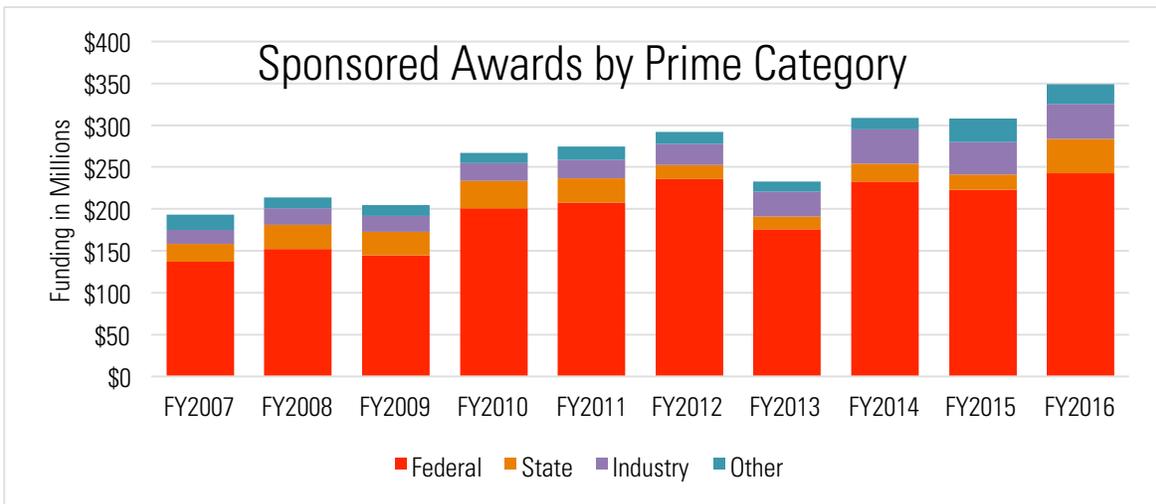


Annual Report for FY2016

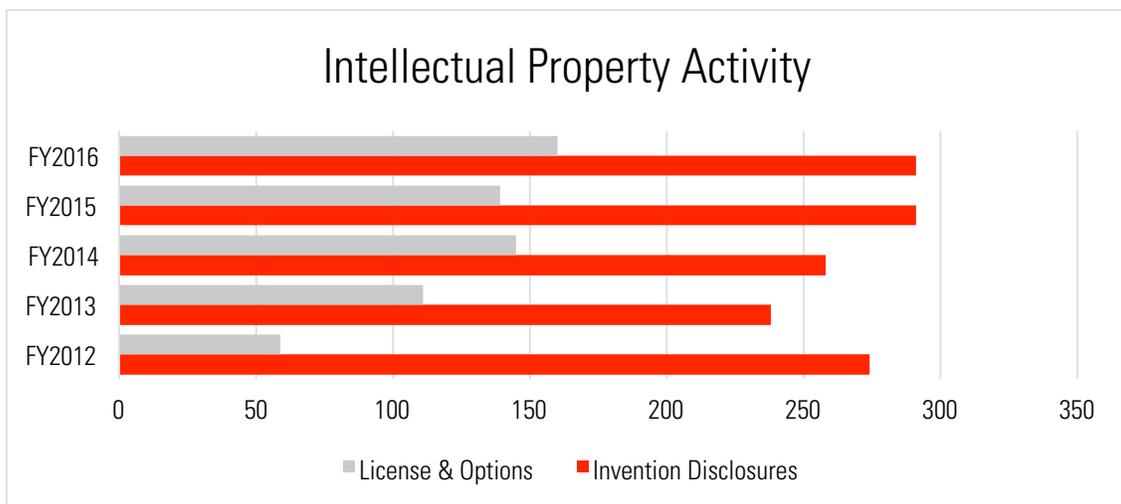
The Office of Research, Innovation and Economic Development (ORIED) plays a critical role in NC State's success as a preeminent Research I university. The Vice Chancellor (VC) for ORIED and the units reporting to him actively support and nurture the research enterprise, providing resources, expertise, and regulatory control, leading the way to advance innovation and discovery. ORIED includes Research Operations; Federal Relations; Partnerships and Economic Development (PED), which includes Centennial Campus and Industry Alliances; Research Development Office (RDO), which includes Proposal Development Unit (PDU) and Research Infrastructure Unit (RIU); Sponsored Programs and Regulatory Compliance Services (SPARCS); Office of Technology Transfer (OTT); and Integrated Support Service Center (ISSC).

