



KENAN INSTITUTE

ENGINEERING, TECHNOLOGY & SCIENCE

NC STATE UNIVERSITY



William R. Kenan, Jr. Institute for Engineering, Technology & Science
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KENAN INSTITUTE GOALS AND ACCOMPLISHMENTS FISCAL YEAR 2023-2024

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A MESSAGE FROM THE DIRECTOR

With the resources so generously provided by the William R. Kenan, Jr. Fund for Engineering, Technology & Science, NC State University, and our corporate, government, and philanthropic partners, in 2023-2024 the Kenan Institute continued to support and advance innovation in science and technology as a vehicle for our economic development and growth as a state and nation.



The Kenan Institute for Engineering, Technology & Science focuses its intellectual, human and financial resources in support of innovative individuals and programs involved in science, mathematics and engineering driven enterprises with demonstrated potential for high impact educational, economical and other benefits to society. Specifically, the Institute continues to support and enable core competencies in four strategic areas: high technology research; science, technology, engineering, and math K-12 education; technology commercialization and entrepreneurship; and science and technology policy.

We remain committed to encouraging multidisciplinary, multi-institutional teams involving government, university, and corporate partners to solve scientific and societal problems, generate technology-based economic development, and bring together the public and private resources necessary to successfully tackle the emerging issues of our time. We do this while maximizing the leverage from the significant strengths of NC State University students, faculty, and staff while focusing on programs that are consistent with the university's strategic goals in research, education, and engagement.

Our Institute support and leadership enables individuals and programs at NC State and at other institutions to continue to produce world-class research and scholarship, which enhances knowledge and learning, produces and supports new innovative companies, and informs sustainable practices and effective public policies that will have lasting impacts.

We really appreciate your interest in the Kenan Institute and welcome your comments and questions on our work and our programs.

Sincerely,

A handwritten signature in black ink, appearing to read "Ruben G. Carbonell".

Ruben G. Carbonell

OVERVIEW OF GOALS

The Kenan Institute for Engineering, Technology & Science (KIETS) aligns its goals with NC State University strategic plan goals. KIETS also has focus areas of its own. Those goals and how KIETS has accomplished them through its support of varied programs and initiatives are outlined in this document.

GOAL 1: Empower Students for a Lifetime of Success and Impact

KIETS Goal: Identify and support NC State student focused initiatives and novel educational approaches to enhance undergraduate and graduate education.

ACCOMPLISHMENTS

KIETS Climate Leaders Program

The KIETS Climate Leaders Program (CLP) led by its Director Amanda Mueller and Senior Faculty Fellow Professor Jeremiah Johnson supports student scholars' engagement with leaders and organizations working on climate change solutions to help empower, educate and inspire young people to embark on careers and become innovative leaders in



mitigating climate change. FY 2023-24 spans two CLP cohorts. The 15 students in the 2023 cohort completed their program year including their internship placements and approached climate change in innovative ways to improve water quality, biodiversity, agriculture, carbon capture/sequestration, energy and material alternatives, landscape and building design, public policy, and environmental justice. The 14 students in the 2024 cohort are approaching climate change in innovative ways to improve agriculture, forest conservation, risks from infectious diseases, carbon capture sequestration, energy hubs and

alternative energy sources, flood modeling and flood mitigation/adaptation, landscape design, community engagement, public policy, and environmental justice. 15 NC State students (3 undergraduate, 12 graduate), representing 6 NC State Colleges, were part of the 2023 cohort and 14 NC State students (2 undergraduate, 12 graduate), representing 6 NC State Colleges are part of the 2024 cohort. The 2nd Annual Climate Leaders Program Fall Symposium, "Think and Do: Climate Challenges and Solutions" was held in conjunction with NC State's Energy Week, September 28-29, 2023.

Technology, Entrepreneurship and Commercialization (TEC) Program

In FY 23-24, KIETS actively engaged and advised *TEC program* graduate students regarding their potential initiation and launch of high-tech companies based on technology developed at NC State and other university, government, and industry partners. TEC teams worked on commercialization plans for *Nicelle Technologies* sustainable fibers and *NC Solar Inverters* power conversion systems. During the 2024 NC State annual entrepreneurship competition, former TEC students advised by KIETS representing startup *Loom3D* received a \$2000 award. KIETS Associate Director Raj Narayan served as faculty advisor and executive in residence to these TEC teams.



NC State Social Entrepreneurship Initiative

KIETS collaborated with the *NC State Social Entrepreneurship* initiative to enable students across NC State with opportunities to engage and learn from social entrepreneurs in North Carolina, nationally, and internationally. In FY 2023-



24, the Social Innovation Fellows Program (SIF) welcomed 18 new Fellows, six returning Senior Fellows, three Team Mentors, and over a dozen community leaders who offered pro bono expertise. KIETS Associate Director Raj Narayan served as one of the core faculty team mentors for the Social Innovation Fellows program working closely with Professor Chris Osburn on the *Blue Economy Initiative*. The SIF Blue Economy team developed a collaboration with the UNC-Wilmington Innovation and Entrepreneurship *Alliance for a Blue Economy Program* to develop a Blue Economy report, resource database, and speaker series.

NC State Science Olympiad Student Alumni Group Division B Invitational

KIETS supported the NC State Science Olympiad Student Alumni Group Division B Invitational in FY 2023-24. This inaugural Division B (middle school) Science Olympiad invitational in North Carolina was held on January 20, 2024. 25 teams participated from across NC with 375 students, representing Durham, Guilford, Hyde, Mecklenburg, Moore, New Hanover, Orange, Union, and Wake Counties. Over 200 undergraduate students volunteered on the day of the tournament. The group additionally had 30 test writers encompassing all disciplines in NC State. Many of the volunteers were recruited through scholarship programs, including the Caldwell Fellows and the Goodnight Scholars. The group also recruited volunteers with the help of the National Science Teacher Association at NC State, which promotes opportunities for future teachers. Five Master's and two PhD students volunteered on the day of the tournament. Although most of the volunteers were NC State students, approximately 10 volunteers from UNC Chapel Hill, two volunteers from the College of William and Mary, and one volunteer from Wake Technical Community College participated in the event. Leveraging KIETS support for the inaugural tournament, the organization aims to improve STEM education access for all, regardless of economic status and was able to waive the fee for two underserved (Title I) schools, providing them their first opportunities to participate in an invitational.



2024 NC State University Creating Solutions for the Global Blue Economy Ideation Workshop

KIETS collaborated with Professor Christopher Osburn in the Department of Marine, Earth and Atmospheric Sciences to support the Blue Economy Innovation Program (BEIP) Workshop. The February 2024 *Creating Solutions for the Global Blue Economy* workshop was successfully completed February 23-24 in Morehead City, NC, at the Carteret Community College Hospitality and Culinary Arts Center and the NC State Center for Marine Science and Technology (CMAST). Over 80 attendees were present including 9 faculty, 45 undergraduates, 14 graduate students, and 14 invited speakers. The BEIP includes members from the KIETS Climate Leaders Program, First Flight Venture Center, and Sea-Ahead, Inc. The overall goal of the program is to expose students to innovation and entrepreneurship in support of a sustainable and equitable blue economy. North Carolina is ideally positioned to create a US mid-Atlantic sustainable blue economy, via a bluetech innovation cluster by tapping North Carolina's diverse and broad ocean-connected resources.



