



**KENAN INSTITUTE**

ENGINEERING, TECHNOLOGY & SCIENCE

**NC STATE UNIVERSITY**



# KENAN INSTITUTE GOALS AND ACCOMPLISHMENTS FISCAL YEAR 2020-2021

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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 2020-2021 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 tackle successfully the emerging issues of our time. We will 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 will enable individuals and programs at NC State and at other institutions to continue to produce world-class research and scholarship, which will enhance knowledge and learning, produce and support new innovative companies, and inform 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, which appears to read "Ruben Carbonell". The signature is fluid and cursive, written in a professional style.

Ruben G. Carbonell

# OVERVIEW OF GOALS

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

## GOAL 1: Enhance Student Success

- **UNC System Strategic Initiative on Student Success:** Increase degree attainment and ensure value and relevance for students.
- **UNC System Strategic Initiative on Access:** The UNC system must continue its proud heritage of access and student diversity.
- **NC State Strategic Plan:** Enhance the Success of Our Students through Educational Innovation.

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

### ACCOMPLISHMENTS

#### *TEC Program*

In FY 20-21, 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. KIETS Associate Director Raj Narayan served as faculty member and executive in residence to TEC teams. Among the progress made with KIETS support and guidance includes a potential startup company (Vertibra) based on NC State technology developed by Professor Jesse Jur focused on innovative textile printing technology. The Vertibra TEC team placed first in the “Think” category during NC State’s annual EGames winning \$9000 to help launch their initiative.

#### *NC State Social Entrepreneurship Initiative*

KIETS collaborated with the *NC State Social Entrepreneurship* initiative led by the College of Humanities and Social Sciences to provide students across NC State with opportunities to engage and learn from social entrepreneurs in North Carolina, nationally, and internationally. In FY 20-21, the NC State Social Innovation Fellows program continued to thrive in its fifth year of operation and grew its program offering to an outstanding group of 28 fellows, six mentors, and six exciting venture partners. Of particular note, the Social Innovation Fellows received national recognition as the 2021 winner of the United States Association for Small Business and Entrepreneurship (USASBE) Excellence in Co-Curricular



Innovation award. This prestigious award gave special tribute to the program's efforts to recruit and retain female students and students of color - those students typically underrepresented in entrepreneurship courses and offerings. Another significant achievement was development of an academic course offering, *Real Social Change*, a full three-credit course that was offered in the fall of 2020. KIETS Associate Director Raj Narayan serves as one of the core faculty mentors for the Social Innovation Fellows and KIETS Program Associate Tara Spivey served as a mentor and advisor to the Social Innovation Fellows Compost Facility team.

### ***NC State Engineers Without Borders Student Chapter Initiative***

KIETS supported the NC State Engineers Without Borders Student Chapter in FY 20-21. The Guatemala Water Systems (GWS) team continued the implementation of rainwater catchment systems in the indigenous community of Caserio Panhux to provide households with consistent access to clean water. Due to the travel limitations of the COVID-19 pandemic, a team of 15 students coordinated virtually with community members to complete their first remote implementation in September of 2020, during which 10 systems were installed. The North Carolina Projects (NCP) team members transitioned from the assessment phase and into the implementation phase of their project with Powell Elementary in Raleigh. In FY 20-21, with guidance from KIETS, EWB-NCSU developed an Advisory Board composed of several EWB-NCSU alumni, engineering professionals, and organizational leaders with the intention of supporting chapter activities. Professor Andrew Grieshop from the College of Engineering serves as the faculty advisor for EWB-NCSU and KIETS Associate Director Raj Narayan serves as a member of their advisory board. KIETS support has helped develop materials for local project promotion and chapter and community engagement including a travel book that is available in hard copy or can be accessed digitally through the website at [www.ewbnosu.org/travel-books/](http://www.ewbnosu.org/travel-books/).

### ***Agricultural Biotechnology in Our Evolving Food, Energy and Water Systems***

KIETS supported the AgBioFEWS program in FY 20-21 led by Dr. Fred Gould and the Genetic Engineering in Society (GES) Center. Dr. Gould reported 16 NC State faculty engaged from five different colleges. The first cohort of nine graduate students in the AgBioFEWS program is now in the last semester of their second year and working on a group project that uses databases to assess impacts of genetic engineering and other agricultural practices on farm biodiversity. A second cohort of nine students came into the program in August 2020 from five different colleges. Due to the COVID-19 pandemic, instead of immediate immersion into a farming community, the students engaged in online collaborations on their projects with the goal of being involved in fieldwork in Summer 2021. A third cohort of eight students has been selected for 2022 and will start their program of work in Fall 2021. Dr. Jennifer Kuzma and Dr. Heike Sederoff who are Co-PIs on the AgBioFEWS program were selected to become members of the NC State Research Leadership Academy. The GES Center completed a successful 5-year review in Fall 2020 and the progress of the AgBioFEWS was well received during the review.





## GOAL 2: Enhance Scholarship and Research

- **NC State Strategic Plan:** Enhance Scholarship and Research by Investing in Faculty and Infrastructure

**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 enabled the *Bioseparations/Bioprocessing Development Center (BBDC)* initiative led by KIETS Director Dr. Ruben Carbonell in partnership with BTEC. BBDC helped BTEC 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). For FY 20-2021, the NIIMBL funding for projects done at BTEC is approximately \$1.15 million and \$160,000 from CESSMI. The NIIMBL grants are in collaboration with NC State faculty or small companies inside and outside NC. These grants include: (1) Novel dehydration technology to streamline drug substance processing and preservation; (2) SPIDER Project 2.0 (an automation platform developed with prior NIIMBL funding); (3) Gene therapy training network (GTTN) and instructional transfer platform (ITP); (4) Identification, characterization and removal of host cell proteins in Chinese Hamster Ovary (CHO) cells; (5) Single-use modules for continuous removal of antibody fragments; (6) Expanding Adeno-Associate Virus (AAV) process characterization analytical technologies. It should also be noted that BTEC responded quickly to the COVID-19 pandemic by producing large quantities of FDA-approved hand sanitizer that is being used throughout the university and the NC Museum of Natural Sciences.

