

Overview

The College of Sciences is home to people and programs in the biological, mathematical and physical sciences at NC State. The 11-year-old college continues to be one of the largest and most research-intensive units at the university, with about 4,200 students, 627 active research projects and more than \$50 million in annual research expenditures. The college seeks to provide an inclusive, world-class science education; catalyze scientific research and innovation that improve our world and our collective understanding; and invite everyone into our work as we become a local and global hub for open science. This annual report reflects the priorities laid out in NC State's strategic plan and supported by college leadership.

Responsiveness to Universitywide Strategic Goals**1. Empower students for a lifetime of success and impact.**

Our Academic Affairs office and the newly-established Office of College Success and Well-Being held events to support students, which this year included a College Connections event at Wolfpack Welcome Week, a sizable presence at Packapalooza, and an Academic Affairs Open House. Student mental health continues to be a focal point, and the offices held fun, stress-relieving events on Halloween and Valentine's Day and offered opportunities for students to interact with therapy dogs at the end of both semesters.

Our faculty continue to help lead the Wicked Problems, Wolfpack Solutions course for incoming first-year and transfer students. Jane Lubischer, Melissa Ramirez and Jason Flores of the Department of Biological Sciences were among the course's core team recognized with NC State's 2024 Gertrude Cox Award for Excellence in Teaching and Learning with Technology.

A significant highlight for students was astronaut and alumna Christina Koch's visit to NC State. Sciences and Engineering organized a breakfast and fireside chat with Koch and over 100 students. Later, Koch launched model rockets with K-12 students from the Science House programs.

2. Ensure preeminence in research, scholarship, innovation and collaboration.

Faculty hiring continues to be a top priority. To that end, 29 new tenured, tenure-track and professional faculty arrived on campus in 2023-24, and about six more plan to start in 2024-25. Overall, Sciences faculty authored or co-authored nearly 1,000 journal publications from January 2023 through June 2024, including in top-tier journals such as *Science* and *Nature*, according to estimates from the NC State University Libraries.

College faculty are leading a major new research center that was awarded 2023-24, called the North Carolina Center for Coastal Algae, People, and Environment (NC C-CAPE), that brings together researchers from five colleges at NC State to study the human health risks posed by harmful cyanobacterial algal blooms in North Carolina coastal waters. Director Astrid Schnetzer in the Department of Marine, Earth, and Atmospheric Sciences and co-director Scott Belcher in the Department of Biological Sciences lead the \$6.9 million center, which was jointly funded by the National Science Foundation and the National Institute of Environmental Health Sciences. With this new center, there are now four toxicology-focused National Institutes of Health Centers at NC State that are led by our college. The other three are the Center for Human Health and the Environment, the Center for Environmental and Health Effects of PFAS and the Southeastern Liver Health Study.

A major infrastructure project began in summer 2023 when work commenced on the Integrative Sciences Building. The building, which will sit on the former Harrelson Hall site, will be the core facility for the new Integrative Sciences Initiative and home to the burgeoning Chemistry of Life training and research program when it opens in 2027. Another positive facilities development was the funding of the first two phases of renovations of Dabney Hall; construction will begin in 2025. Many faculty and staff affected by the construction in Dabney will move to newly renovated space in Broughton Hall during the Dabney modernization.

3. Expand and advance our engagement with and service to North Carolina and beyond, defining the standard for a 21st-century land-grant university.

The long-awaited Dueling Dinosaurs exhibit launched at the NC Museum of Natural Sciences. The project is the brainchild of Lindsay Zanno, who has a joint appointment between the

Department of Biological Sciences and the museum. The exhibit consists of the fossilized skeletons of a tyrannosaur and a *Triceratops horridus* entangled with one another and entombed in sandstone. Museum staff will excavate the specimens in real time in front of the public.

The college's academic departments were extremely active in outreach. The Department of Physics hosted the U.S. Association for Young Physicists Tournament in collaboration with the Science House. The Department of Biological Sciences coordinated Brain Night, an award-winning neuroscience public engagement event, at the NC Museum of Natural Sciences. Mathematician Lorena Bociu collaborated with the Science House to hold a Girls in Applied Math, Modeling and Analysis event. In the Department of Marine, Earth and Atmospheric Sciences, Lian Xie's seasonal hurricane forecasts were again widely disseminated by media outlets.