Coastal Resilience and Sustainability Initiative Coastal Community Intensive Training (CCRIT) Program

The NC State Coastal Resilience and Sustainability Initiative (CRSI) led by Professor Erin Seekamp is part of the Provost's Office of University Interdisciplinary Programs. The CRSI is leading the Coastal Community Resilience Intensive Training (CCRIT) program in collaboration with the KIETS Climate Leaders Program led by Amanda Mueller. In FY 2023-24, the CCRIT program secured its partnerships with Conservation Corps North Carolina, creating a call for applications, crafting and using an application rubric, and hiring 6 AmeriCorps 10-week positions (Assessment Coordinators), all of whom are NC State students. The CCRIT also secured program development, implementation, and student mentor leads: Rebecca Ward (Coastal Resilience and Sustainability Initiative postdoctoral scholar) and Georgina Sanchez (Center for Geospatial Analytics research scholar). The CCRIT partnered with the North Carolina Office of Recovery and Resilience (NCORR) to identify and select Jones County as the region for Year 1 participating communities. The CCRIT program will annually support six (6) AmeriCorps interns (internship stipend funding provided by the Conservation Trust for North Carolina) to support these capacity limited communities.



GOAL 2: Ensure Preeminence in Research, Scholarship, Innovation and Collaboration

KIETS Goal: Identify programs that support faculty research efforts, promote career development, and help enhance the research infrastructure at the university.

ACCOMPLISHMENTS

KIETS is supporting several research programs involving NC State faculty and students:

Bioseparations/Bioprocessing Development Center (BBDC)

KIETS supported the *Bioseparations/Bioprocessing Development Center* (BBDC) initiative led by KIETS Director Dr. Ruben Carbonell in partnership with BTEC. The BBDC funding provided by the Kenan Institute is helping BTEC staff, graduate and postdoctoral students participate in industry analytical and process development projects, which are not funded by the State. BTEC provides matching funds in the amount of \$2.5 million in facilities for this effort. In addition, BTEC is providing leverage in the amount of \$350,000 per year in staff salaries to support the analytical and process services program. BTEC has over \$300,000 in bioprocess services projects for small and large companies in NC. BBDC also enabled BTEC to succeed in getting three major grants from the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL), and more recently, from the Clean Energy Smart Manufacturing Institute (CESSMI) and the Bio-industrial Manufacturing Institute (BioMADE). In addition to participating in several NIIMBL grants with NC State faculty, BTEC has initiated a long-term contract with NIIMBL to develop a testbed for studies on adaptive process control methodologies for the production of biopharmaceuticals and the development of process and raw materials data ontologies that can be disseminated to NIIMBL companies. This program will provide BTEC with approximately \$1.3 million in new equipment, and several hundred thousand dollars a year during the next five years for support of personnel, supplies and other related expenditures. The services provided by BBDC are playing an increasingly important role in the ability of NC State to establish new partnerships and develop new proposals for future funding from industry, non-profits, and federal sources.



BTEC/NIIMBL Big Data Project

KIETS supported the BTEC/NIIMBL Big Data Project in FY 2023-24. The project aims to accelerate the development and adoption of data-driven innovation and standards to increase the productivity, speed, and resilience of biopharmaceutical manufacturing. Biopharmaceuticals, such as numerous medicines based on monoclonal antibodies (mAbs), are significantly



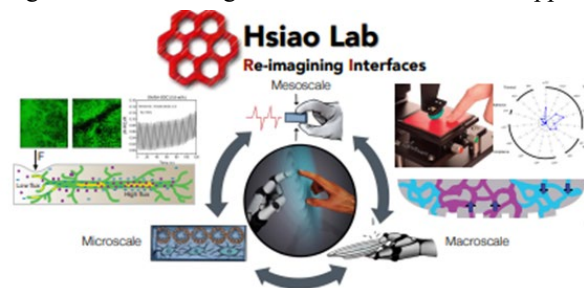
improving health outcomes for the millions of patients around the world who use them. The portions of NIIMBL's Big Data project being conducted by BTEC – which BTEC refers to as the Big Data Phase 3 project - commenced in March 2024 and currently is in progress. The first batch of bioreactor runs have been executed, samples were collected and analyzed. The health benefit of biopharmaceuticals such as monoclonal antibodies is significant, with biopharmaceuticals used to treat a range of diseases, including but not limited to diabetes, various cancers, stroke, heart attack, multiple sclerosis, rheumatoid arthritis and a host of other autoimmune

diseases, various eye diseases, etc. KIETS is supporting a portion of the total cost share required by NIIMBL.

Reimagining Soft Materials for Haptic Engineering Initiative

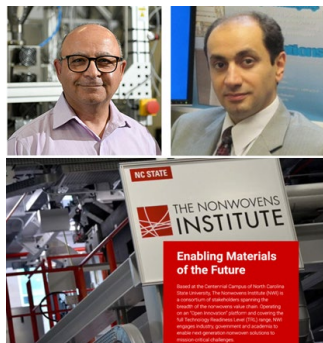
KIETS supported NC State Chemical and Biomolecular Engineering Professor Lilian Hsiao's research program centered around intelligent soft materials focused on enhancing virtual reality through haptic materials that can alter the sense of touch to the user. Dr. Hsiao's project addresses NC State's strategic research area in "Enriching the Human Experience" as well as in "Secure and Intelligent Systems". In FY 2023-24, Dr. Hsiao's group developed new fundamental understanding of how the surface structure of molecular additives are affected by the pressures and shearing action experienced by wearable devices and how their structure subsequently explains the generated energy and tactile sensation.. These devices will pave the way for a sustainable future, where energy can be generated from large-scale ambient motion as opposed to harmful environmental extraction of chemical fuels.

KIETS funds support Dr. Hsiao's graduate students working towards wearable energy harvesters using triboelectric effects generated by polymeric substrates. Dr. Hsiao's research complements the efforts of a startup company called X-MED Hydrogels, which will commercialize hydrogel fibers that are tailored for stable and long-duration release of drug cocktails to burn wounds.



Modeling Electrostatically Charged Filters Loaded with Liquid Aerosols

KIETS supported Professor Hooman Tafreshi in the NC State Department of Mechanical and Aerospace Engineering along with Dr. Behnam Pourdeyhimi, Director of the NC State Nonwovens Institute (NWI) who are collaborating to address the need for efficient, sustainable, and affordable aerosol filter manufacturing. Despite its widespread applications, aerosol filtration has remained an empirical trial-and-error-based art in desperate need of a design theory and a generalizable manufacturing methodology. Professors Tafreshi and Pourdeyhimi are developing a computational model to simulate the process of charging a filter. The project provided support for a postdoctoral researcher, Dr. Sashank Gautam and started in January 2024, and since then, the research team has developed an in-house computer program to simulate liquid droplet deposition and redistribution in a fibrous filter. With these effects included in the model, the PIs will be able to quantify the changes in the collection efficiency and pressure drop of the filter caused by liquid deposition. Similar models will also be developed for hydrocharging and triboelectric charging of nonwovens. The success of this project can help to design and manufacture more resilient facemasks and HVAC filters, and thereby can help to reduce the spread of airborne diseases and help the health and wellbeing of the society. KIETS leverages support from the NWI.



GOAL 3: Expand and Advance our Engagement with and Service to North Carolina and beyond, defining the standard for a 21st-century land-grant University

KIETS Goal: Support strategic partnership among industry, state government, federal agencies, and state school districts to enhance STEM education in our schools.

