



Fiscal Year 2015 - 2016

**Kenan Institute Goals and Accomplishments
Aligned with the NC State University Strategic Plan Goals**

NC State Strategic Plan Goal 1: 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:

- KIETS supported the *Integrative Graduate Education and Research Traineeship Program (IGERT) in Bioengineering and Society* led by Prof. Fred Gould that annually engages 6-7 PhD graduate students in interdisciplinary scholarship regarding challenges that will face society as genetic technologies for manipulation of pest genomes are developed.
- KIETS supported *The Entrepreneurs Living and Learning Village*, a program of the NC State Entrepreneurship Initiative (EI) led by Dr. Tom Miller. KIETS Associate Director Raj Narayan served as a mentor for 2015-16 EI Fellow Leigh Kathryn-Bonner, Founder of Bee Downtown.
- KIETS supported the NC State student team that participated in the *IEEE International Future Energy Competition* in the United Kingdom. The NC State team won the best energy efficiency award and a \$3000 prize.
- 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 an executive mentor and advisor to TEC teams including Hi-LUM, which was selected for \$20K support by the Andrews Accelerator Fund through the Poole College of Management Entrepreneurship Clinic.
- KIETS helped initiate and support the *NC State Social Entrepreneurship and Innovation Speaker Series* led by the NC State Institute for Nonprofits to provide students with opportunities to engage and learn from social entrepreneurs in North Carolina and nationally.

NC State Strategic Plan Goal 2: 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.

- KIETS supported the *Development of a Filtration System for Contaminated Water* led by Prof. Jan Genzer.
- KIETS supported the *Hybrid Solar Redox Process* led by Prof. Fanxing Li
- KIETS supported the *Research Triangle MRSEC on Soft Matter* led by Profs. Jan Genzer, Carol Hall, Michael Dickey, Orlin Velev.
- KIETS enabled the *Bioseparations/Bioprocessing Development Center (BBDC)* initiative led by KIETS Director Dr. Ruben Carbonell in partnership with BTEC.
- KIETS supported the *Annual Meeting of the International Graduate Research Training Group in Self-Assembly of Soft Matter Near Interfaces* which was held in Wilmington, NC on October 7-10, 2015.
- KIETS supported the *Continuous Downstream Process for Influenza Vaccines Enabled by Disposable Technologies* led by Professor Stefano Menegatti.
- KIETS supported the *NC State Science, Technology, and Society Program NSF Intelligence, Secrecy and Ethics Workshop* led by Prof. Kathleen Vogel.
- KIETS supported the College of Agriculture and Life Sciences' *Stewards of the Future* conference held on November 2, 2015 as well as its *Emerging Plant Disease and Global Food Security Symposium* held on March 23-24, 2016.

NC State Strategic Plan Goal 3: 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:

- KIETS supported the development of the *National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL)* initiative. KIETS Director Ruben Carbonell is one of several lead investigators preparing a proposal to establish NIIMBL, an institute that will become part of the National Network of Innovation Institutes to enhance the nation's manufacturing-based economy. NIIMBL's mission is to advance the economic competitiveness of the US biopharmaceutical industry, to create jobs and improve the economy by accelerating the development and implementation of high-impact biomanufacturing innovations that can be applied to current and future biopharmaceutical products, and to educate and train a world leading workforce for the future of this industry.
- KIETS provided support for the *Research Innovation Seed Funding (RISF)* program. RISF projects selected for support in fiscal year 2015-16 include the following:
 - Dr. Michael Kudenov, College of Engineering, *Development of Sentinel Reporter Plants to Guide Efficient Screening of Germplasm and Management for Yield Improvement*
 - Dr. Rosangela Sozzani, College of Agriculture and Life Sciences, *High-Resolution In-Vivo Imaging of Stem Cell Divisions with Light Sheet Microscopy*
 - Dr. Carl Kelley, College of Sciences, *Computational Photochemistry, Sparse Interpolation, and Solar Energy*
 - Dr. Elizabeth Dickey, College of Engineering, *Electrochemical Capacitor Research Thrust*
 - Dr. Xiaoning Jiang, College of Engineering, *Laser Patch Using Carbon Nanofiber Composites*
 - Dr. Sunkyu Park, College of Natural Resources, *Pyrolysis Bio-oil from Biomass as Drop-in Fuels for Diesel Engines*
 - Dr. Joshua Pierce, College of Sciences, *Development of Novel Therapeutics to Modulate Bacterial Biofilms*
 - Dr. Jonathan Lindsey, College of Sciences, *Toyporphin - an Unprecedented Natural Product from Terrestrial Cyanobacteria*