#### ***Molecular Education, Technology and Research Innovation Center (METRIC)***

KIETS continued its collaboration with the NC State Molecular Education, Technology, and Research Innovation Center (METRIC) led by Professor David Muddiman. METRIC provides state-of-the-art innovative technologies to address a diverse range of scientific questions while making state-of-the-art, scientific infrastructure and instrumentation such as mass spectrometry, magnetic resonance and X-ray crystallography available to all departments and faculty at NC State. Even though the COVID pandemic has delayed some of the workshops planned, METRIC was able to award some pilot grants in FY 2020-21 as follows:

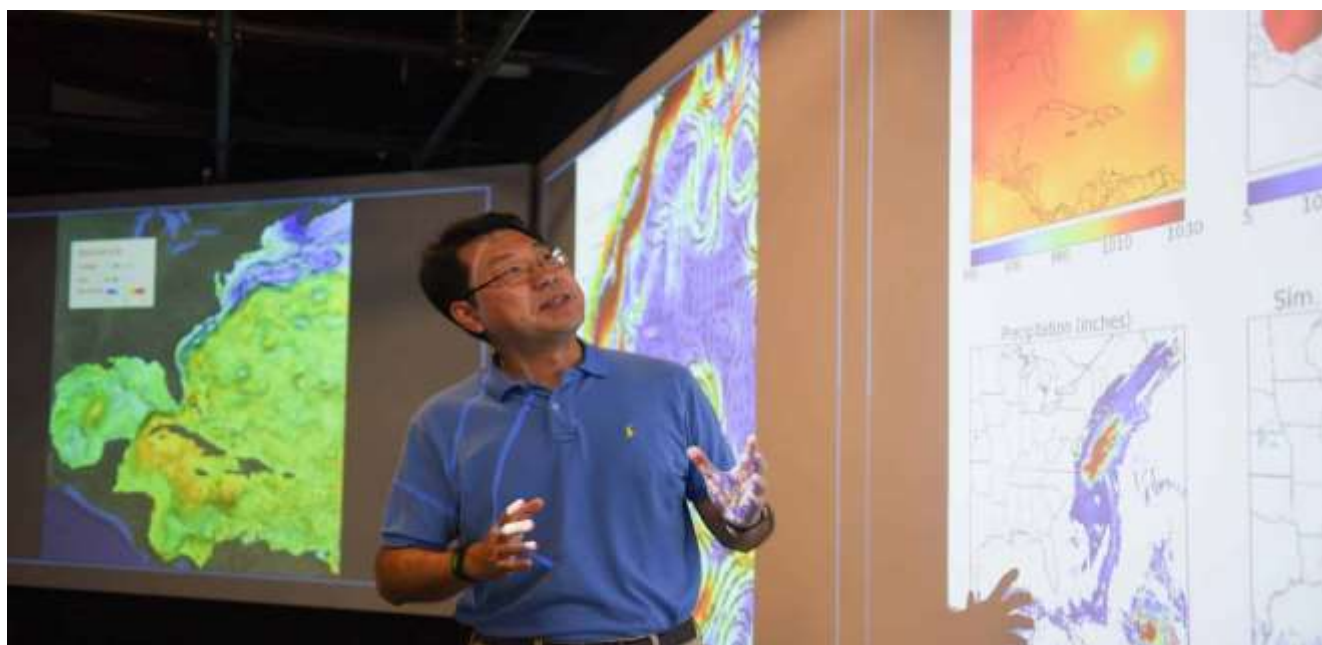
- Jacqueline Cole (COE), *Identifying Molecular Biomarkers of Ischemic Stroke within Bone, Proposal Submitted as an ROI to the National Institutes of Health, Pending;*
- Owen Duckworth and Oliver Baars (CALs), *Developing a Pipeline for Metal Siderophore Complex Structures;*

- Arion Kennedy (CALs), *Investigating Metabolism for Fructose in Polarized Macrophages using <sup>13</sup>C NMR Spectroscopy Stable Isotope Tracers*;
- Santosh Mishra (CVM), *Lipid Mediators in Itch Research*;
- Michael Hyman (CALs), *Proteomic and Exometabolomic Analysis of Hydrocarbon Oxidation by Mycobacterium Vaccae*;
- Pietro Ranieri (COE), *Investigation of Solvated NO and OH for Plasma Medical and Agricultural Applications*;
- Deyu Xie (CALs), *Structural Elucidation of Novel Anthocyanins from Engineered Red Artemisia Annuua Cells*.

Several proposals have been submitted and already one has been funded as a direct result of the support from the Kenan Institute. Dr. Michael Gamcsik (COE) was awarded a \$220,542 grant by the National Institutes of Health (NIH) for his proposal *Mapping Functional Heterogeneity in Tissue*.

### ***Novel Material Platform for Crop Protection***

KIETS supported Professor Saad Khan who is investigating ways to create a platform for crop protection from fungi and insects using biodegradable matrices derived from trees, and to tackle this problem at different fronts: leaves, seeds and seedlings. In FY 20-21, Dr. Khan extended the crop protection approach for Togo, Ghana and Uganda in sub-Saharan Africa (SSA) and also developed (a) hybrid fibrous materials for seed coating and (b) hybrid particulate dispersions for foliar application. For sub-Saharan Africa, Dr. Khan has developed a cost-effective approach to produce biodegradable matrices for seed/seed piece treatment for nematode infested soils in sub-Saharan Africa (Kenya and Benin). As another approach to establish sustainable agriculture for mechanized farming, Dr. Khan has developed a facile approach by coating soybean seeds with agrochemicals loaded biopolymer-based electrospun nanofibers that are capable of sustained release of two different active ingredients (AIs): abamectin (nematicide) and fluopyram (a fungicide) as model AIs. These innovations help improve crop quality and market value while sustainably managing the use of pesticides in an environmentally and economically efficient manner. Dr. Khan also report two invention disclosures, one patent application filed, two publications generated, two graduate students, one undergraduate and one post doc supported. Dr. Khan also reported that Kenan Institute support helped leverage grants from the Bill and Melinda Gates Foundation and Eastman Chemical.



### ***Developing an Integrated Marine Environment Observation and Prediction System in Support of NC Energy Initiatives***

KIETS supported Professor Roy He in FY 20-21 on a project to refine and implement state-of-the-art marine environment observing and prediction (both hindcast and forecast) capabilities that can support wind, current, and wave energy development, and risk mitigation offshore of NC. Dr. He is integrating newly developed state-of-the-art, data-assimilative, coupled ocean-atmosphere-wave modeling systems with a carefully designed observing network and emerging powerful cloud-computing technology to generate accurate, real-time marine environmental predictions at a horizontal spatial resolution of roughly 100 m. The system will be fully capable of addressing multi-disciplinary coastal and marine

problems, as well as enhancing an understanding of the complex physics that arise from a confluence of very different water masses off NC and their interactions with the atmosphere. Dr. He reports that research efforts to date have been very productive and successful for all of the components of this project, ranging from successfully competing for new research funding from federal, state, and non-governmental agencies, to the communications of scientific findings in peer-reviewed publications, collaborations, and public outreach. Dr. He also reported four publications, three graduate students, five post docs, one undergraduate, 14 universities, eight corporate partners engaged in this project, and one startup company – Fathom Science. Working with NC State’s Office of Research Commercialization, Fathom Science continues to develop its ocean prediction methodology and was a finalist for the NC Technology Association’s Clean Tech / Green Tech award in November 2020. In addition, Dr. He received a \$2.5 million NSF grant for his proposal *AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (AI2ES)* and a National Academies of Sciences, Engineering, and Medicine (NASEM) grant of \$2 million for his work on *Understanding and Predicting the Gulf of Mexico Loop Current*.