ACCOMPLISHMENTS

Kenan Fellows Program for Teacher Leadership (KFP)

From the 2022-2023 cohort of Kenan Fellows to 2023-2024 cohort, KFP has expanded the number of Fellowships provided from 24 to 38. Much of the expansion in the number of educators served is a product of new partnerships with statewide initiatives including the STEPS4Growth Initiative (8 Fellows) and SparkNC (4 Fellows). These 38 Fellows hail from 23 North Carolina counties; three of the counties are new to KFP: Cabarrus, Gates, Halifax. Twenty-four members of the new cohort teach in low-income (Title I) schools, twenty-eight are female, ten are male and thirteen are lateral entry teachers. More than half of this cohort are from rural communities and the majority teach in high school or middle school; seven teach at the elementary level. Funding partners for the Fellowships included Biogen Foundation, Burroughs Wellcome Fund, Duke Energy, Dogwood Health Trust, Goodnight Educational Foundation, Kenan Institute for Engineering, Technology & Science, North Carolina Department of Environmental Quality, North Carolina Department of Public Instruction, North Carolina's Electric Cooperatives and Randolph EMC, North Carolina Farm Bureau and Brunswick County Farm Bureau, NC State Climate Office, Meta, NSF grants to Dr. Toshi Hige and Dr. Amy Maddox of UNC-Chapel Hill, SparkNC, the STEPS4Growth Initiative at NC A&T University, and the Whole Community Health initiative. A complete list of the universities, industries, and foundations that provide support for the KFP through funding and/or hosting/mentoring Fellows can be found at <https://kenanfellows.org/partners/> and <https://kenanfellows.org/mentors/>. In FY 2023-24 KFP began piloting two new outreach initiatives, Not Your Average PD (NYAPD) and STEMwork Sprint. STEMwork Sprint provides educators the opportunity to earn micro credentials, and enough Continuing Education Units for a full, five-year teaching license renewal. Not Your Average PD (NYAPD) leverages the instructional expertise of KFP alumni to provide one-hour, live streamed professional development (PD) sessions to anyone with an internet connection. As of April 16th, 2024, the three NYAPD sessions have collectively reached 105 education professionals in more than thirty NC counties and eight states. KFP also published its seventh issue of JoITL in December of 2023, which included seven articles: *JOITL Vol. 7, No. 1*. Since the journal was founded in 2016, KFP has published articles from 20 national universities. KFP in collaboration with their Board of Advisors has been working on a strategic plan to guide the development of the program over the next five years. The strategic plan was adopted by the KFP BOA at their May 2024 meeting.



NC Children's Museum

In FY 2023-24, KIETS supported the Kidzu NC Children's Museum initiative. With KIETS support, Kidzu has been gathering statewide stakeholders to develop the vision of the NC Children's Museum. The Kidzu Children's Museum (current operating name) was awarded \$250,000 through the North Carolina Department of Natural and Cultural Resources (DNCR).

This funding will support the expansion to become the North Carolina Children's Museum through staffing and operations support. Kidzu Children's Museum is in the process of purchasing 45 acres at 510 Mt. Carmel Church Road in Chapel Hill for its new museum home. The property will be home to an early learning campus with indoor and outdoor programming for children – birth through teens, their caregivers, educators, and researchers. Simultaneously, the digital campus of the NC Children's Museum is being developed with an initial framework that is platform independent, and the museum is actively seeking private philanthropy with a digital partner to build the initial designs.



Kidzu has also developed a partnership and collaboration with the Kenan Fellows Program for Teacher Leadership and is hosting a Kenan Fellow in FY 2024-25. Among the partners supporting the NC Children's Museum initiative are the Kenan Charitable Trust, Burroughs Wellcome Fund, National Endowment for the Arts, North Carolina Arts Council, Kohl's National Giveback Initiative, Institute of Museum and Library Services – Museums for America, GlaxoSmithKline Ribbon of Hope, The Grable Foundation, Frances R. Dewing Foundation, and the Orange County Partnership for Young Children.

KIETS Goal: Seek and support efforts that will inform research, public policy and engagement for the benefit of North Carolina and the Nation.

ACCOMPLISHMENTS

NC Coastal Federation Newport River Estuary Protection and Restoration Strategic Plan

The NC Coastal Federation (NCCF) is working with key partners to develop a watershed action plan for the Newport River. In FY 2023-24, KIETS support enabled the NCCF and NC State team to finalize the draft watershed plan. The team shared the plan with local government partners (Newport, Morehead City, Beaufort and Carteret County) for their review and input. The draft plan provides an overview of the past, present, and projected water quality conditions of the Newport



River, as well as methods and strategies intended to reduce the rate and volume of polluted stormwater runoff to improve water quality and mitigate flooding. As part of an effort to begin implementing recommendations within the draft watershed plan, the Federation worked in partnership with the N.C. Coastal Land Trust to delineate a 3,000-acre protected and restored riparian buffer along the north shore of the estuary near the community of Mill Creek. Funding for the first land acquisition has come from the N.C. General Assembly, the N.C. Land and Water Fund, U.S. Fish and Wildlife Service and the U.S. Department of Defense (DoD). NC State researchers Dr. Natalie Nelson and Dr.

Angela Harris, and PhD student Julia Harrison prepared a water quality sampling and analysis report regarding hotspots of contamination along the main stem of the Newport River. The Federation is partnering with the KIETS Climate Leaders Program to host a scholar in the summer of 2024 at the Federation's Central Office. Swarna Chowdhury, NC State PhD Student in Environmental Engineering, will help implement the watershed plan in the summer of 2024. She has expertise in coastal modeling that evaluates coastal hydrodynamics and sediment transport in the face of different environmental and anthropogenic activities, which include extreme events like hurricanes, aquatic habitat changes, shoreline migration and aquaculture. The Federation is also hosting a Kenan Fellow teacher in Summer 2024 at their Central Office.

NC Sea Grant /WRR/ NC Space Grant Community Collaborative Research Grant Program

KIETS collaborated with the NC Sea Grant in support of the Community Collaborative Research Grant (CCRG) program to address priority coastal issues in the state through strategically linking local ecological knowledge (LEK) sources with academic experts in the field. For the FY 2023-24 solicitation, 17 applications were received proposing over \$500,000 worth of work. This is the highest ever number of applications for the CCRG program. Projects awarded in April 2024 include Phil Bresnahan (UNCW), *Hydrological Connectivity: Improving Coastal Literacy and Resilience in Classrooms and Communities in the City of Wilmington*; Emily Berglund (NCSU), *Direct Potable Reuse for NC State's Centennial*

Campus: Exploring Water Quality Needs and Regulatory Pathways; Kimberly Jones (Brunswick Community College) *Bottlenose Dolphin Distribution, Abundance and Health along the Brunswick County Coast/Cape Fear River Region of North Carolina;* Chris Osburn (NCSU), *Organic Nitrogen Sources in Tributaries to the Chowan River from the Town of Edenton after Rain Events;* Kathryn Stevenson (NCSU), *Investing in Teacher Expertise to Scale up a Resilience Curriculum.* The FY 2023-24 RFP also invited collaborations with the Kenan Fellows Program for Teacher Leadership as well as the KIETS Climate Leaders Program to more systematically align with KIETS initiatives and priorities. Two of the awarded projects (Jones and Stevenson) include collaborations with the Kenan Fellows Program. KIETS Associate Director Raj Narayan served on the CCRG review and selection committee.



GOAL 4: Champion a Culture of Equality, Belonging and Well-Being in All We Do

KIETS Goal: Seek opportunities for enabling equality, belonging and well-being, maximizing efficiency and effectiveness, enhancing resources for KIETS operations and continuously improving services for our stakeholders and partners.

