



**Division of
Science, Technology
& Innovation**

**Centers for Advanced Technology Report
(FY 2016 -2017 & FY 2017-2018)**

Empire State Development's Division of Science, Technology & Innovation (NYSTAR) manages funds 15 Centers for Advanced Technology (CATs) to encourage greater collaboration between private industry and universities in the development and application of new technologies. The CAT program, created in 1983, facilitates a continuing program of applied research, development and technology transfer in multiple technological areas, in collaboration with and through the support of private industry. CATs play a critical role in spurring technology-based applied research and economic development in the state, promoting national and international research collaboration and innovation, and leveraging New York's research expertise and funding with investments from the federal government, foundations, businesses, venture capital firms and other entities.

NYSTAR periodically identifies technology fields of strategic importance to New York's economic competitiveness and holds competitions to award 10-year CAT designations to New York universities, university-affiliated research institutes.

The CATs report was previously included in a larger reported that contained information regarding a number of programs run by NYSTAR. This report contains more information than previous NYSTAR reports, while being presented in a summarized manner where information can be gleaned quickly and easily. The information is layout in the following categories:

- Importance to NYS
- Impacts
- Federal or Other Grants Awarded
- Education and Technology Commercialization Activities
- Commercialization
- Start-up Companies Formed
- Licensing Agreements
- Level of Matching Funds Provided

Center for Advanced Ceramic Technology (CACT)
Alfred University
John Sisson - Center Director
Technology Focus: Material Science

Importance to NYS

The CACT, provides New York-based industrial partners with unmatched access to a range of analytical and research capabilities, with specific strengths in the high temperature characterization of ceramic materials, ceramic machining and finishing, and additive manufacturing (3D printing) of ceramics. The Alfred CACT works as the primary point of contact for industry seeking to work with Alfred University, assisting in the development of programming from short-term analytical testing services to long-term sponsored research programs. The CACT also supports the development of industry-focused educational programming, including webinars, short courses, and conferences, and working to match students with internship opportunities at employers located across the state.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	9.0	5.0	\$1,957,260	\$1,281,382	\$1,293,090	\$297,000	\$695,750	\$5,524,482
2017-2018	0.0	0.0	\$566,920	\$956,474	\$0	\$200,000	\$7,500	\$1,730,894

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs.)	Summary
2016-2017	ExOne Characterization	William Carty	DoD	\$148,396	9/5/2016 - 6/14/17	3D printing of silicon carbide for use in outer space
	Hierarchical Waste	Dr. S. Misture	DoE	\$273,000	8/1/16 – 7/31/20	Using synchrotron X-ray scattering data to describe nanoscale-disordered bimetallic nanoparticles
	Acquisition a Raman Spectrometer	S. Misture, S.K. Sundaram	NSF – DMR	\$370,000	9/1/16 – 8/31/18	Purchase of an in-situ Raman Spectroscopy system
	Bioinspired Composites	Dr. A. Wren	NIH	\$20,000	3/1/17 – 2/28/18	Bioinspired composites for Dental Restorations
	Transparent Non-Cubic Ceramics	Dr. Y. Wu	DoD	\$118,307	8/1/16 – 6/30/18	Fabrication of non-cubic ceramic particles
	Ionic Valencies	Dr. Y. Wu	NSF – DMR	\$324,287	7/1/16 – 6/30/21	Off-valence substitution to control the valency of laser ceramics
2017-2018	Not Reported					

Education and Technology Commercialization Activities**Industry-Oriented Education and Training**

The CACT cooperates closely with local schools and supports an annual Engineering Day organized by Dr. S Pilgrim. Faculty also participates in regional STEM programs and Dr. Pilgrim recently completed a sabbatical at Corning Incorporated supporting the STEM initiative and technician pipeline. Alfred University also cooperates with Corning Community College to offer college credit courses previously unavailable to students in the Corning area.

CACT funding continues to support students at AU to work on industry projects to obtain experiential learning while working on projects. The CACT also continues to provide support to bring students to the annual Ceramics Expo in Cleveland, providing students with exposure to a wide range of firms working the technical ceramics and glass fields, the AU alumni network, and in providing direct support to the conference managers in running plenary and other educational programs throughout the Expo.

The CACT has also taken a leadership role in the Western New York Section of the American Ceramics Society (ACerS), in providing direct support for student engagement in developing ACerS programming, as well as scheduling events throughout the Western New York region at area employers focused on ceramics and glass. Events during the period were held at ASK HI-TECH, the Corning Museum of Glass, and Praxair. CACT also provided matching funding through its associates program to support student employment opportunities at three NYS firms.

Commercialization

Moving forward, CACT, and other NYSTAR-supported centers, is working to improve collaboration to better serve the needs to New York's industrial base. Alfred CAT, in partnership with other CAT's from Binghamton University, Clarkson University, and the Rochester Institute of Technology, met in Syracuse, NY at the first multi-CAT conference. This program focused on how the materials-science CAT's are working with industrial partners to solve some very difficult technical challenges and discussing how they can improve on the innovation ecosystem in New York. Work is underway now to identify additional areas of need faced by industry, specifically in the areas of workforce development, and how the CAT's (including but not limited to CACT) can support those needs.

Recent outreach to the ceramics business community across the state has included a booth at the NY Clean Energy conference in NYC, a booth at the Ceramics Industry Conference in Cleveland OH (which all NY manufacturers attend), the Clarkson University CAMP meeting in Canandaigua and the Fuzehub regional resources meeting in Buffalo NY. Statewide and in WNY, CACT is leveraging new and renewed relationships with UB (NY Center of Excellence in Materials Informatics), Buffalo Manufacturing Works (additive manufacturing and metrology), Clarkson University CAMP (NY CAT with expertise in materials preparation and characterization) and RIT AMPrint (NY CAT in additive manufacturing) in order to provide a unique service to ceramics companies in NYS and ceramic users in a wide range of industries.

Invention Disclosures

Not Reported

Start-up Companies Formed

Not Reported

Licensing Agreements

Reporting Period	Project	Inventor	Licensing Partner
2016-2017	N/A	Matthew Hall	Conax Technologies, LLC

Level of Matching Funds Provided**2016-2017 Reporting Period**

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$506,515	\$262,642	\$363,744	\$1,132,901
Indirect Costs	\$74,195	\$40,275	\$29,004	\$143,474
Equipment	\$78,415	\$0	\$13,266	\$91,681
Materials & Supplies	\$25,167	\$34,511	\$32,019	\$91,697
Tuition	\$35,235	\$23,490	\$40,461	\$99,186
Travel	\$33,632	\$12,466	\$13,406	\$59,504
Subcontractors	\$0	\$0	\$20,628	\$20,628
Other	\$141,309	\$2,258	\$12,228	\$155,795
Total	\$894,469	\$375,641	\$524,756	\$1,832,589

\$37,723 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$408,621	\$168,818	\$182,585	\$760,024
Indirect Costs	\$61,475	\$42,204	\$45,646	\$149,325
Equipment	\$10,321	\$0	\$266,554	\$276,875
Materials & Supplies	\$10,714	\$13,196	\$55,925	\$79,835
Tuition	\$0	\$0	\$61,126	\$61,126
Travel	\$24,066	\$2,681	\$20,721	\$47,468
Subcontractors	\$0	\$0	\$0	\$0
Other	\$145,535	\$4,237	\$254	\$150,026
Total	\$660,731	\$231,136	\$632,811	\$1,562,402

\$32,333 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Integrated Electronics Engineering Center (IEEC)
Binghamton University
S.B Park - Center Director
Technology Focus: Semiconductors and Microelectronics

Importance to NYS:

The CAT works with packaging as an enabling technology to spur economic growth in areas including biomedical, photonics and sensor applications, military and homeland security applications, Micro-Electro-Mechanical Systems (MEMS), intelligent manufacturing processes, and wireless and secure networked computer and telecommunications systems.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	22.0	30.0	\$2,975,000	\$7,118,700	\$750,000	\$472,000	\$1,190,700	\$12,506,400
2017-2018	8.5	46.5	\$2,537,390	\$3,798,746	\$884,674	\$8,625,000	\$111,577	\$15,957,387

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs.)	Summary
2016-2017	Solid-State "Chip" Level Research Study	S. B. Park	National Transportation Safety Board	\$1,187.38	11/7/16-11/11/16	Assisting National Transportation Safety Board with data recovery efforts.
2017-2018	Not Reported					

Education and Technology Commercialization Activities**Industry-Oriented Education and Training**

The IEEC holds an annual Packaging Symposium during October. The symposium attracts a significant number of industrial and academic professionals from New York State industry and institutions; including but not limited to, faculty and students at Binghamton University, Corning Inc. (Corning, NY), Custom Electronics (Oneonta, NY), Eastman Kodak (Rochester, NY), General Electric (Schenectady and Niskayuna, NY), Global Foundries (Malta, NY), i3 (Endicott, NY), Lockheed Martin (Owego, NY), Prismark Partners (Cold Spring Harbor, NY), Universal Instruments (Conklin, NY) and SUNY Polytechnic Institute (Utica, NY).

Additionally, IEEC arranges and hosts on-site visits/tours with groups of educators from local elementary and secondary schools whereby attendees tour the S3IP labs, including the IEEC lab. During wrap-up sessions following the tours, there is a discussion of how the S3IP centers; including the IEEC, could work to introduce students to the "cool" aspects of science.

Lastly, the IEEC, along with other S3IP centers, took part in *Binghamton University Day* at the Oakdale Mall in Johnson City, NY on February 24, 2018 by setting up an exhibit there - among the displays was a 3D printer; which, was very popular. S3IP and IEEC also set up a 3D printer display as part of a TEDX program at(on) the Binghamton University campus on March 25, 2018.

Commercialization

The IEEC met with or worked with 40 New York State companies. These interactions ranged from meetings to introduce the center and its capabilities, to discussions of specific company needs and how the IEEC can help.

Additionally, the IEEC worked with the following agencies: Binghamton University - Office of Entrepreneurship and Innovation; Southern Tier Incubator; CNY BioTech Accelerator at Upstate Medical; MedTech Association; Trade

Adjustment Assistance Center; Alliance for Manufacturing and Technology; Cornell University - Center for Materials Research; Cornell University - Institute of BioTechnology; FuzeHub; and NEXUS NY.

Invention Disclosures

Not Reported

Start-up Companies Formed

Not Reported

Licensing Agreements

Not Reported

Level of Matching Funds Provided

2016-2017 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$587,197	\$377,591	\$600,796	\$1,565,584
Indirect Costs	\$88,080	\$88,230	\$137,475	\$313,785
Equipment	\$13,091	\$0	\$18,968	\$32,059
Materials & Supplies	\$100,433	\$42,039	\$28,754	\$171,226
Tuition	\$7,850	\$82,327	\$90,410	\$180,587
Travel	\$200	\$17,100	\$9,948	\$27,248
Subcontractors	\$0	\$0	\$0	\$0
Other	\$104,634	\$37,255	\$11,341	\$153,230
Total	\$901,485	\$644,542	\$897,692	\$2,457,336

\$13,617 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$685,777	\$442,987	\$461,505	\$1,590,269
Indirect Costs	\$102,867	\$107,625	\$109,692	\$320,184
Equipment	\$0	\$0	\$0	\$0
Materials & Supplies	\$37,077	\$25,751	\$52,401	\$115,229
Tuition	\$13,413	\$51,380	\$54,488	\$119,281
Travel	\$0	\$16,573	\$73,625	\$90,198
Subcontractors	\$0	\$56	\$624	\$680
Other	\$82,067	\$91,283	\$39,397	\$212,747
Total	\$921,201	\$735,655	\$791,732	\$2,464,133

\$15,545 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Materials Processing (CAMP)
Clarkson University
Devon Shipp & Silvana Andreescu - Center Co-Directors
Technology Focus: Materials Science and Engineering

Importance to NYS:

The Center for Advanced Materials Processing at Clarkson University is designated in the materials and materials processing technology focus. CAMP provides its business partners with technical support related to synthesis, characterization and processing of advanced materials. Specific technologies are colloidal materials and surfaces – very small particles and the properties they exhibit when suspended in air, water, or other fluids. A specific area of CAMP's expertise is chemical mechanical planarization, a technology used in fabricating advanced generation logic/ memory devices. The project work will be performed by chemical, mechanical, civil and electrical engineering faculty and members from physics, chemistry and biomolecular sciences.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	6.0	0.0	\$2,600,000	\$2,242,000	\$275,000	\$509,000	\$60,000	\$5,686,000
2017-2018	1.0	6.0	\$2,350,000	\$1,687,646	\$900,000	\$50,000	\$250,000	\$5,237,646

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Co-Investigator	Source	Amount	Duration (yrs.)	Summary
2016-2017	Potsdam Sensors	M. He	N/A	NSF	\$115,000	1/1/17-12/31/17	Sensor provides a direct measure of air particles
2017-2018	Not Reported						

Education and Technology Commercialization Activities**Industry-Oriented Education and Training**

CAMP continues to address the education and training needs of graduate and undergraduate researchers; including but not limited to students working toward the requirements of their Ph.D. Several students have moved on to employment with a variety of New York companies. Adjunctly, CAMP has a blend of undergraduate and graduate researchers working within their labs on projects involving New York companies.

CAMP participated in an industry day at Clarkson's expanded Capital Region Campus in Schenectady. This event was designed to introduce industry (existing relationships and potential new relationships) to the graduate education opportunities and resources available to strengthen their work force.

The 20th Annual CAMP sponsored CMP meeting received record attendance by representatives from around the globe. Numerous educational talks were given by representatives of both the international academic and industrial communities. The event also served to build networking relationships among faculty, industry and graduate students who were in attendance.

Professor Babu continues to be one of the leading voices across the globe in CMP research. He was invited to China and Taiwan where he presented several lectures on CMP at universities and at the ICPT conference. During his travels he also met with several businesses to discuss international research collaborations.

CAMP hosted Norsk Titanium to discuss not only research opportunities, but the educational benefits of a collaborative relationship to the Norsk Titanium work force. The meeting also touched on the benefit to graduate students looking to move into additive manufacturing or related fields. Background work continued the Railroad Transportation System

Safety Initiative (RTSS) as CAMP investigated industry partners to expand participation for its next round. Also, CAMP held an exploratory meeting on biocompatible technologies to determine where the materials faculty of Clarkson and CAMP could contribute and make positive relationships with industry. CAMP also hosted Corning Incorporated and Harris Corporation to discuss not only research opportunities, but also educational benefits of a collaborative relationship. Out of the meeting several areas where collaborative research projects can be undertaken were established.

CAMP Staff and researchers visited St. Lawrence County area schools in Massena and Canton, New York, and gave talks to young people on chemistry and STEM related technologies and career paths. Between biology and chemistry classes at Massena High School and Canton High School, they spoke to approximately 150 students. Additionally, CAMP presented on the chemistry of opioid remediation to SUNY Potsdam's adult SOAR course. Likewise, CAMP Staff and researchers travelled to Alfred University where they spoke to precollege teachers on the value of STEM education and experiences. This was part of an Annual STEM Conference hosted by Alfred.

The Director of the Materials Science and Engineering (MSE) Academic Program, collaborates with the Dean of Clarkson's School of Engineering to continue to grow the MSE curriculum and degree opportunities at both the undergraduate and graduate level. Also, there is tentative approval from both the School of Engineering and the School of Arts and Sciences to offer more undergraduate MSE courses and establish an official MSE undergraduate minor. These steps represent a conscious effort to increase the capabilities of Clarkson graduates from these programs as they transition into the workforce.

CAMP co-sponsored with the Clarkson University Chapter of the American Chemical Society a Polymer Symposium which was well attended by academics from around the globe as well as industry representatives from across the North Country. Additionally, CAMP partnered with companies sponsoring research with CAMP to offer graduate students working with the sponsoring companies an opportunity to attend the full CAMP Annual meeting; which marked the first-time students were allowed full participation; and, both faculty and industry were in full support of the increased participation due to the interactions whereby the graduate students engaged in with their industry sponsors.

Commercialization

CAMP has added new research contracts, establishing multi-year relationships to conduct sponsored research and technology transition projects for industry partners. They rekindled and strengthened relationships with past corporate partners, as well as with national and international corporations. This brings the total number of New York companies to twelve, including two (2) small start-up companies initiated by Clarkson faculty members.

CAMP continued participation as a member of the Board of Directors of IncubatorWorks which is also supported by Corning and includes the CACT at Alfred University. The NanoMaterials Innovation Center (NMIC) in Alfred is a subsidiary of IncubatorWorks and CAMP collaborates extensively with NMIC as well as Alfred CACT. CAMP and members of the faculty have worked on developing a cooperative working relationship with the AMPrint Center of Rochester Institute of Technology to cooperatively draw on the materials expertise of CAMP and developments in the additive manufacturing field.

CAMP hosted the collaborative technical symposium with the CATs at Binghamton University, Alfred University and Rochester Institute of Technology. The meeting brought together the sponsoring CATs, other CATs and their industry partners. The result has been a series of new and ongoing discussions relating to collaboration on projects of interest to several industry partners.

CAMP staff and researchers attend and present talks at various national and international conferences and trade shows to market CAMP technologies; and, identify companies that can further develop/license these technologies.