### ***Renewable Natural Gas from Carbonaceous Wastes via Phase Transition CO<sub>2</sub>/O<sub>2</sub> Sorbent Enhanced Chemical Looping Gasification***

In FY 20-21, KIETS supported Professor Fanxing Li on a project to develop a significantly intensified, sorbent enhanced – chemical looping gasification (SE-CLG) process, which combines biomass gasification, air separation, and syngas conditioning and cleaning into a single circulating fluidized bed (CFB) gasifier to produce methanation ready syngas. The SE-CLG technology being developed has excellent potential to produce cost-competitive renewable natural gas (RNG) to serve the domestic market. According to Dr. Li, these research activities have led to very positive impacts in terms of new inventions, publications in leading journals, technology development and job creation through a start-up company, as well as addressing the global energy and environmental challenges. He reported 9 published articles in leading peer-reviewed journals, one patent application granted, one invention disclosure was filed, five invited seminars and conference presentations (virtual), 3 graduate students and one post doc directly involved in the research project. A NC State based start-up company, Catalytic and Redox Solutions LLC (CatRedox), co-founded by Dr. Li has licensed the patents from NC State and successfully completed an STTR Phase I project supported by the DOE and was awarded Phase II support of \$1.1 million. Dr. Li also hosted a Kenan fellow, Mr. Shane Barry, in Fall 2020 and Mr. Barry successfully developed and implemented a high school STEM Capstone course at the Athens Drive Magnet High School. Dr. Li was awarded a grant from the NC State Chancellor’s Innovation Fund and Humboldt Fellowship for Experienced Researchers in 2020. KIETS support for his research is leveraged with support from the DOE, NSF, and CatRedox.





## GOAL 3: Enhance Interdisciplinary Scholarship

- **NC State Strategic Plan:** Enhance Interdisciplinary Scholarship to Address the Grand Challenges of Society

**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 is one of the lead investigators that led to the establishment of NIIMBL, an institute that is part of the Manufacturing USA Network to enhance the nation's manufacturing-based economy. Dr. Carbonell serves as NIIMBL's Senior Technology Strategist. To date, the State of NC has provided \$6 M in funding to be used as cost-share matches for NIIMBL projects being led by NC companies or academic institutions, and laboratory renovations necessary to carry out NIIMBL projects. These funds also helped to pay NIIMBL membership fees for small NC companies and community colleges. Twenty-seven different NC entities participate in NIIMBL, including five universities (ECU, NCCU, NC State, UNC-CH and UNC-W), nine community colleges, eleven small- and medium-sized companies (five in Wilmington, five in RTP and one in Charlotte). In the first four year of NIIMBL operations, NC members participated in projects totaling \$16.2 M with \$7.34M of federal funds received by NC entities. Funds provided by the State of NC (\$6M) have been leveraged 2.7 to 1 in NIIMBL total project costs.

#### *Research Innovation Seed Funding*

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 FY 20-21, 81 proposals were submitted to the RISF program and 9 awards were made utilizing KIETS resources including the following:

- Dr. Aram Amassian, College of Engineering, *Combinatorial High-throughput Development and Screening of Biocidal Materials for Response Against Pathogens Including Coronaviruses;*
- Dr. Julio Belmonte, College of Sciences, *The Forces That Shape Us: Measuring Tissue Biomechanical Properties During Embryonic Development;*
- Dr. Michael Dickey, College of Engineering, *New Approaches to Combat Wound Infections Using Active Particles;*
- Dr. Kenan Gundogdu, College of Sciences, *Discovery and Engineering of High Temperature Macroscopic for Quantum Phases in Lead-Halide Perovskites;*
- Dr. Lillian Hsiao, College of Engineering, *Seeing Microbiomes Collectively React in Real Time for Gut Health;*
- Dr. Nanette Nascone-Yoder, College of Veterinary Medicine, *Modeling Stomach Curvature;*
- Dr. Natalie Nelson, College of Agriculture and Life Sciences, *Towards Real-Time Fecal Indicator Bacteria Monitoring in Nearshore Waters;*
- Dr. Wenyan Tang, College of Engineering, *Data-Driven Planning and Operation of Integrated Energy-Water Systems;*
- Dr. Xiaoqi Wang, College of Agriculture and Life Sciences, *Deciphering Porcine Uterine Capacity by In-Vivo Gene Editing.*

Since 2016, the RISF program has received 367 proposals and awarded 60 projects. These RISF projects have generated approximately 106 follow-on proposals to external organizations of which 31 received awards totaling \$16,140,051 and leveraged the total ORIED/KIETS awards of \$1,365,359 during the corresponding period. In addition, 54 students were supported, 211 publications or presentations made and 23 workshops/symposia held during that period. KIETS Director Ruben Carbonell and Associate Director Raj Narayan served on the RISF selection committee.

### ***Game-Changing Research Incentive Program for Plant Sciences Initiative***

In FY 20-21, KIETS collaborated with the Office of the Vice Chancellor for Research and College of Agriculture and Life Sciences to initiate the Game Changing Research Incentive Program for Plant Sciences. The GRIP4PSI initiative enables the NC State community to collaborate on integrated research/outreach projects that are focused on plant improvement, data-driven agricultural bioscience, and resilient agricultural systems. This program is intended to seed, incentivize and amplify visionary research that will result in a high return on investment in terms of extramural funding, award-winning research impacts, and first-class interdisciplinary graduate education and training. Four awards were made in FY 2020-21 each worth up to \$650,000 over three and a half years, and are supported by the Office of Research and Innovation in partnership with the College of Agriculture and Life Sciences, the College of Engineering, the College of Natural Resources, the College of Sciences, Wilson College of Textiles, Poole College of Management, the Office of the Executive Vice Chancellor and Provost, and the Kenan Institute for Engineering, Technology and Science. KIETS Associate Director Raj Narayan served on the GRIP4PSI proposal review and selection committee. The current GRIP4PSI projects awarded are as follows and funding began in July 2020:

- Dr. Christine Hawkes, Department of Plant and Microbial Biology, *FUN-CROPS: Foliar Fungal Endophytes for Enhanced Crop Sustainability and Resilience*;
- Dr. Jean Ristaino, William Neal Reynolds Distinguished Professor and Director of Emerging Plant Disease, Department of Plant and Microbial Biology, *Plant-Aid: A Data-Driven and Sensor-Integrated Platform for Monitoring Emerging Plant Diseases*;
- Dr. Katharina Stapelmann, Department of Nuclear Engineering, *Harnessing (Bio-) Electrochemical Technologies as Sustainable Sources for On-Demand Precision Agriculture*;
- Dr. Cranos Williams, Department of Electrical and Computer Engineering, *Improving Crop Productivity and Value Through Heterogeneous Data Integration, Analytics, and Decision Support Platforms*.



