



**Division of  
Science, Technology  
& Innovation**

**A Division of Empire State Development**

**Centers of Excellence**

**2021 Report**

## NYSTAR's Center of Excellence Report (2021)

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|--|----|
| Contents   |    |
| Program Overview and Purpose .....   | 3  |
| Center of Excellence for Food and Agriculture at Cornell AgriTech - Cornell University.....                          | 4  |
| Center for Disaster Medicine - New York Medical College.....   | 7  |
| Center of Excellence in Advanced and Sustainable Manufacturing - Rochester Institute of Technology.....              | 10 |
| Center of Excellence in Weather and Climate Analytics - University of Albany .....                                   | 14 |
| Small Scale Systems Integration and Packaging Center of Excellence - State University of New York at Binghamton..... | 18 |
| Center of Excellence in Bioinformatics & Life Sciences - University at Buffalo .....                                 | 23 |
| NYS Center of Excellence in Materials Informatics - University at Buffalo .....                                      | 27 |
| Center of Excellence in Nanoelectronics and Nanotechnology (CENN) - SUNY Polytechnic Institute .....                 | 33 |
| Center of Excellence: Advanced Energy Research and Technology Center - Stony Brook University.....                   | 37 |
| Center of Excellence in Wireless and Information Technology (CEWIT) - Stony Brook University .....                   | 41 |
| Syracuse Center of Excellence in Environmental and Energy Systems - Syracuse University .....                        | 48 |
| Center of Excellence in Data Science - University of Rochester .....   | 51 |
| CoE in Healthy Water Solutions - Clarkson University/ SUNY ESF .....   | 54 |
| Center of Excellence in Digital Game Development The NYU Game Center - New York University .....                     | 57 |
| Center of Excellence in Digital Game Development - Rensselaer Polytechnic Institute .....                            | 60 |
| Center of Excellence in Digital Game Development - MAGIC Center - Rochester Institute of Technology ....             | 63 |

## NYSTAR's Center of Excellence Report (2021)

### **PROGRAM OVERVIEW AND PURPOSE**

Empire State Development's Division of Science, Technology & Innovation (NYSTAR) manages the Centers of Excellence (CoE) program with a goal of fostering collaboration between the academic research community and business sector to: develop and commercialize new products and technologies; to promote critical private sector investment in emerging high-technology fields in New York State; and to create and expand technology-related businesses and employment. This program was created to enhance and accelerate the university research centers' operations, which facilitates joint university-industry research and development, product commercialization, and workforce training.

The information for each CoE is provided in each of the following categories:

- Technology Focus
- Importance to NYS
- Purpose
- Impacts
- Designations and Recognitions
- Operating Budget
- Capital Expenditures
- Companies Served and Projects
- Actual or Anticipated New Products or Processes with Commercial Application
- Start-ups Formed
- Licensing Agreements
- Science and Technical Activities with Students
- Strategic Plan

This report covers the 2019-2020 reporting period.

# NYSTAR's Center of Excellence Report (2021)

## Center of Excellence for Food and Agriculture at Cornell AgriTech Cornell University

Executive Director Catharine Young

### Technology Focus

Farm robotics and automation including sensors, drones, autonomous vehicles; controlled environment agriculture (large indoor growing facilities); systems to strengthen local supply chains and food safety; breeding of new varieties of fruits and vegetables; novel crop protection technologies to control pests and diseases in farmers' fields and boost productivity; developing biomaterials such as hemp; soil health scientific breakthroughs; reduction of food waste; food safety and traceability; and developing new food and beverage products and cutting edge processing techniques.

### Importance to NYS

Agrifood businesses are extremely important to New York State (NYS), providing significant jobs and revenues to the state's economy. NYS is poised to lead the country in agrifood innovation, and the time is ripe for new agtech solutions and leading-edge food and beverage applications to take root and grow within the state's booming food and ag economy. New York (NY) is the dominant agricultural state in the Northeast and typically ranks within the top five in the U.S. for production of apples, milk, cottage cheese, sour cream, yogurt, maple syrup, grapes, wine, and several other commodities. As of 2017, there were 33,438 farms in NY. Food, agriculture and related industries make up 9.7 percent of NY's employment, with 1.25 million people employed in agrifood-related jobs in the state. The USDA Economic Research Service found in 2019 that NY's agrifood industry contributed at least \$73 billion to the state's GDP, a total of 4.3 percent of the state's \$1.7 trillion dollar economy. New York ranks second in the U.S. to California for food and beverage manufacturing, with an estimated 2,946 plants operating in the state with 40 percent of food manufacturing facilities in New York City.

### Purpose

Cornell University is a global leader in discovery related to agrifood, and the Center of Excellence (CoE) is focused on connecting agrifood advancements to the private sector to invigorate the state's economy. The CoE uses a "push, pull, grow" strategy to expand NY's economy by pushing startups and entrepreneurs to scale up their companies, pulling agrifood businesses into NY from other states and countries, and growing existing food, beverage and ag tech companies. The CoE connects private sector companies to Cornell's research, innovation and technology to achieve commercialization; provides business mentoring; and makes connections to business-to-business partnerships, supply chain assets, sources of capital, and government incentives. The CoE's team includes industry experts that provide companies with advice and linkages to resources to help them be successful.

CoE facilities provide laboratory, office and co-working space to private sector companies that wish to co-locate on the Cornell AgriTech campus to commercialize Cornell's research, innovation and technology, thereby, growing jobs and opportunities in NY. Grant funds have been secured to establish an R&D Test Kitchen in partnership with the Cornell Food Venture Center and Pilot Plant to help entrepreneurs and companies develop new food and beverage products. The CoE has invested in state-of-the-art food development equipment to aid in the discovery of new food products and techniques for manufacturing.