Invention Disclosures

Reporting Period	Patent Name	Inventor	Co-inventor	Licensing Partner	Research Sponsor	Description
2017-2018	Post Chemical-Mechanical-Polishing Cleaning Compositions	S. V. Babu	Jihoon Seo Charith Kasun Ranaweera, Akurana Gamaralalage	None	Global Foundries	Cleaning compositions for post-CMP cleaning for co interconnect application
	Real-Time Monitoring of Battery State-of-Charge	Cetin Cetinkaya	None	None	None	Real-time li-ion battery monitoring platform for state-of-charge
	Cleaning Tool for Removing Remnant Materials in Additive Manufacturing	Cetin Cetinkaya	Scott Volk; John A. Graham	None	None	Laser-based precision cleaning tool for additive manufacturing

Start-up Companies Formed

Reporting Period	Company Name	City	Product/Service
2016-2017	Potsdam Sensors LLC	Potsdam	Next generation air quality monitors for long-term monitoring of ultrafine particles.
	DMAX Plasma LLC	Potsdam	Plasma reactors for use in water purification
2017-2018	Not Reported		

Licensing Agreements

Reporting Period	Project	Inventor	Licensing Partner
2016-2017	Not Listed	Selma Mededovic	D-Max Plasma
	Not Listed	Not Listed	New World Consumer Products LLC
2017-2018	Not Listed	Not Listed	Ferro Corporation

Level of Matching Funds Provided**2016-2017 Reporting Period**

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$654,241	\$258,567	\$288,437	\$1,201,245
Indirect Costs	\$97,785	\$38,785	\$28,712	\$165,282
Equipment	\$287,637	\$35,328	\$0	\$322,965
Materials & Supplies	\$54,173	\$71,911	\$25,88	\$126,084
Tuition	\$0	\$25,485	\$48,524	\$74,009
Travel	\$54,346	\$34,601	\$9,489	\$98,436
Subcontractors	\$2,477	\$0	\$0	\$2,477
Other	\$29,541	-\$3,527	\$5,499	\$31,513
Total	\$1,180,200	\$461,150	\$380,661	\$2,188,653

\$166,642 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$644,504	\$262,642	\$357,676	\$1,264,822
Indirect Costs	\$96,110	\$40,275	\$43,297	\$179,682
Equipment	\$0	\$0	\$17,269	\$17,269
Materials & Supplies	\$83,541	\$34,511	\$100,353	\$218,405
Tuition	\$22,295	\$23,490	\$32,280	\$78,065
Travel	\$25,281	\$12,466	\$25,554	\$63,301
Subcontractors	\$2,931	\$0	\$0	\$2,931
Other	\$46,415	\$2,258	\$141,663	\$190,336
Total	\$921,077	\$375,642	\$718,092	\$2,052,534

\$208,060 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Life Science Enterprise (CLSE)
Cornell University
Jocelyn Rose - Center Director
Technology Focus: Life Science, Enabling Science and Agricultural Science

Importance to NYS:

Cornell University's Center for Life Science Enterprise (CLSE) serves for the identification, selection, cultivation and incubation of NYS life science technologies for commercialization. Adjunctly, the CLSE -supported state-of-the-art incubator facility and program (i.e., the Kevin M. McGovern Family Center for Venture Development in the Life Sciences) has enhanced the efficiency of moving life science technology from concept to successful independent operation. Thus, the CLSE is now leading development of the life science economic sector for NYS, addressing all life sciences fields, including but not limited to pharmaceuticals, medical devices, animal and plant biotechnologies.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	34.0	18.0	\$5,391,588	\$2,078,906	\$2,476,699	\$16,640,400	\$1,186,300	\$27,773,893
2017-2018	24.0	4.0	\$6,216,804	\$203,389	\$1,008,548	\$17,810,904	\$43,763	\$25,283,408

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Co-Investigator	Source	Amount	Duration (yrs)	Summary
2016-2017	Bio-Nanomanufacturing of Protein Therapeutics using Membrane Microfluidics	C.B.E. Daniel	Matthew DeLisa	NSF	\$374,425	7/1/17-6/30/20	Therapeutic proteins with desired posttranslational modifications
	N-Glycan Specific Antibodies for Advancing Glycobiology Research	Judith Merritt	Matthew DeLisa	NIH	\$150,000	8/1/17-7/31/18	Pipeline for producing renewable, well-defined glycotopes
	Non-Thermal Plasma: Application of a Novel Disinfection Technology to the Treatment of Infected Wounds	Jason Spector	N/A	FuzeHub Manufacturing Innovation Grant	\$75,000	7/1/17-6/30/18	Wound therapy device using plasma generated reactive oxygen, nitrogen species and vaporized hydrogen peroxide
2017-2018	Autonomous Tissue Cartridges for Regenerative Medicine	Jason Spector	CorSolutions	SBIR Phase 1	N/A	N/A	Would Healing

Education and Technology Commercialization Activities

Industry-Oriented Education and Training

Entrepreneurship at Cornell (EaC) was established in 1992 as a combined initiative of the Johnson School of Management and the College of Agriculture and Life Sciences. Since that time, EaC has expanded to every school and college at Cornell. EaC brings a multi-disciplinary approach to the study of entrepreneurship and implements programs that benefit both students and community at large.

As an integral part of the EaC service offering, EaC conducts an active summer internship program which places students in small businesses throughout the United States and abroad. The internship program focuses on the placement of undergraduates, graduates and first-year MBA students for summer internship positions. The program is a vibrant and very important source of job placement for startup companies that do not recruit on campus. The internship program is different from others as they accept all majors at Cornell and focus solely on those students with an interest and desire to work for a small business.

The grant they receive from New York State Center for Advanced Technology has enabled them to place interns in small entrepreneurial firms that otherwise could not afford a summer intern. These firms are undertaking impressive efforts and focusing on promising technology in fields as diverse as medicine, software and materials science. Many of them are using technology created at Cornell; and are in the midst of turning these inventions into ventures, with the promise of new discoveries, new product offerings, and additive economic development activity. It is unquestionable that these young companies need the intern support that EaC provides.

The Cornell CAT held an event called “Writing a Competitive CAT Proposal: Essential Facts to Know”. After an informative talk about the application process for Cornell’s CAT grants, a dialogue was opened for the attendees to ask about what the proposals review panel was looking for, how to identify competing technologies already on the market, how to work with an industry partner, how to predict future economic impacts, and other items related to commercialization processes supported by the CAT.

Commercialization

Cornell University, University of Rochester, and Rochester Institute of Technology have partnered to create the Upstate New York (UNY) I-Corps Node. Together the three universities have received a \$4.2 million award from the NSF to support this Node (<http://crea.cornell.edu/icorps/>). In October and November, Marla Coppolino and Lou Walcer each attended an I-Corps Short Course, in Ithaca and in Rochester, respectively, to learn how the inventors are taught the basics of customer discovery. Lou Walcer taught a regulatory focused portion of the didactic material in the Rochester course. After positive experience with the Short Courses attended, the Cornell CAT is now in the planning stages of an I-Corps Short Course for April 2018 to evaluate early stage high-tech inventions emanating from the university. This will replace the Cornell CAT’s usual Pre-Seed Workshop as a more efficient means to determining the viability of a potential startup company.

Adjunctly, Cornell’s Kevin M. McGovern Family Center for Venture Development in the Life Sciences, which is funded in part by the Cornell’s NYSTAR-funded CAT for Biotechnology in the Life Sciences, supported/assisted its resident company clients.

Invention Disclosures

Reporting Period	Patent Name	Inventor	Co-inventor	Licensing Partner	Research Sponsor	Description
2016-2017	Glycoengineered Monoclonal Antibodies	Matthew DeLisa	Dario Mizrahi	Glycobia	Glycobia	Compositions and methods for making water-soluble integral membrane proteins
	Rapid Cell-Free Production of Glycoengineered Monoclonal Antibodies	Matthew DeLisa	J.C. Stark, T. Jaroentomeechai, M.C. Jewett	Glycobia	Glycobia	Cell-free glycoprotein synthesis (CFGpS) in prokaryotic cell lysates enriched with
	Medicine on Demand: Rapid Cell-Free Production of Glycoengineered Monoclonal Antibodies	M.C. Jewett	J.C. Stark, M. DeLisa, T. Jaroentomeechai	Glycobia	Glycobia	Method for rapid in vitro synthesis of bioconjugate vaccines via recombinant
2017-2018	Not Reported					

Start-up Companies Formed

Reporting Period	Company Name	City	Product/Service
2016-2017	Bactana	Ithaca	Growth supplement for dairy calves
	Capro-X	Ithaca	Capro-8 chemicals
	Dynamic Boundaries	Ithaca	Dry eye treatment
	Esper Biosciences	Ithaca	Nanopore-integrated carbon nanotube sensors for DNA sequencing
	FloraPulse	Ithaca	Water monitoring system for vineyards
	TET™	Ithaca	Tethered enzyme technology for detection of lung cancer
	Versatope, Inc.	Ithaca	Influenza vaccines
	Dimensional Energy	Ithaca	Artificial photosynthesis by converting waste carbon dioxide from industrial emissions solar fuels and feedstocks with distributed sunlight
	EndoVOR, LLC	New York City	Temporary Jejunal Feeding Tube with a Bolstered Securement Device
	OR Link, Inc.	Ithaca	new surgical preference card system that helps surgeons, teams and hospitals position for success in the OR.
	Pure Spinach, Inc	Ithaca	Fresh spinach for local markets
	Bactana	Ithaca	Growth supplement for dairy calves
2017-2018	Esper Biosciences, Inc.	Ithaca	Low-cost, high-speed DNA sequencer, for use in point-of-vcare medical diagnostics and scientific

Licensing Agreements

Reporting Period	Project	Inventor	Licensing Partner
2016-2017	Not Reported		
2017-2018	18250004	Daryl Nydam	Acumen Detection Systems

Level of Matching Funds Provided**2016-2017 Reporting Period**

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$452,994	\$56,628	\$288,437	\$798,059
Indirect Costs	\$67,949	\$11,763	\$28,712	\$108,424
Equipment	\$0	\$0	\$0	\$0
Materials & Supplies	\$147,326	\$34,364	\$25,88	\$181,690
Tuition	\$41,100	\$43,355	\$48,524	\$132,979
Travel	\$3,996	\$0	\$9,489	\$13,485
Subcontractors	\$0	\$0	\$0	\$0
Other	\$207,835	\$442,889	\$5,499	\$656,223
Total	\$921,200	\$588,999	\$380,661	\$2,448,850

\$557,590 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$441,534	\$63,598	\$327,302	\$832,434
Indirect Costs	\$66,230	\$15,899	\$68,568	\$150,697
Equipment	\$0	\$0	\$0	\$0
Materials & Supplies	\$176,373	\$27,878	\$18,937	\$223,188
Tuition	\$32,212	\$29,500	\$0	\$61,712
Travel	\$356	\$0	\$0	\$356
Subcontractors	\$0	\$0	\$0	\$0
Other	\$22,446	\$27,207	\$2,000	\$51,653
Total	\$739,151	\$164,082	\$416,807	\$1,484,122

\$164,082 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Telecommunications (CATT)
NYU-Polytechnic University
Shivendra Panwar Center Director
Technology Focus: Information Technology & Telecommunications

Importance to NYS:

The Center for Advanced Technology in Telecommunications (CATT) at New York University; with research support from Columbia University, is designated in the information technology and telecommunications technology focus and will operate as a collaborative research center consisting of researchers from the electrical engineering and computer science departments. The CATT conducts collaborative applied research with industry leading to technology transfer and economic impact, conducts industry-oriented education and training, and facilitates outreach and networking on three main areas: Wireless networks, Network Security and Network Applications.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	125.0	5.0	\$350,000	\$400,000	\$1,745,129	\$108,601,000	\$4,765,000	\$115,861,129
2017-2018	157.0	128.0	\$10,630,179	\$1,216,540	\$2,462,916	\$56,660,400	\$1,091,749	\$72,061,784

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs.)	Summary
2016-2017	Material Synthesis and Contact Engineering	Davood Shahrjerdi	U.S. Department of Health	\$150,000	7/1/16-12/31/17	Understanding the key factors limiting the performance of an emerging class of electronics materials
	Caching and Coding for Media in Wireless Networks	Elza Erkip	National Science Foundation	\$389,554	9/1/16-8/31/19	Efficient delivery of video-based services over next generation heterogeneous wireless networks
	Security Framework for Mobile Devices	Justine Cappos	National Science Foundation	\$299,877	9/1/16-8/31/19	Framework to calculate integral data quality and security (DQS) indicators
	School-Based Cyber Security Education for High School Girls	Nasir Memon	National Science Foundation	\$299,890	9/1/16-8/31/18	cybersecurity awareness and proficiency among high school teachers and high school girls
	Finger Print Based Authentication Systems	Nasir Memon	National Science Foundation	\$249,971	10/1/16-9/30/16	Investigate the security of fingerprint authentication systems, especially those using partial fingerprints
	Community Augmenting Influenza Modeling	Rumi Chunara	National Science Foundation	\$180,877	9/1/16-8/31/18	Assessing the value of community sourced data in infectious disease modeling efforts
	Chips That Prove Their Own Correctness	Siddharth Garg	National Science Foundation	\$107,389	7/1/16-8/31/18	Verifying the correctness of chips sourced from possibly untrusted fabricators
	Nonlinear	Sundeep	National	\$195,367	7/15/15-	High-dimensional nonlinear

Centers for Advanced Technology Report (FY 2016-2017 & FY 2017-2018)

	Models in Large Neural Population	Rangan	Science Foundation		6/30/20	systems with a particular focus on systems in cortical networks
	Spatial Distribution of Risk in Animal Groups	Daniel Rubenstein	National Science Foundation	\$13,190	4/1/17-3/19/19	Recreate information transmission networks and demonstrate how it moves through animal groups
	Scalable Edge Architecture for Massive Location-Aware Heterogeneous IoT Systems	Henning Schulzrinne	National Science Foundation	\$149,999	4/1/17-3/31/19	Address essential research problems for developing network design and Internet of Things systems in both high bandwidth and low bandwidth environments
		Theodore Rappaport	National Science Foundation	\$150,000	4/1/17-3/31/19	
	Lymphedema Intervention Exercise	Yao Wang	National Science Foundation	\$50,000	3/15/17-8/31/22	Benefit for individuals at risk or have developed chronic lymphedema
	Material Synthesis and Engineering	Davood Shahrjerdi	U.S. Department of Health	150,000	7/1/16-12/31/17	Emerging class of electronics materials two-dimensional molybdenum disulfide
2017-2018	Secure and Trusted Hardware	Siddharth Garg	National Science Foundation	\$44,966	9/1/17-8/31/18	Hardware security research identify defense mechanisms
	Dense Multi-Beam Millimeter-Wave Communications	Theodore Rappaport	National Science Foundation	187,500	8/15/17-7/31/20	Performance of key array signal processing components in wireless base stations
	Ion-Exchange Process for High-Density Carbon Nanotubes	Davood Shahrjerdi	National Science Foundation	\$291,971	10/1/17-9/30/20	Chemical assembly process that is used for selective placement of nanotubes
	Crowd Defense Against Phishing Attacks	Quanyan Zhu	National Science Foundation	\$300,000	9/1/17-8/31/19	Protecting against phishing attacks.
	Embedded Machine Listening for Smart Acoustic Monitoring	Juan Bello	National Science Foundation	\$50,000	11/1/17-4/30/18	Use of embedded machine listening as a low-cost, turnkey solution for early detection of machinery malfunction and improve predictive maintenance.
	Display Devices to Study Visual Analytics Beyond the Desktop	Enrico Bertini	National Science Foundation	\$273,552	9/1/17-8/31/20	Real-time data monitoring in mission-critical settings; and immersive virtual navigation of "data spaces".
	Algorithms for Real-Time Anomaly Detection	Rumi Chunara	National Science Foundation	\$49,708	9/1/17-8/31/19	Unstructured spatial-temporal data sets for detection of anomalous events.
	Prove Forensic Soundness of Digital Evidence	Nasir Memon	National Science Foundation s	\$125,000	10/1/17-9/30/19	Explore challenges of developing E-Witness