## **GOAL 4: Enhance Organizational Excellence**

- **UNC System Strategic Initiative on Excellent & Diverse Institutions:** Help institutions achieve excellence within individual missions.
- **UNC System Strategic Initiative Affordability & Efficiency:** Ensure a UNC education is within the financial means of all in the state.
- **NC State Strategic Plan:** Enhance Organizational Excellence by Creating a Culture of Constant Improvement

**KIETS Goal:** Seek opportunities for professional training, to save costs, maximize efficiency and enhance resources for KIETS operations and improve services to our stakeholders.

## **ACCOMPLISHMENTS**

### ***Leveraging Partnerships***

In FY 20-21, KIETS core operating and program investments of \$1,681,621 were leveraged by approximately \$20,512,267 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 57% turnover ratio and 25% new projects at the start of FY 20-21.

### ***Collaborating on Initiatives***

KIETS continues to work collaboratively with the NC State Advancement on the NC State Campaign to identify and develop resources for priority initiative such as the Kenan Fellows Program. KIETS Board member John Atkins is serving as the Chair of the KIETS Campaign cabinet in collaboration with KIETS Director Ruben Carbonell and Kenan Fellows Program Assistant Director of Development Darrell Kain. KIETS also developed collaborations with the Office of the Provost in support of the KIETS Climate Leaders Program. Specifically, KIETS is collaborating with the NC State Coastal Resilience and Sustainability Initiative led by College of Natural Sciences Dean Emeritus Mary Watzin. KIETS support for the Climate Leaders Program is leveraged with complementary support from the Office of the Provost. The KIETS Climate Leader Program under development will focus on solutions to mitigating or reversing negative effects of climate change via technical, managerial, political or economic approaches that, if adopted, offer a promise of impactful developments that will help humanity deal with this existential threat. The opportunities provided by this program will help empower, educate and inspire young people to embark on careers and become innovative leaders in mitigating climate change, which affects almost all aspects of people's lives.

### ***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. Results for the 2020-21 program will be available in July 2021 in the form of a formal report and executive summary. 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. The impact data reported here reflect activities that occurred from June 2020 – March 31, 2021. Thus far, each Fellow has completed 60 hours of professional development and a three-week internship with their business/industry or university mentor (at least 140 hours of work per Fellow). In addition, the impact log reflects the following activities since they began the Fellowship in June 2020:

- 906 students engaged in lessons and other Fellowship products
- 520 educators engaged in PD led by members of this cohort
- 10 community members and mentors engaged in Fellowship lessons or products

The Kenan Fellows Program also continued to develop its STEMwork initiative which will engage the Kenan Fellows Alumni base of close to 500 Fellows. The KFP will pilot STEMwork in two NC regions in 2021-22: Western North Carolina and the Triangle. Sixteen KFP alums have been trained to facilitate teams of 5 to 6 teachers each, with a goal of including 70-80 participants during the pilot. The Friday Institute for Educational Innovation has been engaged to conduct a thorough evaluation of the project. The pilot is being funded by the Biogen Foundation, the Dogwood Health Trust, and individual contributions.

### ***Improving Branding***

KIETS continued to update its website ([kenan.ncsu.edu](http://kenan.ncsu.edu)) and identity materials to better align with the branding of NC State, provide easier website and social media management, and enhance the overall website visitor experience. KIETS continued to promote its programs and activities through regular new releases featured on its website and distributed through social media platforms including Linked-In, Twitter and Facebook. In FY 20-21 KIETS also continued to implement a Google analytics process which identified 3,040 new visitors to the KIETS webpage and subsequent referrals and links to partners webpages including NC State's webpage.

### ***New Staff and Board Appointments***

In FY 20-21 KIETS welcomed two new Board of Trustees members, Dr. Laura Niklason, CEO of Humacyte and Dr. Philippe Gilbert, Senior Program Officer of the Bill and Melinda Gates Foundation. The Kenan Fellows Program also

welcome new Board of Advisors Members including Dr. Mary Hemphill, Director of Computer Science and Technology Education with the NC Department of Public Instruction, Dr. Jamie Lathan, Dean of Distance Education at the NC School of Science and Math, Dr. Kim Morrison, Superintendent of Mount Airy Schools, Ms. LaTanya Patillo, Director of Policy and Advocacy at NWEA and Former Kenan Fellow / Teacher Advisor to Governor Roy Cooper, Dr. Mark Sorrells, Senior Vice President for Academic and Student Services at Fayetteville Technical Community College, Dr. Robert Witchger, Director of Career and Technical Education with the NC Community Colleges System. The Kenan Fellows Program also welcomed Ms. Carrie Horton a 2013 Kenan Fellow as their new Program Manager. KIETS welcomed Dr. Roy He as its inaugural Senior Faculty Fellow and Ms. Amanda Mueller as the new Program Director both of whom will be leading the KIETS Climate Leaders Program. In addition, KIETS engaged Dr. Mary Watzin (Chair) as well as Dr. Roy He, Dr. Gavin Smith, Dr. Susan White, Dr. Kathy Dello, Dr. Christopher Galik, Dr. Louis Rivers, Dr. Joe DeCarolis, and Dr. Derek Aday to the KIETS Climate Leaders Program Steering Committee. KIETS continues to focus on engaging a diverse community of individuals who bring multi-faceted perspectives and experiences to serve the diverse stakeholders and communities it serves.

## **GOAL 5: Enhance Local and Global Engagement**

- **UNC System Strategic Initiative on Economic Impact & Community Engagement:** Deepening partnerships that strengthen local communities and the state's economy.
- **NC State Strategic Plan:** Enhance Local and Global Engagement Through Focused Strategic Partnerships

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

### **ACCOMPLISHMENTS**

#### ***Novo Nordisk Foundation International Collaboration on Bioprocessing***

KIETS supported the Accelerated Innovation in Manufacturing Biologics (AIM-Bio) project enabled by funding from the Novo Nordisk Foundation. KIETS Director Ruben Carbonell and Gary Gilleskie, Director of BTEC, serve as principal investigators for the grant. NC State will receive \$18 million to achieve its activities. NC State and BTEC, in conjunction with the Technical University of Denmark (DTU) in Copenhagen, will carry out a new five-year project focused on an international collaborative research and training program in biomanufacturing science and technology. NC State and DTU are developing 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. 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. Each project will involve tasks executed by investigators, graduate and postdoctoral students from both DTU and NC State to make the best use of each institution's strengths, infrastructure and capabilities. Among the topics being investigated: novel yeast cell therapeutic modalities, high productivity perfusion bioreactor systems, automation and high-throughput fermentation, specific ligands for affinity purification of next-generation protein therapeutics, membrane and resins enabling continuous manufacturing with single-use devices, biosensors for multiplexed real-time monitoring of critical product quality attributes, and modeling and simulation of bioprocesses. In North Carolina, Novo Nordisk operates a major fill-finish facility for insulin and is building a \$2 billion facility for active pharmaceutical ingredient manufacture for diabetes products, both in Clayton. In addition, Novozymes manufactures enzymes at its site in Franklinton. Representatives from Novo Nordisk and Novozymes serve on BTEC's Advisory Board.

