



**KENAN INSTITUTE**

ENGINEERING, TECHNOLOGY & SCIENCE

**NC STATE UNIVERSITY**



# KENAN INSTITUTE GOALS AND ACCOMPLISHMENTS FISCAL YEAR 2019-2020

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Technology & Science  
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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 2019-2020 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, appearing to read "Ruben G. Carbonell". The signature is stylized with a large, flowing "R" and "C".

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 19-20, 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 based on NC State technology developed by Professor Fran Ligler focused on diagnostic testing devices.

#### ***NC State Social Entrepreneurship Initiative***

KIETS collaborated with the *NC State Social Entrepreneurship* initiative led by the NC State Institute for Nonprofits to provide students with opportunities to engage and learn from social entrepreneurs in North Carolina, nationally, and internationally. The NC State Social Innovation Fellows (SIF) program continues to thrive in its third year of operation. Twenty-five Fellows, along with five team mentors, five venture partners and a Brain Trust of over 45 individuals make up the primary collaborators of the 2019-20 cohort. In Spring 2020, the NC State Social Innovation Fellows was a winner of the 2020 Sustainability Award from the NC State Sustainability Council in the campus organization category. Additionally,

students who make up the NC State Social Innovation Fellows continue to excel after engagement in the program. KIETS provided a letter of recommendation in support of SIF Gracie Hornsby's application for admission to Stanford graduate school for which she received the Knight-Hennessy scholarship. KIETS also nominated SIF Craig Prince for the inaugural Eisenhower Fellows Global Scholars Program for continued graduate study abroad. KIETS Associate Director Raj Narayan serves as one of the core team mentors for the Social Innovation Fellows and KIETS Program Associate Tara Spivey provided advisory and logistical support to the SIF Reborn Clothing team.

### ***Goodnight Scholars Annual Interviews***

KIETS supported the Goodnight 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 February 2020.

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

KIETS supported the NC State Engineers Without Borders Student Chapter in FY 19-20. A group of team members traveled to Guatemala in August of 2019 to continue implementing rainwater catchment systems on 16 households, bringing the total number of implemented systems to 50. A final monitoring trip to Sierra Leone in March 2020 marked the culmination of a renewable energy project started 13 years ago and served to evaluate the continued function of the implemented systems, conduct closing interviews with local leadership, and officially turn over ownership of the systems to the community. The North Carolina Projects (NCP) team began a project with Powell Elementary School in East Raleigh to integrate solar power into the irrigation system for the school's garden, while also educating students about engineering challenges and the design process. EWB-NCSU has reached new milestones in building the capacity of the chapter. In addressing turnover in leadership and strengthening the chapter's network, with guidance from KIETS, an advisory board was established that is represented by leaders from industry, academia, and prior EWB-NCSU officers.

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

KIETS supported the AgBioFEWS program in FY 19-20 led by Dr. Fred Gould. The first cohort of nine graduate students in the AgBioFEWS program spent the Summer of 2019 in Eastern NC visiting with farmers and other stakeholders to gain an understanding of the agricultural systems in the region and how biotechnology impacts the dynamics of that system. The students' program culminated in their investigation and presentation of an overview of their experiences and how these experiences have affected their perspectives on agricultural biotechnology. Dr. Gould reported 16 NC State faculty engaged from 5 different colleges. The 9 students in this first cohort came from 4 different colleges. Partnership discussion with Penn State and Michigan State University are underway as well. A second cohort of nine graduate students has been selected for 2020. In FY 19-20, Dr. Gould was recognized with a lifetime achievement award from the Entomological Society of America







## 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:

#### ***Modular Liquid Fuel and Power Co-Generation System for Shale Gas Upgrading***

*The Modular Liquid Fuel and Power Co-Generation System for Shale Gas Upgrading* led by Prof. Fanxing Li continued to perform both fundamental and applied research on developing redox catalysts to convert methane and ethane, the main components of shale gas into syngas or light olefins such as ethylene. With KIETS support, Dr. Li reported 9 journal articles published in top journals, two patent applications awarded, an invention disclosure filed, and an SBIR Phase 1 grant supported by the Department of Energy for Dr. Li's startup company *Catalytic and Redox Solutions*. Dr. Li also received a grant from the National Science Foundation which will support his collaboration with the Kenan Fellows Program for Teacher Leadership in 2020. Dr. Li received the Alcoa Foundation Engineering Research Achievement Award from the College of Engineering and was named as an Alcoa professor.

#### ***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. In fiscal year 2019-2020, BTEC completed bioprocess and analytical services projects totaling approximately \$400,000. In addition, BTEC is collaborating on six projects including the following: *Identification, Characterization and Removal of Host Cell Proteins*, led by Dr. Stefano Menegatti, *Next Generation Sequencing Internal Controls for Adventitious Agent Detection* (with AccuGenomics), *Novel Dehydration Technology for Drug Substance Preservation* (Lindy Biosciences), *Lyophilization Online Course*, *Development of Microchip CE-HPMS Analyzer for Bioreactor Monitoring*, and *Biopharmaceutical Manufacturing for the FDA*. BTEC / BBDC facilitated grants have significant matching funds from the State of North Carolina and from NC State University, and in total will bring over \$3.84 million in salaries, equipment and supplies to BTEC operations and NC State.