Threat Intelligence Generation	Damon McCoy	National Science Foundation	\$492,064	8/1/17-7/31/20	Identify an attacker's infrastructure and attack tools
Query Routing in Distributed Search Engines	Torsten Suel	National Science Foundation.	\$499,994	8/1/17-7/31/20	Partitioning and replicating document and index data to improve query processing
Intelligence through Algorithm Invention and Selection	Julian Togelius	National Science Foundation	\$427,000	9/1/17-8/31/20	Algorithms that can solve many different problems, without a human having to adjust the algorithm for every problem.
Transportable Energy for Enhancing Power Grid Resilience to Natural Disaster.	Yury Y Dvorkin	National Science Foundation	\$78,666	10/1/17-9/30/18	Mobile energy storage units that can provide backup flexibility to power grids.
Fellowships in Electrical Engineering	Ramesh Karri	United States Department of Education	\$408,315	8/16/17-9/29/18	Highly competitive four-year support for outstanding Ph.D. applicants.
DNA Forensics using Microfluidic Biochips	Ramesh Karri	Army Research Office	\$485,000	7/1/17-11/30/18	Use of Digital microfluidic biochips hardware for security purposes
Crowd Defense Against Phishing Attacks	Quanyan Zhu	National Science Foundation	\$300,000	9/1/17-8/31/19	This research is aimed at preventing phishing attacks.
Information Framework for Web Privacy	Elza Erkip	National Science Foundation	\$487,080	9/1/18 - 8/31/21	Web privacy from an information theoretic perspective.
E Sustainable, Viral Infrastructure-as-a-Service Edge Cloud	Justin Cappos	National Science Foundation	\$89,339	3/1/18 - 2/28/19	Develop and prototype a viral, sustainable, software-only distributed testbed for Cloud-in-the-Loop Systems.
Securing the Software Supply Chain	Justin Cappos	National Science Foundation	\$766,000	7/1/18 - 6/30/21	Provides insights and end-to-end guarantees about the software supply chain
Mitigating Adversarial Manipulation of Content Curation Algorithms	Damon McCoy	National Science Foundation	\$241,555	7/15/18-7/15/18	Improve understanding of Online social networks and deterrence of current algorithmic curation attackers.
Multi-Resolution Utility Discovery and Maximization	Farshad Khorrami	BAE Systems	\$69,000	7/28/18-8/31/18	Environment-specific utility functions that encapsulate the trade-offs between sensing, storage, and defensive actions.
Cloud-Enhanced Open Software-Defined Mobile-	Sundeep Rangan	Rutgers University	\$1,150,388	4/1/18-12/31/18	City-scale platform for advanced wireless research

	Wireless Testbed					
	Defense Distributed Denial of Service Attacks	Jonathan Chao	Fortinet	\$240,000	4/1/18-3/31/20	Defense system using machine learning to detect DDoS quickly, efficiently and with high precision
	Algorithmic Obfuscation at the Register Transfer Level	Siddharh Garg	The Boeing Company	\$50,000	4/19/18-10/18/18	Protecting the design of an integrated circuit (IC) from being reverse engineered or stolen by an external foundry
	Verification-Guided Hardware Synthesis for Security	Ramesh Karri	Texas AM Engineering Experiment Station	\$877,783	1/1/18-12/31/21	Develop design approaches and computer-aided tools to design for security

Education and Technology Commercialization Activities

Industry-Oriented Education and Training

CATT continues to work with New York University Tandon School of Engineering, in partnership with New York City Cyber Command (NYC3), to launch the New York Cyber Fellows program, a unique, affordable online cybersecurity master's degree program designed in conjunction with elite New York City employers to address the acute shortage of highly trained technical professionals in the city and nation.

Likewise, CATT continues to work with NYU-Tandon's Office for Enterprise Learning; the Center's PIs have developed customized programs and course offerings for a number of industry partners, most notably AT&T, Goldman Sachs, SAIC, ConEdison, and IBM. The PIs have developed these offerings for the ongoing education and training, of the workforce. In particular, certificate programs have been developed for working professionals. These are in the areas of mobility, data centers and power engineering.

The Center's PIs have developed customized programs and course offerings for a number of industry partners, most notably Blackstone, Booz Allen Hamilton, Bridgewater, EY LLC, Goldman Sachs, IBM Security, Jefferies, Loki Labs, Morgan Stanley, Synack, and U.S. Bank. The program offers scholarships of as much as 75 percent of tuition to U.S. residents, bringing the total tuition for the rigorous, highly technical education to \$15,000 for the entire program — the lowest of any cybersecurity master's degree program in New York City.

In addition to its commitment to corporate education and training, the Center has been involved for a number of years with high school students up to doctoral students through the Cyber Security Awareness Week (CSAW) competition; now in its fifteenth year and growing. It has also attracted corporate interest since it is a venue for them to interact with academics in this critical area and recruit cyber security talent.

- This year the CSAW program has expanded to Europe, Israel, India, Tunisia and Mexico. Additionally, it has also attracted corporate interest since it is a venue for them to interact with academics in this critical area and recruit cyber security talent.

Additionally, CATT and NYC Media Lab seeks to coordinate the community of faculty, students, entrepreneurs and media executives and technologists via the Combine program to build a 'spinoff engine' focused on commercializing media technologies from universities. Applications for the Combine opened in September 2017 at NYC Media Lab's annual Summit, which hosted startups and demonstrations from across all the City's universities. Following a recruitment process that included networking events with NYC Media Lab advisors and leadership, dozens of teams applied. Ten

teams were selected to receive an initial grant of \$25,000, and will advance into an intensive, 12-week market validation and customer discovery program. talent.

Commercialization CATT staff held multiple one-on-one meetings with companies within the information technology and telecommunications technology sector. These meetings continue to represent a diverse cross-section of the sector including but not limited to wireless networks, network security and network applications; and have resulted in additional projects. Additionally, CATT staff met with multiple Federal and State stakeholders invested in facilitating technology development and commercialization in the sector; including but not limited to National Science Foundation, Department of Defense, and NYCEDC.

Invention Disclosures

Not Reported

Start-up Companies Formed

Reporting Period	Company Name	City	Product/Service
2016-2017	MilliLabs Inc.	Not Listed	MilliLabs is the pioneer in implementing the world's first emulator for 5G millimeter wave (mmWave) cellular systems
	Vidrovvr	Not Listed	multimodal computer vision and machine learning systems to index, tag, and understand video
2017-2018	Entryppy Inc.	Not Listed	Technology-based, powered by AI, authentication solution to provide trust to buyers and sellers of luxury goods

Licensing Agreements

Not Reported

Level of Matching Funds Provided

2016-2017 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$722,345	\$1,897,298	\$863,172	\$3,482,815
Indirect Costs	\$108,352	\$262,864	\$129,269	\$500,485
Equipment	\$0	\$23,084	\$37,742	\$60,826
Materials & Supplies	\$14,311	\$819,112	\$673,606	\$1,507,029
Tuition	\$77,850	\$25,356	\$24,749	\$127,955
Travel	\$3,178	\$55,605	\$135,935	\$194,718
Subcontractors	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0
Total	\$926,036	\$3,083,319	\$1,864,473	\$6,009,787

\$135,959 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

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Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$757,747	\$901,124	\$957,690	\$2,616,561
Indirect Costs	\$113,662	\$202,226	\$67,959	\$383,847
Equipment	\$0	\$25,883	\$15,087	\$40,970
Materials & Supplies	\$11,447	\$866,806	\$1,001,486	\$1,879,739
Tuition	\$78,425	\$15,008	\$15,885	\$109,318
Travel	\$2,333	\$85,836	\$120,563	\$208,732
Subcontractors	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0
Total	\$963,614	\$2,096,883	\$2,178,670	\$5,385,545

\$146,378 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Automation Technologies and Systems (CATS)
Rensselaer Polytechnic Institute
Daniel Walczyk Center Director
Technology Focus: Advanced Manufacturing

Importance to NYS

The technology focus of The Center for Automation Technologies and Systems (CATS) at Rensselaer Polytechnic Institute (RPI) is advanced manufacturing, centered on automation, robotics, processes, systems and devices that improve efficiency, increase productivity, or provide new functionalities. Rensselaer CATS leverages nearly 50 faculty members across nine departments and three schools, plus full-time, dedicated research staff, to help its partner companies develop system-level solutions for high-impact, advanced manufacturing challenges across a broad array of industries — from biotech and renewable energy to aerospace and nanoscale manufacturing — following a proven university-industry collaboration model to deliver technology-based economic development.

Rensselaer CATS has identified six research thrusts: industrial automation and control, advanced robotics and control systems, continuous processing and control, additive and bio-additive manufacturing, energy-systems design and manufacturing, and advanced composites and bio-composites manufacturing.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	8.0	0.0	\$1,633,668	\$592,600	\$3,991,304	\$2,067,190	\$30,361	\$8,315,123
2017-2018	27.0	2.0	\$4,379,104	\$913,660	\$4,539,640	\$4,075,491	\$1,588,579	\$15,496,474

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs.)	Summary
2016-2017	Fault Diagnosis and State Estimation	A. Agung Julius	National Science Foundation	\$469,247	10/01/2016-09/30/2020	Mathematical models for HVAC control of a smart building
	Management of High Transient Heat Loads Using Microchannel Evaporators	John Wen	Office of Naval Research	\$555,915	08/15/2016-05/31/2020	Cooling control methodology from macro-scale evaporators to microchannel evaporators
2017-2018	Microstructure Evolution from the Microscale to the Macroscale	Robert Hull	National Science Foundation	\$1,524,300	09/01/2017-08/31/2021	Processing conditions to generate a prescribed microstructure
	Data Driven Cyberphysical Systems	Sandipan Mishra	National Science Foundation	\$110,000	10/01/2017-09/30/2020	Algorithms for metal and polymer additive manufacturing
	Robotic Assistant for Composites Manufacturing	John Wen, Rich Radke, Dan Walczyk	ARM Institute & GE Global Research	\$1,447,592	9/1/2017-4/20/2019	Semi-automatic assembly process using industrial robots
	Predict Microstructure Evolution in Selective	Daniel Lewis	NASA	\$150,439	01/15/2018-01/14/2021	Models of material behavior to simulate

	Laser Melting Additive Manufacturing of Nickel Alloys					additive manufacturing processes and predict properties
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Education and Technology Commercialization Activities

Industry-Oriented Education and Training

CATS worked with numerous companies across the technology sector involving students; including undergraduates, graduate students and post-doctoral research fellows, in various capacities on research projects for credit; or for experience, where they learned various aspects of automation, control design, additive manufacturing, as well as sensor instrumentation. Additionally, CATS undergraduate students were supported as “Engineering Ambassadors” to preach about and deliver STEM outreach material to middle and high schools in NY’s Capital Region. CATS supported the PREFACE program (~\$10K) in which 20 high school students received STEM training on the RPI campus.

Center staff organized the first annual NY Automation and Robotics Conference. The event drew 210 attendees, 32 industry speakers, 20 posters, 17 exhibitors and four sponsors included a breakfast talk by officials from the Advanced Robotics for Manufacturing Institute (ARM).

Connected and met with the Workforce Development Institute (WDI) across the State (Troy, Plattsburgh, Rochester), held several conversations on how CATS could collaborate and attended the New York Talent Symposium, hosted by WDI.

Commercialization

CATS staff held multiple one-on-one meetings with companies within the advanced manufacturing, automation, and robotics sector. These meetings continue to represent a diverse cross-section of the sector including but not limited to industrial automation and control, advanced robotics and control systems, continuous processing and control, additive and bioadditive manufacturing, energy-systems design and manufacturing, and advanced composites and biocomposites manufacturing; and have resulted in additional projects. Additionally, CATS staff met with multiple Federal and State stakeholders invested in facilitating technology development and commercialization in the sector; including but not limited to Manufacturing USA Institutes, and NYSERDA.

Invention Disclosures

Reporting Period	Patent Name	Inventor	Co-inventor	Licensing Partner	Research Sponsor	Description
2016-2017	Voracious Boiling Heat Transfer by Vapor Venting	Joel Plawsky	Yoav Peles, Corey Woodcock, Xiangfei Yu	N/A	DARPA	Cooling of microelectronic devices
	Robotic Construction of Masonry Walls	Scott Peters	Nathan Podkaminer; Steve Rock; Ray Puffer; Michael Kleinigler; Justin Gullotta; Thomas Coller;	Construction Robotics, LLC	Construction Robotics, LLC	Patent pending ‘Brick Laying System’
	Fiber Tows with Thermoplastic Resin for use in Additive Manufacturing	James Garofalo	Daniel Walczyk	RPI	NYSTAR Funding	Impregnate fiber tows with molten thermoplastic resin for fabrication of custom composite shapes

Start-up Companies Formed

Reporting Period	Company Name	City	Product/Service
2016-2017	One, Comfort Labs	Troy	Smart, energy efficient solutions for residential homes and commercial buildings.
	Hydro Holdings	New York City	Micro-hydro power system
	AM Ceramics	Poughkeepsie	3D printed ceramic cores for investment cast part production
	Lithoz America	Troy	Additive Manufacturing Equipment and Services for Ceramic Parts
2017-2018	InSitu Composites	Troy	Advanced Composites Additive Manufacturing Equipment

Licensing Agreements

Not Reported

Level of Matching Funds Provided**2016-2016 Reporting Period**

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$608,195	\$233,684	\$554,928	\$1,396,807
Indirect Costs	\$96,969	\$58,421	\$138,732	\$294,122
Equipment	\$51,175	\$3,438	\$6,908	\$61,521
Materials & Supplies	\$25,156	\$21,442	\$58,936	\$105,534
Tuition	\$0	\$68,400	\$313,372	\$381,772
Travel	\$22,954	\$13,000	\$29,719	\$65,673
Subcontractors	\$0	\$0	\$413,320	\$413,320
Other	\$39,040	\$3,761	-\$16,707	\$26,094
Total	\$843,489	\$402,146	\$1,499,208	\$2,956,782

\$211,939 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$657,402	\$466,617	\$1,414,622	\$2,538,641
Indirect Costs	\$82,020	\$116,654	\$237,631	\$436,305
Equipment	\$145,185	\$10,822	\$196,750	\$352,757
Materials & Supplies	\$36,960	\$123,215	\$287,523	\$447,698
Tuition	\$0	\$0	\$0	\$0
Travel	\$7,235	\$11,328	\$35,067	\$53,630
Subcontractors	\$0	\$0	\$0	\$0
Other	\$37,635	\$0	\$0	\$37,635
Total	\$966,437	\$728,636	\$2,171,593	\$3,938,787

\$72,121 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Future Energy Systems (CFES)
Rensselaer Polytechnic Institute
Jian Sun Center Director
Technology Focus: Alternative Energy Systems

Importance to NYS:

The Center for Future Energy Systems (CFES) at Rensselaer Polytechnic Institute (RPI) (hereinafter referred to as the "CAT") is designated in the alternative energy systems technology focus.

The CAT collaborates with the industry to conduct fundamental and applied research to create economic impact. The CAT will also consult with a New York State Energy Research and Development Authority (NYSERDA) designated representative on pertinent issues related to center direction and projects. The vision of CFES is a future energy system that is sustainable, resilient, and economical; enabled by new technologies such as renewable energy sources such as wind and solar, energy storage, energy efficiency and smart grids; including microgrids and advanced grid control.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	7.0	0.0	\$2,006,000	\$771,039	\$275,000	\$2,750,996	\$1,168,475	\$6,971,510
2017-2018	9.0	2.0	\$2,503,172	\$270,000	\$892,612	\$10,510,000	\$559,800	\$14,735,584

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs)	Summary
2016-2017	Modeling and Control of Grid Connected Inverters	Jian Sun	China EPRI	\$447,000	2017	Modeling and control of grid-connected inverters for wind and solar applications
	Thermal Transport and Fracture of Sintered Fuel Pellets	Jie Lian	Department of Energy	\$650,000	3 Years	Research with Penn State and Idaho National Lab to obtain critical experimental data for validation of physics based MARMOT thermal transport and fuel fracture models
	Lithium Ion Batteries with Graphene and Graphene Silicon Anodes	Nikhil Koratkar	National Science Foundation	\$200,000	18 Months	Demonstration of pouch and cylindrical form factors of graphene and graphene silicon anodes in lithium ion batteries
	Channeling Engineering of Hydroxide Ion Exchange Polymers and Reinforced Membranes	Chulsung Bae	ARPA-E	\$2,245,327	4 Years	Synthesis of highly conductive and stable, mechanically robust hydrocarbon based hydroxide ion conducting quaternary ammonia functionalized polymers
	Advanced Electrochemical Hydrogen	Chulsung Bae	Department of Energy	\$360,000	3 Years	Hydrogen compressor membrane technology from highly acidic, mechanically stable, hydro-carbon based

	Compressor					proton exchange membranes
	Toward High Power Output Electrostatic Converters	Diana Borca-Tascuic, John Tichy	National Science Foundation	\$330,000	3 Years	Ambient energy harvesting is available in the form of sunlight, thermal gradients and mechanical vibration and could allow wireless devices to become fully autonomous
	Unified Framework of Data Analysis for Power Systems	Meng Wang	National Science Foundation	\$500,000	5 Years	Directly measure voltage and current phasors in wide area networks at a rate of 30-60 samples per second
2017-2018	Novel Fluorinated Ionomer for PEM Fuel Cells	Chulsung Bae	SBIR	\$40,000	April 2018 to Jan 2019	The objective of this work is to design and develop a new catalyst layer ionomer that can lead to optimal platinum interaction, enhancing electrode kinetics and reducing local mass transport losses
	High Density Sulfonated Aromatic Polymer Membranes for Electrochemical Hydrogen Compression	Chulsung Bae	SBIR	\$50,000	April 2018 to Jan 2019	Next generation PEM's that enable electrochemical compression >1Kg/hour at 875 bar with an energy consumption of 1.4 Wh/kg.
	Membrane Development for Hydrogen Compression	Chulsung Bae	SBIR	\$60,000	April 2018 to Jan 2019	Fabricate composite membranes to produce structures capable of hydrogen compression
	Fluorinated Ionomer for Fuel Cells	Chulsung Bae	Department of Energy	\$334,000	October 2017 to September 2020	Elastic, hydrocarbon-based anion exchange membranes for water electrolysis.