4. Champion a culture of equity, diversity, inclusion, belonging and well-being in all we do.

Sciences staff continue to lead NC State's Women in Science and Engineering (WISE) program, which brings together first- and second-year female students and upper-class mentors in Lee Hall. WISE began with 56 students in 2003 and had 370 students during 2023-2024. The program celebrated its 20th anniversary during the year.

The college also held its Diversity in STEM Dinner, which is held yearly, and its Diversity in STEM Symposium, which is held every other year. Both events attracted a record number of attendees, with the symposium drawing 500 participants.

In the Science House, the Kyran Anderson and Imhotep Academies continued to reach underserved elementary- and middle-school students; more than 260 students participated throughout the year. Eighty-seven percent of these programs' participants were African-American, Latino or Native American students, 55% identified as girls or non-binary, and more than 80% received need-based financial support to participate.

5. Improve university effectiveness through transformative technologies, cutting-edge processes and actionable data.

At the beginning of the previous fiscal year, the college's post-award research support services were restructured and centralized, while finance and human resources functions remained

decentralized. During 2023-24, the college's assistant dean of finance and business management convened a task force composed of college and departmental representatives to discuss and agree upon the responsibilities of post-award accounting staff in the College Research Office while allowing as much customization of workflow within the departments as possible. Negotiations and testing for supporting processes occurred throughout the fiscal year, and updates will go live during the next fiscal year alongside a training and communication plan.

The College Research Office also made a number of changes to improve service, including pivoting to Airtable for more cost-effective and user-friendly pre-award proposal management. The office has also implemented a ticketing system that will collect metrics on team performance and customer satisfaction and aims to keep customers informed about the status of their requests.

6. Lead in developing innovative partnerships, entrepreneurial thinking and applied problem-solving.

The college continues to be a key player in the Chancellor's Faculty Excellence Program cluster hiring initiative. At the end of 2023-24, Sciences was home to 19 of these faculty, the second-most of any college at NC State.

The Department of Statistics continued to provide high-quality statistical support and engagement with on- and off-campus researchers throughout the year, and its Graduate Industrial Traineeship Program placed students with industrial partners such as SAS, United Therapeutics and the Mayo Clinic. The Departments of Chemistry and Physics, in particular, were highly engaged in research commercialization and the creation of spin-off companies.

Another significant example of partnership creation is the Blue Economy Innovation Program led by Chris Osburn in the Department of Marine, Earth, and Atmospheric Sciences. The program integrates interdisciplinary education and research to support sustainable maritime technologies and economies. NC State honored Osburn and his team with a 2024 NC State Sustainability Award.

7. Elevate the national and global reputation and visibility of NC State.

Programs in the college continue to perform well in national rankings. In the latest rankings of graduate schools in science by *U.S. News and World Report*, our statistics program ranked 11th in

the nation, while applied mathematics ranked 18th. College programs also fared well in the National Science Foundation's most recent Higher Education Research and Development Survey of research and development expenditures by field. Among the highlights: 8th in mathematics and statistics; 35th in geosciences, atmospheric sciences and ocean sciences; 44th in biological and biomedical sciences; 51st in chemistry; and 61st in physics.

Our outreach programs continued to be recognized for their work, with the Science House earning the Center for Advancing Research Impact in Society's 2024 Enduring Achievement Award for demonstrating achievement in research engagement and societal impact.

College faculty and staff also provide scientific guidance to national leaders. Kathie Dello, director of the State Climate Office, participated in the first White House Forum on Federal Climate Services. She also delivered testimony to Congress on the Weather Act reauthorization and, along with other NC State faculty and staff, authored chapters for the Fifth National Climate Assessment.

Our faculty and staff are often sought out by media outlets to comment on scientific findings and current events. Recent examples include the Environmental Protection Agency's new PFAS drinking water limits, animal behavior during the 2024 solar eclipse, and research on a new drug sensor that can detect opioids, even when they are mixed with other substances.

Areas of Impact in 2023-24

1. Changes in service environment

The college experienced a major leadership change during 2023-24 when Lewis Owen took over as dean in August 2023. Owen had been head of the Department of Marine, Earth, and Atmospheric Sciences since 2019.

This past year was also the 10th anniversary of the college's formation, and activities and events throughout the year noted and celebrated our "Decade of Discovery". A new suite of marketing materials and web content were created and disseminated to mark the anniversary.

2. Initiatives

A signature donor-funded outreach event occurred in April when the college hosted its State of the Sciences lecture. The speaker was Marshall Brain, founder of HowStuffWorks.com.