#### ***Gordon-Kenan Graduate Research Seminars***

KIETS continued its partnership with the Gordon Research Conferences, helping young scientists and engineers throughout the world to be exposed to state of the art research through the *Gordon-Kenan Graduate Research Seminars*. Due to COVID-19, the GRC team launched *GRC Connects* in August 2020. GRC Connects is a free virtual initiative that provides opportunities to connect and collaborate with GRC colleagues until in-person meetings resume. Topics such as the academia/industry response to the COVID-19 pandemic (expert panel), navigating your career (GKGRS mentorship panel for graduate students and post docs), and improving equality and inclusion (GRC Power Hour) are offered. The GRC had originally planned to resume the 2021 conference season in May 2021 and operate through August 2021 in the U.S. and

Europe only. However, with the enduring effects of the pandemic, the GRC has decided to postpone its summer conferences and resume operations with a subset of 17 conferences and related Graduate Research Seminars to take place in the Fall of 2021. Since 2001, Kenan Institute support has provided seed funding for 181 new Gordon-Kenan Research Seminars, helped leverage \$9,213,617 from private & federal sources, and helped provide registration and travel support for 3,640 GKRS registrants, roughly 44% of all GKRS participants. From 2001 to 2018, GKRS/GRC Chairs have raised \$3,397,162 from federal funding and \$5,816,455 million from private industry partners. During that time, 4,336 scientists from North Carolina have attended 2,878 GRC conferences or seminars. In addition, NC State University scientists have participated as a speaker 260 times, and have chaired 16 GRC conferences or seminars.

#### ***NC Sea Grant Community Collaborative Research Grant Program***

KIETS supported the NC Sea Grant Community Collaborative Research Grant Program. As a result of the FY 2020-21 solicitation, 16 applications were received proposing over \$342,000 of projects including 15 new applicants that have never previously worked with NC Sea Grant or WRRI. The applicants included 7 universities, 4 state agencies, 5 county cooperative extension services, 7 municipalities, 10 NGO / private businesses, and 7 seafood suppliers. Work was proposed for 3 Tier-1 counties, 11 Tier-2 counties, and 7 Tier 3 counties. Topics included climate change resilience planning, environmental literacy and workforce development, and oyster / aquaculture efforts. A 7-member technical committee met virtually on May 4, 2021 to review proposals. KIETS Associate Director Raj Narayan serves on the CCRG review and selection committee. NC Sea Grant has invited continued KIETS collaboration for the CCRG in FY 2021-22. Projects selected in the FY 20-21 include the following:

- Kathryn Stevenson, NC State University, *Building Disaster Resilience through Youth-Led Community Conversations.*
- Scott Belcher, NC State University, *Determining Contaminant Accumulation and Exposures in Local Shark Species from Domestic Fisheries.*
- Natasha Bell, East Carolina University, *Hybrid Constructed Wetlands to Further Reduce Nitrogen and Phosphorus Loads from Municipal Wastewater Treatment Plants.*
- Joel Fodrie, UNC-Chapel Hill, *Using Adaptive Management to Guide the Next Phase of the New River Estuary Oyster Highway.*
- Reide Corbett, East Carolina University, *Science and Data Support for the Town of Nags Head Estuarine Shoreline Management Plan.*
- Lindsey Zarecky, Greensboro Science Center, *Increasing Environmental Literacy of North Carolina Freshwater Mussel Conservation through a Projection Mapping Exhibit.*

#### ***NC Coastal Federation Aquaculture Project***

KIETS supported a partnership with the NC Coastal Federation and NC Sea Grant regarding their aquaculture initiative. The new Oyster Blueprint, which includes oyster mariculture priorities, was released in April 2021 to guide priorities from 2021 to 2025. In FY 20-21, much of the programming shifted to virtual measures, from oyster blueprint committee meetings to promotion of the new NC Oyster Trail. The federation partnered with NC Sea Grant and NC Shellfish Growers Association to conceptualize and launch the NC Oyster Trail in Fall 2020 at [ncoysters.org/oyster-trail](http://ncoysters.org/oyster-trail). To date, there are forty-three trail member sites, including everything from restaurants to farm tours to art exhibits centered around oysters and educational experiences. In 2020-21, the federation hosted their first fellow through the Kenan Fellows Program for



Teacher Leadership. Erin Strohschein, an art teacher at Havelock Middle School, worked alongside the federation’s education coordinator to develop the federation’s take-home STEAM learning kits for students at the Beaufort Boys & Girls Club and Smyrna Elementary School. The federation made significant progress on the 21 recommendations of the NC mariculture plan and continues to build momentum and enthusiasm statewide for oysters and local, homegrown industry. Key partners on this initiative include Brooks-Pierce, Carteret Community College, Coastal Conservation Association, Coastal Studies Institute, East Carolina University, N.C. Division of Marine Fisheries, North Carolina Coastal Federation, North Carolina Sea Grant, North Carolina State University Center for Marine Science and Technology, University of North Carolina Institute of Marine Sciences, University of North Carolina Wilmington, and The Pew Charitable Trusts.

#### ***NC Museum of Natural Sciences Hand Sanitizer Initiative***

In March 2020, the NC Museum of Natural Sciences (NCMNS) was closed to the public due to the COVID pandemic. NCMNS invited KIETS and BTEC support to produce hand sanitizer for guests visiting the museum in order to help ensure public health and safety. The NCMNS reopened to the public in late September 2020 and was able to provide hand sanitizer to approximately 101,792 visitors to the museum through March 2021. The museum anticipates using approximately 880 gallons of hand sanitizer and expects the total number of visitors served through June 2021 to reach 176,000 visitors to the NCMNS. BTEC provided personnel time and expertise required to prepare the sanitizer and KIETS provided support to help cover the cost of sanitizer ingredients and supplies. The NCMNS provided cost share to purchase the ethanol required to produce the hand sanitizer