Executive Summary / Highlights

Fiscal year 2016 was another successful year for the Office of Research, Innovation and Economic Development (ORIED) with a record-breaking number of proposals submitted, awards received and licenses and options executed. FY2016 closed with \$349M in sponsored program awards, a record high, and a 13% increase over the previous year. As of July 1, 2016, over 2,600 sponsored projects were active, many spanning multi-years, representing over \$1B in total funding. Thirty-four of the proposal submissions were large-scale projects, assisted by Proposal Development Unit (PDU), requesting \$425M in research funds, an increase of 190% over FY2015 requests. Also, for the third year in a row, faculty research proposals totaled over \$1B dollars.



Faculty and researchers continued to submit high volumes of invention disclosures and the Office of Technology Transfer (OTT) executed a record 160 licenses and options with corporate partners. OTT increased its effort to match technologies with companies by utilizing the technology-marketing web portal, Nouvant. OTT created 95 marketing profiles for new NC State technologies that can be viewed through Nouvant and had over 6,700 visitors access the portal. OTT also continued to improve service to faculty by reducing the invention assessment time to 62 days - a reduction of 96 days since 2011.



ORIED continued to develop strategic partnerships through the office of Partnerships and Economic Development (PED) with support from Sponsored Programs and Regulatory Compliance Services (SPARCS). These offices facilitated the signing of 6 new master research agreements

(MRAs) with Avintiv, BASF, Glen Raven, LexisNexis, Lubrizol, and Positive Energies for a total of 10 managed MRAs. These 10 managed MRAs have resulted in 26 patents. PED's Industry Alliances manages 22 research partnerships, representing \$8.4MM in new sponsored research activity in FY 2016. In addition SPARCS established significant contractual relationships with Caterpillar, Novozymes, and Battelle Energy Alliance. PED's Centennial Campus welcomed 10 new partners including Alkemere, Allasso Industries, Cloudbees, Eva Garland Consulting, IBM, i2m, Liaison Technologies, Locus Biosciences, Merck, and MS Consultants bringing the total number of Centennial Campus Partners to 72, employing more than 3,200 people. PED also worked 50 distinct new and expanding economic development projects in areas throughout North Carolina and continues to be a valuable asset to the state of North Carolina.

Enhancing the Success of Our Students through Educational Innovation

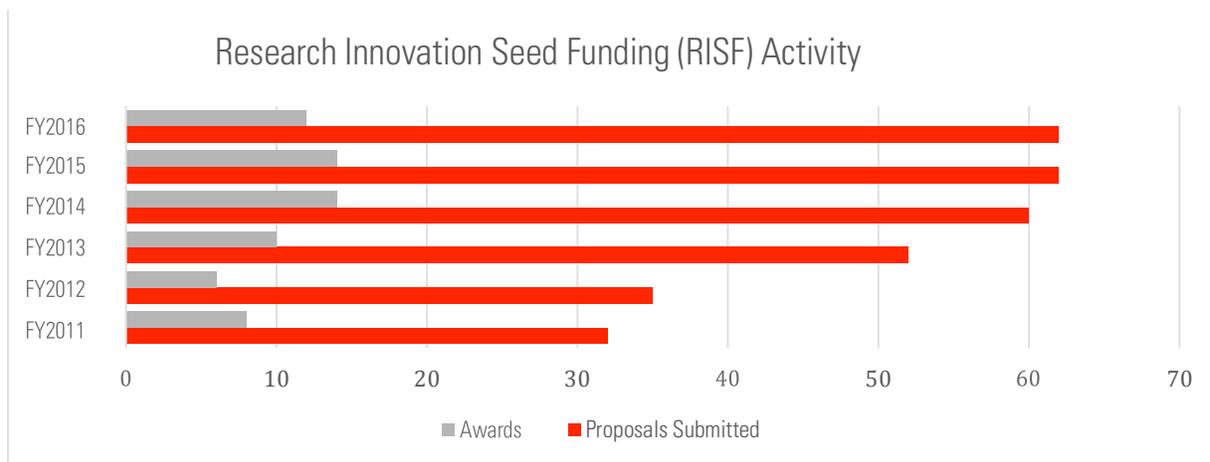
ORIED enhances the education of undergraduate and graduate students by providing access to real world research problems through research assistantships. In FY 2016, 171 undergraduate and graduate students participated in research assistantships at one of ORIED's core centers and institutes. ORIED also contributed \$100k to the Office of Undergraduate Research's Undergraduate Research Awards (URAs) program. ORIED's financial contribution provides support to the faculty who mentor undergraduates, for student travel and the coordination of 22 Summer Research Experience Programs (REUs).