NYSTAR's Center of Excellence Report (2021)

**Impacts**

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds  | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|-------------|----------------|------------------|---------------|
| 102      | 14            | \$9,804,820        | \$6,764,500  | \$4,509,364 | \$21,414,243   | \$1,444,376      | \$43,937,303  |

**Designations and Recognitions**

| Awards / Recognition | Date Received | Recognizing Organization | Link |
|----------------------|---------------|--------------------------|------|
| Not Reported         |               |                          |      |

**Operating Budget**

| Operating Budget     | NYSTAR Funding | Matching Funds     |               | Total Budget |
|----------------------|----------------|--------------------|---------------|--------------|
|                      |                | Company Cost Share | Other Sources |              |
| Salaries & Fringe    | \$509,030      | \$0                | \$665,183     | \$1,174,213  |
| Indirect Costs       | \$76,354       | \$0                | \$0           | \$76,354     |
| Equipment            | \$0            | \$0                | \$0           | \$0          |
| Materials & Supplies | \$8,133        | \$0                | \$18,331      | \$26,464     |
| Tuition              | \$0            | \$0                | \$0           | \$0          |
| Travel               | \$12,500       | \$0                | \$583         | \$13,083     |
| Subcontractors       | \$73,590       | \$0                | \$8,227       | \$81,817     |
| Other                | \$22,144       | \$0                | \$597,735     | \$619,879    |
| <b>Total</b>         | \$701,751      | \$0                | \$1,290,059   | \$1,991,810  |

**Capital Expenditures**

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Note Reported               | \$0            | \$0     | \$0           | \$0     | \$0   |

**Companies Served and Projects**

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 187 companies         | Not Reported           | Not Reported            | Not Reported                         |

**Actual or Anticipated New Products or Processes with Commercial Application**

| Patent Name   | Inventor             | Patent Number             | Description  |
|---|----------------------|---------------------------|--|
| Compositions and Methods for antimicrobial articles | Halomine Mingyu Qiao | 63025028                  | Microorganisms can contaminate a number of surfaces, such as those of consumer products. The present disclosure describes compositions and methods of manufacturing and using the same for providing biocidal activity on such surfaces. |
| Disinfectant Compositions and Methods Thereof       | Halomine Mingyu Qiao | Not yet assigned a number | Halofilm is a disinfectant compound that acts as a chlorine extender holding chlorine on a surface in a safe and effective manner.   |

**Start-up Companies Formed**

| Company Name | City | Product/Service | Sector |
|--------------|------|-----------------|--------|
| Not Reported |      |                 |        |

## NYSTAR's Center of Excellence Report (2021)

### Licensing and Other Agreements

| Project      | Inventor | Licensing Partner |
|--------------|----------|-------------------|
| Not Reported |          |                   |

### Science and Technical Activities with Students

The CoE began discussions with Jamestown Community College to explore programming to give students access to careers related to agriculture and food. In addition, Cornell AgriTech has fostered a relationship with Finger Lakes Community College.

The CoE is in the process of establishing a student internship program under the Cornell AgriTech Summer Scholars Program. COVID-19 delayed the implementation of the program since the AgriTech campus was shut down due to the pandemic, but the CoE plans on starting the program as soon as possible.

### Strategic Plan

The strategic plan is focused on growing the agriculture, food and beverage economy in NYS by working with entrepreneurs and startups, and existing food, beverage and agriculture technology companies. Strategies include: connecting businesses with Cornell University's research, services, technology and innovation; providing business mentoring; establishing business-to-business partnerships; connecting with supply chain assets and distribution methods; linking to government economic development incentives and sources of private capital funding; and providing expertise on manufacturing sites and plant layouts.

The CoE works across programs and systems at Cornell University to determine current and emerging high-tech opportunities, and to bring Cornell excellence into the marketplace. This includes: Grow-NY; Cornell Food Venture Center and Pilot Plant; Cornell School of Integrative Plant Science; the Cornell Dairy Program; Cornell Institute for Digital Agriculture; Cornell Cooperative Extension; and the Cornell Agriculture and Food Technology Park. Externally, the CoE works closely with economic development entities such as the United States Department of Agriculture, NYS Empire State Development, and local economic developers and Industrial Development Agencies to connect CoE clients to the resources they need to grow their operations.

Metrics for ensuring the CoE is maintaining its focus and fulfilling its mission include: number of companies served, number of contacts with each company, and increases in company jobs, revenues; federal, state and local funding; and capital investment.

NYSTAR's Center of Excellence Report (2021)

**Center for Disaster Medicine  
New York Medical College  
David S. Markenson**

**Technology Focus**  
Disaster Medicine

**Importance to NYS**

The first civilian resource of its kind in the nation, the Center for Disaster Medicine (the Center) is a major advance in the fight against chemical and biological terrorism, mass casualty incidents and disasters. The Center's expertise encompasses natural disasters, terrorism, operational and tactical medicine, and public health preparedness with a competence in the unique needs of children, persons with disabilities, healthcare systems, and facility preparedness.

**Purpose**

The Center is a unique and widely sought resource for law enforcement, emergency medical services (EMS), fire services, healthcare, public health, business, and education sectors. The Center's offerings include education and training, structured simulation exercises with feedback, drills, and expert consulting.

**Impacts**

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|------------|----------------|------------------|---------------|
| 0        | 0             | \$0                | \$64,000     | \$0        | \$0            | \$0              | \$64,000      |

**Designations and Recognitions**

| Awards / Recognition | Date Received | Recognizing Organization | Link |
|----------------------|---------------|--------------------------|------|
| Not Reported         |               |                          |      |

**Operating Budget**

| Operating Budget     | NYSTAR Funding | Matching Funds     |               | Total Budget |
|----------------------|----------------|--------------------|---------------|--------------|
|                      |                | Company Cost Share | Other Sources |              |
| Salaries & Fringe    | \$474,763      | \$0                | \$609,419     | \$1,084,182  |
| Indirect Costs       | \$71,213       | \$0                | \$0           | \$71,213     |
| Equipment            | \$127,766      | \$0                | \$269,123     | \$396,889    |
| Materials & Supplies | \$2,227        | \$0                | \$0           | \$2,227      |
| Tuition              | \$0            | \$0                | \$0           | \$0          |
| Travel               | \$30,053       | \$0                | \$0           | \$30,053     |
| Subcontractors       | \$45,617       | \$0                | \$0           | \$45,617     |
| Other                | \$51,607       | \$0                | \$4,244       | \$55,851     |
| <b>Total</b>         | \$803,246      | \$0                | \$882,786     | \$1,686,032  |

**Capital Expenditures**

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

## NYSTAR's Center of Excellence Report (2021)

### Companies Served and Projects

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 20                    | 2                      | 4                       | 50                                   |

### Actual or Anticipated New Products or Processes with Commercial Application

| Patent Name  | Inventor | Co-inventor | Patent Number | Description |
|--------------|----------|-------------|---------------|-------------|
| Not Reported |          |             |               |             |

### Start-up Companies Formed

| Company Name | City | Product/Service | Sector |
|--------------|------|-----------------|--------|
| Not Reported |      |                 |        |

### Licensing and Other Agreements

| Project      | Inventor | Licensing Partner |
|--------------|----------|-------------------|
| Not Reported |          |                   |

### Science and Technical Activities with Students

The Center provided education to student physicians, public health students, allied health students, and dental students at New York Medical College (NYMC). The didactic and hands-on emergency, prehospital and disaster medicine education provided by the Center allows student physicians, dental students and public health students to apply their new clinical skills at hospitals, healthcare institutions, public health departments, and corporations in the Westchester County and New York City area. These students are representative of the over 200 healthcare and public health providers produced by New York Medical College each year, many of which choose to remain in NY.