The Academic Affairs office held its second annual event to recognize excellence in teaching and advising within the college. The office also instituted a new event to recognize advisors and the critical role they play in the academics and well-being of our students.

The Department of Chemistry spearheaded a collaboration with other NC State units to host a ChemEd Summit that brought together members from the industrial, academic, state and federal chemical sciences communities. The goal was to connect campus and industry partners to facilitate engagement in an interdisciplinary approach to education and training.

In September, the college held its first Excellence Symposium. The event brought together faculty, staff and students from across the college to share ideas and promote interdisciplinary collaboration in teaching and research.

3. Instructional program advances

The Department of Physics revamped its undergraduate major program to extend its bachelor of science in physics degree to include a bachelor of science in physics with interdisciplinary physics concentration. The department had its first graduate in the program with a concentration in astrophysics in Spring of 2024.

In the Department of Marine, Earth and Atmospheric Sciences, the Climate Change and Society Master's Program and Climate Adaptation Certificate continue to set annual records for applications and enrolled students.

4. Research

During 2023-24, Sciences faculty received 257 awards totaling \$53.1 million in funded projects. Research expenditures reached \$50.3 million, up nearly 14 percent from the previous year. The college was also the second-leading F&A revenue generator among all NC State colleges in 2023-24. Among our research highlights:

Biological Sciences: A study from Cathrine Hoyo and others found that environmentally caused alterations to specific areas of the genome – known as imprint control regions – during early development may contribute to the risk of developing Alzheimer's disease, and that Black people

may be more affected than white people. The work adds to understanding of the ways in which environmental factors can contribute to genetic alterations and disease susceptibility.

Chemistry: Joshua Pierce co-leads a research team that was awarded \$1.5 million from the UNC System to accelerate molecular and biological innovations enabled by next-generation self-driving labs. Self-driving labs leverage artificial intelligence, robotics and lab automation to fast-track the discovery and development of advanced materials and molecules needed to develop new medicines, semiconductors and sustainability solutions.

MEAS: Ethan Hyland co-authored a study in *Science* that looked at CO₂ levels and their corresponding temperatures from 66 million years ago until now, to see if the data could inform our potential future. The researchers found that the last time Earth had CO₂ levels comparable to current ones was 14 million years ago, and that the effects of even small amounts of greenhouse gases on climate are both myriad and long-lasting.

Mathematics: The Mathematics and Statistics departments hosted 20 participants in a Research Experiences for Undergraduates program. The goal is to get more undergraduates with diverse backgrounds interested in graduate degrees in mathematical and statistical sciences and to provide research opportunities that can generate high-quality outputs.

Physics: A study by Sebastian König and others has opened a new avenue for modeling low-energy nuclear reactions, which are key to the formation of elements within stars. The research lays the groundwork for calculating how nucleons interact when the particles are electrically charged.

Statistics: Brian Reich and Shu Yang were among researchers who studied whether marine protected areas (MPAs) — where fishing is either prohibited or tightly controlled — conserve ocean resources and protect species and habitats. They found that both no-take (where fishing is prohibited) and multiple-use (fished) MPAs see increases in fish counts.

State Climate Office: The office partnered with state agencies on a Heat Action Plan Toolkit that provides original research and resources for local governments to plan for heat waves. The toolkit includes an easy-to-use heat action plan template and outreach resources to help communities prepare and become more resilient.

5. Extension

Programs of the Science House impacted 156,000 students and 4,600 teachers in 78 counties across the state during the year. The Science House's Rural Equipment Loan program supplied resources, labs, kits and technologies to perform hands-on STEM investigations to 236 teachers serving nearly 17,000 students.

The NC Science Olympiad, which is part of the Science House, led elementary, middle and high school tournaments across the state. A total of 755 teams participated. Activities culminated with the NC Science Olympiad State Tournament on the NC State campus. Another Science House program, Catalyst, hosted a STEM and resource fair for K-12 students with disabilities, along with their families and friends. More than 600 students attended.