#### ***NC State Non Wovens Institute / BTEC COVID Response Initiative***

With a special allocation of \$100,000 from the Board of Directors of the Kenan Fund for Engineering, Technology and Science, KIETS was able to assist in a NC State response to the COVID-19 challenge in support of efforts being led by NC State’s Non-Wovens Institute (NWI) as well as BTEC to develop face masks and hand sanitizer for use by those addressing the needs of individuals affected by the coronavirus. The Nonwovens Institute used the funds together with other commitments to purchase two surgical masks machines. These were purchased and installed off-campus at a partner’s facility, Freudenberg Performance Materials (FPM) and have been operational since summer 2020. The masks have received FDA approved and millions have been supplied to health care providers. NWI is also donating 60,000 masks per week to NC State for use by faculty, staff and students. To date, NWI has supplied NC State close to one million masks. To date, NWI has produced over 8 million meters of filter which translates to over 100 million masks. NWI also received the INDA Association of the Nonwoven Fabrics Industry Innovation award in 2020 for the formation of a new class of filters for facemasks. Over 30 NWI staff members worked tirelessly since March 2020 to make filters for facemasks and respirators. BTEC began its efforts to manufacture hand sanitizer in March 2020 in response to the Public Health Emergency COVID-19 pandemic. After registering the facility with the FDA and obtaining the required permits, BTEC was positioned to produce hand sanitizer. BTEC’s production and distribution of hand sanitizer enabled NC State to obtain a reliable and readily available source for hand hygiene that contributed towards the continuity of essential and research activities on campus. This initiative enabled BTEC to start-up its hand-sanitizer production program and produce the initial 700 gallons of finished hand sanitizer primarily used by NC State faculty and staff in research labs and offices during a time when supplies were extremely low on the market during the initial months of the spread of COVID-19 in the US. To



date, BTEC has produced a total of 2400 gallons of hand sanitizer for use both within and outside the university. Novozymes was instrumental in helping to secure an ethanol supplier and also donating over 600 gallons of ethanol. KIETS support helped BTEC procure the raw materials and consumables necessary to manufacture the hand sanitizer.

## KIETS GOAL: Enhance K-12 STEM Education

**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*

KIETS continued to support the *Kenan Fellows Program (KFP) for Teacher Leadership*. The 2020-21 cohort consisted of 18 teachers selected from counties across the state. The first intensive professional development institute was scheduled to take place at the North Carolina Center for the Advancement of Teaching (NCCAT) during the week of June 22<sup>nd</sup>, however, due to the pandemic, those face-to-face sessions could not occur and the KFP quickly pivoted to develop and deliver a series of virtual professional learning sessions during that same timeframe. Funding Partners for the 2020-21 cohort include: the KIETS/KFP Board of Advisors, NC Coastal Federation, Biogen, the Burroughs Wellcome Fund, Cornerstone Building Brands, Facebook, Fidelity Investments, NC Farm Bureau, NC Electric Cooperatives, SAMSI, UNC /NC State researchers: Dr. Paul Maddox and Dr. Fanxing Li, Community Public Charter School, and Bonnie Cone Classical Academy. 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://kenanfellow.org/partners/> and <https://kenanfellow.org/mentors/>

Five new articles were published in the KFP Journal of Interdisciplinary Teacher Leadership over the past year <https://kenanfellow.org/journals/>. In FY 2020-21, the journal was added to a number of directories which should elevate its visibility and increase its exposure; these include the Directory of Open Access Journals (DOAJ), Google Scholar, Ulrichsweb (Ulrich's), and ERIC (application pending). Since the journal was founded in 2016, the KFP has published articles from 17 universities and the NASA Langley Research Center. Universities included were: Univ. North Texas, Elon, Texas Tech, Idaho State, Univ. of Washington, Walla Walla Univ., Univ. CO-Co. Springs, Cal St. East Bay, Univ. Nevada Las Vegas, Bradley Univ. Oklahoma State, Western KY and, within the UNC System: NC State, ECU, UNC-G, UNC-W, and UNC-P. A recent research article by Dr. Rolf Blank in the KFP JoITL provided insight into the growth that teachers experience as a result of their Fellowship: "The study showed the effectiveness of the Kenan Fellows program model for developing leadership knowledge and skills of their participating teachers. While many of the teachers did carry out leader roles prior to their entry to the program, the data analysis shows that after participating in the Kenan Fellows Program, the level of leadership activity of these teachers increased substantially. It is likely that the schools and districts employing these teachers received a significant benefit in the teachers' increased capacity for providing leadership

with others in curriculum development, instruction, school planning and decisions, as well as in leading professional education organizations.”

The following list of accomplishments and activities of KFP alumni over the past year well demonstrate what was conveyed in Dr. Blank’s research. The full article can be found on the KFP website

<https://kenanfellows.org/journals/article/new-research-on-teacher-leadership-in-schools-efficacy-of-a-survey-method-for-analyzing-multiple-dimensions-of-leadership/> .

Recognition for Kenan Fellows in FY 20-21 include the following:

*Donna Pyatt* was named NC District 8 Outstanding Elementary Science Teacher, *Marlin Jones* was named the NC Council for Social Studies Teacher of the Year, *Rachael Polmanteer* was the recipient of the 2020 NC Science, Mathematics & Technology Education Center's Outstanding K-8 Teacher award, *Carrie Robledo* was named the NCTIES 2020 Outstanding Teacher of the Year, *Jamie Lathan* was the recipient of the UNC Board of Governor's Excellence in Teaching Award for the NC School of Science and Mathematics, *Christie Frederick* was named Teacher of the Year for Fremont Elementary School. *Tyler Honeycutt* was named Teacher of the Year for Henderson County Early College and was nominated for the NCDPI Marvin Pittman Champion of Education Award, and *Erin Strohschein* was named Havelock Middle School Teacher of the Year. *Consuelo Johnson* was a recipient of the Governors Educator Discovery Award, *Michelle Ellis* was the 2020 recipient of the Herman and Emma Gatling Award presented by the NC Science Leadership Association, *Joann Blumenfeld*, *Wayne Shore*, and *Michelle Smith* were selected for the NC Space Education Ambassadors program, *Sheronica Sharp* received the ECPS Cutting Edge Award, *LaTanya Pattillo* was selected as a member of the William C. Friday Fellowship for Human Relations Class of 2020, *Ursela Garvin* was a recipient of the NCWiT Education award, *Kimberly Perry Sanderlin* was one of 20 educators selected from 14 states to serve on the National Humanities Center 2019–20 Teacher Advisory Council, *Keith Burgess* was selected as a Visiting Doctoral Fellow at the Middle Grades Institute (MGI) as part of its inaugural Visiting Scholars Program, *Jennifer Allsbrook*, *Rebecca Brown*, *Keith Burgess*, *Michelle Ellis*, *Heather Roof*, *Sheronica Sharpe*, and *Emily Warnke* were recipients of the 2020 Promoting Innovation in Science and Mathematics (PRISM) award, *Jennifer Allsbrook*, *Jeff Edwards*, *Dave Glenn*, and *Michelle Hafey* were named 2020-22 NC Science Leadership Association Fellows, *Michelle Ellis* was named the National Science Teachers Association Division VI Director representing TN, NC, and SC. She was also featured in an Education NC podcast in February where she discussed equity and inclusivity in education, *Sheronica Sharp* was selected for the second cohort of Educators of Color Academy with the NC Association of Educators, and *Jeff Edwards* was a recipient of the 2020 NC Science Teachers Association Distinguished Service in Science Education Award.