- Dr. Lauren Schnabel, College of Veterinary Medicine, *Effect of 3D Culture and Inflammatory Conditions on Equine Mesenchymal Stem Immunophenotype and Secretome Stability - A Pilot Study*
 - Dr. Tarek Aziz, College of Engineering, *Development of a Reservoir Column Reactor to Experimentally Evaluate the Effect of Mixing on Harmful Algal Communities*
 - Dr. Ashley Brown, College of Engineering, *Development of Wound Targeting Particles for Theranostic Applications*
 - Dr. Troy Ghashaei, College of Veterinary Medicine, *Discovery and Modeling of Clonality in Forebrain Stem Cells During Giliogenesis*
- KIETS is helping to support several large NC State Centers including the *FREEDM Center* and the *Statistical and Applied Mathematical Sciences Institute*. In addition, KIETS is collaborating with these centers as well as with the *ASSIST Center* to extend the value of university research to the K-12 community through its Kenan Fellows Program.
 - KIETS is collaborating with the Vice-Chancellor for Research, Innovation, and Economic Development to develop and launch the *Game Changing Research Incentive Program (GRIP)*.

NC State Strategic Plan Goal 4: 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:

- KIETS conducted a business model and sustainability review of its *Kenan Fellows Program* and worked with Bellwether Education Partners. Recommendations resulting from this review that are helping the Kenan Fellows Program continue refine its processes and adapt novel strategies for improved program effectiveness, outcomes, and impact while implementing strategies for long-term sustainability.
- In 2015-16, KIETS core operating and program investments of \$1,315,930 leveraged approximately \$14,315,363 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 identified and engaged new members of its Board of Trustees including Bob Geolas, Judith Cone, David Gardner, Stick Williams, Juan Luis Torres, and Rob Tyler.
- KIETS' Kenan Fellows Program identified and engaged new members of its Board of Advisors including Creighton Blackwell, Alisa Chapman, Eric Davis, Aaron Fleming, Kendall Hageman, Steve Hill, Jo Ann Honeycutt, Ethan Lenker, Matt Meyer, Keith Poston, Lisa Rhoades, Stephen Saucier, and Tom White.
- KIETS is working 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' Kenan Fellows Program successfully managed the retirement of two staff (Cindy Malecha and Susan Parry) and transition of one staff member (Tia McLaurin) who was selected to become the new Community Impact Manager for Google Fiber in RTP. Kelly Vogel and Cordella Rasheed were selected as the new Asst. Director for Development and Asst. Director for Finance respectively for the Kenan Fellows Program.
- KIETS supported the Institute for Emerging Issues (IEI) as it successfully transitioned to the Provost Unit as its new administrative home effective July 1, 2016 thereby strategically integrating IEI into the academic heart of the university consistent with IEI's evolving role in translating scholarship into impactful discussions on important issues of public policy.
- KIETS' Kenan Fellows Program was awarded a "Golden Gear" award for Higher Education Department of the Year on Wednesday, May 25, 2016 at the first annual STEMmy Awards hosted by US2020 Research Triangle Park (RTP) at the Research Triangle Park Headquarters.
- KIETS updated its website (www.ncsu.edu/kenan) to better align with the branding of NC State, provide easier website and social media management, and enhance the overall website visitor experience.

NC State Strategic Plan Goal 5: Enhance Local and Global Engagement Through Focused Strategic Partnerships

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

Accomplishments:

- 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*. In fiscal year 2015-16, five new GKRS programs have been held to date with 265 attendees participating and an average attendance of 53 attendees per seminar. The GRC credits the Kenan Institute for their explosive growth of the GKRS program.

- 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. KIETS Director Ruben Carbonell enabled an ad-hoc committee to advise and guide the enhanced engagement of NC State faculty in IEI activities.
- KIETS helped support and advise two Kenan Creative Collaboratory supported programs including the *Innovate NC* initiative and the *NC Venture Labs* initiative. KIETS Associate Director Raj Narayan participated with the Innovate NC strategic partnership / steering committee.
- KIETS provided financial support and guidance to the NC State *Genetic Engineering and Society* program to develop their outreach efforts in genetically modified organisms and facilitate their collaboration with the Kenan Fellows Program.
- KIETS supported and helped reinstitute the NC Sea Grant Community Collaborative Research Grant Program. As a result of KIETS support, four successful proposals were awarded as a result including the following:
 - *Spatial and Biogeomorphic Properties of Oligohaline Marshes in Currituck Sound: Implications for Response to Sea-Level Rise*; James “Bo” Dame of Chowan University, with Heather L. McGuire of Chowan, along with Brandon Puckett of the North Carolina Coastal Reserve and Robbie Fearn of the National Audubon Society;
 - *Cape Shark Project*; Evan Ferguson of Cape Hatteras Secondary School, along with Jeffrey Aiken of Jeffrey’s Seafood, and Rev. Richard Joyner of the Conetoe Family Life Center;
 - *Quantifying and Communicating the Function of Restored Estuarine Habitats*; Michael F. Piehler of the University of North Carolina at Chapel Hill’s Institute of Marine Science, with Pat Donovan-Potts of the City of Jacksonville, Carolyn Currin of the NOAA National Ocean Service, Jennifer Dorton of the N.C. Sentinel Site Cooperative and Susan Cohen of U.S. Marine Corps Base Camp Lejeune;
 - *The 1997 Fisheries Reform Act: An Oral History Perspective*; Susan West of Buxton, with Jimmy Johnson of the Albemarle-Pamlico National Estuary