Education and Technology Commercialization Activities

Industry-Oriented Education and Training

CFES gave a lab overview of its materials characterization and device capabilities to high school sophomores enrolled in the Clean Energy and Entrepreneurship program. They also participated in the Undergraduate Research Program Showcase to educate students on CFES research possibilities. Preliminary discussions were also held Global Foundries to support the Manufacturing Technology Education Center (MTEC) being constructed on the Malta site. Potential collaboration includes Advanced Professional Studies MS program in Electric Power Systems and Power Quality Lab training and support.

CFES sponsored three company partner technologies to the Masters Scholar Research Program organized by the Lally Business School which afforded graduate students the opportunity to work on real client market investigations in biomaterials, HVAC and water purification. The students did a full semester of research and then presented their results to a group of Lally and company representatives.

The Center Director, Dr. Sun held a webinar on Turbine and Transmission System Technologies for Offshore Wind Power Plants. The webinar was well attended by over 100 power systems engineers and stakeholders from the Northeast power industry, power utility and government agencies.

CFES supported educational outreach to RPI undergraduates at the URP Fair held by the Research Portfolio. Over 35 students were engaged in CFES activities with the assistance of faculty and graduate research partners. CFES organized a Seminar by Dr. Christoph Buchhagen from Tennet Offshore GmbH. The seminar titled: Development of Offshore Wind Energy in Germany was held in the CBIS auditorium and attended by over 40 interested industry and government personnel.

Commercialization

RPI Severino, CFES, Center for Economic Growth and Center of Gravity partnered on Capital Region NYSERDA Clean Energy Incubator proposal (PON 3413). The incubator is charged with catalyzing clean energy innovation and establishing an ecosystem in the Albany area. NY REV interconnection concerns have been the focus of a technical working group team and we continue to interface with key engineers. The contacts have led to several proposals with strategic partners (NPPT, Intertek, JEM Engineering, Pterra) CFES also partnered with the SUNY POLY PVMC team on a project to study solar farm multi-inverter ground fault overvoltage. We continue to meet with National Grid to lend support for the NY REV Clifton Park project recently approved by the PSC.

CFES collaborated with the Northeast Clean Energy Council (NECEC) on DOE FOA 1643 Regional Ecosystem Assessment. The proposal is to conduct a study of the Northeast regional energy technology innovation ecosystem system, and a collaborative strategy to evolve and leverage the northeast for accelerated energy innovation. CFES and RPI Emerging Ventures Ecosystem also support monthly Navigate Connectors Network calls organized by the NECEC.

Center continues to stay abreast of the NYPA AGILE initiative and met with key players from Albany and White Plains to better understand a future role for RPI. Attended key events with NYSES, 76 West, NEXUS-NY, FUZEHUB and P2I to support partners and initiatives that have or may in the future utilize CFES resources.

Center Director enlisted as a Technical Advisor in the successful New York State NYSERDA led bid for the National Offshore Wind Research and Development Consortia (\$18.5M). CFES supported NY BEST Technology Conference in March and the Advanced Energy Conference.

Invention Disclosures

Reporting Period	Patent Name	Inventor	Licensing Partner	Research Sponsor	Description
2016-2017	Smart Blades to Enhance Wind Turbine Performance	Miki Amitay	TBD	NYSERDA	Apparatus and methods for controlling flow fields in wind
	Saleable Graphene anodes for Li-ion Batteries	Nikhil Koratkar	EnerMat Technologies	NYSERDA	A novel porous graphene network electrode material and all-carbon lithium ion battery
	Ionic Polymer Electrolyte Membrane for Electrochemical Energy Conversion	Chulsung Bae	Xergy		Anion exchange polymers and anion exchange membranes for low cost, high performance fuel cell
	Research and Development of Next Generation Energy Systems for Buildings	Anna Dyson	TBD	SOM	A distributed energy flow network for buildings that captures, transforms, stores and redistributes ambient energy resources
	Energy Systems for Buildings	Anna Dyson	MIMiC	SOM	Modular indoor microclimate control in the form of stand-alone modular radiant system

Centers for Advanced Technology Report (FY 2016-2017 & FY 2017-2018)

2017-2018	Hardware-in-the-Loop Study of Islanding	Huan Guo	Applied Power Systems - SBIR Grant	NYSERDA	Develop a low cost microprocessor based smart protection device (SPD) for GFOV protection
	Development of Reinforced Composite Membranes	Chulsung Bae	ORION Polymer	NSF	Ionic Functionalization of Aromatic Polymers with Halogenated Alcohols using Acid Catalysts
	Low Cost Silicon Anodes for High Energy Lithium Ion Batteries	Nikhil Koratkar	EnerMat Technologies	NYSERDA	Self-Heating Induced Healing of Lithium Dendrites – dendrite formation can reduce coulombic efficiency and eventually short the lithium ion battery

Start-up Companies Formed

Reporting Period	Company Name	City	Product/Service
2016-2017	MIMiC Systems Inc.	New York, NY	Modular HVAC Units based the TEG's
2017-2018	ORION Polymer	Cohoes, NY	Formed in 2018 to advance RPI proprietary advanced composite ion exchange polymer resins and solutions that deliver unmatched performance, stability and durability critical to electrochemical processes

Licensing Agreements

Not Reported

Level of Matching Funds Provided**2016-2017 Reporting Period**

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$469,721	\$917,719	\$694,943	\$2,082,383
Indirect Costs	\$70,458	\$152,686	\$129,477	\$352,621
Equipment	\$153,989	\$56,721	\$7,258	\$217,968
Materials & Supplies	\$31,641	\$107,572	\$64,849	\$204,062
Tuition	\$64,376	\$0	\$0	\$64,376
Travel	\$14,459	\$51,420	\$30,992	\$96,871
Subcontractors	\$0	\$175,000	\$202,963	\$377,963
Other	\$580	\$8,453	\$0	\$9,033
Total	\$805,224	\$1,469,571	\$1,130,482	\$3,554,678

\$149,401 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
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Centers for Advanced Technology Report (FY 2016-2017 & FY 2017-2018)

Salaries & Fringe	\$412,318	\$474,760	\$992,535	\$1,879,613
Indirect Costs	\$61,848	\$80,340	\$196,751	\$338,939
Equipment	\$26,918	\$53,199	\$28,209	\$108,326
Materials & Supplies	\$34,834	\$85,130	\$149,542	\$269,506
Tuition	\$33,150	\$0	\$0	\$33,150
Travel	\$17,209	\$10,279	\$30,520	\$58,008
Subcontractors	\$4,750	\$20,000	\$630,376	\$655,126
Other	\$4,400	\$8,533	\$0	\$12,933
Total	\$595,427	\$732,241	\$2,027,933	\$3,439,641

\$84,040 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Advanced Manufacturing (AmPrint)
Rochester Institute of Technology
Denis Cormier Center Director
Technology Focus: Advanced Manufacturing

Importance to NYS:

Rochester Institute of Technology will establish the Additive Manufacturing and Multi- Functional Printing (AMPrint) Center for Advanced Technology. The AMPrint CAT falls under the Advanced Manufacturing technology focus and addresses a critical need within New York State to establish a focal point for 3D printing (3DP) and additive manufacturing (AM) applied research.

The AM Print Center has technical thrust domains pertaining to (1) Additive Process Innovation; (2) Functional Materials; (3) Novel Applications; and (4) Consumer Grade 3D Printing. Clarkson University and SUNY New Paltz along with a mix of small, medium, and large industry partners will join with RIT to form a Consortium.

Applied research will focus on (1) development of new functional 3D printing materials that enhance performance of tomorrow's products; (2) creation of entirely new 3DP/AM processes that address the speed, cost, size, and quality limitations of current technologies; and (3) design of innovative new products that are only possible using new materials and multi-functional printing processes developed through joint industry-academia partnerships.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	3.0	0.0	\$869,500	\$1,080,000	\$558,712	\$215,000	\$75,000	\$869,500
2017-2018	0.0	14.0	\$0	\$2,571,800	\$1,119,704	\$1,151,058	\$485,345	\$5,327,907

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs)	Summary
2016-2017	Development of a Wireless Disposable 3-lead ECG	Denis Cormier	NextFlex Institute	\$49,649	06/01/16 - 12/31/17	Feasibility of printing a wireless disposable 3-lead ECG medical device
2017-2018	Highly Thermally Conductive Ceramics for High Power Laser Applications	Denis Cormier	Office of Naval Research	\$372,154	9/01/17 – 12/31/2021	A joint project with Alfred University to develop processes and materials for producing optical structures having locally controlled indices of refraction

Education and Technology Commercialization Activities**Industry-Oriented Education and Training**

RAPID Exhibition – RAPID is North America's largest conference and exhibition dedicated to additive manufacturing. It is the premier event for companies to see and learn about additive manufacturing technologies. The AMPrint Center had a booth at the RAPID event held in Pittsburgh. AMPrint Center staff met with hundreds of industry professionals. Denis Cormier also served on the RAPID event organizing committee.

HPICS Annual Conference – Center Director gave a keynote address on 3D printing at Hewlett Packard's internal annual conference.

The AMPrint Center conducted K-12 outreach education and training activities involving nine (9) locales and over 175 students. In addition to the above K-12 outreach and training activities, AMPrint Center Director Denis Cormier gave numerous invited talks in industry.

AMPrint Center faculty, staff, and students participated in nearly 20 workshops, conferences, and other “formal” external workforce development activities. Above and beyond formal events, the AMPrint Center hosted an average of 2-3 industry or government visitors per week to provide informal advising or guidance on additive manufacturing materials, processes, or applications. A summary of formal events is as follows:

Fourteen students were trained as research assistants in the AMPrint Center using industry, federal government, university, and/or state funds.

Workforce Training: Elementary and Secondary Schools and Community Colleges at over locations and involving over 800 students.

Commercialization

RIT's Center of Excellence in Sustainable and Advanced Manufacturing has referred two companies to the AMPrint Center. Currently in discussions with those companies about potential projects.

The AMPrint Center hosted by RIT and the Ceramics CAT hosted at Alfred University held a meeting to discuss specific ideas for collaboration moving forward. The immediate result was the inclusion of Alfred faculty as a collaborator on a Zero Valent Nanometals SBIR proposal with the AMPrint Center.

The AMPrint Center was extremely active this past year with outreach and networking activities involving over a dozen venues and over 200 attendees.

Invention Disclosures

Reporting Period	Patent Name	Inventor	Co-inventor	Licensing Partner	Research Sponsor	Description
2016-2017	Not Reported					
2017-2018	Enabling Microsystem Technologies for Advanced Drug Delivery	David Borkholder	F. Forouzandeh, J. Ouyang, D. Smith, R. Carter, C. Mahajan, and D. Cormier	N/A	NIH	For use in implantable micropump used to deliver drugs to the inner ear to treat hearing loss.
	Enabling Microsystem Technologies for Advanced Drug Delivery	David Borkholder	J. Ouyang, D. Cormier, and A. Alfadhel	N/A	NIH	Uses included train sensors, medical ultrasound imaging instruments, and energy harvesting devices
	Enabling Microsystem Technologies for Advanced Drug Delivery	David Borkholder	F. Forouzandeh, J. Ouyang, D. Smith, R. Carter, C. Mahajan, and D. Cormier	N/A	NIH	The commercial potential is an implantable micropump used to deliver drugs to the inner ear to treat hearing loss.

Start-up Companies Formed

Not Reported

Licensing Agreements

Not Reported

Level of Matching Funds Provided**2016-2017 Reporting Period**

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$297,314	\$76,986	\$160,173	\$534,473
Indirect Costs	\$39,806	\$19,247	\$40,772	\$99,825
Equipment	\$441,552	\$472,342	\$338,331	\$1,252,225
Materials & Supplies	\$10,489	\$14,612	\$64,849	\$89,950
Tuition	\$0	\$1,742	\$12,243	\$13,985
Travel	\$15,507	\$7,213	\$0	\$22,720
Subcontractors	\$24,990	\$0	\$48,170	\$73,160
Other	\$49,313	\$152,278	\$873,943	\$1,075,534
Total	\$878,971	\$744,420	\$1,538,481	\$3,161,872

\$0 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$224,652	\$53,185	\$109,968	\$387,805
Indirect Costs	\$39,794	\$13,296	\$27,492	\$80,582
Equipment	\$48,710	\$0	\$338,331	\$387,041
Materials & Supplies	\$2,059	\$14,612	\$58,887	\$75,558
Tuition	\$0	\$1,742	\$0	\$1,742
Travel	\$98	\$7,213	\$3,124	\$10,435
Subcontractors	\$0	\$0	\$2,745	\$2,745
Other	\$56,030	\$152,278	\$151,880	\$360,188
Total	\$371,343	\$242,326	\$692,427	\$1,369,302

\$63,206 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Biotechnology (CfB)
Stony Brook University
Clinton Rubin Center Director
Technology Focus: Life Sciences, Enabling Sciences and Agricultural Sciences

Importance to NYS

The Center for Advanced Technology in Biotechnology at Stony Brook University (hereinafter referred to as the "CfB") of the State University of New York (SUNY) is designated in the life sciences, enabling sciences, and biomedical technology focus. The CfB capitalizes upon the intellectual and physical resources of Stony Brook University to catalyze, accelerate, and enhance commercial opportunities to fuel the growth and economic impact of New York's life sciences industry

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	54.0	14.0	\$37,957,481	\$470,804	\$9,068,613	\$32,545,999	\$1,066,421	\$81,109,318
2017-2018	21.5	5.0	\$35,152,249	\$214,156	\$6,761,293	\$9,688,000	\$598,000	\$52,413,698

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs.)	Summary
2016-2017	Cholesterol-Mediated Mycobacterium Tuberculosis Resistance	Nicole Sampson	NIAID	\$1.25M	6/19/17-5/31/22	New therapeutics will reduce the treatment time to cure TB disease
	Breast Cancer Detection Treatment Response	Eric Brouzes	Simmons Foundation	\$238,760	1/1/17-12/31/17	Developing a new microfluidics-based platform
	Characteristics and Position of Biofilms on Urinary Catheters	Annie Rohan	AACCN	\$9,988	3/2/17-3/1/29	Timing the removal of high-risk catheters
2017-2018	Magnetic Extraction from Microfluidic Droplets	Eric Brouzes	NSF	\$299,830	9/1/17-8/31/20	Tiny magnets to extract the samples from the oil carrier droplets
	Approaches to Protein Structure Prediction	Kenneth Dill	NSF	\$15,566	8/1/17-7/31/19	Prediction of protein structure from sequence
	Selenium Solid-State Photomultiplier	Amirhossein Goldan	NIBIB	\$196,883	7/1/18-6/30/18	Feasibility of a novel pixel structure.
	Accelerating Modeling of Proteins	Kenneth A Dill	NIGMS	\$316,515	1/1/18-12/31/18	This proposal is to develop MELD
	Establishing STS-1 as a Target for Treatment of Systemic Candidiasis	Nicholas A. Carpino	NIAID	\$256,959	12/15/17-11/30/18	Small molecule drug to be used to treat life-threatening C. albicans infections
	Roles of MIR-129 in Colorectal Cancer	Jingfang Ju	NCI	\$359,202	5/1/18-4/30/19	Enhance 5-FU efficacy to benefit patients
	Mycobacterium Tuberculosis Resistance to Oxidative Stress as a	Nicole S. Sampson	NIAID	\$392,421	6/1/18-5/31/19	Drug discovery that eliminates Mtb persistence and drug

	Drug Target					tolerance
	Translating Biomedical Science into Innovations	Clinton T. Rubin.	BARDA	\$392,421	6/1/18-5/31/19	Expand successful accelerator programs

Education and Technology Commercialization Activities

Industry-Oriented Education and Training

The Fundamentals of the Bioscience Industry Program (FOBIP) is an 84-hour seminars and workshops program, led by industry executives. It provides participants with a comprehensive understanding of product development cycles, regulatory affairs, intellectual property, finance, corporate culture, and other issues unique to the bioscience industries. The FOBIP program is offered at Stony Brook's Long Island campus as well as a satellite Manhattan location, and is open to participants from throughout the greater metropolitan area. Funding has allowed the CfB to introduce a hands-on technology commercialization project into the program that requires students to develop commercialization strategies around real intellectual property.

CfB has implemented a Commercialization Fellowship to provide a select number of Fundamentals alumni with time limited appointments (usually 1-3 years) at the CfB. They work side-by-side with CfB senior staff members and industry advisors to develop commercialization strategies and help position clients for their first round of professional financing.