ACCOMPLISHMENTS

Enabling Equality, Belonging and Wellbeing

The Kenan Fellows Program (KFP) for Teacher Leadership integrates procedures, support mechanisms, and professional development that prioritizes equality, belonging and well-being as a core program element. Beginning in 2019, KFP has partnered with the Burroughs Wellcome Fund (BWF) to create seven Kenan Fellowships that support this goal. These Fellowships have supported asset mapping with the STEM Ecosystems in NC, partnered with the Dudley Flood Center, participated in the Color of Education Summit, and the Governor’s DRIVE Summit. Mark Townley, KFP Associate Director, serves on the Governor’s Teacher Advisory Committee and has contributed to planning the DRIVE Summit. The NC State Office of Equal Opportunity, Alfred Mays at the Burroughs Wellcome Fund, the NC DPI Office of Educator Engagement, No Kid Hungry, and Village of Wisdom mentored these KFP Fellows. In 2023, KFP added two further Fellowships, funded partly by the Burroughs Wellcome Fund. One Fellowship with the Southern Appalachian Wilderness Stewards supported a Kenan Fellow working to ensure all students and community members feel safe outdoors. The other, in partnership with LatinXEd, supported a Kenan Fellow focused on building community connections and engaging bilingual educators through the development of bilingual informational materials for the Fellow’s school. To expand the impact of KFP’s partnership with BWF and to expand KFP’s investment to include pre-service teachers, in 2024, KFP is expanding its partnerships with BWF to include the NC Teaching Fellows programs at NC State and NC A&T University to create four new Fellowships. These Fellowships will focus on creating and implementing focused professional development workshops for the 100+ pre-service Teaching Fellows served by the two universities.

The KIETS Climate Leaders Program (CLP) aims to build a network of Scholars comprised of committed, emerging, innovative leaders focused on finding solutions to mitigating or reversing the negative effects of climate change. In FY 2023-24, the CLP continued its outreach to the colleges and student programs that serve a varied population across campus. The 2024 CLP cohort of 14 students includes six international students, students from five of our 10 Colleges and 9 women/5 males. In preparation for the 2025 cohort applications, CLP will partner with additional groups on campus that work to provide equitable access to all NC State students (e.g., Shelton Leadership Center, TRIO Programs, Living and Learning Villages, NC State Campus Community Centers, etc.). In establishing the cohort each year, the selection committee is charged with creating an interdisciplinary group. Each cohort has expressed that they have learned from each other’s lived experiences through their career and education paths, program internships, cultural and ethnic contributions, and personal interests and hobbies.

Collaborating on University Wide Initiatives

KIETS collaborated with the Office of the Provost in support of the KIETS Climate Leaders Program as well as with the NC State Coastal Resilience and Sustainability Initiative. KIETS support for the Climate Leaders Program is leveraged with complementary support from the Office of the Provost. KIETS also continued its collaboration with the Vice Chancellor for Research in supporting the Research Innovation Seed Fund (RISF) Program. KIETS also continued to work collaboratively with the NC State Advancement on the NC State Day of Giving to identify and develop resources for priority initiative such as the Kenan Fellows Program. KIETS supported the Goodnight Scholars and Caldwell Scholars

annual interviews providing space and organizational support. KIETS University Program Associate Tara Spivey helped organize and support the annual interviews, which were held at the Kenan Institute offices in Spring 2024. KIETS also engaged with NC State Innovation and Entrepreneurship (TEC Program and Social Innovation Fellows), the Office of University Interdisciplinary Programs (Long View Initiative), Centennial Campus Partnerships Office (Daugherty Initiative) and Office of Research Commercialization (ICorps and Spark Plug) initiatives.

Improving Program Effectiveness, Outcomes and Impact

The Kenan Fellows Program (KFP) for Teacher Leadership continues to refine its processes and adapt novel strategies for improved program effectiveness, outcomes, and impact while implementing strategies for long-term sustainability. The NC State Friday Institute conducts the KFP annual program evaluation. In addition to this external evaluation, the KFP gathers data regarding the impact that the current cohort of Fellows is having on students, teachers, and other key stakeholders. At the close of FY 23-24, each Kenan Fellow had completed 80 hours of professional development and a three-week internship with their business/industry or university mentor. In addition, the KFP impact log reflects the following activities since they began the Fellowship in June: The KFP reported that the 2023-24 cohort reached over 8,695 students and 1,650 other teachers, 20 state and regional presentations given to more than 1400 attendees, \$158,935 in grant funding secured, and eight Teacher of the Year award recipients. In the Fall of 2023 KFP embarked on an effort to (1) construct and administer the technology undergirding their application system and to (2) significantly increase the number of teachers applying for the 38 available 2024-25 Kenan Fellowships. To increase the number of registrants and applicants, KFP's Assistant Director of Communications, Amneris Solano, authored and executed a year-long strategic marketing campaign that included the commission of a video focused on recruiting teachers. As a result of these efforts, KFP saw a 314% increase in the number of teachers registering to apply for Fellowships and a 100% increase in the number of completed Fellowship applications

Leveraging KIETS Resources

In FY 2023-24, KIETS' core operating and program investments of \$2,086,371 were leveraged by approximately \$35,557,286 in complementary funding from NC State University and external partners. While only a portion of these funds flows directly through KIETS, the resulting impact of the Institute's ability to enable leveraged support for its programs is significant and continues to grow annually. KIETS continued to maintain a healthy and active portfolio of 24 supported projects representing a 68% turnover ratio and 21% new projects at the start of FY 23-24.

GOAL 5: Improve University Effectiveness Through Transformative Technologies, Cutting-Edge Processes and Actionable Data

KIETS Goal: Identify, develop, and foster new interdisciplinary approaches in research, education, outreach that address the Grand Challenges of Society.

ACCOMPLISHMENTS

National Institute for Innovation in Manufacturing Biopharmaceuticals

KIETS supported the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL), a \$70M collaborative agreement over five years from the National Institute for Standards and Technology (NIST). KIETS Director Ruben Carbonell serves as NIIMBL's as a Senior Technology Strategist. From 2017-2023, NC State University has received approximately \$13.8 million in federal funding and \$11.2 million in State cost share for project and operational expenditures. The early support of the Kenan Institute for the BBDC program at BTEC played a key role in positioning BTEC to become a major player in biopharmaceutical manufacturing nationwide and taking a leadership position within NIIMBL. NIIMBL has been expanded for another five years with a budget of \$70 million from NIST, and an additional \$83 million dollars from the ARP budget for COVID-19 related efforts. New efforts are under development in vaccine technologies, gene and cell therapy, applications of big data to biomanufacturing and process intensification and control. On September 29, 2023, the Director of NIIMBL, Kelvin Lee, and other members of the



NIIMBL leadership convened a group of NIIMBL members from NC at the North Carolina Biotechnology Center to discuss NIIMBL progress and future activities. Dr. Lee mentioned the critical role that NC State played in the proposal that led to the establishment of NIIMBL, and mentioned that without the efforts of KIETS Director, Dr. Ruben Carbonell,

NIIMBL would not exist. This was followed by a visit in March 29, 2024 to NC State and the laboratories of NC-VVIRAL to explore additional use of these facilities in NIIMBL-led projects.