In addition, the Center provided Center-developed and customized, operational and tactical medicine, trauma, hemorrhage control, and emergency management education for healthcare, EMS, Law Enforcement, Fire Service, Public Health, and Emergency Management entities. This education contributes to workforce development efforts and scope and capacity increases for employees.

Lastly, the Center supports programs at local colleges and schools in Disaster Medicine to stimulate interest in this area of Science and Technology.

### Strategic plan

The first non-military resource of its kind in the nation, the Center is a major advance in the fight against chemical and biological terrorism, an ever-present threat in today's world. This unique Center combines NYMC's globally recognized assets in disaster medicine and medical countermeasures with individualized precision medical strategies. It seeks to translate research findings in order to protect Americans from the threat of catastrophic bioterrorism, and natural and man-made disasters.

Specific elements include:

- Sensory Overload and Sensory Deprivation Training Room
- Simulated Apartment, Criminal Location, and Meth Laboratory
- High Fidelity Human Patient Simulations and Training Mannequins
- Tactical Medical Equipment and Police Simulation Equipment
- Simulated Patient Rooms



## NYSTAR's Center of Excellence Report (2021)

The Center annually develops metrics guided by its advisory board and approved by the director. The metrics focus on the education, drills and analysis provided to the sectors served. Quarterly these metrics are reviewed against targets and then presented to the Advisory Board.

# NYSTAR's Center of Excellence Report (2021)

## Center of Excellence in Advanced and Sustainable Manufacturing Rochester Institute of Technology Michael Thurston - Director

### Technology Focus

Advanced and Sustainable Manufacturing

### Importance to NYS

The New York State Center of Excellence in Advanced and Sustainable Manufacturing (the Center or COE-ASM) provides technical assistance, technology development and technology transfer expertise to New York State manufacturing companies in order to improve the sustainability of their products and processes and enable adoption of advanced manufacturing technologies. The Center also works closely with start-up companies across the state, particularly to, but not limited to, green technology companies by supporting advancement of their technology and manufacturing readiness. These two activities increase the economic competitiveness of partner companies and helps to grow the number of value-added manufacturing jobs in the state.

### Purpose

The research and development focus of the Center includes: 1) reducing manufacturing energy intensity; 2) product design improvement including reducing product material and energy intensity over the life-cycle; and 3) developing advanced manufacturing process technologies to improve product and process efficiency and effectiveness.

### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds  | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|-------------|----------------|------------------|---------------|
| 52       | 26            | \$6,373,327        | \$402,416    | \$3,746,330 | \$5,306,548    | \$303,639        | \$16,132,260  |

### Designations and Recognitions

| Awards / Recognition | Date Received | Recognizing Organization | Link |
|----------------------|---------------|--------------------------|------|
| Not Reported         |               |                          |      |

The Center remained very engaged in Manufacturing USA activities and in trying to bring that expertise and funding opportunities to NY companies. Center Director, Dr. Michael Thurston, was named to the Technical Advisory Committee (TAC) of the digital manufacturing Institute, MxD. Dr. Thurston is also the leader of the remanufacturing technology node of the REMADE Institute, located in Rochester, NY, and served on the REMADE Strategic Advisory Committee with Brian Hilton serving on the REMADE TAC and Andy Harlan on the REMADE Governing Board and Work Force Development Committee.

NYSTAR's Center of Excellence Report (2021)

**Operating Budget**

| Operating Budget     | Matching Funds     |                    |                    | Total Budget       |
|----------------------|--------------------|--------------------|--------------------|--------------------|
|                      | NYSTAR Funding     | Company Cost Share | Other Sources      |                    |
| Salaries & Fringe    | \$875,805          | \$35,757           | \$394,088          | \$1,305,650        |
| Indirect Costs       | \$124,340          | \$5,364            | \$58,719           | \$188,423          |
| Equipment            | \$0                | \$0                | \$0                | \$0                |
| Materials & Supplies | \$60,387           | \$34               | \$29,828           | \$90,249           |
| Tuition              | 0                  | \$0                | \$65,340           | \$65,340           |
| Travel               | \$6,318            | \$178              | \$812              | \$7,308            |
| Subcontractors       | \$0                | \$0                | \$0                | \$0                |
| Other                | \$12,956           | \$12,092           | \$683,409          | \$708,457          |
| <b>Total</b>         | <b>\$1,079,806</b> | <b>\$53,425</b>    | <b>\$1,232,196</b> | <b>\$2,365,427</b> |

**Capital Expenditures**

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

**Companies Served and Projects**

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 24                    | 10                     | 17                      | 4                                    |

**Actual or Anticipated New Products or Processes with Commercial Application**

It should be noted that not all technologies developed by the Center are patentable. Items listed below include one instance of Rochester Institute of Technology (RIT) Intellectual Property (IP) commercialization activity and a second project focused on developing practical and manufacturable implementations for the client's previously registered patents. The primary COE-ASM staff contributors to the technology development/commercialization are listed in the "Description" column. COE-ASM also developed technologies with and without company partners, and with commercial application, which are listed in the second table provided below.

| Patent Name  | Inventor        | Co-inventor                             | Patent Number                          | Description  |
|--|-----------------|---|--|--|
| Temperature Measurement by Infrared Analysis                     | Timothy Johnson |   | Client Patent #<br>US20180045573<br>A1 | Proof of concept testing of client device in environmental chamber.<br>COE-ASM primary contributors: Kyle Depalma, Mike Thurston   |
| Apparatus, System and Method for Compact Mobile Fuel Cell System | M. Waller       | M. Walluk,<br>T. Trabold,<br>M. Bradley | RIT Patent #<br>US 10,622,654<br>B2    | Design for integrated high temperature PEM fuel cell that operates on hydrocarbon fuel. Patent application granted 4/14/2020. Note: development funded by NIST. Licensed to Falcon Fuel Cells in February 2021 |

| Technology Developed       | Project Lead | Project Co-Lead | Description   |
|----------------------------|--------------|-----------------|---|
| Portable Manufacturing Pod | Gerry Hurley | Mike Thurston   | Concept design for solar powered portable manufacturing stamping pod in shipping container. |

## NYSTAR's Center of Excellence Report (2021)

### Start-up Companies Formed

| Company Name      | City      | Product/Service                | Sector    |
|-------------------|-----------|--------------------------------|-----------|
| Falcon Fuel Cells | Pittsford | High temperature PEM fuel cell | fuel cell |