#### ***Dynamic Model Downscaling of Climate Change and Its Impacts on Marine Environmental Conditions off North Carolina***

KIETS supported NC State Professor Roy He's project on *Dynamic Model Downscaling of Climate Change and Its Impacts on Marine Environmental Conditions off North Carolina*. In FY 19-20, Dr. He and his research team continued to make substantial progress in developing an integrated ocean prediction system to perform studies on climate change and its impact on the marine environmental conditions off NC. Dr. He's related startup company *Fathom Science LLC*

(<http://fathomscience.com/>), a spin-off company from their NC State research, continues to expand. They created *FishCast*, an offshore fishing map tool, and offered it for sale as their first publicly available product and are pursuing a B2B partnership in that sector, as well as investigating how they can serve the sailing sector. Fathom is part of a team that has won an international metocean construction and analysis contract and work will begin in Summer 2020. They are also continuing work on a second contract with the National Oceanic and Atmospheric Administration.

### ***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. Dr. Muddiman served as a mentor for 2019-20 Kenan Fellow Megan Alvord of Broughton High School (Wake County Public Schools) on her project titled *Using METRIC to Improve STEM Education*. With KIETS support, METRIC hosted a symposium in FY 2019-20 focused on *Mass Spectrometry* in collaboration with Thermo Fisher Scientific and Agilent Technology. A second symposium on *Protein Production for Macromolecular Structure Determination* has been postponed due to COVID-19. METRIC's 2019-20 pilot grants supported by KIETS are as follows:

- Jacqueline Cole (COE), *Identifying Molecular Biomarkers of Ischemic Stroke within Bone, Proposal Submitted as an R01 to the National Institutes of Health, Pending;*
- Arion Kennedy (CALS), *Investigating Metabolism for Fructose in Polarized Macrophages using <sup>13</sup>C NMR Spectroscopy Stable Isotope Tracers;*
- 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.*

### ***System for Manufacturing Large Human Blood Vessel Networks***

KIETS supported Professors Stefano Menegatti and Michael Daniele on their research developing an engineered tissue scaffold to optimize the growth of continuous blood vessel networks and large tissue grafts. Drs. Daniele and Menegatti have synthesized a peptide-decorated tissue scaffold and evaluated its pro-angiogenic capacity. These results lay the foundation for a proposal titled "Smart Modular Systems for Cardiac Monitoring and Regeneration" to a new NSF program called *Addressing Systems Challenges through Engineering Teams (ASCENT)*. The PIs reported 3 faculty members, 3 undergraduate students, 5 graduate students, 2 post docs, and 4 seminar presentations in FY 19-20. This research is also part of the NC State NSF Innovation Corps (I-Corps) Phase I program during which PhD candidate Ashlyn Young investigated the market potential for engineered tissue models of the human blood-brain barrier, which would incorporate the technologies under development. KIETS provided guidance and support to Ms. Young and her team through the ICORPS program.

### ***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 2019-20, Dr. Khan extended their crop protection approach for sub-Saharan Africa (SSA) and also developed an alternate seed coating approach capable of slow and sustained release of pesticides without impacting the seed germination process. More specifically, Dr. Khan and his colleagues have developed a novel wrap and plant technology for smallholder farmers in Benin and Kenya and other parts of Africa. As a result of the progress to date, Dr. Khan is extending the field trials beyond Kenya and Benin to other countries including Uganda, Ghana, Togo, and Nigeria. This research has potential impacts in North Carolina where sweet potato and soybean crops are vulnerable as well. Dr. Khan reported two manuscripts published and an invention disclosure submitted to NC State. Dr. Khan also reported that Kenan Institute support helped leverage a grant from the Bill and Melinda Gates Foundation, which has prompted the foundation to fund further studies in this area of food insecurity.



## 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. In 2019, \$2 million in State funds were allocated to pay Institute membership fees for six NC-based small and medium-sized enterprises (SMEs; A1 Biochem Labs, AccuGenomics, Lindy Biosciences, Redbud Labs, SeaTox Research, and SoyMeds) and to provide additional cost share for NIIMBL projects carried out in NC. A new laboratory was constructed in BTEC to facilitate NIIMBL technology and workforce development projects. To date, NC universities and companies have been awarded \$6.9 million from NIIMBL, \$3.6 million from State cost share, and \$3.3 million in cost share from industry and other partners.

#### *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. RISF projects supported in FY 19-20 include the following:

- Dr. Tiffany Barnes, College of Engineering, *Towards a STARS Center of Excellence in Broadening Participation;*
- Dr. Veljko Dubljević, College of Humanities and Social Sciences, *Sociotechnical Principles for Ethics of Autonomous Vehicles and other AI;*
- Dr. Owen Duckworth, College of Agriculture and Life Sciences, *Recovery of Strategic Metals from E-waste Using Manganese Oxidizing Fungi;*
- Dr. Steffen Heber, College of Engineering, *Multimodal Storytelling for Data Analysis and Quality Control in RNA Sequencing;*
- Dr. Jeremiah Johnson, College of Engineering, *Optimal Use of Grid-Connected Energy Storage to Reduce Human Health Impacts;*
- Dr. Jun Liu, College of Engineering, *Developing Thermal Diffusivity Based Multifunctional Sensing, Monitoring, and Prognosis Platform;*



- Dr. Gustavo Machado, College of Veterinary Medicine, *Development of a Dissemination Platform for Temporal, Spatial & Phylogenetic Analysis of Avian Infectious Bronchitis Virus Sequences*;
- Dr. Spyridon Pavlidis, College of Engineering, *Engineering and Science of 2D-3D Electron-Hole Liquids using TMD/GaN Heterostructures*.