### ***EngineerGirl***

KIETS collaborated with the National Academy of Engineering to support the *EngineerGirl* initiative. 23 new ambassadors were selected for the 2020-21 year and participated in a virtual national conference of the Society of Women Engineers. *EngineerGirl* served as a resource to over 622,000 users and 198 individuals received answers to their engineering-related questions via the *Ask an Engineer* program. A fundamental activity of *EngineerGirl* is an annual essay contest that is promoted through the website, email, and via partner organizations. The 2020-21 essay contest theme was on the engineering response to the pandemic and invited essays regarding engineering’s role in meeting and defeating the challenges presented by COVID-19. *EngineerGirl* received 785 entries in response to the essay contest. In 2020, Gitanjali Rao, a two-time *EngineerGirl* essay contest winner was selected as the first ever TIME Kid of the Year. Leveraged support includes funds contributed by Chevron, John McDonnell, and Oracle. In addition, *EngineerGirl* received a multi-year pledge (\$2,000,000 over 5 years) from the A. James and Alice B. Clark Foundation to be used for a program endowment to support *EngineerGirl* programming in the future. With an introduction by KIETS, *EngineerGirl* is also collaborating with the Maria Mitchell Foundation to include a feature of Maria Mitchell on a new *EngineerGirl* page for women trailblazers in science and math. In 2021, *EngineerGirl* celebrated its 20<sup>th</sup> anniversary.

### ***Applied Synergies Partnership (ASaP) Entrepreneurship Leadership Program***

Apex Friendship High School teacher Dan Jackson has been collaborating with KIETS Associate Director Raj Narayan to develop the *Applied Synergies Partnership (ASaP) Entrepreneurship Leadership Program* focused on enabling entrepreneurial analytical skills in his high school students. In FY 20-21, ASaP worked with the NC State TEC Program, KIETS, and Leslie Scott to develop and implement the Guide to Experiential Entrepreneurship (GEE), a hands-on curriculum that blends the NCDPI Entrepreneurship Standards and NC State TEC algorithm for Honors Entrepreneurship I and II. With the onset of pandemic and transition to virtual learning in high school classrooms, the GEE was adapted into an online curriculum platform and, in addition to Mr. Jackson, three other teachers implemented the curriculum in



Buncombe County, Surry County and Wake County in the Fall 2020 semester. The GEE was also implemented virtually in Wake County and Mt Airy Schools in Spring 2021. In collaboration with Dan Jackson, Will Pfizer a local entrepreneur and teacher in Mt. Airy Schools expanded the course offering as a pilot program for Mt. Airy Schools in collaboration with YESurry, a nonprofit organization that supports educational innovation in the Surry County community. Three of the Apex Friendship High School teams that completed business plans in Fall 2020 placed in the NC DECA business plan virtual conference including two first place teams. KIETS Associate Director Raj Narayan serves on the board of directors of the ASaP nonprofit established in 2019 and as a mentor to the entrepreneurship students.

## **KIETS GOAL: Support Launch of High-Tech Start-Ups**

**KIETS Goal:** Support the launch of high technology start-ups based on NC State innovations and support technology commercialization programs at NCSU, the State 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 firms initiated with university intellectual property. The Daugherty Initiative continued its collaboration with the NC State Entrepreneurship Initiative to feature the selection of the Daugherty Initiative recipients as part of the NC State eGames. The 2021 Daugherty Initiative track at the NC State eGames supported three awards including two first place winners and took place on April 13, 2021. The 2021 Daugherty Initiative awardees are as follows:

- **1<sup>st</sup> Place** – \$25,000 *Indago*: RFID technology to prevent counterfeiting of circuit board electronics.
- **1<sup>st</sup> Place** – \$25,000 – *Gradient Medical*: ACE (Algorithmically Controlled Electrotherapy) to target and eliminate cancerous tumor cells.
- **2<sup>nd</sup> Place** – \$15,000 – *Baynano Technologies*: Nano-crystal ink technology that can be applied to glass to make it automatically tint to save electricity.

Since 2008, the Daugherty Initiative has invested \$408,847 in 39 companies and 2 research projects with 29 of the companies (74%) still in business. Cumulative follow-on funding received by the awardees since 2008 is approximately \$37 million. 2020 Daugherty Initiative awardee Photocide received a \$225,000 NSF STTR Phase 1 grant. The Daugherty Initiative is managed by the NC State Office of Partnerships. Among the priorities the governance committee will be investigating is the potential to identify complementary resources and increase the endowment of the Daugherty Initiative as well as develop promotional materials including a website and video documenting the impact of the program. KIETS Director Ruben Carbonell and Associate Director Raj Narayan serve on the Daugherty Initiative Governance and Selection Committee.

### ***Wolfpack Investor Network (WIN)***

In FY 20-21, KIETS continued to support the *Wolfpack Investor Network (WIN)* initiative focused on connecting alumni investors with promising NC State-affiliated startup companies to facilitate angel investments. In fiscal year 2020-21, WIN members and sidecar investment vehicles surpassed investing \$15 million into NC State-tied startups since the network's inception in December of 2016. During fiscal year 2020-2021, WIN invested approximately \$2.5 million into eight portfolio company transactions screened by WIN staff. The education component of WIN is its diligence program. WIN utilizes both MBA graduate students as well as graduate students in STEM disciplines to perform due diligence on each company that presents to the membership. Many students who are selected for the due diligence pool are either enrolled in a course offered by the Poole College of Management (PCOM) or have relevant experience. The course is *MBA Special Topics: Private Equity Ventures & Operations* and provides education in line with WIN's operations, and will be a great base for potential diligence students/analysts. In FY 20-21, WIN engaged 17 graduate due diligence analysts to complete due diligence reports for companies that present to WIN. Faculty members are also a key component to WIN's screening process. To date, approximately 35 faculty members have aided in the WIN screening processes. The eight WIN portfolio companies closed within FY 2020-21 drive innovation, job creation, and positive environmental impact in North Carolina and beyond. WIN has collaborated with UNC-Chapel Hill on two deals and Duke University on two additional deals. The WIN initiative is currently being housed in the Kenan Institute offices and KIETS Associate Director Raj Narayan serves as a member of the WIN Steering committee.



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

In FY20-21, 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. In FY 2020-21, ORC engaged the First Flight Venture Center (FFVC) based in RTP to provide access to their LiftOff and Federal and State Technology (FAST) programs which acts as an annual grant-readiness “bootcamp” to train and prepare startups to submit their first SBIR/STTR proposal. Five companies from NC State have been accepted into the first FAST cohort that began in April 2021. These companies include the following:

- *Vector Textiles*: Developing non-chemical-based insect and bite resistant products.
- *TreeCo*: Revolutionizing the forestry industry by combining insights from tree genetics with the power of CRISPR-Cas3 genome editing to breed more resilient trees.
- *Vetletics*: Commercializing a pneumatic dynamic compression device for equine use to improve recovery and promote overall horse health.
- *Mammae Biosciences*: A solution able to transform lactose in milk.
- *DNAli Data Technologies*: Focused on pairing molecular biology and encoding technologies to be able to scale DNA storage systems.