### Licensing and Other Agreements

| Project  | Inventor                                     | Licensing Partner             |
|--|--|-------------------------------|
| Patent: Apparatus, System and Method for Compact Mobile Fuel Cell System   | M. Waller, M. Walluk, T. Trabold, M. Bradley | Falcon Fuel Cells             |
| <i>Projects under a research agreement sponsored in part by companies during the reporting period are listed below with the PI in place of the "Inventor" and the partner or sponsoring company in place of the "Licensing Partner."</i> |  |                               |
| Project  | PI/Inventor                                  | Sponsor/Licensing Partner     |
| <i>Sponsored Research: Assessment for Markin Tubing</i>  | Gerry Hurley                                 | Markin Tubing                 |
| <i>Sponsored Research: Portable Manuf Pods Commercialization Assessment</i>  | Gerry Hurley                                 | R&B Designs                   |
| <i>Sponsored Research: Flow Simulation Analysis of Manifolds for Multi-Heat Exchanger Air Sterilization System</i>   | Allen Luccitti                               | You First Services            |
| <i>Sponsored Research: Light Lace Circuit Design Support</i>   | Chris Piggott                                | Organic Robotics Corporation  |
| <i>Sponsored Research: Enclosure Cooling Simulation</i>  | Brandon Baker                                | PEKO Precision Products       |
| <i>Sponsored Research: Thermal PV Panel Reliability Assessment</i>   | Brandon Baker                                | Tyll Solar                    |
| <i>Sponsored Research: Infrared Thermometer Testing</i>  | Kyle Depalma                                 | Infrared Medical Technologies |
| <i>Sponsored Research: Validation of Geothermal Vertical Ground Loop Installation Comparison</i>   | Brandon Baker                                | Dandelion Energy              |
| <i>Sponsored Research: Electrical Testing of 10KW DC-DC Bi-Directional Converter Phase 2</i>   | Chuck Faisst                                 | Combined Energies             |
| <i>Sponsored Research: Evaluation of Membrane Electrode Assemblies</i>   | Mark Walluk                                  | Plug Power                    |
| <i>Sponsored Research: Environmental Testing of M1500HP Communications Unit</i>  | Scott Nichols                                | Council Rock                  |
| <i>Sponsored Research: ThermApparel Pouch Analysis</i>   | Mark Walluk                                  | ThermApparel LLC              |
| <i>Sponsored Research: Enclosure Cooling Simulation</i>  | Brandon Baker                                | PEKO Precision                |
| <i>Sponsored Research: Technology and Design Reviews</i>   | Chris Piggott                                | Meltek Inc.                   |
| <i>Sponsored Research: Enclosure Revision Assistance</i>   | Brandon Baker                                | WeRadiate                     |
| <i>Sponsored Research: Modeling of Pressure Plate Assemblies</i>   | Brandon Baker                                | AGreatE                       |
| <i>Sponsored Research: Enclosure Design Technical Assistance</i>   | Brandon Baker                                | Bead Digital Technology       |
| <i>Sponsored Research: Battery Cell Design Review</i>  | Brandon Baker                                | Salient Energy                |
| <i>Sponsored Research: Packaging Operations Assessment and Improvement Assistance</i>  | Gerry Hurley                                 | Air Innovations               |
| <i>Sponsored Research: Advanced Test Bed Fabrication for Telemetry Systems (Fuzehub funded)</i>  | Mark Walluk                                  | Enetics                       |
| <i>Sponsored Research: Energy Harvester Evaluation</i>   | Mark Walluk                                  | Enetics                       |
| <i>Sponsored Research: New Facility – Manufacturing Layout Planning Support</i>  | Gerry Hurley                                 | RBW Studios                   |
| <i>Sponsored Research: Industry 4.0 Assessment</i>   | A. Khaladkar                                 | Inficon                       |
| <i>Sponsored Research: Assessment and Design of a Robotic Automation System for Packing Egg Cartons</i>  | Kyle Depalma                                 | Kreher's Farm Fresh Eggs      |

## NYSTAR's Center of Excellence Report (2021)

### **Science and Technical Activities with Students**

Activities with secondary schools were curtailed due to COVID-19 related limitations.

COE-ASM continued discussions with Monroe Community College to investigate how Industry 4.0 technologies can be integrated into new programming at the downtown Rochester campus. These activities have also been limited due to COVID-19 related restrictions.

### **Strategic plan**

The Center will develop technologies in collaboration with NYS manufacturing companies to help make their products and processes more sustainable and therefore more competitive, and to increase the number of value-added manufacturing jobs. As stated previously, the research and development focus of the Center includes: 1) reducing manufacturing energy intensity; 2) product design improvement including reducing product material and energy intensity over the life-cycle; and 3) developing advanced manufacturing process technologies to improve product and process efficiency and effectiveness.

Activities include, applied research to address common technology problems, supply chain integration, comprehensive metrics for sustainable manufacturing, technology proof-of-concept demonstration and evaluation, and technology deployment and commercialization support. Deployment activities include, but are not be limited to, licensing of technology that results from research, technical and economic assessments for candidate technologies, and technical training (e.g., training in sustainable design, manufacturing readiness, digital manufacturing). The Center is also developing an Industry 4.0 initiative under an Empire State Development (ESD) High Tech Matching Grant to advance the integration of digital technologies (such as machine learning, business intelligence, and robotics, among others) in manufacturing operations, particularly with small and medium sized manufacturers.

The Center will focus on activities that promote increased federal funding for Advanced and Sustainable Manufacturing in NYS, and that directly enhance the competitiveness of NYS companies resulting in economic growth in the state. Specific strategies that will be employed include:

- Strengthen and build relationships with industrial partners;
- Develop/maintain a diverse and highly qualified advisory board;
- Partner/collaborate with existing programs to facilitate outreach and marketing;
- Support/advance growth of existing NYS clusters including Energy Storage and Food Processing;
- Engage in Manufacturing USA institutes in aligned technology areas; and
- Identify opportunities for new company formation, existing company job creation, support smart products and systems, and provide value added sustainability services to industry.

To determine whether and to what degree the Center is maintaining its focus and fulfilling its mission COE-ASM will continue to collect and analyze ESD's required metrics from companies assisted.

# NYSTAR's Center of Excellence Report (2021)

## Center of Excellence in Weather and Climate Analytics University of Albany Chris Thorncroft, Ph.D.

### Technology Focus

Atmospheric Science's (Weather's) impact on New York State Industry

### Importance to NYS

The Center of Excellence in Weather and Climate Analytics (the Center or COE) is critical to New York State's economy. As every sector of an economy is sensitive to changes in the weather, NY's economy is not weatherproof. The state's economy estimate of weather sensitivity is 3.4% of its \$1.7 Trillion economy or \$58 Billion per year.<sup>1</sup> The COE's research helps business leaders protect economic activity from weather risk through weather and climate analysis. The Center expands weather-climate-emergency preparedness in its new Emerging Technology and Entrepreneurship Complex (ETEC) building, grows Artificial Intelligence (AI) weather prediction modeling and claims eminence for NY in the global weather and climate analytics arena.