Since 2015, the RISF program has received 286 proposals and awarded 50 projects. These RISF projects have generated approximately 91 follow-on proposals to external organizations of which 25 received awards totaling \$12,385,147 and leveraged the total ORIED/KIETS awards of \$1,146,611 during the corresponding period. In addition, 45 students were supported, 176 publications or presentations made and 16 workshops/symposia held during that period. KIETS Director Ruben Carbonell serves on the RISF selection and steering committee.

#### ***Field-Portable Thermoplasmonic Plant DNA Extraction Device for Emerging Plant Disease Diagnosis***

KIETS supported Dr. Qingshan Wei from the Department of Chemical and Biomolecular Engineering and Dr. Jean Ristaino from the Department of Entomology and Plant Biology, on their *Field-Portable Thermoplasmonic Plant DNA Extraction Device for Emerging Plant Disease Diagnosis* project. In FY 19-20, the PIs report having developed a multifunctional and miniaturized diagnostic platform consisting of a microneedle patch and smartphone device for rapid nucleic acid extraction, amplification, detection, and delivery of therapeutic reagents. A smartphone-based amplification and optical readout system was also developed to support isothermal nucleic acid amplification of extracted samples directly in the field. The PIs reported 3 publications generated, 8 undergraduate students, 2 graduate students, and an invention disclosure titled *A Multifunctional Microneedle-Based Smartphone Device for Rapid Nucleic Acid Extraction, Amplification, Detection of Plant Pathogens, and Delivery of Fungicide* has been submitted to the NC State Office of Research Commercialization (ORC). Drs. Wei and Ristaino are involved with NC State's Emerging Plant Disease and Global Food Security Cluster and submitted a successful proposal to the NC State GRIP for Plant Sciences Initiative to continue their work.

#### ***2019 Society of Rheology Conference***

KIETS supported the *Society of Rheology (SoR) Conference*. Rheology is a branch of physics and engineering that refers to the flow and deformation of matter, and has applications in a wide array of fields including pharmaceuticals, coatings, plastics, health, nanoscience, and food to name a few. SoR is composed of physicists, chemists, biologists, engineers, and mathematicians interested in advancing and applying rheology. For the first time since its inception 91 years ago, SoR held its meeting from October 19-24 in North Carolina at the downtown Raleigh Convention Center, attracting over 524 attendees. This was the biggest meeting in the Society's history in terms of attendance and also in the number of parallel sessions (7) and total presentations. NC State Professors Saad Khan and Lilian Hsiao with the Department of Chemical & Biomolecular Engineering at NC State were the local co-hosts for the meeting. Drs. Khan and Hsiao reported over 100 faculty members involved, 200 graduate students, 10 undergraduates, 50 post docs, 20 universities represented, 20 companies engaged, and 150 K-12 students reached (through a rheology festival at the NC Museum of Natural Science).

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

In FY 2019-20, 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 and review proposals. In response to the RFP, the GRIP4PSI initiative received 20 pre-planning proposals in March 2019 of which four proposals have been selected for funding. KIETS Associate Director Raj Narayan served on the GRIP4PSI proposal review and selection committee. The GRIP4PSI projects funding will begin in July 2020.

#### ***Statistical and Applied Mathematical Sciences Institute (SAMSI)***

During FY 19-20, KIETS supported three SAMSI research programs, one on "Deep Learning," one on "Causal Inference," and one on "Games, Decisions, Risk and Reliability." SAMSI reported 7 new postdocs entering a two-year program for a total of 11 this year, and 13 graduate students worked directly with one of their three research programs. SAMSI estimated about 100 publication and two graduate-level courses were taught during the 2019-20 academic year. SAMSI also supported Kenan Fellow Shannon Bowman of Centennial Campus Magnet Middle School (Wake County Schools) on her project titled *Using Statistics to Solve Authentic Problems*. Her mentor was Dr. David Banks, Director of SAMSI.



## 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 2019-20, KIETS core operating and program investments of \$1,466,319 were leveraged by approximately \$26,117,952 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 28 supported projects representing a 56% turnover ratio and 28% new projects at the start of fiscal year 2019-20.

#### *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. The KIETS Board of Trustees pledged approximately \$20,000 for fiscal year 2019-20 representing 53% board participation and the Kenan Fellows Board of Advisors pledged approximately \$5,000 representing 48% board participation with a total board commitment from the KIETS and KFP boards of \$25,000. With this support, Erin Strohschein of Havelock Middle School in Craven County has been selected as the 2020 KIETS BOT Kenan Fellow. In addition, the Kenan Fellows Program has established a new endowment managed by the NC State University Foundation and supported with a lead gift by KFP Advisory Board Chair John Hardin.