Long Island BioMentor Initiative - The purpose of the Long Island BioMentor Initiative is to provide intensive team mentoring to first-time entrepreneurs. The program is modelled after the successful MIT Venture Mentor Service (MIT-VMS), and will continue to be modified to meet the specific needs of the Long Island bioscience ecosystem. Potential mentees are recruited through the Center for Biotechnology's extensive network and are required to formally apply to the program. Consideration is based upon stage of development, identified needs of the entrepreneur, and the intake assessment conducted by the program's Entrepreneur Liaison. The intake assessment includes a personal interview between the entrepreneur, program staff and the Entrepreneur Liaison to discuss the guiding principles of the program, review guidelines for engagement and potential conflict of interest issues and discuss the responsibilities of the entrepreneur and their commitment to the rigor of the program. If all agree that the initiative is a good fit for the entrepreneur, and it is likely that the entrepreneur will benefit from engagement, then the entrepreneur is introduced to the mentor pool.

SBIR/STTR Training - A professional consulting firm, BBC Entrepreneurial Training and Consulting, was hired to provide NIH specific SBIR/STTR training to companies in the Long Island region.

Commercialization

Technology Commercialization Clinic (TCC) - Designated a satellite program of the New York State Science and Technology Law Center's (STLC) at Syracuse University, Technology Commercialization Clinic (TCC) in 2008, CfB has utilized seed funding provided by the Law Center to integrate TCC concepts into the Center for Biotechnology's business development and workforce training programs. More specifically, the CfB's BioStrategy Sessions are a direct outgrowth of the TCC and were created to help assess the needs of client companies and position them for future funding. Clients are invited to give a 20-30 minute "investor" presentation to a group of CfB-affiliated industry advisors, which is followed by an intense 1-1.5-hour Q&A and strategic discussion. The overall purpose of a BioStrategy Session is to (a) enhance and improve the overall commercialization and business development strategy for client companies, (b) facilitate access to the CfB's network of academic, industry and government resources, and (c) identify and address specific weaknesses in the company's commercialization strategy that could be addressed by the TCC process. If weaknesses are identified the project can be brought "in-house" for further assessment in a collaboration between the CfB and company client. Projects often include IP due diligence and strategy development, market and competitive analysis, exploring the appropriate regulatory pathway, and/or financial modelling. This "due diligence" process also serves as a screening process for companies interested in presenting to the Long Island Angel Network.

Invention Disclosures

Reporting Period	Patent Name	Inventor	Licensing Partner	Research Sponsor	Description
2016-2017	Apparatus for Fabrication of Multi-Well Selenium Devices	Wei Zhao, Amirhossein Goldan			Not Reported
	Tissue Culture Plate for Three Dimensional High Throughput Invasion Assay	Jian Cao, Yizhi Meng, Vincent Alford			Not Reported
	Novel miR-129 Based Cancer Therapeutics	Jingfang Ju			Not Reported
	Synthesis of a Positron Imaging Tomography (PET) Imaging Agent for Bacterial Infection	Peter Tonge, Peter Smith-Jones, Zhuo Zhang, Hui Wang			Not Reported
	Inhibitors of Animal Viruses by Compounds that Target Tsg101-Ubiquitin Interaction	Carol Carter, Lorna Ehrlich			Not Reported
	Targeted Anti-Thrombotic Drug Delivery Using Engineered DNA Nano-Carriers		NIH REACH		Targeted Drug Delivery using Shear-Sensitive DNA Nano-Carriers
	Azasteroids for Combination anti-TB therapy	Nicole Sampson, Xin-xin Yang		NIH REACH	Anti-MtLDL antibodies for tuberculosis diagnosis
	Novel miR-129 Based Therapeutics for Colon Cancer	Andrew Fesler, Jingfang Ju		NIH REACH	Development of miR-15a and miR-15a mimic as anti-cancer therapeutics
External Beam Therapy for Brain Tumor	F. Avraham Dilmanian, William McLaughlin, Brendan Lukaniec, Kurt Kruger		NIH REACH	Collimator for use in orthovoltage x-ray minibeam	
2017-2018	Not Reported				

Start-up Companies Formed

Reporting Period	Company Name	City	Product/Service
2016-2017	Manhattan BioSolutions	Lab space located in New York, NY	Drugs/Biologics
2017-2018	CuraMir Inc		Drugs/Biologics

Licensing Agreements

Reporting Period	Project	Inventor	Licensing Partner
2016-2017	R-8042	William Van Nostrand	Gyrus Pharmaceuticals
	R-8708	Yi-Xian Qin	Research Sponsor: QB Sonic
2017-2018	R-8026	Clinton Rubin	BTT Health GmbH

Level of Matching Funds Provided**2016-2017 Reporting Period**

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$651,125	\$736,868	\$1,336,421	\$2,724,414
Indirect Costs	\$84,277	\$184,216	\$333,448	\$601,941
Equipment	\$0	\$0	\$8,201	\$8,201
Materials & Supplies	\$66,085	\$80,095	\$364,129	\$510,309
Tuition	\$5,793	\$1,561	\$37,718	\$45,072
Travel	\$7,314	\$0	\$44,898	\$52,212
Subcontractors	\$10,250	\$0	\$207,649	\$217,899
Other	\$44,708	\$53,978	\$153,068	\$251,754
Total	\$869,552	\$1,056,718	\$2,485,532	\$5,141,201

\$729,399 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Cost Share	Other Sources	Total
Salaries & Fringe	\$524,835	\$352,725	\$445,226	\$1,322,786
Indirect Costs	\$37,651	\$88,181	\$111,306	\$237,138
Equipment	\$0	\$0	\$9,500	\$9,500
Materials & Supplies	\$84,112	\$51,367	\$36,100	\$171,579
Tuition	\$0	\$0	\$8,376	\$8,376
Travel	\$1,170	\$0	\$0	\$1,170
Subcontractors	\$22,170	\$0	\$125,938	\$148,108
Other	\$42,114	\$73,936	\$23,806	\$139,856
Total	\$712,052	\$566,209	\$760,252	\$2,467,377

\$428,864 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Integrated Electrical Energy Systems
Stony Brook University
Benjamin Hsiao Center Director
Technology Focus: Advanced Energy Systems

Importance to NYS:

The Center for Integrated Electric Energy Systems (CIEES) at Stony Brook University is designated in the energy systems technology focus. The Center capitalizes upon the intellectual and physical resources of Stony Brook University to accelerate the progress of renewable energy as one of the mainstream resources displacing fossil fuel-based electric power worldwide by facilitating the integration of renewable sources into the electric grid.

The Center facilitates New York companies' access to economic development programs that support company growth including but not limited to the Long Island Regional Economic Development Council, Long Island High Tech Incubator (LIHTI), other NYSTAR-designated centers, Small Business Development Centers, Strategic Partnership for Industrial Resurgence; and, other local and state economic development programs. The Center continues to expand its partnership with Brookhaven National Laboratory and enhancing its infrastructure to proactively support the energy industry sector. Center will additionally explore mechanisms to provide small companies with access to relevant technologies from the intellectual property portfolios of New York State's research institutions.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	1.0	3.0	\$750,000	\$0	\$0	\$0	\$0	\$750,000
2017-2018	19.0	7.0	\$1,680,000	\$142,400	\$0	\$510,000	\$380,000	\$2,712,400

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs)	Summary
2016-2017	Highly Permeable Desalination Membranes Based on Directed Water Channel Concept	Benjamin Hsiao	Electric Power Research Institute	\$330,000	10/20/16 – 10/19/19	Nanocomposite membranes for energy efficient desalination
2017-2018	Inventory Control	Dr. Eugene Feinberg	National Science Foundation	\$300,000	Not Reported	Not Reported
	Nanocatalysts for Fuels form CO ₂ -Rich Syngas	Dr. Devinder Mahajan	North Carolina Ag and Tech State University	\$28,005	Not Reported	Not Reported
	Microscopy Investigation of Complex Manganese Oxides for Energy Storage	Dr. Amy Marschilok	Brookhaven Science Associates LLC	\$82,151	Not Reported	Not Reported
	Dual Function Solid State Battery with Self Forming Self Healing Electrolyte and Separator	Dr. Esther Takeuchi	US Department of Energy	\$355,324	Not Reported	Not Reported
	Carboxycellulose Nanofibers from	Dr. Benjamin	National Science	\$540,000	Not Reported	Not Reported

	Underutilized Biomasses for Water Purification	Hsiao	Foundation			
	Center for Mesoscale Transport Properties	Dr. Esther Takeuchi	US Department of Energy	\$12 M	4 years	Not Reported

Education and Technology Commercialization Activities

Industry-Oriented Education and Training

CIEES has engaged numerous post-doctoral researchers to lead industry projects. As an example, CIEES employed a PhD student, to assist BAH Holdings LLC in the development of laser-processing for a new chip carrier for mid-IR LED and receiver. The student has been introduced to pilot manufacturing of semiconducting components and chip processing technologies. The project aims at the development of a compact, low power (< 100 microWatts) methane leak monitor for industrial and residential use.

CIEES engages undergraduate students as well. A UTS battery storage project currently employs three undergraduate students from Stony Brook University. The students are actively participating in the design and assembly of the molten salt battery testing unit, developing the LabView code for the energy storage control and data acquisition.

Commercialization

CIEES participated in the FuzeHub matching event in Saratoga Springs on June 17, 2017. The CIEES team represented resources available in the Long Island area. We established three potential project contacts.

The CIEES delegation participated in the “100% Renewable South Fork” workshop in East Hampton, NY. During the workshop, the CIEES team established a partnership with the East Hampton Grid Resilience Team who is working on establishing a self-sustained microgrid in the Springs area of East Hampton. The team will take part in the evaluation of molten-salt batteries delivered under the NYSERDA contract) in order to evaluate the molten-salt technology as a safer alternative to Li-ion in flood-prone areas of East Hampton.

CIEES continues to work jointly with Green Technology Accelerator Center, NYSP2 at Rochester Institute of Technology on the flow battery demonstration project. The project’s statement of work was completed and the contract is ready to be signed.

Invention Disclosures

Not Reported

Start-up Companies Formed

Reporting Period	Company Name	City	Product/Service
2016-2017	Storen Technologies Inc.	Stony Brook	Vanadium flow battery
2017-2018	Not Reported		

Licensing Agreements

Not Reported

Level of Matching Funds Provided

2016-2017 Reporting Period

Centers for Advanced Technology Report (FY 2016-2017 & FY 2017-2018)

Expense Category	NYSTAR Funding	Company Cost Share	Other Sources	Total
Salaries & Fringe	\$285,744	\$19,578	\$405,982	\$711,304
Indirect Costs	\$42,861	\$4,895	\$31,005	\$78,761
Equipment	\$118,780	\$0	\$0	\$118,780
Materials & Supplies	\$65,907	\$3,615	\$0	\$69,522
Tuition	\$0	\$0	\$0	\$0
Travel	\$10,388	\$1,404	\$0	\$11,792
Subcontractors	\$42,688	\$0	\$0	\$42,688
Other	\$20,000	\$1,056	\$0	\$21,056
Total	\$586,368	\$30,548	\$436,987	\$1,114,999

\$61,096 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Cost Share	Other Sources	Total
Salaries & Fringe	\$522,783	\$153,861	\$212,579	\$889,223
Indirect Costs	\$78,417	\$38,465	\$53,144	\$170,026
Equipment	\$118,331	\$0	\$0	\$118,331
Materials & Supplies	\$105,583	\$4,651	\$0	\$110,234
Tuition	\$0	\$0	\$0	\$0
Travel	\$16,128	\$5,519	\$0	\$21,647
Subcontractors	\$39,113	\$0	\$0	\$39,113
Other	\$15,420	\$8,727	\$0	\$24,147
Total	\$895,775	\$211,223	\$265,723	\$1,770,253

\$397,532 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Sensor Technology
Stony Brook University
Serge Luryi Center Director
Technology Focus: Sensor Technology

Importance to NYS:

The Stony Brook University Center for Advanced Technology in Diagnostic Tools and Sensor Systems hereinafter referred to as the Sensor CAT) works to establish itself as a world-class resource in sensor-related technical directions including magnetic, optical, X-ray, and infrared sensors; signal processing and image recognition; super-conducting electronics for sensor applications; DNA sequencing devices; and Micro-Electro-Mechanical Systems (MEMS)-based sensors and actuators.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	15.0	3.0	\$5,274,000	\$1,125,000	\$4,557,000	\$508,250	\$1,346,000	\$12,810,250
2017-2018	21.0	0.0	\$660,000	\$725,000	\$4,320,000	\$2,004,000	\$593,000	\$8,302,000

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs)	Summary
2016-2017	Sampling for Signal Processing	Monica Fernandez-Bugallo	NSF	\$498,000	2016-2019	Signal processing
	Prediction with Nonparametric Bayesian Methods	Petar Djuric	NSF	\$465,000	7/2016-6/2019	Contributes to North Atlantic Instruments work
	Metamorphic Heterostructures for Long Wave Infrared Optoelectronics	Dmitri Donetski, Gregory Belenky, Sergey Suchalkin	US Army	\$249,000	2016-2017	RDMC Mid-IR research
	Data-Driven Mechanism Design Innovation	Anurag Purwar, QJ Ge	NSF	\$441,000	2016-2019	
	Properties of the InAsSB Bulk Alloys	Gregory Belenky, Suchalkin, Shterengas	Bi-National Commission	\$150,000	2016-2017	Support for Optoelectronic Lab
	Framework for Data-Driven Mechanism Design Innovation	Anurag Purwar, QJ Ge	NSF	\$441,000	2016-2019	
	Bringing Spectrum Sensing to the Masses	Samir Das, Djuric, Dr. Petar M : Gupta, Dr. Himanshu : Milder, Dr. Peter	NSF	\$800,000	2016-2019	Communication technology for sensor networks
	Inventory Control	Eugene Feinberg	NSF	\$300,000	2016-2019	Smart-grid control software
2017-2018	Compact Room Temperature Operated	Leon Shterengas, Gregory Belenky	Sensors Photonics	\$118,000	10/2017-9/2018	Optoelectronic Lab

	THz Emitters		GmbH			
	VLWIR nBn detectors	Sergey Suchalkin, Gregory Belenky	Jet Propulsion Lab	\$50,000	2/2018- 12/2018	Optoelectronic Lab
	Acquisition of the Auger Electron Probe	Gregory Belenky, Leon Shterengas	US Army Research Office	\$85,000	9/2017- 8/2018	Optoelectronic Lab
	Compact Room Temperature Operated THz Emitters	Leon Shterengas, Gregory Belenky	NSF	\$306,000	7/2017- 6/2020	Optoelectronic Lab
	High Power GaSb-Based Photonic Crystal Surface Emitting Lasers	Leon Shterengas, Gregory Belenky	US Army Research Office	\$428,000	1/ 2018- 1/2019	Optoelectronic Lab

Education and Technology Commercialization Activities

Industry-Oriented Education and Training

The CAT continued its support of an extensive program in fostering high school student interest in scientific careers, while at the same time preparing them to work with and in industry. This program, led by Prof. Miriam Rafailovich, involves up to 100 high school students and 20 undergrads into serious research, a substantial part of which is industry-related. During the reporting period, the CAT continued to co-sponsor three of Prof. Rafailovich's R&D projects with industry, each of those projects incorporated significant participation of students. One part of it is The Garcia Summer Scholars Program, a research apprenticeship program that mentors each year more than 50 high school students from diverse ethnic and socio-economic backgrounds. Over the course of the six-to-eight-week program, the students learn to conduct university-level research in Materials Science and Engineering. In many cases, students in the program come from poorly funded school districts.

More recently, they began supporting a large educational project with National Grid.

Commercialization

Continued effort to establish collaboration between one of our customers, Graphene 3D Labs, and Additive Manufacturing and Multifunctional Printing (AMPrint) Center at RIT.

Invention Disclosures

Not Reported

Start-up Companies Formed

Not Reported

Licensing Agreements

Not Reported

Level of Matching Funds Provided**2016-2017 Reporting Period**

Expense Category	NYSTAR Funding	Company Cost Share	Other Sources	Total
Salaries & Fringe	\$765,399	\$674,828	\$249,235	\$1,689,462
Indirect Costs	\$114,793	\$168,707	\$62,308	\$345,808
Equipment	\$25,869	\$907	\$18,607	\$45,383
Materials & Supplies	\$56,966	\$24,694	\$3,766	\$85,426
Tuition	\$4,886	\$11,568	\$0	\$16,454
Travel	\$5,084	\$13,038	\$0	\$18,122
Subcontractors	\$64,343	\$0	\$0	\$64,343
Other	\$16,925	\$22,110	\$37	\$39,072
Total	\$1,054,265	\$915,852	\$333,953	\$2,857,084

\$553,014 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Cost Share	Other Sources	Total
Salaries & Fringe	\$784,852	\$527,335	\$295,122	\$1,607,309
Indirect Costs	\$112,807	\$131,834	\$73,780	\$318,421
Equipment	\$0	\$116,398	\$0	\$116,398
Materials & Supplies	\$25,218	\$39,391	\$33,922	\$98,531
Tuition	\$11,922	\$2,010	\$0	\$13,932
Travel	\$2,815	\$15,012	\$0	\$17,827
Subcontractors	\$15,578	\$0	\$15,153	\$30,731
Other	\$15,320	\$4,860	\$875	\$21,055
Total	\$968,512	\$836,840	\$418,852	\$2,808,084

\$583,880 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Nanotechnology and Nanomaterials
SUNY Polytechnic
Mike Fancher Center Director
Technology Focus: Nanotechnology

Importance to NYS:

The Center for Advanced Technology in Nanoelectronics and Nanomaterials (CATN2) located at the State University of New York Polytechnic Institute (SUNY Poly) Colleges of Nanoscale Science and Engineering (CNSE) is focused on nanotechnology technology; with an emphasis on nanoelectronics, nanomaterials, IT cyber security, cloud computing, gaming, data analytics, etc.), clean energy, power electronics, photonics, and nano-biotechnology.