### Purpose

The Center's purpose is to develop and maintain partnerships to support NYS industries such as Energy (Renewable Energy, Outage Management, etc.), Transportation (Autonomous Vehicles, Unmanned Aerial Systems (UAS), etc.), Agriculture, Finance, Healthcare, Advanced Communications, AI, etc. The Center also continues to build a core research facility in its new ETEC building that is easily accessible to weather-sensitive businesses and able to quickly solve business problems with research solutions. The COE has supported the creation of the xCITE laboratory (ExTreme Collaboration, Innovation, and Technology), which is a state-of-the-art software development and data/visual analytics innovation facility. The lab equips the scientific weather community with the tools and resources they need to take their research to the next level with high-end Graphics Processing Unit- (GPU) based scientific visualization and Machine Learning (ML) platforms. The COE also collaborates with the New York State Mesonet, a network of 126 weather stations across the state, with at least one site in every county and borough. The New York State Mesonet collects, archives, and processes data in real-time every five minutes, feeding weather prediction models and decision-support tools for users across the greater NY region.

### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds | Non-Govt Funds | Capital Improvements | Total Impacts |
|----------|---------------|--------------------|--------------|------------|----------------|----------------------|---------------|
| 0        | 7             | \$261,084          | \$172,000    | \$350,000  | \$1,900,000    | \$0                  | \$2,683,084   |

<sup>1</sup> <https://www2.ucar.edu/atmosnews/news/4810/economic-cost-weather-may-total-485-billion-us>

## NYSTAR's Center of Excellence Report (2021)

### Operating Budget

| Operating Budget     | NYSTAR Funding   | Matching Funds     |               | Total Budget     |
|----------------------|------------------|--------------------|---------------|------------------|
|                      |                  | Company Cost Share | Other Sources |                  |
| Salaries & Fringe    | \$286,304        | \$0                | \$0           | \$286,304        |
| Indirect Costs       | \$31,623         | \$0                | \$0           | \$31,623         |
| Equipment            | \$0              | \$0                | \$0           | \$0              |
| Materials & Supplies | \$2,698          | \$0                | \$0           | \$2,698          |
| Tuition              | \$0              | \$0                | \$0           | \$0              |
| Travel               | \$20,579         | \$0                | \$0           | \$20,579         |
| Subcontractors       | \$0              | \$0                | \$0           | \$0              |
| Other                | \$674            | \$250,000          | \$0           | \$250,674        |
| <b>Total</b>         | <b>\$341,878</b> | <b>\$250,000</b>   | <b>\$0</b>    | <b>\$591,878</b> |

### Companies Served and Projects

| # Of Companies Served | # Of projects on-going | # Of projects completed | # Of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 16                    | 8                      | 3                       | 6                                    |

### Actual or Anticipated New Products or Processes with Commercial Application

| Patent Name                  | Inventor         | Patent Number                                    | Description   |
|------------------------------|------------------|--|---|
| Weather Risk Assessment Tool | Dr. Nick Bassill | SUNY RF Case No. for that invention is 010-19-10 | A New Technology Disclosure Form has been filed for the "Weather Risk Assessment Tool". The SUNY RF Case No. for that invention is 010-19-10. The tool is being used by BOCES, DOT, All NYS Utilities, and most SUNY campuses to understand and manage operations for weather events. The tool is able to predict weather at a very localized scale and apply risk factors to events such as hail, sleet, and snow. |

### Science and Technical Activities with Students

*STEP (Science and Technology Entry Program)* - The Center provides funding for undergraduate research in support of the STEP program. The STEP prepares historically underrepresented and economically disadvantaged elementary and secondary school students to acquire the aptitude and skills necessary to pursue post-secondary degree programs that lead to professional careers in the scientific, technical, health-related, or other licensed professions.

*K-12 Education Programming* - The Center helps promote STEM education at local schools by supporting elementary school bus trips to New York State Mesonet's weather stations where students engage in hands-on learning experience while being taught by University at Albany atmospheric sciences faculty. Additionally, elementary school students are invited on an annual basis to visit the University's Atmospheric Sciences Research Center, where students learn about weather modeling, forecasting, instruments, and get to watch a weather balloon launch.

*Girls Inc.* - The Center helps to promote STEM education through the Girls Inc. program. The goal is to spark high school girl's interest towards a career in STEM.

## NYSTAR's Center of Excellence Report (2021)

*Annual Family Earth Day Events* - The University hosts a week-long series of events to promote Earth Day culminating in a weekend of activities encouraging school-aged children to pursue STEM degrees. Activities exposing children to atmospheric sciences include: creating arctic creature mobiles; a traveling nitrogen game where students learn how clouds are formed; and a glacier then and now demonstration. Additionally, celebrity meteorologists have face to face meetings with children and discuss careers as atmospheric scientists.

*UAlbany Weather & Climate Camp* - is a free weeklong day camp open to Capital District teens. The Camp provides high-school aged children with a unique opportunity to learn to forecast, visit a weather observatory, conduct experiments, and learn about careers and college opportunities in the atmospheric sciences field.

### **Strategic plan**

The Center's strategic plan targets partnerships in the high priority Energy and Transportation industries. The Center plans to increase its presence by developing partnerships in the segments of the Energy industry (Renewable Energy, Outage Management, Grid Resilience, etc.) and in the Transportation industry (Autonomous Vehicles, Unmanned Aerial Systems (UAS), Space, etc.). The Center plans to expand its strong momentum in the Energy and Transportation industries with additional positioning in the Agriculture, Finance, Healthcare, Advanced Communications, AI, etc.

The weather impacts the U.S. economy \$485B every year. At a macro-level, the economic impact of weather is well understood. However, little is known about the weather's impact on individual businesses. This lack of research creates an opportunity for R&D projects to not only help businesses assess the weather's impact on key financial indicators (costs, revenue, etc.), but also to develop solutions that help businesses leverage the weather to improve performance.