#### *Successful 5 Year Institute Review and Continued Administrative Effectiveness*

NC State Centers and Institutes are required to hold a review every 5 years. KIETS successfully held its 5 Year review meeting in July 2019 covering Institute activities during the 2014-2019 fiscal year periods. KIETS BOT members Charles Coble and Dick Daugherty served on the review committee along with NC State faculty member Dr. Denis Gray and external advisor Ms. Deborah Watts. Based on the successful review findings, the NC State Board of Trustees

recommended the continuation of KIETS. KIETS continued to leverage its existing administrative structure enabling more efficient and effective use of Institute resources and operational expenditures while remaining nimble and responsive to stakeholder inquiries and partnership needs.

### ***Improving Program Effectiveness, Outcomes and Impact***

The Kenan Fellows Program for Teacher Leadership continues refine its processes and adapt novel strategies for improved program effectiveness, outcomes, and impact while implementing strategies for long-term sustainability. The Kenan Fellows Program continued collaborations with school districts in NC including expanded offerings in the Charlotte-Mecklenburg school system and to new counties including Clay, Edgecombe, Jackson, Polk and McDowell to further leverage complementary resources increasing the KFP presence to 69 NC Counties. The Kenan Fellows Program continued its annual program evaluation in collaboration with the Friday Institute. From June 2019 – March 2020, Fellows have implemented new curricula directly impacting 694 students. Fellows have made 23 presentations at the following levels: 6 school, 7 district, 3 region, 6 state, and 1 international. Through these presentations, they have reached 655 educators and 573 community members. The Kenan Fellows Program also continued to develop its STEMwork initiative which will engage the Kenan Fellows Alumni base of close to 500 Fellows. STEMwork modules are under development and will be launched in 2021.

### **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. KIETS also implemented a Google analytics process which identified 1,575 new visitors to the KIETS webpage and subsequent referrals and links to partners webpages including NC State's webpage.

### **Supporting Community Safety and Wellbeing during the COVID Crisis**

With a special allocation 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) to develop face masks for use by those addressing the needs of individuals affected by the coronavirus. NWI is using its two research and training pilot production lines to produce face mask materials that will be used to protect medical workers on the front lines of fighting the effects of COVID-19. NC State's Biomanufacturing and Education Training Center (BTEC) is also producing hand sanitizer which will be available to units at NC State. Support is leveraged internally by units such as the Office of Research and Innovation, the Office of Finance and Administration, the Office of the Provost, the Wilson College of Textiles and KIETS, as well as externally by industry partners.

## **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. The Novo Nordisk Foundation announced in August 2019 that it will provide \$27 million in funding for the project, which NC State will manage. 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 will develop 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 will also establish nine 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. This program will create a lasting bond for international collaborations that will enable both DTU and NC State to pursue future granting opportunities in biopharmaceutical manufacturing, which will ensure the sustainability of this effort for the benefit of the universities, the two nations, the global biopharmaceutical community and society at large. 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, NC.

### ***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*. A total of 409 attendees participated in 8 Gordon-Kenan Research Seminars from July 1, 2019 to March 31, 2020. The majority of attendees were young investigators - 52% graduate students and 38% post-doctoral students. North Carolina was represented at the seminars with 2 speakers and 1 participant from UNC-CH and 2 speakers and 3 participants from Duke University. Due to COVID-19, the GRC team is currently working on a “virtual” GRC/GRS option for a few of the 2020 withdrawn conferences/seminars that they hope to run as an experiment later in Summer 2020. 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.

### ***IEI Faculty Fellows for Public Policy Engagement***

KIETS supported and advised the *IEI Faculty Fellows for Public Policy Engagement* program to help enable faculty engagement in significant research and outreach activities associated with recent IEI Forum topics. In FY 19-20, the central focus was to engage NC State faculty advisers for each of the two ReCONNECT NC forums held this year. Programs held in FY 2019-20 include the *ReCONNECT to Economic Opportunity* (October 2019, Charlotte) and *ReCONNECT to Technological Opportunity* (February 2020, Raleigh). Dr. Becky Bowen and Dr. Susan Jakes (NC State Extension) were both engaged to provide support to the five communities selected for their work in helping lower wage adult workers get education and training to move into higher paying jobs (Economic Opportunity) and five communities working to overcome digital divides in their communities (Technological Opportunity). For the IEI Spring 2020 Forum, *ReCONNECT to Technological Opportunity*, IEI had a very productive collaboration with Dr. Marc Hoit, NC State's Vice Chancellor for Information Technology and Chief Information Officer. In addition, KIETS continues to advise and attend the IEI National Advisory Board (NAB) quarterly meetings and KIETS Director Ruben Carbonell serves on the IEI NAB.

### ***Innovate NC 2.0 Initiative***

KIETS advised the *Innovate NC 2.0 initiative* led by the NC Office of Science, Technology & Innovation in partnership with Forward Cities, a national non-profit headquartered in Durham. On October 2, 2019 Innovate NC held a statewide convening that engaged people from cities interested in this work, shared some of the successes of past city participants, and exposed participants to methodologies that can be applied through existing efforts around inclusive entrepreneurship. With a sold-out audience, this event was also supported by the Community Foundation of Greater Greensboro, NC Works Commission, NC Impact, and Thread Capital. Brian Hamilton, founder of Sageworks was the keynote speaker.