CATN2 uses NYSTAR funds and required matching funds to: conduct collaborative applied research with industry leading to technology transfer and economic impact; conduct industry-oriented education and training; and facilitate outreach and networking. CATN2 maintains a balanced customer base of large and small companies and emphasize potential economic impact as the key criteria for selecting projects that will be cost-shared with NYSTAR funds.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	18.0	0.0	\$3,609,042	\$1,642,347	\$28,908,441	\$373,500	\$78,529,150	\$113,062,480
2017-2018	195.0	11.0	\$80,031,654	\$2,617,342	\$39,661,501	\$65,517,410	\$77,485,146	\$265,313,053

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs)	Summary
2016-2017	Fundamental Devices in 2-D TMD Semiconductors	Ji Ung Lee	NSF	\$380,000	9/1/16-8/31/19	Not Reported
	Stable Photocathode for Ultraviolet Astronomy	Fatemeh Shahedipour-Sandvik	Jet Propulsion Lab	\$240,000	6/23/16-9/30/17	
	Reprogramming of tRNA Modifications and Translation of Response Genes	Thomas J. Begley	National Institutes of Environmental Health Sciences	\$1,691,894	6/1/16-5/31/17	
	Human Respiratory Tract Toxicity	Xinxin Ding	National Cancer Institute	\$1,819,797	9/12/16-7/31/17	
	Characterization & Engineering Advanced Dielectric Thin Films	Mengbing Juang	Lawrence Livermore National Lab	\$53,299	12/12/16-9/30/17	
	Semiconductor & Nanotechnology Education	Robert Geer	NSF	\$1,606,445	7/1/15-8/31/17	
	Erbium Silicon Photonics Integrated Oscillator	Douglas Coobaugh	DARPA	\$867,212	7/1/15-3/31/17	
	Deterministic Implants of Single Ions Over a Nanometer Scale	Mengbing Huang	NSF	\$389,073	9/1/15-8/31/17	

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	Betavoltaic Device with Enhanced Performance using Nanostructures	Fatemeh Shahedipour-Sandvik	Army Research Lab	\$49,998	8/19/15-5/18/16
	Memristive Dynamic Adaptive Neural Network Array	Nathaniel Cady	AFRL	\$1,192,071	1/12/16-11/11/18
	Stretchable High Electron Mobility Transistors	Fatemeh Shahedipour-Sandvik	Army Research Lab	\$84,737	3/21/16-3/20/17
	Automated Proof Construction and Verification	Roopa Vishwanathan	NSF	\$174,860	5/1/16-4/30/18
	Investigation of Time Series using Topological Data	Firas Khasawaneh	NSF	\$196,499	4/1/16-3/31/19
	Machine Learning on Dynamical Systems	Firas Khasawaneh	NSF	\$93,111	9/1/16-8/31/19
	Integrity & Reliability of Integrated Circuits	James R. Lloyd	DARPA	\$386,802	4/25/16-6/1/17
2017-2018	Characterization of PTP1B-Dependent Regulation	Benoit Bovin	American Heart Association	\$154,000	7/1/17-6/30/19
	Evaluation of Darkfield Imaging	Sara Brenner	Centers for Disease Control	\$39,545	7/12/17-7/11/18
	Ultrafast Scintillation Detectors	Serge Oktyabrsky	NSF	\$399,779	7/15/17-6/30/20
	Engineering Salivary Glands	James Castracane	National Institute of Dental and Craniofacial Research	\$254,077	8/1/17-7/31/18
	Role of the Phosphoprotein Phosphatase PTP1 B in Cardial Hypertrophy	Benoit Boivin	National Heart Lung and Blood Institute	\$445,959	9/1/17-8/31/20
	Semiconductor & Nanotechnology Education	Robert Geer	NSF	\$2,249,997	9/1/17-8/31/20
	PN-junctions by Ion Implantation Techniques for GaN	Fatemeh Shahedipour-Sandvik	DoE	\$570,000	9/13/17-9/12/19
	Nanoscale Electronics Fabrication	Nathaniel Cady	AFRL	\$288,430	10/24/17-10/24/20
	Transistor Power Devices	Fatemeh Shahedipour-Sandvik	Army Research Lab	\$66,177	11/27/17-11/26/21
	Structurally Interacting RNAs(xRNA) Technology	Scott Tenenbaum	National Institute of General Medical Sciences	\$567,247	1/1/18-12/31/18
	Metrology Changes in Multi-Nanowire	Alain Diebold	SRC	\$90,000	1/1/18-12/31/18

	Manufacturing of Ultra-High-Voltage Devices	Woongje Sung	Army Research Lab	\$500,000	6/20/18-7/19/21	
	Quantum Dots in a Semiconductor Matrix	Serge Oktyabrsky	DoE	\$100,000	5/1/18-4/30/19	

Education and Technology Commercialization Activities

Industry-Oriented Education and Training

CATN2 NanoEducation efforts have focused on 1) Engagement; 2) Enrichment; and, 3) Education. Efforts have included regional, state-wide and national and international activities resulting in over 65,900 attendees and over 6,700 student visits to CNSE throughout the year.

Established almost ten years ago, the Center for Construction Trades Training (CT2) with its focus on hands-on training for the skilled trades was established at the Watervliet Arsenal, and subsequently expanded by the construction trade unions with workforce training cleanrooms in Glens Falls and Colonie. The CATN2 initiated a new expansion of this program by establishing a partnership with SEMATECH to establish the Center for Careers in Sub-systems and Site-services (CS2) with a mission to extend this focus on tailored R&D capabilities in close collaboration with these large and under-served market segments. Additionally, CS2 will also focus on workforce development to address the chronic shortage of skilled technicians trained in the enabling technologies that serve as the foundation for the growing nanofabrication industry. Hubs are being established with Edwards Vacuum serving as the anchor industry partner with a focus on contamination control and Inficon serving as the anchor partner with a focus on data analytics and in-situ monitoring technologies as part of the AMP Center for more information see Section 4.9.B.d.), and with M+W Group with a focus on overall facilities operations as part of the ongoing efforts of the Nano-Alliance Center at the Capital South Campus Center for more information see Section 4.8.C.b.iii).

CATN2 has successfully implemented a comprehensive E3 approach to preparing the high-tech workforce by focusing on 1) Engagement, to attract potential workers; 2) Enrichment, to build a workforce pipeline; and 3) Education and training that is industry-oriented. E3 efforts have included management leadership of regional, state-wide, national, and international activities, resulting in over 65,900 attendees and over 6,700 student visits to CNSE throughout the year. Engagement efforts have emphasized exposure to careers in nanotechnology (e.g. NanoCareer Day). Enrichment efforts have targeted high school students (co-located Tech Valley High internships, Albany City Schools NanoHigh, etc.); underserved populations (e.g. Girls, Inc. Eureka! program, etc.) and college-level entrepreneurial training (e.g. NY Business Plan Competition), and not-for-profit clean energy project development (e.g. US-DOE Solar in Your Community). Education and training efforts have focused on degree and certificate granting programs with the award of Ph.D., M.S., and B.S. degrees in Nanoscience and Nanoengineering; certificate and badges under the NSF NEATEC program and collaborative programs with community colleges, state and national higher educational institutions under the federally funded AIM Photonics and PVMC centers.

The CATN2 has developed and managed several initiatives during the reporting period to establish dedicated hands-on learning (Data Science and Analytics (DSA) workforce-training and education test-beds tailored to support the Center's SIGs. These training test-beds include the: Zero Energy Nano (ZEN) facility; the NanoFab North AM support systems, and Clean Energy Monitoring (CEM) network. The AMP Center includes the High Tech Data Analytics Workforce Training Hub that will integrate these three test-beds along with a wide array of other training facilities established over the past few years under state supported investments (SUNY 2020, CGAM, etc.) and federal awards (e.g. NEATEC) at SUNY Poly and at other institutions that will establish a training continuum from bench-level to tool-level to fab process-level that includes training curriculum and training stands delivered on-line, in-classroom, and hands-on training. The ZEN facility will be used to as a workforce education and training test-bed for general controls systems related to the energy management of the building.

Commercialization

The CATN2 has undertaken a business outreach strategy through the creation of RD&D alignment frameworks that focus on the formation of advanced manufacturing consortia with sustainable business models e.g. US-PVMC, NY-PEMC, AIM Photonics, etc.). These efforts support technology commercialization, entrepreneurial acceleration, workforce education, and regional cluster formation. At the core of these consortia is the establishment of industry-compliant test-beds through co-investment by industry, state and federal government, and SUNY Polytechnic to incentivize capital expenditures.

A major responsibility of the CATN2 is the support of nascent innovations and technologies. The Center realizes disruptive innovation tends to come from smaller- to medium-sized companies and as such is host to numerous entrepreneurial programs, roundtable discussions and business plan competitions.

The CATN2 supported the establishment of outreach and networking through referral networks in 1) Regional Academic Partnerships; 2) RD&D Industry Alignment Frameworks; 3) RD&D Shared-Use Facilities; 4) Strategic Economic Development Initiative Partnerships; 5) Entrepreneurial Programs; and 6) Participation in Industry and Academic Sponsored Conferences, Meetings, Forums, and Workshops.

The CATN2 has developed and implemented a successful RD&D industry alignment framework by establishing manufacturing scale test-beds with significant investment from industry, state and federal government, and the educational institution resulting in the launch of the following centers. These investments have: incentivized capital expenditures; enabled cost savings by providing access to billions of dollars in specialized equipment; enabled increased acquisition of funds to support shared projects; and created and retained jobs including directly with industry partners that use the test-beds as well as at the shared-use facilities operated on behalf of the industry partners. This model results in a hybrid outcome where multiple companies share in the consortia activities without directly operating the facilities, owning the assets, acquiring the outside funding, or expending the resources exclusively. Successful examples of executed and active industry alignment frameworks follow:

The CATN2 conceptualized, developed, and established the Advanced Manufacturing Performance (AMP) Center in partnership with Inficon based in Syracuse, Edwards Vacuum based in Buffalo, and New York Wired for Education based in Albany. CATN2 continues to work closely with partners and has established the formation of a Special Interest Group by the Semiconductor Equipment and Materials Industry Association (SEMI) in the area of Semiconductor Components, Instruments, and Subsystems (SCIS). The AMP Center will work closely with the SEMI SCIS to undertake projects and develop standards and curriculum for workforce development. Specifically, the AMP Center will focus on performance and quality improvements in advanced manufacturing supported by specialized testing and test-bed integration research that can also support workforce training and data analytics solutions. The AMP Center will serve the needs of the Technology Infrastructure Strategic Industry Group.

Invention Disclosures

Not Reported

Start-up Companies Formed

Not Reported

Licensing Agreements

Reporting Period	Licensing Agreements
2016-2017	Six licensing agreements were executed during this period.
2017-2018	Four licensing agreements were executed during this period.

Level of Matching Funds Provided**2016-2017 Reporting Period**

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$680,740	\$0	\$0	\$680,740
Indirect Costs	\$102,111	\$0	\$0	\$102,111
Equipment	\$7,100	\$0	\$0	\$7,100
Materials & Supplies	\$75,647	\$0	\$0	\$75,647
Tuition	\$23,376	\$0	\$0	\$23,376
Travel	\$15,370	\$0	\$0	\$15,370
Subcontractors	\$45,000	\$0	\$0	\$45,000
Other	\$36,386	\$4,735,456	\$0	\$4,771,842
Total	\$985,730	\$4,735,456	\$0	\$5,721,186

\$0 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$6,794	\$64,510	\$0	\$71,304
Indirect Costs	\$1,019	\$9,676	\$0	\$10,695
Equipment	\$0	\$0	\$0	\$0
Materials & Supplies	\$1,772	\$0	\$0	\$1,772
Tuition	\$0	\$0	\$0	\$0
Travel	\$0	\$0	\$0	\$0
Subcontractors	\$0	\$0	\$0	\$0
Other	-\$10,737	\$0	\$0	-\$10,737
Total	-\$1,152	\$74,186	\$0	\$73,034

\$0 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Bioinformatics and Biomedical Engineering
University of Buffalo
Norma Nowak & Jeff Dunbar Center Co-Directors
Technology Focus: Life Sciences, Enabling Sciences and Agricultural Sciences

Importance to NYS:

The Center for Advanced Biomedical and Bioengineering Technology (CAT) comprises the necessary interdisciplinary life sciences technology and faculty portfolio critical to the development of new products and services in two major focus areas: drug and diagnostics discovery and development; and, medical devices and biomedical informatics. The CAT will utilize its resources to identify and develop business relationships which create economic impacts through CAT projects, with project selection following a formal evaluation/admittance process. In addition, the Center works with New York State companies to develop future project prospects on an ongoing basis, in line with its strategic imperative to expand the CAT's outreach to small, medium, and large companies both inside and outside the Western New York region. The CAT will work collaboratively with academic, technology transfer and business development partners to provide all these elements to foster technology development, creation of start-up companies, expansion of existing businesses, and attraction/relocation of outside firms.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	51.0	0.0	\$5,298,017	\$815,920	\$2,707,472	\$51,608,019	\$713,553	\$61,142,981
2017-2018	212.0	0.0	\$897,612	\$5,398,371	\$6,693,452	\$44,633,421	\$703,200	\$58,326,056

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Co-Investigator	Source	Amount	Duration (yrs)	Summary
2016-2017	Not Reported						
2017-2018	Electrochemical Sense and Respond Osseointegrated Prosthesis 2	Mark Ehrensberger	Anthony Campagnari, Albert Titus, Thomas Duquin,	US Navy Office of Naval Research	\$631,974	8/2/17 – 7/31/19	Cathodic voltage controlled electrical stimulation for bacterial biofilm infection control in prosthetic limbs

Education and Technology Commercialization Activities**Industry-Oriented Education and Training**

Workforce Development: The UB CAT, in conjunction with its sister programs the NYS Center of Excellence in Bioinformatics & Life Sciences (CBLIS) and the NYS Center of Excellence in Materials Informatics (CMI), offers a multitude of workforce development opportunities for a variety of ages and education levels. Sandra Small, Ph.D., the Science Education Manager, leads these initiatives. Her duties include science career education outreach, genomics and bioinformatics education in formal and informal, K-16 environments through UB's Genome, Environment and the Microbiome Community of Excellence (GEM), managing the CBLIS and CMI Career Experience Programs, participating in the planning of entrepreneurial workshops, and interfacing with new and growing companies to help fulfill their workforce needs.

Student-Oriented Workforce Development

Life Sciences Career Experience Program: During the reporting period, the CBLIS supported 21 full-time UB students - undergraduate and graduate - working at 18 local life sciences companies, ten of which are UB CAT companies, during

the spring 2017 semester. Students were allowed to work a total of 144 hours, typically allocated as 12 hours per week for 12 weeks. The positions were in an array of fields. The CMI administers an identical program focused on the materials and advanced manufacturing industries. Recruitment for both programs occurs simultaneously during the preceding fall semester.

Buffalo Public School STEM Experience: UB's CAT and CBLS have a strong relationship with the Buffalo Public Schools (BPS), the City of Buffalo and SUNY to promote Science, Technology, Engineering and Math (STEM) awareness through the "BPS STEM Experience" Program. March 2017 marked the 4th annual Buffalo Public School STEM Experience. The CAT and CBLS were heavily involved in affiliated events, including:

- **Genome Day:** Four hundred eighth grade BPS students and over 50 student, faculty and staff volunteers visited the CBLS to learn about genetics and genomics. Students worked in small groups, led by a volunteer, to extract DNA from their cheek cells. The group leaders also served as STEM role models to answer questions the students had regarding careers in STEM. All CBLS and UB CAT staff members participated in this event.
- **WNY STEM Hub:** The WNY STEM Hub is a consortium of educators, administrators, counselors and industry professionals working to increase STEM awareness in WNY. The group was founded in December 2013, and hosts meetings and events at the CBLS. Dr. Small is a member of that group.
- **Research Laboratory Program in Bioinformatics and Life Sciences:** UB CAT has supported the start of a new high school in the Buffalo Public School District, the Research Laboratory Program in Bioinformatics and Life Sciences (RLP). The creation of which was inspired by Genome Day. Dr. Small is a member of the steering committee for the school, and has been a key member of the steering committee. Dr. Small manages a student from The Graduate School of Education, with a degree in bioinformatics, to work with the school administrators and teachers on integration of bioinformatics in curriculum development.

Commercialization

The UB CAT and CBLS business development functions are closely aligned and focused on technology-based economic development (T-BED). Their coordinated efforts have established the UB as a comprehensive point of entry to the region's life sciences and entrepreneurial eco-systems.