Although there are weather solutions currently available for weather-sensitive businesses, those solutions generally do not address the specific needs of individual businesses at spatial and temporal scales that these businesses require. Given the increasing importance of weather as an economic driver, the lack of adequate solutions, the University's rich history of contributions to atmospheric sciences coupled with its intellectual and physical resources, the Center is uniquely positioned to develop the solutions that weather-sensitive businesses desperately need. The Center is executing a four-phase strategy for expanding into new sectors:

- *Phase I, Industry Analysis & Sector Prioritization:* The Center has analyzed many weather-sensitive industries and prioritized target sectors. The Center gives priority to the Energy and Transportation Industries. The Center plans to expand its momentum in the Energy and Transportation Industries with additional positioning in the Agriculture, Finance, Healthcare, Advanced Communications, AI, etc.
- *Phase II, Customer Discovery:* In each of the target markets, the Center engages in a customer discovery process aimed at gaining a deep understanding of the industry's weather-related problems, the value of potential solutions, how R&D money is spent, and stakeholders from whom buy-in is needed. Customer Discovery helps the center understand the intricacies of target markets and help develop a targeted sales roadmap.



## NYSTAR's Center of Excellence Report (2021)

- *Phase III, Use Case Development:* The Center will develop use cases that define solutions for problems and demonstrate the return on investment a partner will experience if the Center is engaged to develop the solution. Multiple use cases will be developed for each target sector, providing multiple products and services for the Center to sell to various partners.
- *Phase IV, Business Development:* The Center is executing a business development approach that leverages well-defined use cases and promotes solutions to stakeholders in target industries. This process includes using existing customers for leads to new customers in non-competitive markets and strategically targeting decision makers at potential partner companies. Once decision makers are targeted, the business development approach uses a combination of industry knowledge, research expertise, and the assets of the Center to finalize agreements. By targeting business partners identified in Phases I and II, and developing use cases in Phase III, the Center has a well-defined development roadmap. The roadmap will inform personnel (the program coordinator and/or associated faculty) of the use cases, solutions and return on investment that partners will experience when they invest in a R&D partnership.

The Center maintains focus by using the following metrics and goals:

1. **Partnerships:** The Center's goal is to develop and maintain 2-4 high profile enterprise partnerships, 5-7 partnerships with small- to mid-size companies, and expand other Weather Energy initiatives and public private partnerships. High-profile partnerships are between the Center and large national or multinational organizations. For example, IBM, GE, ConEd, National Grid, SpaceX, Google, etc., are high-profile partners. Expanding high-profile partnerships will help the Center attract other businesses to the Center and by extension to NYS. Additionally, high-profile relationships are significant sources for matching funds. Small- to mid-size companies include start-up companies, local and regional focused businesses, and other businesses with less than 500 employees. Helping these companies is important for NYS economic impact. The Center helps startup companies increase revenue and save costs, which enables companies to add jobs and grow the economy.
2. **Community Engagement:** The Center will also engage the weather-sensitive business community to a weather-energy workshop in the Spring of 2022 and plans similar annual workshops and seminars.
3. **Student Engagement:** The Center will continue to promote engagement with secondary schools and community colleges designed to foster student interest in scientific and technical careers.
4. **Internships:** The center monitors and promotes internships with its business partners.

# NYSTAR's Center of Excellence Report (2021)

## Small Scale Systems Integration and Packaging Center of Excellence State University of New York at Binghamton Bahgat Sammakia, PhD

### Technology Focus

Electronics and Energy Storage Manufacturing

### Importance to NYS

Electronics and energy storage are technically complex, high value manufacturing activities, aligned with the strongest growth sectors of the global, national, and regional economy. These industries bring well-paying jobs to New York State; require a well-educated, skilled workforce; offer meaningful jobs and career growth paths for workers; opportunities for retention of new college graduates; attraction of skilled professionals from out of state; and contribute to a high quality of life for the people of NY.

### Purpose

The Small Scale Systems Integration and Packaging (S3IP) Center of Excellence (the Center) provides a dedicated building for staff, laboratories and associated interactions with industry. The Center is an umbrella organization comprising of 6 distinct research centers and seven laboratories. The labs are equipped with instruments for physical characterization of materials, surfaces, interfaces, and manufactured electronic devices and batteries. Labs are operated by professional doctoral-level staff or faculty. All labs are available for, and actively used, in support of industrial research projects and problem solving assisted by the professional staff.

### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|------------|----------------|------------------|---------------|
| 13       | 7             | \$5,859,500        | \$1,037,500  | \$120,000  | \$99,000       | \$1,078,100      | \$8,194,100   |

### Designations and Recognitions

| Awards / Recognition                                   | Date Received | Recognizing Organization                        | Link  |
|--|---------------|---|---|
| Nobel Prize in Chemistry, M. Stanley Whittingham       | October 2019  | Nobel Committee                                 | <a href="https://www.nobelprize.org/prizes/chemistry/2019/press-release/">https://www.nobelprize.org/prizes/chemistry/2019/press-release/</a>   |
| 2020 Heat Transfer Memorial Art Award, Bahgat Sammakia | 2020          | American Society of Mechanical Engineers (ASME) | <a href="https://www.asme.org/about-asme/honors-awards/achievement-awards/heat-transfer-memorial-award">https://www.asme.org/about-asme/honors-awards/achievement-awards/heat-transfer-memorial-award</a> |
| iMAPS Society Fellow, Benson Chan                      | October 2019  | iMAPS   | <a href="https://www.imaps.org/imaps_2020_society_award_winne.php">https://www.imaps.org/imaps_2020_society_award_winne.php</a>   |

NYSTAR's Center of Excellence Report (2021)

**Operating Budget**

| Operating Budget     | Matching Funds     |                    |                    | Total Budget       |
|----------------------|--------------------|--------------------|--------------------|--------------------|
|                      | NYSTAR Funding     | Company Cost Share | Other Sources      |                    |
| Salaries & Fringe    | \$785,655          | \$39,839           | \$1,092,545        | \$1,918,039        |
| Indirect Costs       | \$117,805          | \$5,782            | \$159,846          | \$283,433          |
| Equipment            | \$0                | \$0                | \$1,253,675        | \$1,253,675        |
| Materials & Supplies | \$14,531           | \$6,506            | \$80,726           | \$101,763          |
| Tuition              | \$7,926            | \$2,889            | \$25,278           | \$36,093           |
| Travel               | \$5,820            | \$2,422            | \$117,975          | \$126,217          |
| Subcontractors       | \$0                | \$0                | \$150,647          | \$150,647          |
| Other                | \$68,884           | \$6,185            | \$426,514          | \$501,583          |
| <b>Total</b>         | <b>\$1,000,621</b> | <b>\$63,623</b>    | <b>\$3,306,206</b> | <b>\$4,370,450</b> |

**Federal Funding Included: \$2,683,652**

**Capital Expenditures**

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

**Companies Served and Projects**

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 41                    | 46                     | 30                      | 76                                   |