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

KIETS supported the NC Sea Grant Community Collaborative Research Grant Program. The 2019-20 RFP was distributed through Coastwatch magazine, NCSG and WRRI press releases, NC university research offices, multiple program research and education listservs, NCSG advisory board members, WRRI advisory board members, multiple websites, social media and other stakeholder communication avenues in November 2019. This RFP also encouraged work focused on rural areas of North Carolina. A seven-member technical committee met in Raleigh on March 13, 2020 to review and select the proposals. KIETS Associate Director Raj Narayan serves on the CCRG review and selection committee. Projects awarded pursuant to the 2019-20 call for proposals include the following:

- Rachel Gittman, Assistant Professor, Biology, East Carolina University, *Testing Novel Substrates and Approaches to Improve Oyster and Salt Marsh Restoration Success*.
- Joel Fodrie, Associate Professor, Institute of Marine Sciences, UNC-CH, *Determining the Ecological Impacts of Shellfish Relay in North Carolina*.
- Rose Hoban, Founder, Editor, and Reporter, North Carolina Health News, *Speak Your Piece: Coastal Youth, Environment and Community*.



#### ***Developing a Shellfish Mariculture Strategic Plan for North Carolina Initiative***

KIETS supported a partnership with the NC Coastal Federation and NC Sea Grant regarding their *Developing a Shellfish Mariculture Strategic Plan for North Carolina Initiative*. In FY 19-20, the project completed the second year of work to develop a much-needed strategic plan to grow shellfish farming to a \$100 million industry by 2030 along the North Carolina coast, combining science and management with best practices from other states to position NC's shellfish mariculture industry for success. *The North Carolina Strategic Plan for Shellfish Mariculture: A Vision to 2030* continues to be distributed and used as a basis for future action. Next steps will focus working to implement key recommendations in the new shellfish mariculture strategy while at the same time updating the North Carolina Oyster Blueprint. The State of the Oyster Report was released in September of 2019 and summarizes progress made in the past year on objectives in the oyster blueprint, including oyster mariculture. The federation launched a new demonstration mariculture facility at their Wanchese office. This facility showcases different techniques, gear, and procedures for successfully growing oysters so that prospective new farmers and even current farmers can explore different techniques, share lessons learned, and have a resource for sharing information. The Coastal Federation is also partnering with the Kenan Fellows Program for Teacher Leadership and will host a Kenan Fellow in 2020.

#### ***Poole College of Management Value Creation Programs Conference***

KIETS collaborated with Poole College of Management Faculty Steve Barr and Lisa Chang in support of the 2019 International Conference on Value Creation Programs at NC State held on September 10-12 2019. The 2019 conference was the first time that the VCP group has met outside of Europe. As a result of efforts to date, NC State has been asked to join Chalmers University in Sweden and the Norwegian University of Science and Technology in a leadership position in developing the strategic plan for the Value Creation Programs group to include sharing information and best practices for value creation programs as well as setting priorities for research in entrepreneurship education between the participant universities. At least three working papers have been created from this interaction and will be presented at the 2020 annual VCP meetings in England. Two papers with faculty at NC State, Norwegian University of Science and Technology and Chalmers University in Sweden have been accepted for the 2020 ECSB European Entrepreneurship Education Conference and are being prepared for journal submission. In November 2019, Lisa Chang was recognized as the 2019 NC State Risley Entrepreneur of the Year.



### ***2020 National Academy of Engineering Regional Conference***

KIETS supported and helped organize the National Academy of Engineering Regional Meeting held on March 9-10, 2020 at NC State University. The event began with a dinner on March 9 hosted by the organizing committee (Frances Ligler, George Ligler, Dean Louis Martin-Vega, Carol Hall and KIETS Director Ruben Carbonell) with the NAE leadership and invited speakers. On the second day, a business meeting took place in the morning, followed by a symposium in the general topic of *Engineering the Future of Therapeutics*, with leading academic and industry speakers. This focus was particularly appropriate given the importance of the biopharmaceutical manufacturing industry to the State and its recent growth in the increasingly important gene and cell therapy areas. The event engaged approximately 120 NAE members, faculty members to highlight the university's infrastructure and capabilities and help enhance its national and international reputation. KIETS University Program Associate Tara Spivey provided logistical and administrative support in organizing this event.



## **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 Kenan Fellows class of 2019-20 was chosen through a competitive process from 85 applications submitted from schools in 28 North Carolina counties. 27 teachers from this group were awarded Fellowships representing 15 school districts, one charter school, and two UNC system schools: the North Carolina School for Science and Mathematics (NCSSM) and the Catamount School, which is Western Carolina University's Lab School. Five of the Fellows live in counties new to the KFP: Clay, Edgecombe, Jackson, Polk, and McDowell. A summary of projects and partners follows:

- A grant from the Appalachian Regional Commission (ARC) is supporting six Fellows in western NC, as part of the WNC STEMwork project. Industry mentors include: Team Industries-Cherokee County, TekTone-Macon County, Gaia Herbs-Transylvania County, GE Aviation-Buncombe County, Eaton Corporation-Rutherford County, and Coats America-McDowell County.
- Charlotte Mecklenburg Schools (CMS), the Belk Foundation, and Duke Energy are supporting four Fellows who comprise the CMS Teacher Leader Cluster (TLC). Industry mentors for the four include: Bosch Rexroth, Siemens, Carowinds, and Hyde Park Partners.
- Four fellowships are supported through grant funding obtained by University faculty/mentors: Drs. Amy and Paul Maddox (UNC), Dr. Alex Nevzorov (NC State), and Dr. David Muddiman (NC State).