The UB CAT/CBLS Business Development Executive, Kim Grant, continues to engage existing and new life sciences firms with University assets poised to help them thrive. She does this by identifying alignment for Start-Up NY firms, cultivating relationships with faculty researchers embarking on entrepreneurial endeavors, connecting industry contacts with UB resources, and providing guidance and outreach to the region's growing biotech community.

CBLS Co-location continues to foster successful collaborations. During the reporting period, 17 companies were located within the Center.

Since 2009, the UB CAT and CBLS have led Bright Buffalo Niagara, an event that connects promising startups and business ideas with the funding sources that help them prosper. The goal is to create long-term economic impact for Buffalo and beyond.

The 2017 Bright Buffalo Niagara Entrepreneur Expo was held June 28, 2017, and featured 22 of the most promising entrepreneurs from across the region representing the companies listed below:

Seventeen of the companies gave a 90-second pitch, had a table at the Bright trade show and competed for a \$5,000 People's Choice Award. The remaining five gave 5-minute pitches to a panel of investors and competed for \$20,000 Grand Prize. SweetSpot took the People's Choice Award, while Rachel's Remedy won the Grand Prize.

In addition to the entrepreneur pitches, Frans Johansson, author of *The Medici Effect* and *The Click Moment* was the keynote speaker. His international best sellers shatter assumptions about how great ideas happen. Johansson spoke about his experience as an intersectional thinker and entrepreneur in his software startup, a healthcare firm and a hedge fund. The event was held at one of Buffalo's preserved and revived historic facilities, the Hotel Henry at the Richardson Complex.

Feedback obtained from the post event survey was overwhelmingly positive with most people saying they were "extremely likely to attend a similar event in the future." The entrepreneurs also provided positive feedback that the ability to pitch followed by exhibit and networking enabled them to meet potential investors.

Critical Path Life Sciences Accelerator In the fall of 2015, Steve Case, Chairman and CEO of Revolution LLC brought his Rise of the Rest tour to Buffalo. [Revolution](#)'s investment philosophy is to identify startup ecosystems in American cities and focus on building the innovative companies of tomorrow. In each city, Steve Case hosts a pitch competition, giving away \$100,000 to a local entrepreneur.

Mr. Case took note of Buffalo's growing life sciences ecosystem and encouraged its leaders to compete for a ViCap Community designation to receive ongoing support for our life science technology startups. The CBLs was notified in July 2016 that we had been selected and as a result developed the Critical Path Life Sciences Accelerator Program.

Critical Path kicked off its five-month program in September 2016. Twenty-seven companies applied for the program and eight were selected to work with expert mentors and advisors on key business issues designed make them "investor ready."

The program included a daylong kickoff event, followed by monthly three-day workshops, featuring facilitator Holly Hillberg, president of Hillberg Consulting and former executive at Johnson & Johnson and OrthoClinical Diagnostics, a recognized leader in imaging and the health care industry.

Participating companies employed a peer-selection process provided by ViCap to give each other feedback. The culmination of this ongoing, self-analysis was Abcombi Biosciences and Accutheranostics receiving \$50,000 investments from the Launch NY Seed Fund at the completion of the program in January 2017.

NSF I-Corps The UB CAT and CBLs, in collaboration with Cornell University, hosted an I-Corps short course focused on university researchers interested in exploring the market potential of their work and learning entrepreneurial skills.

As a result of this program, the participants were eligible to apply to the national NSF I-Corps program to advance the scientific discoveries. This program provides \$50,000 of non-dilutive funding to produce prototypes, perform validation testing and evaluate market potential and development the technologies, products and processes needed for successful commercialization.

In June 2017, UB was awarded the NSF I-Corps Site designation for \$100,000 a year for five years that in conjunction with the CAT enable us to enhance technology commercialization and industry engagement.

UB Biorepository The UB CAT in conjunction with CBLs, BIG, and UB's Jacobs School of Medicine & Biomedical Sciences are developing a sustainable biorepository that will provide high-quality biomaterials to support science and clinical research through centralized and standardized services for the collection, processing, management and distribution of biological assets. It will enable critical clinical science research and diagnostic development, as well as the advancement of precision medicine through deep annotation and "big data" integration.

This vital resource will support private and public research across diseases, including those that cost tax payers the most – cardiovascular, neurological/neurovascular and autoimmune – in order to improve public health and reduce health care costs. Currently, there is no central biorepository program – anywhere in New York State.

The biorepository will collect, share and use deeply annotated, well-characterized and consented biospecimens for research and development. Researchers at UB, other Universities and companies can access the biorepository system with the goal of using biological samples to make discoveries that will advance diagnosis, prediction, prevention and treatment for patients.

Invention Disclosures

Not Reported

Start-up Companies Formed

Reporting Period	Company Name	City	Product/Service
2016-2017	Not Reported		
2017-2018	Veronomics, Inc	Buffalo	Veronomics Inc. offers the Verotest1 pipeline, which uses functional genomic screens and bioinformatics analyses to identify drug sensitivities in drug-resistant and undruggable cancers.
	Neurovascular Diagnostics, Inc.	Buffalo	blood-based biomarker diagnostic test for the early detection of unruptured cerebral aneurysms.

Licensing Agreements

Reporting Period	Project	Inventor	Licensing Partner
2016-2017	16-14-0207	Blaine Pfeifer	Abcombi Biosciences
2017-2018	1144591	Hui Meng, Ph.D.	Neurovascular Diagnostics

Level of Matching Funds Provided

2016-2017 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$473,635	\$115,252	\$25,442	\$614,329
Indirect Costs	\$71,045	\$17,288	\$3,816	\$92,149
Equipment	\$270,766	\$13,966	\$25,000	\$309,732
Materials & Supplies	\$83,369	\$111,733	\$0	\$195,102
Tuition	\$281	\$2,229	\$0	\$2,510
Travel	\$0	\$156	\$0	\$156
Subcontractors	\$0	\$0	\$0	\$0
Other	\$109,821	\$97,837	\$0	\$207,658
Total	\$1,008,917	\$358,461	\$54,258	\$1,780,097

\$358,461 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total
Salaries & Fringe	\$340,144	\$33,421	\$199,191	\$572,756
Indirect Costs	\$51,022	\$5,013	\$33,659	\$89,694
Equipment	\$0	\$0	\$5,788	\$5,788
Materials & Supplies	\$64,771	\$86,754	\$23,451	\$174,976
Tuition	\$0	\$1,831	\$0	\$1,831
Travel	\$353	\$1,338	\$3,392	\$5,083
Subcontractors	\$0	\$0	\$0	\$0
Other	\$325,696	\$454,454	\$30,317	\$810,467
Total	\$786,335	\$582,811	\$295,798	\$2,247,755

\$582,811 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Emerging and Innovative Sciences
University of Rochester
Mark Bocko Center Director
Technology Focus: Photonics and Imaging

Importance to NYS:

The Center for Emerging and Innovative Sciences (CEIS hereinafter referred to as the CAT)) at the University of Rochester is designated in the photonics and imaging science systems technology focus. The CAT conducts applied research and development in electronic imaging systems that encompass the disciplines of image recording, compression, storage, coding, enhancement, retrieval, printing, and visualization. The CAT focuses on application areas such as imaging for security and surveillance, distributed and networked imaging, human and robotic vision, computer interpretation of images, image display, quantum photonics, photonic sensors, and medical imaging.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improvements	Total Impacts
2016-2017	40.0	12.0	\$1,276,127	\$5,562,407	\$30,318,639	\$1,770,000	\$113,000	\$39,040,173
2017-2018	28.4	35.3	\$1,563,699	\$6,536,372	\$32,730,633	\$1,470,000	\$263,377	\$42,564,081

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Co-Investigator	Source	Amount	Duration (yrs)	Summary
2016-2017	NEOCam	Dr A Mainzer, JPL	J Pipher	NASA	\$125,000	1/17 – 2/18	Developing micron arrays operated at high sensitivity
	Infrared Signature Control	Chunlei Guo	Michael Campbell	DARPA	\$400,000	2/1/17-10/31/17	Surface processing of metals for use in aeronautics
2017-2018	NEOCam	Dr A Mainzer, JPL	J Pipher	NASA	\$225,000	3/18 – 3/19	Developing arrays operated at high sensitivity
	High-definition corneal imaging	Cristina Canavesi		NIH	\$225,000	4/1/18-3/31/19	Corneal imaging for eye banks
	Surveillance Augmentation Using Satellites	John Kerekes	Andreas Savakis	DOD	\$699,919	2/12/18 - 5/9/22	Surveillance Augmentation with RIT's support
	Binocular Vision After Long-Term Adaptation to Ocular Optics	Geunyoung Yoon		NIH	\$2.2M	03/1/18 – 02/28/23	Investigate the role of ocular optics in binocular neural processing
	Wavefront Guided Soft Contact Lens	Geunyoung Yoon		NIH SBIR (Phase II)	\$1.46M	09/1/17 – 08/31/19	Improves vision by correcting optical defects

Education and Technology Commercialization Activities**Industry-Oriented Education and Training**

CEIS has engaged undergraduate and graduate students in at various company projects over the reporting period. Student responsibilities include research, presenting updates to company representatives, and training employees on

how to use developed technology and/or software programs. Companies that have been engaged for these types of projects include: Bausch & Lomb; Corning Incorporated; Clerio Vision, Inc.; Harris Corporation; UR Ventures; HYPRES, Inc.; Kitware; LightTopTech Corp; OptiPro Systems; Thermo Fisher Scientific; Adarza BioSystems, Inc.; Kodak Alaris; SiMPore, Inc.; and Visual Dx,

Commercialization

CEIS has worked with a several companies assisting them with manufacturing scale-up; animal studies funding and product development.

Invention Disclosures

Report ing Period	Patent Name	Inventor	Co-inventor	Licensing Partner	Research Sponsor	Description
2016-2017	Femtosecond Micromachining of Polymers	Wayne Knox			Clerio Vision, Inc.	Manufacturing an Intracorneal Presbyopia Corrector
	Modeling and Optimizing the LIRIC Writing Process	Daniel Brooks	Ellis, JD	Clerio Vision, Inc.	Clerio Vision, Inc.	Curved image plane microscope objective and relay system for laser-based photomodification
	Pathway towards in-vivo IRIS	Daniel Brooks, Jonathan Ellis			Clerio Vision, Inc.	Relay and Microscope Objective for curved image plane photomodification
2017-2018	Properties in IRIS Contact Lenses	Kaitlin Wozniak	Paul Funkenbusch, Cory Leeson, Ted Foos		CEIS, Clerio, NSF	Method to stabilize the induced refractive change over long periods
	Controlling Cellular Behavior with Lasers	Knox, Savage and Huxlin			Clerio Vision, CEIS	Slow growth of cancer cells by modifying the extracellular matrix of the tissue.
	Design of Refractive Corrections using Ultrafast Laser	Brooks, Wozniak, Knox, Ellis, Huxlin			Clerio Vision, CEIS	Describes different kinds of designs for laser-written refractive correctors.
	Scalable Manufacturing	Knox			Clerio Vision, CEIS	Design scalable manufacturing systems

Start-up Companies Formed

Not Reported

Licensing Agreements

Not Reported

Level of Matching Funds Provided**2016-2017 Reporting Period**

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$829,684	\$959,872	\$0	\$1,789,556
Indirect Costs	\$97,320	\$123,801	\$0	\$221,121
Equipment	\$1,860	\$10,247	\$0	\$12,107
Materials & Supplies	\$72,466	\$108,028	\$0	\$180,494
Tuition	\$0	\$32,111	\$0	\$32,111
Travel	\$13,356	\$84,975	\$0	\$98,331
Subcontractors	\$79,548	\$0	\$0	\$79,548
Other	\$200,584	\$104,485	\$0	\$305,069
Total	\$1,294,818	\$1,423,519	\$0	\$3,354,400

\$636,063 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$577,392	\$1,233,854	\$0	\$1,811,246
Indirect Costs	\$67,971	\$152,141	\$0	\$220,112
Equipment	\$21,470	\$111,793	\$0	\$133,263
Materials & Supplies	\$47,345	\$146,568	\$0	\$193,913
Tuition	\$8,359	\$46,682	\$0	\$55,041
Travel	\$29,958	\$70,630	\$0	\$100,588
Subcontractors	\$96,197	-\$113,175	\$0	-\$16,978
Other	\$78,593	\$163,423	\$0	\$242,016
Total	\$927,285	\$1,811,916	\$0	\$3,596,847

\$857,646 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

Center for Advanced Technology in Computer Applications and Systems Engineering
University of Syracuse
Pramod Varshney Center Director
Technology Focus: Information and Telecommunications Technology

Importance to NYS:

The CASE Center for Advanced Technology hereinafter referred to as the "CAT") at Syracuse University is designated in the information technology and telecommunications technology focus.

CASE will work with company partners to conduct research aimed at developing and improving products and services that utilize large quantities of different types of information about the environment (physical, biological, cyber) or human behavior (marketing, financial, social networks), analyze the information and determine an appropriate action or response. These systems depend on sensors, hardware, software, humans and on reliable and secure information networks both wired and wireless. Specific applied research areas will include high assurance software and systems including cyber security and verification, distributed networks and data mining including information fusion, situation awareness for unmanned systems, real-time targeted customer data delivery, and wireless telecommunications. The CASE's capabilities are expressed as interdisciplinary expertise in complex information intensive systems, including monitoring and control, predictive analysis, intelligence, security and assurance.

Impacts

Reporting Period	New Jobs	Retained Jobs	Increased Revenues	Cost Savings	Govt Funds	Non-Govt Funds	Capital Improv's	Total Impacts
2016-2017	30.0	18.0	\$11,105,673	\$3,094,012	\$13,735,673	\$1,155,000	\$822,300	\$29,912,658
2017-2018	35.0	71.0	\$4,281,595	\$2,211,055	\$14,546,971	\$1,170,454	\$145,773	\$22,355,848

Federal or Other Grants Awarded

Reporting Period	Project	Principle Investigator	Source	Amount	Duration (yrs)	Summary
2016-2017	Data Handling and Analysis Infrastructure	Duncan Brown, Peter Couvares	NSF	\$ 565,000	3 years	Data analysis of data sets
	Securing Power Grids under Cyber Threats	Sara Eftekharnajad	NSF	\$ 499,550	3 years	Cybersecurity for power grid
	Fundamental Turbulence Mechanisms in Multi-Stream Flows	Mark Glauser, Jacques Lewalle	Air Force Office of Scientific Research	\$ 303,896	2 years	Fluid dynamics
	Cyber Platform for Bio-Manufacturing	Utpal Roy, Pranav Soman	NSF	\$ 10,000	1 year	Smart manufacturing
	Supporting Stigmergic Coordination	Kevin Crowston	NSF	\$ 138,140	1 year	Study of agent-based data organization
	Mobile Phone-Based Voice System for Refugees	Murali Venkatesh, Bahram Attaie	John S. and James L. Knight Foundation	\$ 35,000	1 year	Translation in realtime on mobile phones
	Integrating Different Sources of Social Media	Reza Zafarani	Office of Naval Research	\$ 25,000	1 year	Analysis of data from social