6. Faculty

Many faculty in the college received prestigious awards this year. Five faculty members were recognized at NC State's 2023 Celebration of Faculty Excellence, which honors winners of top state, national and international awards. Several more faculty were honored with college and university awards; two were named University Faculty Scholars; and two were named Provost's Faculty Fellows. Among our faculty award highlights:

Biological Sciences: Christa Baker, C.J. Herrick Award in Neuroanatomy, American Association for Anatomy; Bucky Gates, Libraries Faculty Award, NC State; Erica Kosal, Regional Award for Administrative Advisors, NACADA; Christina Zakas, NSF CAREER Award

Chemistry: Phil Castellano, Distinguished Speaker Award, NC Section of the American Chemical Society; David Muddiman, Fellow, American Association for the Advancement of Science; Leslie Sombers, President-Elect, Society for Electroanalytical Chemistry; Myung-Hwan Whangbo, Highly Ranked Scholar, ScholarGPS

MEAS: Dave Eggleston, Margaret A. Davidson Stewardship Achievement Award, Coastal and Estuarine Research Federation

Mathematics: Patrick Combettes, Fellow, Society for Industrial and Applied Mathematics; Ilse Ipsen, Olga Taussky-Todd Lecture, International Congress on Industrial and Applied Mathematics

Physics: Harald Ade, Highly Cited Researcher, Clarivate; Julio Monti Belmonte, NSF CAREER Award; Laura Clarke, Fellow, American Physical Society; Gail McLaughlin, Herman Feshbach Prize, American Physical Society Division of Nuclear Physics

Statistics: Emily Griffith, Fellow, American Statistical Association; Emily Hector, NSF CAREER Award; Len Stefanski, Fellow, American Association for the Advancement of Science and Institute of Mathematical Statistics; Shu Yang, Emerging Leader Award, Committee of Presidents of Statistical Societies

7. Students

The college's student population in Fall 2023 was 4,183, including 3,177 undergraduates and 1,006 graduate students. The first-year class had a weighted high school grade point average of 4.39. The college has also maintained a 94-95% first-year retention rate for several years. Our four- and six-year graduation rates were 72.2% and 87.2%, respectively, for the most recent cohort.

Josh Ott, a physics and mathematics double major, was named a 2024 Astronaut Scholar. The award is one of the nation's most prestigious honors for STEM students.

8. Fundraising

The college enjoyed a strong fundraising year, with gifts and new commitments totaling \$6.6 million. Sixteen new funds and endowments were established.

This year's fundraising highlights included a \$400,000 estate gift for the Jennifer Drozd Cantu Memorial Endowment, which honors a biological sciences student who died several years ago. In addition, the Christine M. McGahan Leadership Endowment was established to honor the former dean. It is the first endowment to support student leadership development across the college. In partnership with University Libraries, the college secured a gift of the Einstein/Struble letters, a series of correspondence between Albert Einstein and former NC State math professor Raimond Struble. The college also had a record-breaking Day of Giving, raising \$3.3 million from 1,109 gifts.

Several faculty were awarded named professorships as a result of previous gifts from donors: Wei-chen Chang, Thomas Lord, LORD Corporation Distinguished Scholar; Joshua Pierce,

Howard J. Schaeffer Distinguished Professor; Thomas Theis, Goodnight Distinguished Scholar in Molecular Characterization; and Yi Xiao, Hugh C. Lord, LORD Corporation Distinguished Scholar.

9. Administration

In addition to the new dean, there were some changes to the college's Leadership Team. Atmospheric scientist Gary Lackmann was named head of the Department of Marine, Earth, and Atmospheric Sciences. Biologist Bruce Schulte of Western Kentucky University was named head of the Department of Biological Sciences. Physicist Lex Kemper was named associate dean for research. Jamila Simpson was named associate dean for college success and well-being.

The college also created and filled two new roles that are part of the Leadership Team. Physicist Keith Warren was named the college's first director of facilities and operations, and geologist Paul Liu was named the first first director of international affairs.

10. Recommendations and concerns for the future

The Engineering Expansion, which is already adding hundreds of new students each year to many of our undergraduate courses, continues to be a challenge. The college will need more space, faculty, staff and teaching assistants to accommodate this increase.

While the Integrative Sciences Building will add much-needed teaching and research space, aging infrastructure and critical lack of quality research space remain significant barriers to hiring. Some of these issues will be eased by the renovation of Dabney Hall, but more funds will be needed to complete that renovation and the multi-year renovation process will create complications such as the construction of flex space in Broughton Hall. The college is also running low on space to house live animals. Physics laboratory and office space is now at capacity.

In addition, IT services and support for research faculty lag behind our peers. Other longstanding issues are low graduate student stipends and widespread salary equity and inversion.

We continue to recommend that the university establish an Academy of Environment and Climate. Creating the academy would help address infrastructure challenges, build faculty, enhance training opportunities, foster collaboration and elevate the prominence of our already strong research and community engagement in the area of environmental and climate health.