- GSK supported five Fellows in the RTP area. These Fellows were mentored by Holt Brothers Construction, Mertek Solutions, LORD Corporation, EPA, and Novozymes. Mertek also provided some financial support for the Fellowship they hosted.
- With generous support from the KIETS Board of Trustees and the KFP Board of Advisors, one Fellowship in the 2019-20 cohort was designed to target the under-represented and high-need area of Eastern North Carolina. After a highly competitive recruitment process, Sheronica Sharp of Edgecombe County Public Schools was selected to receive the *Phail Wynn Kenan Fellowship*. Sheronica teaches at Coker-Wimberly Elementary School and completed her three-week internship with Keihin Carolina System Technology, LLC.
- Seven additional fellowships are supported by community and corporate foundations including Fidelity Investments, the Burroughs Wellcome Fund, the North Carolina Farm Bureau, the Goodnight Educational Foundation, NC's Electric Cooperatives, Merck Foundation, Cornerstone Building Brands, Wayne County Farm Bureau, NC Pork Council, Union Power Electric Cooperative, and SAMSI. Many of these organizations/industries also hosted Fellows during their internship experiences. Additional mentorship support was provided by WE ARE and NC State's Office of Institutional Equity and Diversity.
- The KFP published its Fall 2019 issue of *The Journal of Interdisciplinary Teacher Leadership* (JoITL) and continued development of STEMwork a new blended learning program to utilize the leadership capacity of the Kenan Fellows Alumni Network to reach thousands more teachers across the state.

Recognition for Kenan Fellows include the following:

- Henrietta Jutson was the 2nd place winner and recipient of \$50,000 for the 2019 Harbor Freight Tools for Schools Prize for Teaching Excellence.
- Consuelo Maria Johnson was featured in the Educator Spotlight for UNC World View and is also taking part in NC's Bi-lateral Partnership with Moldova, a program of the NC Secretary of State Department.
- Joann Blumenfeld was a recipient of the NC Excellence in Teaching Award from the Council for Exceptional Children and has been named a 2019-20 World View Global Music Fellow and a 2019 National Endowment for Humanities Scholar. Her program Creating Opportunities in STEM for Students with Disabilities located at the Science House has received a generous grant from Duke Energy Foundation and serves 24 high school students from more than 20 high schools in NC.
- Alexandra Boyd received the Elon University Distinguished Alumni Award, and also presented at the American Association of Physics Teachers, Inc. along with Megan Alvord.
- Megan Alvord delivered a presentation to an international audience at CERN in Switzerland.
- Michelle Ellis, Willow Alston-Socha, Wayne Shore, Daria Fedrick, Rachael Polmanteer, Joann Blumenfeld and Jaimie Mosely led separate sessions at the statewide Bridging the Gap Conference in Raleigh.
- Paul Cancellieri, Donna Pyatt, J'Lisa Miles, Stephanie Titzel, Sam Wheeler, Melaine Rickard, Evelyn Baldwin, James Lamberth, Michelle Haffey, Marci Harvey, Carrie Jones, and Wayne Shore presented at the statewide NC Science Teachers Association Conference in Winston-Salem.
- Doug Price, Kimberly Mawhiney, Patricia Coldren, Kimberly Perry-Sanderlin and Dayson Pasion led a panel discussion on advocacy and teacher leadership at the 2019 Kenan Fellows Program Professional Learning Institute.
- Samantha Haislip, Alexandra Humphries, Katherine Baker, Allison George, and Danielle Flores presented at the NC Council of Teachers of Mathematics statewide conference in Greensboro.
- Maggie Gaines-Hackney received a \$1,700 Donors Choose grant.
- Ryan Gardner was named Teacher of the Year for South Lenoir High School.
- Kimberly Perry Sanderlin was one of 20 educators selected from 14 states to serve on the National Humanities Center 2019–20 Teacher Advisory Council.
- Michelle Ellis was selected to deliver a session on equity at the National Science Teachers Association conference.
- LaTanya Pattillo, Teacher Advisor to NC Governor Roy Cooper, organized the first DRIVE Summit dedicated to the importance of getting more teachers of color in NC classrooms.

- Rebecca Brown, Kathy Brintle and Christie Frederick presented projects at the annual NC Farm Bureau convention.
- Ashley Luersman was profiled as part of EducationNC's Great Teacher series.
- Kathy Brintle and Rebecca Brown went to Washington, D.C. and spoke with lawmakers as part of a cohort of educators through the Nuggets on Mars program.