As a result of the Spark Plug program, ORC reports 8 invention disclosures, 17 patents filed, 8 licenses issued, 8 startup companies supported, 9 faculty members engaged. Spark Plug support recipient Synoxa Sciences received two Phase I NIH STTR grants in 2020 totaling \$600,000 and is applying for a Phase II grant for \$1.5 million.

### **NC State Office of Research Commercialization NSF ICorps Site Program**

In FY 20-21, KIETS collaborated with the NC State Office of Research Commercialization on the NSF ICorps program in support of the Fall 2020 and Spring 2021 cohorts. The NC State I-Corps Site offers an NSF training program aimed specifically at helping researchers transition their ideas and inventions into the marketplace through customer discovery and market research. I-Corps participants receive entrepreneurial training and support from industry experts, funding for market & customer research and access to NSF Resources. KIETS Associate Director Raj Narayan served as one of the core instructors for the program and provided guidance to teams from NC State on their research commercialization. Specifically, KIETS worked closely with ICorps Entrepreneurial Lead and College of Humanities Faculty member Dr. Laura Widman, Associate Professor of Psychology and Director of the Teen Health Lab at NC State who is developing an App for use by parents and their children on the topic of sexuality.

## **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 COE Executive Committee, the Daugherty Endowment Board, the Advisory Board for the FSU-FAMU Chemical Engineering Department, the National Academy of Engineering's Audit Committee, the Plant Sciences Initiative Leadership Committee, the Kenan Institute for Private Enterprise Advisory Board, the Executive Committee of the NC Association for Biomedical Research, and as Chief Technology Officer for the National Institute for Innovation in Manufacturing Biopharmaceuticals. He also served on the National Academy of Sciences Board of Chemical Sciences and Technology, and the EU Academy of Sciences.
- KIETS Associate Director Raj Narayan continued his service as a Professor of the Practice of Entrepreneurship and Executive in Residence in the TEC Program within the Poole College of Management's Department of Management, Innovation and Entrepreneurship. He served as a mentor with the Apex Friendship High School Honors Entrepreneurship program and as a board member of the Applied Synergies Partnership, Inc. (ASaP). Mr.

Narayan served on the NC State Entrepreneurship Alliance Steering Committee, as a mentor for the NC State Social Innovation Fellows program, the NC Sea Grant CCRG Review Committee, the Daugherty Entrepreneurship Governance Committee, and the Wolfpack Investor Network (WIN) Steering Committee. He was also an active participant in the NC Eisenhower Fellows, Marshall Memorial Fellows, and William C. Friday Fellows alumni initiatives. In Fall 2020 and Spring 2021, he served as an instructor with the NC State ICorps Site program with the NC State Office of Research Commercialization. Mr. Narayan also continued to serve as a member of the UNC School of Law Institute for Innovation Board of Advisors and was selected to Chair the Board beginning in July 2021 for a two-year term. In Spring 2021, Mr. Narayan was presented with the Chancellor's Award for Excellence for 2021.

- 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 received the 2020 Chancellor's Award for Excellence for outstanding service. Ms. Rashid was also recognized with her 15 Year Service award for her service to the State of North Carolina and NC State. In addition, she completed modules in Data Security training, Diversity training, Benefits training, and Covid Campus Safety training.
- 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 managing needs during the COVID pandemic. 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, and African-American Faculty & Staff Organization. Ms. Spivey also served on the Chancellor's Awards for Excellence selection committee. Ms. Spivey participated as an advisor to the Social Innovation Fellows Reborn team and participated as a member of the 2020-22 cohort 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. Spivey also completed modules in Leadership, Education, and Development training, Data Security training, Diversity training, and certification as a Departmental Purchasing representative for KIETS.
- Dr. Elaine Franklin, Director of the Kenan Fellows Program continued her service as an Adjunct Assistant Professor in the Department of Teacher Education and Learning Sciences in the NC State College of Education. She served as a member of the Advisory Council for the NC State Teaching Fellows Program Board, as a Board Member of The Heritage Education Network (THEN), as a member of the Publications Committee for The Heritage Education Network (THEN), and as a panelist for the National Endowment for the Humanities CARES Grants
- Mr. Darrell Kain, Assistant Director of Development for the Kenan Fellows Program Board served as a member of the Wake County Schools, School to Career Council which advises the county's Career and Technical Education department. He also serves as the Board Chair of the Panther Creek High School Business Alliance. Mr. Kain collaborated to support the NC State-NSF Artificial Intelligence Project launch meeting recruiting a speaker from Bosch and invited guests from the Capital Area Transit (CAT) and Capital Area Workforce Board. Mr. Kain was also actively involved with his church hosting visitors from Kenya to North Carolina.
- Mark Townley, Program Manager for the Kenan Fellows Program continued his service as an Advisory Board member for RaiseNC (formerly First in Teaching), an organization designed to connect educational organizations and leadership across NC with policy makers so that educator stories and appropriate data can be gathered and shared to make the best decisions for NC. He also continues to serve on the Governor's Teacher Advisory Committee for Governor Roy Cooper and has been involved with providing feedback on CDC and DHHS documents for safely reopening schools. Mark also taught courses at UNC and NC State with pre-service teachers and non-profit majors regarding how to create a personal position statement and utilize their strengths through personal branding.
- Amneris Solano, Communications Manager for the Kenan Fellows Program continued to assist KIETS with supporting KIETS website improvements and social media presence. Ms. Solano also successfully completed the NC State Social Media Management and Marketing for Business Certificate program and is pursuing her M.S. in Communication at NC State with a focus on online communication.

- Kenan Fellows Program Director Dr. Elaine Franklin 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

In order to build on its past successes, the Kenan Institute will require 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.

With the challenges posed by COVID-19, KIETS remained responsive to stakeholder needs while effectively managing the continuity of its operations under the challenging circumstances. KIETS and Kenan Fellows Program (KFP) staff continue to work remotely following NC State guidelines to ensure effective follow up and implementation of core organizational functions and priorities including support of its partners and programs. The Kenan Fellows Program is adapting its operations to continue to offer outstanding professional development experiences for its new cohort of Kenan Fellows leveraging remote learning and communications technologies. The impact of the pandemic required the KFP to make a number of modifications and changes to the Fellowship year, from virtual interviews, to online professional development, to a mix of blended, virtual, and in-person internships. The program typically begins with the Summer Institute: 40 hours of residential professional development at the North Carolina Center for the Advancement of Teaching (NCCAT). These sessions were transitioned to a virtual program in Summer 2020. The Fall 2020 institute was also moved to a virtual platform, with Fellows engaged in a series of after-school sessions offered across a two-week period.

As we anticipate a return to an on-campus presence and activity, KIETS will continue to prioritize the health, safety and wellbeing of its staff, advisors and program partners. Moreover, KIETS will continue 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 is a focus on grand challenges in global health and climate change. These two areas of focus for KIETS will 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 will be 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. 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.

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.