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						media platforms
Teaming Citizen Science with Machine Learning to Deepen View of the Cosmos	Kevin G Crowston, Carsten Oesterlund	NSF	\$ 90,629	1 year		Intelligent analysis of crowd-sourced data
Accelerate Student Entrepreneurship and Venture Development	Michael A D'Eredita	Economic Development Administration	\$ 100,000	1 year		Increasing company formations
Characterizing Vortex Wake Structure and Force Production	Melissa Green	Office of Naval Research	\$ 194,302	1 year		Fluid dynamics study
Topology of Force Production in Unsteady Flows Around Wings	Melissa Green	Office of Naval Research	\$ 54,607	1 year		Fluid dynamics
Dynamic Data Driven Information Fusion for Situational Awareness	Biao Chen, Yingbin Liang, Jian Tang, Pramod K Varshney	Air Force Office of Scientific Research	\$ 198,782	2 years		Awareness from multiple data sources
Management of Mobile Phone Sensing via Sparse Learning	Yingbin Liang, Swastik K Brahma, Makan Fardad, Pramod K Varshney	NSF	\$ 400,000	2 years		Wireless research
Network Event Detection with Multistream Observations	Yingbin Liang	NSF	\$ 220,000	2 years		Wireless research
Detecting High-level Events Across Battery-Powered Wireless Smart Cameras	Senem Velipasalar	NSF	\$ 300,000	1 year		Smart camera networks for situation awareness
Scalable Readout of Superconducting Qubits	Britton Plourde	US Army Research Office	\$ 317,500	2 years		Quantum computing
Accurate Qubit control with Single Flux Pulses	Britton Plourde	Department of Defense	\$ 300,000	2 years		Quantum computing
Limits of Wireless Communications	Mustafa Gursoy	NSF	\$ 442,320	3 years		Computational intelligence r
High-Quality Mobile Crowdsourcing with Lifestyle-Aware	Jian Tang	NSF	\$ 354,431	3 years		Mobile data analysis
Spoof-Resistant Smartphone Authentication	Vir Phoha	NSF	\$ 16,000	1 years		Mobile phone based on biometrics
Automated Cyber Reasoning	Heng Yin	US Air Force Research Labs/Rome	\$ 81,455	1 year		Cybersecurity research
Robust Air-to-Air and Air-to-Ground Communications	Biao Chen	US Air Force Research Labs	\$ 124,000	1 year		Wireless research
Inclusive Cloud and Web Computing	Yang Wang, Yun Huang	NSF	\$ 173,202	1 year		Techniques in cloud-based

						computing
Frequency Selective Surface	Jun H Choi	US Air Force Research Labs	\$ 100,000	1 year		Wireless research
DECAF Plug-In for Binary Fault Injection	Heng Yin	DoE	\$ 80,000	1 year		Malware detection research
Cyber-manufacturing: Knowledge-Based Information Platform for Bio-Manufacturing	Pranav Soman, Utpal Roy	NSF	\$16,000	3 years		Improved data efficiency for biotech industry
i-Tree Applications Support	Laura Welch	USDA Forest Service	\$24,750	5 years		Data management - forest service
Cybersecurity for Institution	Steve Chapin	NSF	\$105,369	2 years		Cybersecurity research
Robust Air-to-Air and Air-to-Ground Communications	Biao Chen	US Air Force Research Labs/Rome	\$49,466	3 years		Wireless research
Collaborative Intelligent Radio Network Design	Biao Chen	NSF	\$100,000	1 year		Wireless research
Dynamic Data Driven Information Fusion for Situational Awareness	Biao Chen, Jian Tang, Pramod Varshney	Air Force Office of Scientific Research (AFOSR)	\$294,410	2 years		Combining massive data sets to glean knowledge
Certified Security for Mission Assurance	Shiu-Kai Chin, Mirza Tihic	US Air Force Research Labs	\$322,261	1 year		Cybersecurity research
Adaptable Compressed Absorber for Harsh Electromagnetic Environments	Jun Choi	Air Force Office of Scientific Research (AFOSR)	\$116,443	3 years		Electromagnetic research
Optimization Signal Estimation Fast Algorithms	Yingbin Liang	NSF	\$75,756	2 years		Signal processing research
Secret Key Generation Under Resource Constraint	Yingbin Liang, Qinru Qiu, Pramod Varshney, Yanzhi Wang		\$250,000	3 years		Cybersecurity research
Techniques for Deploying Mission Critical IoT Applications	Gurdip Singh	NSF	\$285,654	2 years		Internet of things
Fast and Accurate Algorithms for Social Network Analysis	Sucheta Soundarajan, Yanzhi Wang	NSF	\$560,783	3 years		Very fast Processing of large data sets
Big Data Enabled Wireless Networking	Jian Tang, Yanzhi Wang	NSF	\$231,238	3 years		Large-scale networking
Leveraging Massively Parallel Data Processing for Large-Scale Information Fusion with a GPU Cluster	Jian Tang, Biao Chen, Pramod Varshney	Air Force Office of Scientific Research	\$294,638	1 year		Basic data/signal processing

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	Fusion of Statistically Dependent Heterogeneous Information	Pramod Varshney	Department of the Army	\$140,000	4 years	Basic data fusion research
	Supporting Stigmergic Coordination	Kevin Crowston	NSF	\$361,792	3 years	Basic data management
	Cybersecurity Risks of Two-Way Distributed Electricity Markets	Jason Dedrick	NSF	\$135,591	2 years	Cybersecurity research for electrical grid
2017-2018	Mapping of Smallest Energy	Jani Onninen	NSF	\$108,666	2 years	Modeling of energy states
	Capability-based Access to Remote Scientific Data	Duncan Brown	NSF	\$101,637	2 years	Search capabilities
	Data Analysis for Gravitational Wave Astronomy	Ryan Fisher	NSF	\$127,249	1 years	"Big Data" project
	Accurate Qubit cControl with Single Flux Quantum Pulses	Britton Plourde	DoD	\$409,993	3 year	Quantum computing
	Robust Air-to-Air and Air-to-Ground Communications	Biao Chen	US Air Force Research Labs/Rome	\$45,165	1 year	High-volume defense
	Dynamic Spectrum Access in Uncoordinated Networks	Biao Chen	NSF	\$275,000	2 year	Managing wireless spectrum
	Enabling Security in Mobile Apps	Wenliang Kevin) Du	NSF	\$497,296	4 year	Cybersecurity in mobile apps
	Enabling Multimodal Sensing, Realtime Onboard Detection	Qinru Qiu, Amit Sanyal, Jian Tang, Senem Velipasalar	NSF	\$400,000	2 year	Sensor network data management
	Cybersecurity Curricula Development	Yuzhe Tang, Wenliang Du	National Security Agency	\$328,481	2 year	Cybersecurity training
	Multi-Modality Sensing and Information Fusion	Pramod Varshney	Air Force Office of Scientific Research	\$183,192	2 year	Situational awareness
	Distributed Multi-Processor for Analysis of Extreme-Scale Grids	John Dannenhoffer	NASA	\$173,581	2 year	Data processing and analysis
	Three-Dimensional Vortex Wakes	Melissa Green	Office of Naval Research	\$121,526	1 years	Fluid dynamics
	Socio-Technological Landscape Automation	Kevin Crowston	NSF	\$499,796	3 years	Large-scale data analytics
	Trackable Reasoning and Analysis	Jennifer Stromer-Galley	Intelligence Advanced Research Project	\$1,000,000	4 years	Large-scale data analytics
	Access to Remote Scientific Data	Duncan Brown	NSF	\$101,637	1 year	Developing search

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						capabilities
Privacy Preserving Sensor Platform for Occupancy Detection and Counting	Senem Velipasalar, Can Isik, Tarek Rakha, Chetna Khosla Chianese, Pramod K Varshney	ARPA-E	\$1,200,000	5 years		Detect human presence without identifying individuals
Accurate Qubit control with Single Flux Quantum Pulses	Britton Plourde	Department of Defense	\$ 300,000	2 years		Quantum computing
Digital Control and Stabilization of Qubits	Britton Plourde	NSF	\$90,000	1 years		Quantum computing
Multi-User Communications in Airborne Platforms	Biao Chen	US Air Force Research Labs/Rome	\$33,375	2 years		High-volume defense
Robust Air-to-air and Air-to-Ground Communications	Biao Chen	US Air Force Research Labs/Rome	\$45,165	1 years		High-volume defense
Dynamic Data-Driven Information Fusion for Situational Awareness	Biao Chen, Yingbin Liang, Jian Tang, Pramod Varshney	US Air Force Office of Scientific Research	\$298,277	3 year		Combining large data to support decisions
Energy Efficient Access in Uncoordinated Networks	Biao Chen	NSF	\$275,000	2 year		Managing wireless spectrum
Enabling Security in Mobile Apps	Wenliang Kevin) Du	NSF	\$497,296	4 year		cybersecurity in mobile apps
Cybersecurity Curriculum Development	Yuzhe Tang, Wenliang Kevin) Du	National Security Agency	\$328,481	3 year		Workforce training
Enabling Multimodal Sensing, Realtime Detection	Qinru Qiu, Amit Sanyal, Jian Tang, Senem Velipasalar	NSF	\$400,000	2 year		Sensor network data management
Cybersecurity Curricula Development	Yuzhe Tang, Wenliang Du	National Security Agency	\$328,481	2 years		Workforce training
Multi-modality Sensing and Information Fusion	Pramod Varshney	Air Force Office of Scientific Research	\$183,192	2 years		Situational awareness project
Statistically Dependent Heterogeneous Information Source	Pramod Varshney	Department of the Army	\$61,746	1 years		Data fusion project
Design and Analysis on Extreme-Scale Grids	John Dannenhoffer	NASA	\$173,581	2 years		Data processing and analysis
Computational Aircraft Prototype Synthesis	John Dannenhoffer	Air Force Research Labs/Wright Patterson AFB	\$75,000	1 year		Aircraft design process improvements
Computational Study	Mark Glauser, Jacques Lewalle	Air Force Office of Scientific Research	\$300,143	2 years		Fluid dynamics

Remote Device for use Under Naturalistic Working Conditions	Leanne Hirshfield	Air Force Office of Scientific Research	\$240,594	2 year	Portable neuroimaging device
Analysis of Three-Dimensional Vortex Wakes	Melissa Green	Office of Naval Research	\$164,526	1 year	Fluid dynamics
Topology of Force in Unsteady Flows	Melissa Green	Office of Naval Research	\$140,399	2 years	Fluid dynamics
Socio-Technological Landscape of Automation	Kevin Crowston	NSF	\$499,796	3 years	Large-scale data analysis
Framework for Modeling and Analysis of Cascading Failures	Makan Fardad	NSF	\$500,000	5 years	Commercial potential for electrical grids
Science with Machine Learning to Deeping View of the Cosmos	Kevin Crowston	NSF	\$96,990	1 year	Machine learning for analysis of gravitational wave data
Analysis for Collaboration and Evaluation	Jennifer Stromer-Galley, McCracken, Oestrund, Schooler	Intelligence Advanced Research Project	\$2,707,178	4 years	large-scale data analytics project

Education and Technology Commercialization Activities

Industry-Oriented Education and Training

CASE, in partnership with the Department of Electrical Engineering and Computer Science (EECS), continues an annual twelve-part colloquium series on technical topics, from distributed sensor networks, information fusion and machine intelligence, to entrepreneurs' personal stories.

Three NYSTAR entities, CASE, New York State Science and Technology Law Center, and Central New York TDO, presented a conference in October 2016, including high-profile keynotes, educational workshops for workforce development and to bolster regional industry capabilities, and a Technology Showcase featuring CAT IP with commercial potential and funding opportunities to bring it to market. We will add a new partner, SUNY Upstate, and continue to present this conference in 2017.

The CASE Industry Co-op program continues to be successful, placing students in a variety of short- and long-term positions within local companies to gain direct work experience and provide opportunities and encouragement to remain in the region after graduation. The Co-op program, under Program Manager, David DiMaggio, conducts a range of recruiting and promotional activities.

CASE continues to work with the New York State Science and Technology Law Center to deliver commercialization and intellectual property training.

Commercialization

CASE plays an active role in NUAIR, a regional coalition of businesses, government, and academe engaged in the FAA designated test site for Unmanned Aerial Systems. NUAIR has received a waiver for Class C airspace, including the Syracuse University campus. CASE Lab Manager Ian Joyce is working towards certification as a Mission Commander to oversee test flights; and is now a licensed FAA commercial drone pilot. NUAIR has received a waiver for Class C airspace,

including the Syracuse University campus. CASE Lab Manager Ian Joyce is certified as a Mission Commander to oversee test flights, in addition to be a licensed FAA commercial UAV pilot.

CASE helps to promote CEO's NY Genius and Grants for Growth Programs, working together with CEO, The Technology Garden, CNY TDO, other universities, and range of representatives from industry to refer companies seeking funding to enable university-industry collaboration with significant commercial potential. One of the six NY Genius finalists is a CASE company, founded by CASE faculty. CASE is working with other winners of the Genius awards to assist them in achieving their business goals, especially prototype design and hiring students to assist with research and development.

CASE regularly refers businesses and faculty to the New York State Science and Technology Law Center and receives referrals from them. CASE meets with leadership at Syracuse COE regularly to identify opportunities for collaboration.

Invention Disclosures

Reporting Period	Patent Name	Inventor	Licensing Partner	Research Sponsor	Description
2016-2017	Machine Learning Multi-Modal Physiological Sensor	Leanne Hirshfield	Not Report		Marked as Confidential
	Diagnostic Marker in Human Urine	Robert Doyle	Confidential		
	Human Eye Health Disclosure	Robert Doyle	Confidential		
	Assessment Using Machine Learning Algorithms	Michael Marciano, Jonathan Adelman	Not Report		
	Fuel Cell Replacement of Catalytic Converter	Jeongmin Ahn	Ryan Milcarek, Thomas Welles		
	Production of Maleic Acid	Jesse Bond	Not Report		
2017-2018	Peptides for HIV Prevention	Ivan Korendovych	Not Report		
	Controlling Polymer Blend Morphology	Ian Dean Hosein, Saeid Biria	Not Report		
	Wireless Stimulation for Electrochemical Control of Medical Device Associated Biofilms	Dacheng Ren, Hao Wang	Not Report		
	Aberrantly Large Single-Channel Conductance of Protein Nanopores	Liviu Movileanu, Avinash Kumar Thakur, Motahareh Larimi	Not Report	National Institute of Health	
	A New Solid-State Battery	Ian Dean Hosein	Not Report		
	Photochemical Preparation of Constrained Polyacetylene	Bruce Hudson, Steluta Dinca	Not Report		
	Integrated Guidance and Feedback Control for Autonomous Vehicle	Amit Sanyal, Sasi Viswanathan	Not Report		
	Probabilistic Method to Detect Allele Sharing	Michael Marciano, Jonathan Adelman	Not Report		
	Single-Molecule Pore-Based Sensor for Proteins and Transient Protein	Liviu Movileanu, Avinash Kumar Thakur	Not Report	National Institute of Health	
	Electro-Controllable Ion Exchange Membrane	Ian Dean Hosein	Not Report		
	A Tri-agonist of the Glugacon Receptor	Robert Doyle	Not Report		
Enzyme-Responsive Shape Memory Polymers	Patrick Mather	Not Report	National Science		

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				Foundation
	Passive Nano-technology Cooling of Electronics Devices	Shalabh Chandra Maroo	Not Report	National Science Foundation
	Iron III) Pyrophosphate Coordination Complex	Robert Doyle	Not Report	
	A Smart Product Lifecycle Management Platform	Utpal Roy	Not Report	
	Furnace with an Integrated Flame Assisted Fuel Cell	Jeongmin Ahn	Not Report	
	Disassembly Planning for Sustainable Manufacturing	Utpal Roy	Not Report	
	ShapeSU	Elizabeth Barlow	Not Report	
	Vitamin B12 Conjugate for Improvement of Glucose Tolerance	Robert Doyle	Not Report	
	Synthetic Human Protein's Role in Organ Function	Robert Doyle	Not Report	
	Dynamic Surface Topography for Controlling Biofouling	Dacheng Ren	Not Report	
	Micro/Meso-Scale Combustion Based Fuel Cell	Heongmin Ahn	Not Report	
	Software to Perform Localization and Classification of Objects	Senem Belipasalar	Not Report	
	Automatic Class Attendance System Software	Yun Huang	Not Report	
	Mobile App for Enrollment and Student Experience	Confidential	Not Report	
	Detecting Figure Element Reuse in Scientific Articles	Daniel Acuna	Not Report	
	Hybrid Additive-Subtractive Biofabrication Platform	Pranav Soman	Not Report	
	Solid Oxide Fuel Cell System for Unmanned Aerial Systems	Jeongmin Ahn	Not Report	
	Enhanced Trained Immunity	John Chisholm	Not Report	
	Resilient Thermal Heat Pump	Jeongmin Ahn	Not Report	
	Polyacetylene Materials	Bruce Hudson	Not Report	
	Novel Ligands	Robert Doyle	Not Report	
	Imaging Agents for Ghrelin O'Acyltransferase	James Hougland	Not Report	American Diabetes Assoc.

Start-up Companies Formed

Reporting Period	Company Name	City	Product/Service
2016-2017	Not Reported		
2017-2018	UsPLM	Syracuse	Integrated, scalable drone fleet management solutions

Licensing Agreements

The 2017-2018 reporting period listed a licensing agreements with Cooper Atkins, Sensgard end other confidential companies.

Level of Matching Funds Provided

2016-2017 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$765,399	\$674,828	\$249,235	\$1,689,462
Indirect Costs	\$114,793	\$168,707	\$62,308	\$345,808
Equipment	\$25,869	\$907	\$18,607	\$45,383
Materials & Supplies	\$56,966	\$24,694	\$3,766	\$85,426
Tuition	\$4,886	\$11,568	\$0	\$16,454
Travel	\$5,084	\$13,038	\$0	\$18,122
Subcontractors	\$64,343	\$0	\$0	\$64,343
Other	\$16,925	\$22,110	\$37	\$39,072
Total	\$1,054,265	\$915,852	\$333,953	\$2,857,084

\$553,014 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.

2017-2018 Reporting Period

Expense Category	NYSTAR Funding	Company Match	Other Sources	Total Expenses
Salaries & Fringe	\$768,336	\$1,187,508	\$326,933	\$2,282,777
Indirect Costs	\$77,676	\$120,377	\$39,119	\$237,172
Equipment	\$0	\$4,080	\$0	\$4,080
Materials & Supplies	\$12,922	\$34,328	\$1,145	\$48,395
Tuition	\$0	\$48,014	\$126,000	\$174,014
Travel	\$2,475	\$13,111	\$7,170	\$22,756
Subcontractors	\$0	\$0	\$0	\$0
Other	\$122,330	\$69,822	\$17,481	\$209,633
Total	\$983,739	\$1,477,240	\$517,848	\$4,063,561

\$1,084,734 of the expenses includes a Small Company Match Credit, as required by Public Authorities Law section 3102-b, subparagraph 3.a.iii, matching funds received from businesses with no more than one hundred employees are counted as double the actual dollar amount toward the center's overall match requirement.