### ***EngineerGirl***

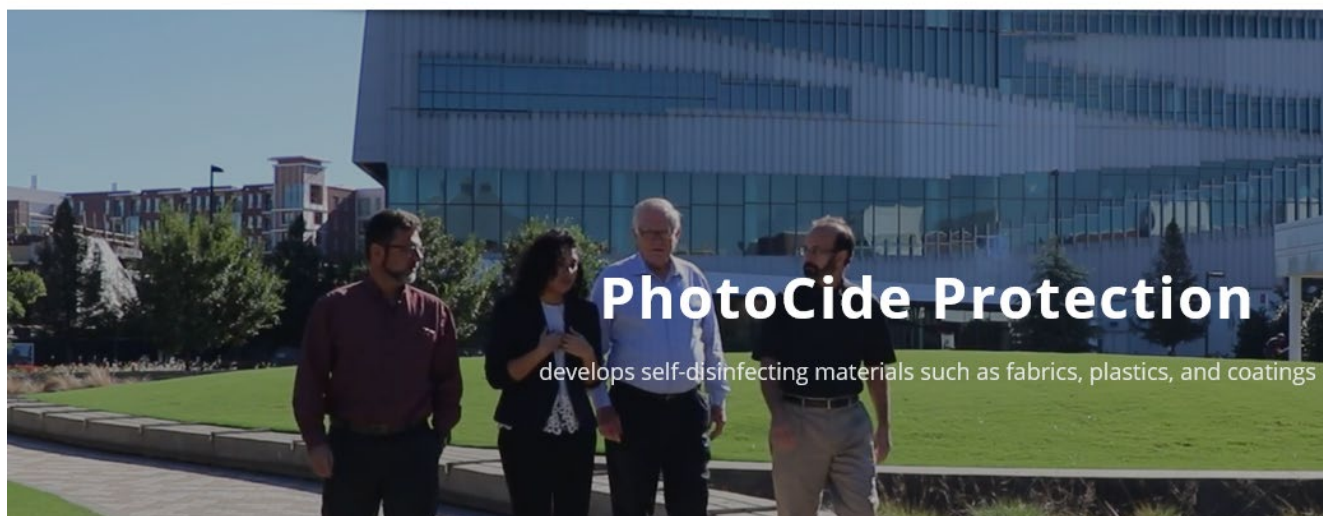
KIETS collaborated with the National Academy of Engineering to support the *EngineerGirl* initiative. During FY 19-20, EngineerGirl began a second year of the EngineerGirl Ambassadors program. Sixteen ambassadors from thirteen states (and one from Puerto Rico) traveled with their sponsors or adult chaperones to the 2019 Society of Women Engineers conference in Anaheim, CA. EngineerGirl served as a resource to over 574,000 users and 100 individuals received answers to their engineering-related questions via the *Ask an Engineer* program. The 2019-20 essay contest theme was on the engineering contribution to education and asked entrants to imagine how students of the future might learn during a long space voyage. EngineerGirl received 553 entries in response to the essay contest. EngineerGirl also received responses from 232 students, 76 parents, and 13 teachers to their feedback survey regarding their experiences with the contest and the website. 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. Also, EngineerGirl Director Simil Raghavan is slated to serve as a panelist as part of the Maria Mitchell Women in Science Symposium scheduled for Fall 2021.

### ***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. Since the program's inception in 2016, 99% of the 233 students who have participated in the program and took the state-mandated end-of-course-assessment met or exceeded the test proficiency levels. In October 2019, the Kenan Institute helped host students to visit NC State University including the Hunt Library, HQ Centennial, Albright Village and Entrepreneurship Garage, and NC State Entrepreneurship Clinic. Several of the AFHS students have been admitted and are continuing their entrepreneurship studies at NC State. In Spring 2020, ASaP worked with the NC State TEC Program, KIETS, and Leslie Scott of Entrepreneurial Places LLC, to develop the Guide to Experiential Entrepreneurship (GEE) which will be made available to teachers across NC.

### ***Shelton Leadership Initiative Rural Entrepreneurship Leadership Program***

KIETS collaborated with Barbara Mulkey and Debbie Acker of the Shelton Leadership Center (SLC) to support the launch of their *Rural Entrepreneurial Leadership Program* in Rutherford County, North Carolina. The SLC partnered with the Rutherford County Public Schools and the McNair Foundation and NC State's DELTA to develop entrepreneurial leadership modules that can assist youth with implementation of entrepreneurial programs. Due to some challenges including the passing of the McNair Foundation donor and the onset of COVID-19, the SLC has had to pivot its strategy for this program. With guidance from KIETS, the SLC is in the process of investigating a collaboration with the Applied Synergies Partnership (ASaP) and The Innovation Project (TIP) to leverage some of the work already done in developing the Guide to Experiential Entrepreneurship (GEE) and explore the possibility of adapting this program model in Rutherford County. The eventual goal is to investigate the potential for providing on-line leadership / entrepreneurial training to approximately 100 students across the state in FY 20-21.