Research Innovation Seed Funding Program

KIETS provided support for the *Research Innovation Seed Funding (RISF) program*, which is a collaboration with the Vice Chancellor for Research that assists researchers in developing new and innovative pilot projects that have the potential for future support from government agencies, corporations, or foundations towards large-scale research centers or industrial consortia. For reported outcomes since 2010, the RISF program has received 456 proposals and awarded 80 projects. These RISF projects have generated approximately 183 follow-on proposals to external organizations of which 50 received awards totaling \$39,437,959 and leveraged the total ORI/KIETS awards of \$2,256,327 during the corresponding period. In addition, 109 students were supported, 323 publications or presentations made, and 41 workshops/symposia held during that period. KIETS Director Ruben Carbonell and Associate Director Raj Narayan served on the RISF selection committee FY 2023-24 RISF proposals in progress include the following: Dr. Orlando Arguello-Miranda, College of Agriculture and Life Sciences, *FungA.I.: Algorithms and Frameworks to Mitigate Fungal Spore Risks*; Dr. Veljko Dubljevic, College of Humanities and Social Sciences, *Embodied Social AI: Personal Robots for Aging at Home*; Dr. Ke Huang, College of Veterinary Medicine, *Vortex-Ultrasound Facilitates Cardiomyocyte Uptake of Cardiac-Targeting MSC-Exosomes for Heart Repair*; Dr. Arion Kennedy, College of Agriculture and Life Sciences, *Molecular Mechanisms of Fructose Induced Metabolic Disease*; Dr. Edgar Lobaton, College of Engineering, *AI-Driven Digital Twin of Human Gait for Prosthesis Control and Rehabilitation*; Dr. Natalie Nelson, College of Agriculture and Life Sciences, *Engaging Oyster Growers to Expand Coastal Monitoring*; Dr. Hao Su, College of Engineering, *Improving Safety and Efficacy of Minimally Invasive Endovascular Surgery via Robotics*; Dr. Liming Xiong, College of Engineering, *Architecting the Microstructure in Chemically Modified Cellulosic Nanocomposites Towards Tunable Mechanical and Biodegradable Performance: Multiscale Simulations and Experiments*.



Comparative Medicine Institute Promoting Interdisciplinary Research Project



KIETS collaborated with the NC State Comparative Medicine Institute (CMI) to provide clinical and research opportunities to professional students, graduate students, clinical residents, postdoctoral fellows, and undergraduates. Led by CMI Co-Directors Professor Jorge Piedrahita and Ashley Brown, the CMI holds the “Think, Collaborate & Do” Ideation event. The goals of this initiative are to encourage interdisciplinary collaborations among research groups, provide seed funding to develop preliminary data that can be used to obtain extramural funding, provide graduate students and postdoctoral fellows with the opportunity to develop their own projects and get experience in grant writing and project management, and incentivize the development of larger collaborative groups that can be competitive for NIH program projects. In FY 23-24, CMI and KIETS supported seven faculty projects and four student projects. KIETS support is leveraged with funding

from the CMI, Data Sciences Academy, Genetic and Genomics Academy, Office of University Interdisciplinary Research, Provost Office, Office of Research Innovation, Colleges of Veterinary Medicine, College of Engineering, College of Sciences, College of Textiles and College of Agriculture and Life Science.

BTEC Professional Development Course Marketing Initiative

In FY 2023-24, KIETS supported the BTEC Professional Development Course Marketing Initiative to help BTEC better understand the market for professional development training in biomanufacturing. The primary year-one goals were to identify a research partner within the NC State University Poole College of Management and to refine research scope and study objectives. In Spring 2024, BTEC completed an agreement with Dr. Stacey Wood, Langdon Distinguished University Professor of Marketing, Executive Director, Consumer Innovation Consortium, Department of Business Management, Poole College of Management. BTEC will work with Dr. Poole in year two to meet the goals of the study. The marketing study will help BTEC expand its reach for online, on-demand training. It will also help BTEC maximize the value of hands-on training within the BTEC facility by underpinning curriculum planning with courses better aligned with customer requirements. This project directly supports BTEC’s strategic goal to enhance the knowledge and skills of biomanufacturing industry professionals.

The Long View, Conversations on the Future

KIETS supported *The Long View, Conversations on the Future* initiative led by Professor Rob Dunn, NC State Senior Vice Provost for Interdisciplinary Programs, in collaboration with Greg Raschke, Director of NC State Libraries to help guide future planning for NC State’s diverse portfolio of interdisciplinary centers. In FY 2023-24, the Long View Initiative engaged freelance science journalist JoAnna Klein to conduct Long View Interviews and communicate insights to various audiences, both within the university and to the general public. She catalogued nearly two dozen topics including emerging trends and breakthroughs in research and industry, ranging from applications of Artificial Intelligence in education to human-centered transportation, the energy transition, evolving urban and rural ecologies, lab-grown organs for food and transplant, and naturally or artificially shaping microbes in the home and body for health. In an effort to both (1) generate more future-facing content and (2) engage graduate students, the Long View Podcasts project is under development. This effort invites NC State graduate students to submit a pitch for a podcast which would anticipate and explore the future of some aspect of science or technology. Some of the topics of the selected podcasts include: the future of smart textiles; urine



diversion (also known as “peecycling”) as a novel approach to source phosphorus for fertilizer; and ethical issues associated with AI and “self-driving labs.” A public event focusing on *Envisioning Urban Futures* was held at the Hunt Library on October 18, 2023, and had a full audience with over 240 attendees. The event featured a series of short, TED-style talks, future-focused food and drink, demonstrations, poster presentations, music, and artistic interpretations of envisioned urban futures. Professor Dunn reported that 32 faculty members, 6 undergraduates, 35 graduate students, 3 K-12

teachers, and 13 K-12 students have been engaged in Long View activities and events in FY 2023-24. KIETS support leverages cash and in-kind commitments from the NC State Libraries, SE Climate Adaptation Science Center, Comparative Medicine Institute, TriCEM, Sigma Xi, NC Museum of Natural Sciences, Danish Natural History Museum, and the College of Agriculture and Life Sciences.

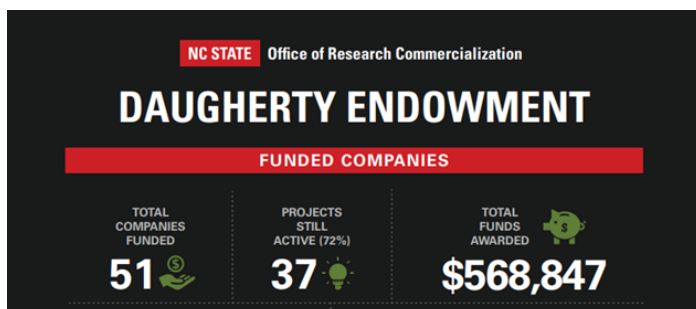
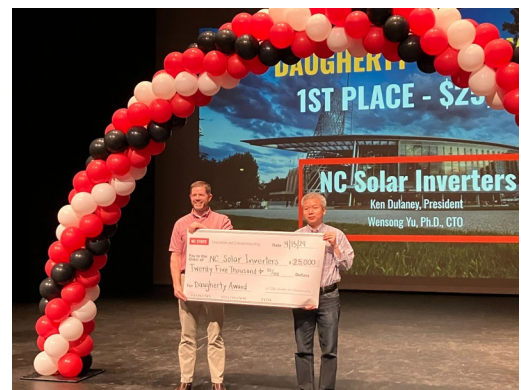
GOAL 6: Lead in Developing Innovative Partnerships, Entrepreneurial Thinking and Applied Problem-Solving

KIETS Goal: Support the launch of high technology start-ups based on NC State innovations and support technology commercialization programs at NC State, North Carolina and the Nation.