Partnership, Sandra Davidson of Bit & Grain, Mary Williford of the Southern Historical Collection at UNC-CH, Barbara J. Garrity-Blake of Duke University Marine Lab, and Karen Ampacher of the Core Sound Waterfowl Museum and Heritage Center.

- KIETS supported a partnership with the NC Coastal Federation and NC Sea Grant regarding their *Environmental Restoration as a Viable Economic Strategy for Success in Rural Coastal Communities Initiative*.
- KIETS supported the *Marine Bio-Technologies Center for Innovation (MBCOI)* which completed a comprehensive review of the freshwater and marine aquaculture industry in North Carolina.
- KIETS helped the NC Land of Water (NC LOW) initiative Institute helped the NC Land of Water (NC LOW) organize a symposium on the *Future of North Carolina's Barrier Islands* that was held on March 22, 2016 at the James B. Hunt Library at NC State.
- KIETS continued its partnership and support of the NC Biotechnology Center (NCBC) *Collaborative Funding Grant (CFG) Program*. Since the program's inception more than \$7 million from the North Carolina Biotechnology Center and the Kenan Institute has been awarded to over 106 grant recipients. As a result of the money awarded in the CFG program, outside sources have provided more than \$352 million dollars in additional investments to the grant recipients based on information from 90 closed grants.
- KIETS collaborated with the Research Triangle Park (RTP) Foundation and TUCASI to develop and launch the request for proposals for the *Catalysts for Innovation* initiative. The purpose of the initiative is to identify new university activities that would benefit from a partnership leveraging the RTP, Triangle universities, and the private sector. The vision is to make North Carolina the leading incubator for innovative ideas leveraging the intellectual, physical and economic assets located in the Research Triangle Park Region and North Carolina. A request for proposals was announced in February 2016 which resulted in 13 proposal submissions totaling over \$1.5 million in requests. Two projects selected for support through the Catalysts for Innovation include the following:
 - *Biomedical Innovation Collaborative for Veteran Entrepreneurs at the Frontier*. The UNC/NC State Department of Biomedical Engineering (BME) will lead the effort in close collaboration with Bunker Labs RDU to help veteran entrepreneurs identify and develop innovative biomedical solutions that can positively impact quality of life.

- *EcoPRT Automated Transit in Research Triangle Park* – This effort is a collaboration of NC State’s Department of Mechanical and Aerospace Engineering along with NC State and UNC’s Departments of Computer Science as well as NC State’s Department of Electrical and Computer Engineering. The PIs are developing a novel transit solution called EcoPRT exploring its uses on RTP and establishing RTP as an automated transportation R&D hub with multi-university collaboration.

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

Accomplishments:

- KIETS continued to support the growth of the *Kenan Fellows Program for Curriculum and Leadership Development*, engaging a large number of industrial partners, non-profits, federal agencies such as the NSF, the DPI, and numerous communities and individuals throughout NC. The Class of 2015-16 was selected through a competitive application process from 133 applications submitted from 39 school districts. The 42 Fellows that were selected represent 14 North Carolina Counties, three of which were new to the program: Greene, Martin, and Person. Each of the 42 Fellows in the 2015-16 cohort completed a 3-5 week internship with a mentor in a STEM research or applied STEM setting, and 80 hours of professional development that were provided through three Professional Advancement Institutes (PAI). Based on reports from the cohort of 2015-16, more than 3,000 K-12 students were engaged in lessons that were designed through the Kenan Fellowship or experienced new instructional strategies that Fellows learned through professional development sessions. In 2015-16, the KFP launched a scholarly journal for K-12 educators, administrators, and researchers from both formal and informal education settings.
- KIETS supported the *NC Museum of Natural Sciences Educators of Excellence Institutes Program*. The Museum of Natural Sciences reported that 22 K-12 teachers participated in the experience from North Carolina along with 2 teachers from Belize as well as a faculty member from St. Augustine’s University in Raleigh. Through formal and informal educational experiences these teachers reached approximately 3,850 K-12 students and over 8,000 individuals in the broader public.
- In 2015-16, KIETS collaborated with the National Academy of Engineering to support the *EngineerGirl* initiative. *EngineerGirl* impacts thousands of students around the world each day and has received over 55,000 unique visitors per month since July 1st, 2015. The program received 770 individual entries to the 2016 essay contest. The contest opportunity was shared with

the Kenan Fellows who shared that information with their classes. EngineerGirl received 30 entries from students in North Carolina schools that represents 4.34% of total US entries for this year. Christy Wilson, A Kenan Fellow, has begun service on the program's steering committee and has provided valuable guidance in developing the essay contest topic for 2017 and plans for future improvements on the site.