**Actual or Anticipated New Products or Processes with Commercial Application**

| Patent Name  | Inventor                | Co-inventor     | Patent Number                      | Description   |
|--|-------------------------|-----------------|------------------------------------|---|
| Synthesis and Electrochemical Performance of Nb Coated/Substituted Nickel-Rich Layered Oxide Cathodes in Lithium Ion Batteries               | M. Stanley Whittingham, | Fengxia Xin     | Technical Disclosure Number RB637  | Layered metal oxides have been the most important cathode materials in Li-ion batteries. However, it is not suitable for electric vehicles because of the relatively low capacity. Nb modified high nickel layered oxide can be widely used in electric vehicles. It will extend the driving miles and reduce cost. |
| Novel Underfloor Air-Directors for Data Center Performance Improvement.  | Bahgat Sammakia         | Mohammad Tradat | Technical Disclosure number RB-636 | This solution impacts, Supply Heat, Return Heat and Rack Cooling Indices for computer racks,  |
| Self-contained wearable ECG device supporting on-board signal processing and analysis and supporting aggressive power-saving operating modes | Kanad Ghose             |                 | Technical Disclosure number RB-628 | This disclosure pertains to a battery-operated wearable device capable of acquiring electro cardiogram (ECG) signals and data for the wearer.   |

## NYSTAR's Center of Excellence Report (2021)

### Start-up Companies Formed

| Company Name | City | Product/Service | Sector |
|--------------|------|-----------------|--------|
| Not Reported |      |                 |        |

### Licensing and Other Agreements

| Project   | Inventor  | Licensing Partner  |
|---|---|--|
| CNS Core: Small: Language Runtime Support for Energy-Aware Applications (RF award 85414)  | Principal Investigator: Yu David Liu  | Sponsor: National Science Foundation (NSF)                           |
| Nanocopper Process and Reliability ((ESD # 19305231, RF award 85649)  | Principal Investigator: Peter Borgesen  | Sponsor: Hitachi   |
| Molecular Mechanisms of Tissue Specific Signaling for Islet Self Assembly (RF Award 85675)  | Principal Investigators: Jin Sha and Kaiming Ye   | Sponsor: NSF   |
| Mechanobiology of Myfibroblast Behavior in Health and Disease (RF award 85694)  | Principal Investigators: Gretchen Mahler, Mei-Hsiu Chen, Bruce T. Murray, Pong-Yu Huang         | Sponsor: NSF   |
| MRI: Acquisition of a Hard X-Ray PhotoElectron Spectroscopy (HAXPES) for the Institute for Materials Research at Binghamton University (RF award 85815) | Principal Investigators: Louis Piper, Natalya Chernova, Mark Poliks, Guangwen Zhou, Tara Dhakal | Sponsor: NSF   |
| Generation of Islet Organoids in Oxygenated Scaffolds (RF award 86107)  | Principal Investigators: Sha Jin and Kaiming Ye   | Sponsor: National Institute of Biomedical Imaging and bioengineering |
| Low-cost and High-Durability Fuel Cells (RF award 86117)  | Principal Investigator C.J. Zhong   | Sponsor: NSF   |
| MRI: Acquisition of a High-Throughput Flow Cytometry for Health Science Research and Training (RF award 86292)  | Principal Investigators: Kaiming Ye and Erik Rozners  | Sponsor: NSF   |
| Electronic Assembly Solder Alloy Development (ESD# 19304113, RF Award 86468)  | Principal Investigator: Junghyun Cho  | Sponsor: Universal Instruments                                       |
| Controlled Synthesis of Multi-Metallic Nanoscale Alloys (ESD #19305230, RF award 86531)   | Principal Investigator: C. J. Zhong   | Sponsor: BASF  |
| Evaluation of TGV Thermo-Mechanical Behavior using Micro DIC Techniques (ESD # 19304118, RF Award 86846)  | Principal Investigator: S. B. Park  | Sponsor: Corning Glass   |
| PDRD Conformal Coating Tin Whiskers (RF Award Number 83178, 87118)  | Principal Investigator: Junghyun Cho  | Sponsor: Honeywell   |
| 2020 SRC CHIRP: Reliable Low Temperature Solder Approach (RF award 87187)   | Principal Investigator: Peter Borgesen  | Sponsor: Purdue  |
| 2020 SRC CHIRP: fine Pitch Cu-Sn Based Interconnection Below Temperatures of 180 degrees C (RF award 87218)   | Principal Investigator: Nikolay Dimitrov  | Sponsor: Purdue  |
| 2020 SRC CHIRP: Conformal Polymeric Thin Films Manufacturing Using Electrospray Printing (RF award 87221)   | Principal Investigator: Paul Chiarot  | Sponsor: Purdue  |
| Implementing Business Intelligence and Analytics to Large-Scale Pharmacy Automation Solutions (ESD # 19304119, RF award 87370)                          | Principal Investigator: Hari Srihari  | Sponsor: Innovation Associates                                       |
| PFI-TTT: Enhanced Electronic Cooling via 3D Printing from Additive Laser Fabrication of Heat Removal Devices (RF award 87871)                           | Principal Investigator: Scott Schiffres   | Sponsor: NSF   |

## NYSTAR's Center of Excellence Report (2021)

|  |  |                              |
|--|--|------------------------------|
| REU Site: Renewable Energy Generation and Storage (RF award 80688, 86923)  | Principal Investigators: Jeffrey Mativetsky and Wayne Jones  | Sponsor: NSF                 |
| Warehouse Operations Management and Analytics Research and Development (ESD# 19305236, RF award 83825)   | Principal Investigator: Hari Srihari                         | Sponsor: Bennet Distribution |
| Process Improvement for the Assembly of Complex Data Server Systems and Advanced Process Research and Development for Complex Surface Mount Device Assemblies (ESD# 19305235, RF awards 85116 and 84917)                 | Principal Investigators: Hari Srihari and Christopher Greene | Sponsor: Smart Modular       |
| Research Driven Continual Process Improvement on Complex Surface Mount Device Assemblies and Process Analysis and Improvement for the Assembly of Complex Data Server Systems (ESD# 19305234. RF awards 85375 and 84916) | Principal Investigator: Hari Srihari                         | Sponsor: Smart Modular       |

### Science and Technical Activities with Students

The Integrated Electronics Engineering Center, a Center for Advanced Technology under the umbrella of S3IP, sponsors an annual Electronics Packaging Symposium. The most recent symposium, held in partnership with General Electric Research Labs in September 2019, attracted 325 participants (including 93 from NYS industry), featured 48 session speakers and four keynote speakers, 36 exhibitors, and 37 student posters.

S3IP works with local elementary and secondary schools, and organizations including the regional BOCES P-tech and the local Girl Scouts chapter, providing tours of its labs and hands-on demonstrations of instruments.