ACCOMPLISHMENTS

Richard and Marlene Daugherty Centennial Campus Entrepreneurism Endowment

KIETS provided matching funds for the *Richard and Marlene Daugherty Centennial Campus Entrepreneurism Endowment* that supports startup companies initiated with university intellectual property. The Daugherty Initiative continued its collaboration with the NC State Innovation and Entrepreneurship to feature the selection of the Daugherty Initiative recipients as part of the NC State Venture Pack Challenge. The 2024 Daugherty Initiative track at the NC State eGames supported three awards and took place on April 15, 2024. The 2024 Daugherty Initiative awardees are as follows: **1st Place** – \$25,000 – *NC Solar Inverters* is building a more reliable inverter for utility and large commercial PV installations; **2nd Place** – \$15,000 – *MithrilAI* is a semiconductor company that designs trusted AI/ML hardware for safety and security-critical applications; **3rd Place** – \$10,000 – *Teen Health*



Research is an early-stage woman-owned startup empowering teens and families for healthier relationships through communication skills. Since 2008, the Daugherty Initiative has invested \$568,847 in 51 companies with 72% of the companies still in business. Cumulative follow-on funding received by the awardees since 2008 is over \$66 million. 2023 Daugherty Initiative first place awardee Hoofprint Biome received

state and federal funds including an NSF SBIR, USDA SBIR, Breakthrough Energy Fellowship, and venture capital totaling over \$3.9 million. 2023 Daugherty Initiative second place awardee Vetletics, Inc. received \$50K support from a NC IDEA grant. 2023 Daugherty Initiative third place awardee SelSym Biotech received \$2 million in funding from a Department of Defense grant and was invited to pitch at the 2024 CED Venture Connect conference. The Daugherty Initiative is managed by the NC State Office of Partnerships. KIETS Director Ruben Carbonell and Associate Director Raj Narayan serve on the Daugherty Initiative Governance and Selection Committee.

NC State Office of Research Commercialization SBIR/STTR Spark Plug Initiative

KIETS collaborated with the NC State Office of Research Commercialization (ORC) in support of the SBIR/STTR Spark Plug Initiative. The SBIR/STTR Spark Plug program is a coordinated and formalized strategy to assist researchers in NC State startup companies help write the SBIR/STTR proposals. The goal is to increase university startup's chances of winning non-dilutive grant funding from the Federal SBIR/STTR Programs. The Spark Plug Program funded five companies in FY 2023-24 including the following: *Redeem Solar Technologies*: Hydrogen storage technology - long duration storage and economic H2 transporting in liquid, eliminates the need for high pressure storage or expensive materials; *Nicelle Technologies*: Recycling / upcycling acrylic utilizing lignin for creation of fiber products for faux hair and other fiber markets; *Ancilla Biosciences*: Harnessing the natural function of CRISPR to develop a new class of Live Biotherapeutics (LBPs) and other bacterial products with engineered immunity against destructive viruses; *Grade-It*: Computer application to produce, administer, and score constructed-response mathematical problems ("word problems") for partial credit; *NC Solar Inverters*: Building a more reliable inverter for utility and large commercial PV installations. Since its launch in late 2019, the Spark Plug program has funded 20 NC State startups that have gone on to generate over \$3.6 million in SBIR/STTR funding. In FY 2023-24, the Spark Plug program engaged 20 faculty, four graduate students, and two post docs. KIETS Associate Director served as a faculty mentor for the Nicelle team in the Fall 2023 TEC program course and the NC Solar Inverters team in the Spring 2024 TEC program course.



NC State Office of Research Commercialization NSF ICorps Program

In FY 2023-24, KIETS collaborated with the NC State Office of Research Commercialization (ORC) on the NSF ICorps program in support of the Summer 2023, Fall 2023 and Spring 2024 cohorts. The total program participants included 30 teams and 89 total participants. Five new NC State startups were launched in FY 2023-24 upon completion of the ICorps program including *WearTech, LLC, Structeryx, Inc, Nicelle Technologies, Flip Biosystems* and *AVEX Motion*. ORC reported that 30 faculty members, 8 undergraduate s, 37 graduate students, and 6 post docs participated in the ICorps Program. Duke University, UNC Greensboro, and Clemson University each had a team participating during FY 2023-24.

As of April 2024, teams completing the NC State Regional I-Corps Program have generated a cumulative \$63.2M in follow-on funding from grant and investment sources. Participating teams have gone on to form 35 new startup companies and have submitted 54 SBIR/STTR awards, 22 of which have been awarded. NC State also secured a partnership with Clemson University to provide I-Corps training for Clemson-based research teams. This will serve to increase the flow of I-Corps teams through NC State's program, generate new collaboration opportunities, and grow I-Corps programming in the Southeast region. Three NC State startups attended CES 2024 in Las Vegas in January 2024 to present their



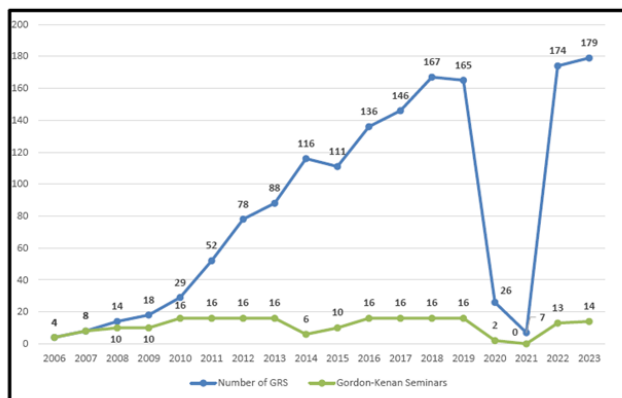
companies/projects on the trade show floor at Eureka Park. All companies were graduates of NC State's I-Corps program and made connections with investors and customers at the event. KIETS Associate Director Raj Narayan serves as an NC State I-Corps ORC faculty instructor and advises the mentors and entrepreneurial leads in the NC State ICorps program.

GOAL 7: Elevate the National and Global Reputation and Visibility of NC State

ACCOMPLISHMENTS

Gordon-Kenan Graduate Research Seminars (GKGRS)

A Gordon-Kenan Graduate Research Seminar (GKGRS) is a two-day meeting designed specifically for graduate students, post-doctoral students, and other scientists with comparable levels of experience. More than 80% of Gordon Research Conferences now have a corresponding Gordon Research Seminar. Dr. Nancy Gray, GRC President reports that the GRC Board has approved requiring all conferences to hold a corresponding GRS beginning in 2024. A total of 178 attendees are



2020 and 2021 meetings were affected by the COVID-19 Pandemic. GRC ran a small sub-set of conferences within the portfolio during this time.

registered to participate in Gordon-Kenan Research Seminars during the months of May and June 2024. Since 2001, Kenan Institute support has helped leverage \$11,273,161 from private & federal sources and helped provide registration and travel support for 4,290 GKRS registrants, roughly 43% of all GKGRS participants. From 2001 to 2022, GKGRS/GRC Chairs have raised \$4,072,666 from federal funding and \$7,200,495 from private industry partners. During that time, 4,712 scientists from North Carolina have attended 3221 GRC conferences or seminars. In addition, NC State University scientists have participated as speakers 307 times and have chaired 20 GRC conferences or seminars. In addition, NC State University scientists have participated as speakers 307 times and have chaired 20 GRC conferences or seminars.