- KIETS supported a collaboration with the *NC Public School Forum Education Policy Fellows* program. In 2015-16, the Kenan Institute supported three Kenan Fellows - Rebecca Hite, Doug Price, and Allison Stewart who were selected to participate in the EPFP. The EPFP reports that all three Fellows developed articles on education policy that were published or in process.

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:

- KIETS provided matching funds for the *Richard and Marlene Daugherty Centennial Campus Entrepreneurism Endowment* that support start-up firms initiated with university intellectual property. In 2015, the Daugherty Initiative supported 10 companies which have raised \$465,400 in grant awards and product sales. Six companies have products on the market, three companies have submitted multiple follow-on grant proposals and one company received a NSF Phase I SBIR award. One company is now located in the NC State Technology Incubator and seven Daugherty initiative awardee companies were selected to attend the CED Tech Venture Life Science Conference. The Daugherty Initiative partnered with the NC State Entrepreneurship Initiative to feature the selection of the Daugherty Initiative recipients as part of the 2016 Entrepreneurship Lulu eGames in April 2016. 36 companies were eligible to apply, 17 companies applied for support and of the 17, 11 companies were new startups launched in 2016. Five companies were selected as finalists with the following awardees: 1st Place: *Smart Material Solutions*; 2nd Place: *RiboWiz & Third Floor Materials*; 3rd Place: *Custom Nano & Insight Finder, Inc.*
- In 2015-16, KIETS worked collaboratively with the NC State Office of Technology Transfer, NC State Entrepreneurship Initiative, and NC State Poole College of Management to develop the *Wolfpack Investor Network (WIN)* initiative focused on connecting alumni investors with promising NC State-affiliated startup companies to facilitate angel investments. WIN will curate startup investment opportunities, coordinate company reviews using student teams, provide members with access to startup company

information through a members-only website, and facilitate the communication between WIN members and the startup company.

KIETS staff also served in leadership and advisory roles and participated in various 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 NC BioImpact Implementation Group, the NCBC Ag Biotechnology Council (Chair), the Strategic Planning Committee for the Biomedical Engineering Department, the UNC CH Applied Physical Sciences Department, the Kenan Institute for Private Enterprise Advisory Board, the IEI Director Recruitment and Selection Committee, and on the Executive Committee of the NC Association for Biomedical Research.
- KIETS Associate Director Raj Narayan served on the Chancellor's Innovation Fund selection committee, as a TEC Program Executive in Residence and Mentor, NC State Industry Liaisons Working Group, the Wolfpack Investor Network (WIN) Steering Committee, the WIN Managing Director Recruitment and Selection Committee, the Kenan Institute of Private Enterprise (KIPe) Review Committee, and the Board of Directors of Xanofi, a startup company based on NC State innovation. He was also an active participant in the NC Eisenhower Fellows, Marshall Memorial Fellows, and NC William C. Friday Fellows alumni initiatives.
- KIETS Business Officer Ena Meng worked closely to help administer HR and financial needs of the Institute for Emerging Issues.
- KIETS Technology Support Technician Ms. Shelley Sutton served on the Chancellors Unit Awards for Excellence Committee. Shelley Sutton served as the Hunt Library building liaison team on behalf the tenants of the tenants in our Hunt Library office suite. Ms. Sutton 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. Amneris Solano, Communications Manager for the Kenan Fellows Program was nominated for the Chancellor's Unit Award for Excellence.
- Ms. Lisa Hibler, Associate Director for Program Operations for the Kenan Fellows Program served as a member of the NC State RET Advisory Board, as a reviewer for the Albert Einstein Distinguished Educator Fellowship, as a reviewer for the Presidential Awards for Excellence in Mathematics and

Science Teaching, and as a member of the Education Committee for the Wake County Chapter of the American Chemical Society.

- Ms. Kelly Vogel, Assistant Director of Development for the Kenan Fellows Program served on the NC State Campaign Operation Workgroup on Volunteer Leadership Management and as a participant in the Triangle Chapter of the Association of Fundraising Professionals Mentor / Professional Development program.

Recommendations and Concerns for the Future

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.

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.