In 2016, researchers, faculty and graduate students at the Friday Institute completed the North Carolina K-12 Digital Learning Plan, which focuses on five elements of digital learning: Innovative Funding Streams and Policy, Digital Content, Human Capacity, and Network Infrastructure. Now being implemented by the state with an annual investment of \$4M, the NC Digital Learning Plan will accelerate the State's progress in providing the personalized, digital-age education that K-12 students need to be successful in college, in careers, and as engaged citizens.

NC State's Data Science Initiative (DSI) coordinated and promoted efforts across campus and across the UNC system (with UNC-Chapel Hill and UNC-Charlotte) to provide graduate and undergraduate education in data science. In partnership with the Odum Institute for Research in Social Science and the National Consortium for Data Science, DSI created a series of one- and two-day classes for faculty, students, staff, and researchers to enhance their skills in data analytics. The weeklong series will be offered in early FY2017 prior to the start of the fall semester.

Enhancing Scholarship and Research by Investing in Faculty and Infrastructure

This year the Research Development Office (RDO) announced over 300 funding opportunities, assisted in over 9 internal limited submission competitions, and managed 3 internal seed-funding programs. The Research Innovation Seed Funding (RISF) program has grown steadily in popularity, matching the previous year in all-time high proposal submissions. In the program's 6th year, and in partnership with the Kenan Institute, the RISF program awarded \$269K to 12 projects supporting 18 faculty members, 2 postdocs, and 10 graduate students. ORIED also returned \$117K to the colleges



to fund the Faculty Research and Professional Development Program (FRPD). ORIED initiated the Game-Changing Research Incentive Program (GRIP), a large-scale seed-funding program (\$2.3MM to be distributed over 3 years), to incentivize visionary research projects that will result in more extramural funding, superior interdisciplinary graduate education and training, and have a greater societal impact. ORIED partnered with RTI International and the Kenan Institute to develop the full

incentive program. The first call for pre-proposals was held in spring 2016, with the final decisions to be made in the fall.

The Chancellor's Innovation Fund, managed by the OTT, has awarded \$1.9M to 28 projects in the past six years, which has resulted in 10 startup companies launched, 14 licenses and option agreements, \$983K in licensing revenue, and \$9.9M in follow-up external funding to support further development. OTT also collaborated with the Poole College of Management to provide an Investor Ready Business Plan course targeted toward emerging start-up companies. The class was launched in January with an initial enrollment of 14 company teams. Independently, OTT launched 2 additional intellectual property educational events: an all-day "Startup Boot Camp" and a "Lunch and Learn" program. The first Lunch and Learn, held in spring 2016, provided an overview of the Chancellor's Innovation Fund program. The second, scheduled for fall 2016, will focus on Tangible Property Licensing & Material Transfer Agreements. Fifteen faculty members attended the Startup Boot Camp event and the next event is planned for spring of 2017.

ORIED launched the Electronic Research Administration (eRA) project to identify a new state-of-the-art eRA system to streamline research activities across the University. The first phase of the eRA project was to engage Attain, LLC to evaluate NC State's existing research administration systems and related business processes; identify gaps, comment on service levels and user experiences; and benchmark the existing systems against popular vendor-provided systems. Based on Attain's assessment a Steering Team was appointed and charged to see the project through to the anticipated launch in January 2018.

SPARCS implemented a new vendor-based Institutional Animal Care and Use Committee (IACUC) electronic protocol submission and animal subject inventory system, trained 80+ faculty and staff on its use, and hired a full-time IACUC Compliance Assistant to provide support. SPARCS also hired a full-time Export Control Compliance Administrator to work directly with faculty and

administrators to identify and manage risks associated with export controlled technology and equipment.

Enhancing Interdisciplinary Scholarship to Address the Grand Challenges of Society

GRIP, the large-scale seed-funding program mentioned previously, aims to stimulate growth of interdisciplinary research at NC State while targeting grand research challenges. The program received 59 preliminary proposals from 10 colleges and 52 departments. Over 300 members of NC State faculty were involved in a proposal (~20%) and half of the proposal teams were collaborations with RTI International. The 10 pre-proposals selected to move forward addressed important societal challenges in the areas of energy, water, safety, education, climate, and data science.