Novo Nordisk Foundation International Collaboration on Bioprocessing (AIM-Bio)

KIETS supported the Accelerated Innovation in Manufacturing Biologics (AIM-Bio) project enabled by funding from the Novo Nordisk Foundation (NNF). KIETS Director Ruben Carbonell and Gary Gilleskie, Director of BTEC, serve as principal investigators for the grant. NC State and BTEC, in conjunction with the Technical University of Denmark (DTU) in Copenhagen, are engaged in an international collaborative research and training program in biomanufacturing science and technology. NC State and DTU developed eight new combined lecture and hands-on short courses aimed at industry professionals on topics that are particularly relevant to the future of biopharmaceutical manufacturing, including the manufacturing of vectors for gene and cell therapies, automation and process control, and analytical methods. Four of these courses are taught by faculty members and staff at both DTU and NC State and offered to students and industry professionals from both Denmark and the US. The program has also established new research projects focusing on technologies of critical importance to biopharmaceutical manufacturing, ranging from cell factory engineering to upstream bioreactor design and optimization, to downstream capture and purification operations. Preparations are underway for a new proposal to the NNF, that would continue the program from 2025 to 2030. A preliminary proposal is under consideration focused on biologics manufacturing technologies that can be extended to bioindustrial applications, and are sustainable, so they can help reduce global CO2 emissions. In the meantime, the current grant has been extended through 2025, and the NNF has shown clear interest in renewing funding after this period. It should be noted that several technologies created with NNF funding have reached the point of commercialization.



Novo Nordisk Foundation Research Proposal Initiative in Partnership with ORI / External Affairs

In FY 23-24, KIETS collaborated with the Office of Research and Innovation (ORI) and External Affairs, Partnerships and Economic Development (EAPED) at NC State University to identify multidisciplinary NC State faculty teams and transformative research concepts that align with the Novo Nordisk Foundation (NNF) 2030 Strategy. The NNF 2030 Strategy centers on three pillars: Health, Sustainability, and Life Science Ecosystem. With support from KIETS, an NC State – NNF liaison, Dr. Brian Hawkins, has been hired to provide institutional focus, development, and management of the Novo Nordisk Foundation relationship with NC State. This includes interactions with Novozymes and Novo Nordisk. Dr.



Leadership from NC State's Office of External Affairs, Partnerships and Economic Development and Office of Research and Innovation share with DTU about strategic research opportunities.

Hawkins supports the successful execution and development of three currently funded projects including Collaborative Crop Resilience Program (CCRP), Accelerated Innovation in Manufacturing in Biologics (AIM-Bio), and Biocatalyst Interactions with Gases (BIG) projects. This is a critical time for NC State relative to developing the relationship with the Novo Nordisk Foundation and the next phase of the Collaborative Crop Research Program (CCRP) and AIM-Bio research program. A current application is under review with NNF for an additional \$7M in bridge funding to support the Collaborative Crop Resilience Program. NC State is currently exploring second generation project opportunities with AIM-Bio. The Biocatalyst Interactions with Gases (BIG) project is in its second year and progressing successfully.

BTEC 2.0 Senior Research Scientist Initiative

With the leadership of KIETS Director Ruben Carbonell and BTEC Executive Director Gary Gilleskie, the Golden LEAF Biomanufacturing Training and Education Center (BTEC) continued to work toward expanding its research and educational programs in an initiative called BTEC 2.0. The Senior Research Scientist will support the establishment of BTEC 2.0 by serving as a liaison to stakeholders and will also contribute directly to the growth of BTEC's research programs by writing research proposals and leading research projects. The Senior Research Scientist position is also integral to the research program being proposed to the Novo Nordisk Foundation (NNF) as the Sustainable and Accessible Manufacturing of Biologics (SAM-Bio) program. SAM-Bio is a follow-on program to the successful Accelerated Innovation in Manufacturing Biologics (AIM-Bio) program already funded by the NNF. Dr. Juan Torres was hired as the Sr. Research scientist and started at BTEC on January 16, 2024 in a part-time role. Dr. Torres has a Ph.D. in Biochemistry and Toxicology from NC State and followed that up with a postdoctoral fellow position in NC State's Chemical Engineering department. He has a wealth of experience in the biopharmaceutical industry, most recently serving as the Chief Quality Officer at Biogen. Dr. Torres is in the process of engaging with a number of companies and is working closely with NCLifeSci (the North Carolina Life Sciences Organization) to realize the vision of BTEC 2.0.



Staff Leadership

KIETS staff also served in leadership and advisory roles in several initiatives at NC State and with external groups.

ACCOMPLISHMENTS

- KIETS Director Dr. Ruben Carbonell served on the RISF Selection Committee, the IEI National Advisory Board, the Daugherty Endowment Governance Committee, the Advisory Board for the FSU-FAMU Chemical Engineering Department, the National Academy of Engineering's Audit Committee, and he is in the NAE Peer Review Committee for Section 3 (Chemical Engineering). He also serves as Senior Technology Strategist for the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) and he is a member of the National Academy of Sciences Board of Chemical Sciences and Technology, helping to guide the future of the nation's educational and technical priorities in chemistry and chemical engineering. Dr. Carbonell is one of the leaders in the AIM-Bio Program, supported by the Novo Nordisk Foundation (NNF), he serves as a member of its Advisory Board and Steering Committee, and is one of the lead principal investigators on the Single Use Devices (SUD) workstream, where he heads a research group on the development of new membrane technologies for high productivity bioseparations. His group recently received support from the Chancellor's Innovation Fund (CIF) and 2ndF to commercialize the technology. Currently, Dr. Carbonell is leading the charge on the development of a new proposal to the NNF that builds on the knowledge generated through the AIM-Bio Program. He also maintains a close working relationship with BTEC and has been instrumental in gathering funding for BTEC from NIIMBL, AIM-Bio and other sources. About a year ago, Dr. Carbonell initiated an effort to establish the NC Facility for Advanced Biomanufacturing (NCFAB) on Centennial Campus, and is currently working with a small group of NC State faculty and staff to win the support of the NC Biotechnology Center, the NC Life Sciences Organization and



major biomanufacturers in NC to make this facility a reality for the benefit of the state of NC, and the university. Dr. Carbonell and his group have published 6 refereed publications in international journals, and has given several oral and poster presentations at international meetings on bioseparations.

- KIETS Associate Director Raj Narayan served as a Professor of the Practice of Entrepreneurship and Executive in Residence in the TEC Program within the Poole College of Management. Mr. Narayan served as a mentor for the NC State Social Innovation Fellows program, the NC Sea Grant CCRG Review Committee, the Daugherty Endowment Governance Committee, the RISF selection committee, and the Wolfpack Investor Network (WIN) Steering Committee. Mr. Narayan was an instructor with the NC State Office of Research Commercialization ICORPS program. Mr. Narayan also served on Board of Advisors of the UNC School of Law Institute for Innovation as well as NC State Engineers Without Borders. He was also an active participant in the NC Eisenhower Fellows and served as Vice President of the NC Eisenhower Fellows Alumni Chapter.
- KIETS Assistant Director for Grants and Finance Cordella Rashid served on the HR Connections Committee, Business Connections Committee, African American Faculty & Staff Organization Committee, the Society for Human Resource Management, and the National Council of University Research Administrators. Ms. Rashid also continued her service on the NC State Staff Senate as a representative of the Chancellor's Unit. Ms. Rashid also served as the selection committee chair for the KIETS Associate Director of Philanthropy recruitment in collaboration with University Advancement.
- KIETS University Program Associate Tara Spivey served as the Hunt Library building liaison team on behalf of the tenants in our Hunt Library office suite. Ms. Spivey also participated on the following committees: NC State Event Planners Council, Hunt Library Partners Meeting Committee, TSS LanTech Meeting Committee, Facilities Liaison Briefing Meetings Committee, Chancellor's Unit Awards for Excellence, and African American Faculty & Staff Organization. Ms. Spivey is also an alumnus of the William C. Friday Fellows program which is a highly respected cross sector leadership program focused on adaptive leadership and impact on our communities statewide.



