments continued to reach out to their alumni, including the Departments of Chemistry and Mathematics, which hosted weekend 130th anniversary celebrations for their faculty, staff, students, alumni and broader communities. The Department of Physics once again hosted its PhysicsPhest celebration.

As the pandemic unfolded, the college was a big player in the donation of personal protective equipment to local hospitals, including tens of thousands of pairs of gloves. And Terry Gates in the Department of Biological Sciences recruited and coordinated the participation of 78 NC State faculty who delivered virtual scientific presentations to public school students across the state at a time when these students were learning from home.

Faculty and staff at the State Climate Office and the Department of Marine, Earth, and Atmospheric Sciences helped lead the development of the *North Carolina Climate Science Report*, the first comprehensive climate science assessment for the state. The State Climate Office also wrote a well-received analysis about 2019 being the warmest year in the state's 125 years of record-keeping.

7. Faculty

Faculty in the college received many prestigious awards this year. At least five faculty members would have been recognized at the 2020 Celebration of Faculty Excellence, an annual event that honors faculty who won prestigious state, national and international awards, but the event was postponed due to COVID-19. In addition, four faculty were honored with teaching awards by the NC State Alumni Association. Among our faculty award highlights:

Biological Sciences: Jane Hoppin, Fellow, Collegium Ramazzini

Chemistry: Phil Castellano, I-APS Award in Photochemistry, Inter-American Society for Photochemistry

MEAS: Paul Byrne, Early Career Fellow, NASA; Helena Mitasova, Fellow, Geological Society of America

Mathematics: Cynthia Vinzant, Sloan Research Fellowship and NSF CAREER Award

Physics: Jacqueline Krim, Fellow, American Association for the Advancement of Science; Katie Mack, Fellow, TED; Dali Sun, Early Career Research Award, U.S. Department of Energy

Statistics: Len Stefanski, Chair, Statistics section of the American Association for the Advancement of Science

8. Students

The college's total student population in Fall 2019 was 4,103, including 3,026 undergraduates and 1,001 graduate students. The first-year class had a weighted high school grade point average of 4.34 and an average SAT score of 1341. Fifty-six percent of the freshmen were in the top 10% of their high school classes.

Jonathan Palmer, a junior chemistry major, and Noah Wolfe, a sophomore physics and mathematics major, won prestigious Goldwater Scholarships, placing them among the nation's most promising young scientists and engineers.

9. Fundraising

The college logged another strong fundraising year. Gifts and new commitments totaled \$7.2 million, which put the college above its \$60 million Think and Do the Extraordinary campaign goal more than 18 months before the end of the campaign.

Highlights included a substantial bequest from an alumnus to support undergraduate scholarships in the Department of Biological Sciences and a full-tuition scholarship gift from an alumnus that will be available to students from North Carolina.

Overall, in 2019-20 the college established one endowed professorship, five scholarship endowments, three program endowments and one graduate endowment. In addition, three distinguished professorships were filled in the college.

10. Administration

In Fall 2019, Provost Warwick Arden extended the deanship of Dean Chris McGahan. McGahan, a leading eye researcher and longtime administrator at NC State, was originally appointed dean of the college in November 2017.

In the departments and units, Carolyn Mattingly, an NC State professor and prominent molecular toxicologist, was named head of the Department of Biological Sciences. She had been serving as the interim head of the department.

11. Recommendations and concerns for the future

The college continues to be constrained by its aging infrastructure as well as limited space for offices and laboratories. The proposed state budget under discussion over the past year had included \$80 million for a new Integrated Sciences Building for the Departments of Biological Sciences, Chemistry and Biochemistry, but those plans are now on hold.

Another pressing issue facing many college units are low levels of faculty and staff. Hiring more faculty and staff is among the college's highest priorities, pending the availability of resources. In addition, despite an increase in 2019-20, graduate student stipends across the college continue to be low, relative to our peers, and hinder recruiting efforts.