ORIED supported the submission of 3 National Network for Manufacturing Institute (NNMI) proposals in Bioenergy/bioprocessing, Fibers/Textiles, and Smart Manufacturing/Clean Tech and partnered with UNC-Chapel Hill and Wake Forest University on the submission of a pre-proposal for a Regenerative Medicine NNMI. The PDU assisted in 34 interdisciplinary proposals and 11 workshops and site visits. In all, over 500 faculty/staff were involved in PDU-supported proposals submitted this year, including 185 PIs/Co-PIs. The PDU also created the Proposal Development Network (PDN) to connect proposal developers and other proposal support staff across campus to foster collaborations involving multiple departments and/or colleges. The group has 40 members and meets bi-monthly with invited speakers presenting on topics of interest.

Enhancing Organizational Excellence through a Culture of Constant Improvement

This year ORIED significantly restructured the organization to improve the overall infrastructure and environment. Dr. Mladen Vouk was appointed to Associate Vice Chancellor for Research Development, a position that had been vacant for 18 months. Sponsored programs activity (research administration) was separated from compliance and new directors were hired/promoted to oversee these units. The Sponsored Programs unit now reports directly to Dr. Vouk and Compliance reports to

Dr. Vouk and Vice Provost for Faculty Affairs, Dr. Katherine Stewart. ORIED also hired a Director of Research Operations to drive the implementation of ORIED strategic initiatives.

In addition to organizational changes, ORIED focused on developing education and training resources. To increase the competitiveness of proposals submitted by NC State, the PDU organized several training sessions, which were attended by over 250 faculty members. SPARCS revived research education for staff; conducted 17 face-to-face classes and Q&A sessions; and hosted 14 NCURA Lifecycle of the Award webinars. The Federal Relations office worked with interested faculty to advise them in pursuing Department of Defense (DOD) research. In support of this effort, the office hosted Bill Regli, Defense Advanced Research Projects Agency (DARPA) and Office of Naval Research (ONR) Science Advisors and helped faculty connect with program managers at Army Research Office (ARO), ONR and DARPA.

In FY2016 ORIED hired Huron Consulting group to examine sponsored programs administration at NC State. The Huron report yielded recommendations in proposal management, award set-up, sub-awards and communications that will drive working groups within SPARCS, Contracts and Grants, and college research offices. The recommendations from the Huron report will be integrated into the eRA project discussed previously. In November 2015, SPARCS established an SOP for Testing Service Agreements (TSAs) and Fabrication Service Agreements (FSAs). Previously a function of the college research offices, the change highlighted previously hidden issues related to acceptance of terms unfavorable to the university and unified the process. The process also heavily burdened the workload of the SPARCS staff, increasing the turnaround time for these activities. The process will be evaluated to determine the benefits and costs of the change.

This fiscal year PED developed a Partnership Strength Score and associated reports for prospects and partners. The goal is to better assess and communicate the strength and impact of NC State's industry partnerships. PED also funded a project with Computer Science to develop a data-driven prospecting tool to identify prospects for future partnerships with NC State.

Enhancing Local and Global Engagement through Focused Strategic Partnerships

NC State has built a reputation on the ability to build strategic partnerships with industry, government and non-profit. These partnerships have been key to ORIED's success in winning federally funded collaborative institutes and engineering research centers. This year ORIED continued to develop a strategic partnership with RTI through the RTI scholars program and collaboration on GRIP. ORIED leadership meets regularly with RTI leadership to continue to identify opportunities for increased collaboration. ORIED also partnered in the submission of a pre-proposal to the DOD for an NNMI on Regenerative Medicine with UNC-Chapel Hill and Wake Forest University.

OTT laid the groundwork for the Wolfpack Investor Network (WIN) to connect alumni investors with promising campus start-ups. Set to launch this fall, WIN will provide a new avenue for engaging the enthusiasm, resources and expertise of this important group of alumni. OTT worked with Advancement, Finance, the Kenan Institute, the Office of General Counsel, the Entrepreneurship Initiative, Poole College of Management, and various NC State alumni investors, as well as collaborators from Duke and UNC Chapel Hill to make this project come to fruition. It has already yielded returns by strengthening OTT's connections with the local entrepreneurial ecosystem.

PED continued to develop partnerships with industry, government and non-profits. This year PED partnered with the City of Raleigh, submitting a joint grant application to the US DOT to develop advanced transportation systems initiatives (EcoPRT). PED also partnered with Lulu Games, a competition for student entrepreneurs, to create a Daugherty Endowment track aimed toward faculty start-up companies. Centennial Campus Partnership signed leases with Merck and IBM to establish the companies' corporate innovation centers on campus. This is a result of PED's strategy to establish Centennial Campus as a hub for corporate innovation centers. Merck and IBM join Eastman, ABB, Mann+Hummel and HanesBrands for a total of 6 corporate innovation centers on Centennial Campus.