- Ms. Lindsay Skinner was hired as the KIETS Associate Director of Philanthropy in December 2023. Skinner served as the Associate Director and Interim Director of Annual Giving at UNC Wilmington for the past two years. Before her time at UNC Wilmington, Skinner dedicated seven years to NC State, initially as the Assistant Coordinator of Student and Young Alumni Programs in the Alumni Association, followed by a term as the Assistant Director of Alumni & Friends for the College of Agriculture and Life Sciences.

- Amanda Mueller in her role as Director of the KIETS Climate Leaders Program continued to serve as a collaborator with the Office of the Provost Coastal Resilience and Sustainability Initiative and as co-coordinator of the Climate Change Synergies Workshop (along with the Coastal Resilience and Sustainability Office, Global One Health Academy, and State Climate Office). Ms.



Mueller was invited to give a talk on "Environmental Challenges" as part of North Raleigh United Methodist Church's series on "Environmental Justice as People of Faith." She is also collaborating with Allison Haskins in NC State's Office of Global Engagement on a "Transatlantic Climate Bridge" initiative with the German Consulate in Atlanta and was a guest lecturer AEE 350: Personal Leadership Development in Ag & Life Sciences, a class taught by Dr. Katherine McKee and Abasiama-Arit Aniche. In April 2024, Ms. Mueller was nominated for NC State's Sustainability Award Staff Member Category, and the Climate Leaders Program was nominated for the Department Category.

- Professor Jeremiah Johnson (Department of Civil, Construction and Environmental Engineering) began his term as Senior Faculty Fellow of the KIETS Climate Leaders Program.
- Vance Kite continued as Director of the Kenan Fellows Program. Over the past year, Dr. Kite published *What are They Good For?: The Importance and Value of NGSS Science Practices* in the Electronic Journal for

Research in Science and Mathematics Education. In addition to his publication, Dr. Kite served on the doctoral committee of Jesus Esquibal, a doctoral student in the Department of Science Education at Texas Tech University.

- Amneris Solano, Assistant Director for Communications for the Kenan Fellows Program continued to assist KIETS with supporting KIETS website improvements and social media presence.
- Mark Townley was promoted to Associate Director of the Kenan Fellows Program. He also served on the Governor's Teacher Advisory Committee for Governor Roy Cooper and on the Board of Directors for the Exploris School in Raleigh, NC.
- Carrie Horton, Program Manager for the Kenan Fellows Program STEMwork initiative completed a Graduate Certificate program for Nonprofit Management at NC State in Spring December 2023. Ms. Horton also volunteers as a co-leader for the NC Coastal Pines Girl Scout Troop #11 in Johnston County.
- Ms. Linda Dion was hired as a program coordinator for the Kenan Fellows Program in July of 2023 and continues to encourage curiosity with intention through her work with educators and their students. Mrs. Dion was a 2017-18 Kenan Fellow and has served on the Kenan Fellow Program faculty since 2018.
- Randy Pinion continued his service as the Logistics and Data Manager for the Kenan Fellows Program.
- Kenan Fellows Program Director Dr. Vance Kite served as the Executive Editor, Amneris Solano served as the Managing Editor, and Randy Pinion served as the Copy Editor of the Kenan Fellows Program *Journal for Interdisciplinary Teacher Leadership*.



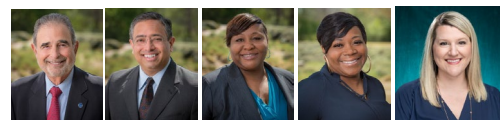
Recommendations and Future Concerns

To build on its past successes, the Kenan Institute requires continued commitment and financial support from its partners including NC State University, the Kenan Fund for Engineering, Technology & Science, and other universities, foundations, and government partners.

In FY 23-24, KIETS remained responsive to stakeholder needs and continued to identify high impact investment opportunities while remaining vigilant of potential impacts to available funding for key initiatives. Among the key priorities for KIETS moving forward remains a focus on grand challenges in global health and climate change. These two areas of focus for KIETS amplify the strategic interests and capabilities of NC State University and its partners toward developing innovative solutions addressing enduring problems in our State, Nation, and the World. KIETS looks forward to building this work in collaboration with key partners including the Provost, Vice Chancellor for Research, and leadership of NC State University's Colleges.

In addition, it remains essential for leadership from within the University, Kenan Fund, and industry to work closely with the Institute's leadership to serve as high-level advocates on behalf of Institute programs such as the Kenan Fellows Program and Climate Leaders Program. This strategic advocacy will help the Institute promote the impact of its programs and build its reputation as an honest broker of best practices in research, education, entrepreneurship, and public policy.

KIETS Staff and Program Leadership



Ruben Carbonell Raj Narayan Cordella Rashid Tara Spivey Lindsay Skinner



Vance Kite Mark Townley Amneris Solano Randy Pinion Carrie Horton Linda Dion Amanda Mueller Jeremiah Johnson

Climate Leaders Program

The KFP will continue leveraging its portfolio of programming to establish a physical footprint in each of the state's 100 counties and a virtual footprint nationwide. KFP continues to engage with school districts, local and national industries, and other partners to build inroads into new geographic locales. The KFP currently receives a small portion of its annual operating budget from a recurring state appropriation. With an eye towards further expanding our services to serve more teachers, KFP is currently working through approved University channels to seek expansion of its recurring state

appropriation to cover the program's operating costs. The KFP has established an endowment fund and will seek to continue to grow that fund to provide long-term support for KFP's operational needs.

The CLP has obtained significant support for its operations from the Office of the Executive Vice Chancellor and Provost and continues to provide valuable internship opportunities for undergraduate and graduate students throughout the university. The CLP is closely linked with other groups and organizations focused on the coastal resilience and sustainability, and in due course, KIETS will consider how the CLP should be integrated more formally as a university-wide initiative. While both the CLP and KFP are important KIETS investments, they make up a considerable percentage of the KIETS programmatic budget each year. KIETS would like to identify additional fundraising opportunities to lower the percentage of these programs on the KIETS budget to fund a wider range of programs at NC State. KIETS will work with its new Associate Director of Philanthropy to make a significant positive impact on KIETS fundraising efforts.

In addition to financial support, the Institute will need continued in-kind support from the University such as the office space provided in the Hunt Library and support from units such as the Office of Advancement, Office of Communications, and Office of Sponsored Programs' Integrated Support Services Center. KIETS continues to maintain very efficient operations with a small staff which poses challenges in managing large-scale events. As KIETS continues to develop its programs, it seeks to leverage and complement its resources from university partners including Special Events and the McKimmon Center to help manage event planning and program implementation. KIETS will also continue to work closely with University Advancement as it seeks resources to leverage its investment in core programs and operations. Ultimately, these are issues related to the sustainability of the Institute and its programs and how the Kenan Institute is regarded in terms of University fundraising priorities.

In the event that there are significant changes in leadership at the Kenan Fund for Engineering, Technology & Science which may coincide with changes in leadership at NC State, the leadership of KIETS will do everything it can to advise the new university and Kenan Fund leadership regarding the role and objectives of KIETS, and how it hopes to serve the university community, and the world at large, in years to come.