## 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 Lulu eGames. 2020 Daugherty Initiative awards include the following: 1st place – \$25,000 – *Photocide Protection*: Environmentally friendly products that can disinfect a wide range of pathogens; 2nd Place – \$15,000 – *Vector Textiles*: Fabrics designed to prevent mosquitoes from getting through to your skin; 3rd Place – \$10,000 – *Stitch Partners*: Smoke remediation technology for use in confined spaces where venting is not an option. 2019 Daugherty Initiative awardee INDTI received an NC IDEA grant and has submitted an SBIR proposal to NSF. NIRSleep was accepted into an accelerator program in late 2019 called Lighthouse Labs. This program is ranked in the top 20 accelerators by the GAN Network and came with additional grant winnings to accelerate the hardware's development. Synoxa Sciences was successful in obtaining 2 STTR grants totaling \$1million. KIETS Director Ruben Carbonell and Associate Director Raj Narayan serve on the Daugherty Initiative Governance and Selection

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

In FY 19-20, 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. WIN members and sidecar investment vehicles invested approximately \$3.5 million into nine portfolio companies screened by WIN staff bringing the total in less than 3.5 years to approximately \$13 million. Each WIN diligence team is led by a Technology Commercialization & Entrepreneurship (TEC) Program Scholar. Within FY 19-20, about 15 graduate students assisted with the WIN due diligence process. Faculty from multiple colleges from NC State have assisted WIN in screening applicant companies for possible investment promise. To date, approximately 30 faculty members have aided in the WIN screening processes. On January 8, 2020, WIN held a “Women in Angel and Venture Capital” event and invited female WIN members, female WIN portfolio company leaders, and a few additional women within the local entrepreneurial ecosystem to a dinner and casual forum focused on increasing female participation within WIN and beyond. 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 FY19-20, 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. As of March 2020, the SBIR/STTR Spark Plug Program has received four applications and supported three companies including the following: (1) *Empathic Research*: working to commercialize a plant-based alternative to opioids for pain relief.; (2) *Synoxa Sciences*: producing novel, effective antibiotic treatments for patients suffering from serious multi-drug resistant bacterial infections; (3) *Oncurie, LLC*: developing a novel targeted radionuclide therapeutic technology to treat small, nascent and anatomically diverse metastatic cancer sites. In Spring 2020, Synoxa Sciences was notified of two STTR awards from NIH. These awards are for \$250K/year for two years for each award. ORC is helping the startup with leased spaces to fulfill the grant terms. A New Venture Program Manager position within the ORC has been created and will spend a portion of their time dedicated to making the Spark Plug SBIR/STTR Program a successful model.

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

In FY 19-20, KIETS collaborated with the NC State Office of Research Commercialization on the NSF ICorps program in support of the Fall 2019 and Spring 2020 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 Duke University and NC State on their research commercialization. In addition, KIETS facilitated introductions to potential research and commercialization partners for ICorps Entrepreneurial Lead and College of Design PhD candidate Sepideh Saidelue.



## **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. During 2019-20, Dr. Carbonell gave eight invited lectures at national and international meetings and published four research articles in peer-reviewed journals.



- 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 was invited to present a talk on the ASaP model in February 2020 at the *Eisenhower Fellows Global Conference on the Future of Education*. The ASaP program was recognized as one of the top 5 program presentations at the conference by over 245 attendees from 37 countries. 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. Mr. Narayan served as a mentor for the Eisenhower Youth Leadership program and nominated NC State alumni Ms. Anita Watkins who was selected as a 2020-21 USA Eisenhower Fellow and will travel to Ghana and Chile to investigate women's leadership in entrepreneurship. Mr. Narayan also nominated KIETS' Ms. Tara Spivey and Kenan Fellow LaTanya Pattillo who were selected for the 2020-22 cohort of the Friday Fellowship. In Fall 2019 and Spring 2020, 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.
- 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. In April 2020, Ms. Rashid received the 2020 Chancellor's Award for Excellence for outstanding service. As the Chancellor's Unit awardee, Ms. Rashid will continue to be considered for the broader NC State university wide and State of North Carolina Awards for Excellence recognition.
- 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 worked collaboratively with CHASS units (SPIA, Institute for Non-Profits) to successfully administer the needs of units located in the Hunt Library 5th floor 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, and African-American Faculty & Staff Organization. Ms. Spivey also supported the Goodnight Fellows selection interviews in February 2020 and served on the Chancellor's Awards for Excellence selection committee. Ms. Spivey participated as an advisor to the Social Innovation Fellows Reborn team. In May 2020, Ms. Spivey was selected 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.
- Dr. Elaine Franklin, Director of the Kenan Fellows Program was appointed 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 joined the Kenan Fellows Program team in October 2019. Mr. Kain serves 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 serves as an Advisory Board member for RaiseNC (formerly First in Teaching), a new 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.

- 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 the onset of COVID-19, KIETS continues to be responsive to stakeholder needs while effectively managing the continuity of its operations under the challenging circumstances. KIETS and Kenan Fellows Program 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. In addition, Kenan Fellows Program alumni engaged with The Innovation Project for a focus group session on how our school systems can innovate as a result of COVID-19 and the Kenan Fellows Program has been working with pre-service teachers in collaboration with NC State's Teaching Fellows through Twitter chats with veteran teachers to share their experience working virtually with kids during this crisis. In collaboration with the NC Business Committee for Education, Kenan Fellows Program alumni served as subject area experts connecting video resources to state standards that Novozyme's scientists have created. Moreover, Kenan Fellows alumni have taken leadership in efforts including 3-D printing of masks, creating and facilitating virtual professional development at the school, district, state, and national levels as well.

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.

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. 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.