S3IP, in partnership with the Semi-Therm Educational Foundation, planned the Thermal Management for Power Electronics and Storage workshop that was delivered via Zoom in July 20, 2020.

The Center's staff continue to train students and industry personnel on the use of equipment in the labs. The Integrated Electronics Engineering Center (IEEC) and Advanced Diagnostic Lab staff documented 64 hours spent on training in the January - June 2019 period.

### Strategic plan

1. The broad focus of the Center is to support the electronics manufacturing and advanced energy storage industries in NY via application of university laboratories and skills (research faculty, professional staff, and graduate students) to generate economic impact. Faculty research activity and contacts with industry is used to inform the long-term technical directions and focal areas of the Center, acquisition of instruments and staff hiring based on industry trends. S3IP engages with and is funded in part by the Semiconductor Research Corporation, which represents leading global manufacturers of integrated circuits and many manufacturers of electronics systems to perform advanced technology research in the area of Heterogeneous Integration (HI), the next emergent generation of electronics manufacturing technology. The Center is active authoring sections of the Institute of Electrical and Electronics Engineers HI roadmap, a definitive document laying out the course of HI in electronics manufacturing for the next decade and beyond. The Center assists the University in capital investment proposals to local and state economic development agencies including the Southern Tier Regional Economic Development Council, the Upstate Revitalization Initiative, and Empire State Development investments. The Center also assists faculty in pursuit of

## NYSTAR's Center of Excellence Report (2021)

grants from state agencies such as the New York State Energy Research and Development Agency. At current time, Congress is considering significant investment in revitalizing electronics manufacturing operations in the U.S. S3IP is part of the SUNY system response team and has partnered with other leading institutions, including Georgia Tech, Purdue, and UCLA to form a response strategy to upcoming opportunities.

2. Being a bridge between academia and industry, key COE business-oriented performance metrics include: the economic impacts reported by industry partners; the quantity of industrial member companies and projects; the level of industrial project activity in COE labs; and patent activity. Academically oriented metrics include: number of COE-affiliated students graduated with MS and PhD degrees; and scholarly publication activity for COE-affiliated faculty and researches.
3. The Center's executive leadership and leadership in key research centers has extensive industrial experience to ensure cognizance and sensitivity to industry expectations. In addition, the Center features an advisory board comprising of senior industry executives and leaders from academia for independent review and advice concerning the Center's performance and strategic directions. The advisory board meets twice annually to review COE progress and directions.

# NYSTAR's Center of Excellence Report (2021)

## Center of Excellence in Bioinformatics & Life Sciences University at Buffalo Dr. Norma Nowak

### Technology Focus

Bioinformatics and Life Sciences

### Importance to NYS

The University at Buffalo's (UB) New York State Center of Excellence in Bioinformatics & Life Sciences (CBLS or the Center) leverages the University's expertise and cutting-edge capabilities in genomics, bioinformatics, proteomics, bioanalysis, data analytics and supercomputing to partner with industry to drive life sciences innovation and to commercialize new technologies that strengthen the region's and the New York State's economies.

CBLS empowers entrepreneurs to launch new companies, it enables the growth of existing firms, and it serves to attract relocating and expanding businesses to NYS.

The CBLS provides the environment and talent to complete the path from discovery through commercialization in its mission to support and enable the growth of NYS life sciences companies.

### Purpose

CBLS is one of the four original CoEs designated in 2001. As part of that designation, CLBS received a capital investment in a building that has served to provide an environment to foster and nurture collaboration between academia and industry. This is achieved through state-of-the-art facilities staffed by experts; business development executives; and supporting programs aimed at enabling the formation and growth of companies. The CBLS provides talent in faculty and funding for student interns with our company partners; outreach to the community through K-12 programs to build the talent pipeline as well as co-location opportunities enabling companies ranging from early stage to mature to work closely with CBLS experts to advance company goals. During the reporting period, the CBLS housed 16 companies ranging from start-up companies, mid-sized and Fortune 500 companies.

CBLS leverages the University's expertise and the Center's cutting-edge capabilities to commercialize new technologies, empowers entrepreneurs to launch new companies, enables the growth of existing firms, and serves to attract relocating and expanding businesses.

CBLS is home to UB's Center for Advanced Technology in Big Data & Health Sciences (UB CAT) and the New York State Center of Excellence in Materials Informatics (CMI), and together they anchor UB's Technology-Based Economic Development (T-BED) infrastructure, providing the platform whereby UB engages with NYS to develop and implement priority projects, like the Buffalo Institute for Genomics & Data Analytics (BIG), Start-Up NY, and other large-scale, public-private partnerships.

These collaborative partnerships serve to improve the health and well-being of the population and drive economic growth that are particularly critical during the current pandemic. The COVID-19 public health crisis has been devastating, from loss of life to loss of livelihood for citizens across the state. The CoEs are ideally positioned to respond to this crisis both as research institutions and drivers of economic growth.

Highlights of the current reporting period include deepening our engagement with Zeptomatrix, an established leader enabling diagnostic assay solutions for the Infectious Disease Diagnostics Market. As the pandemic unfolded, Zeptomatrix rapidly developed COVID-19 control reagents critical to the development

## NYSTAR's Center of Excellence Report (2021)

and application of accurate diagnostic assays for the detection of COVID-19. CBLS industry partner Rheonix, launched testing platforms and assays for COVID-19 diagnostic testing. Circuit Clinical deployed its' clinical trial recruitment technology to enable development of a saliva-based assay for COVID-19.

Citizens' understandings of science and medicine is paramount to successfully navigating the pandemic. As part of the Center's commitment to education and social responsibility, CBLS organized a series of seven online chats with university experts on the COVID-19 crisis. While the chats were promoted to K-12 students, the students' families also engaged and asked questions.

### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds  | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|-------------|----------------|------------------|---------------|
| 119      | 22            | \$6,080,039        | \$897,583    | \$5,583,442 | \$13,795,103   | \$1,158,913      | \$27,515,080  |

### Designations and Recognitions

| Awards / Recognition  | Date Received | Recognizing Organization                            |
|---|---------------|---|
| Dr. Norma Nowak was awarded the Industry Beacon award   | October 2019  | MedTech 2019 Achievement Awards                     |
| Dr. Sandra Small, CBLS workforce development manager, was awarded the School-Community Partnership Award                          | May 2020      | Buffalo Public Schools Parent and Family Engagement |
| \$2.5 M Grant awarded to Dr. Zhen Yan. Targeting Histone K4 Methylation for Treatment of Alzheimer's Disease and Related Dementia | August 2019   | National Institute on Aging                         |
| Grant awarded to Dr. Norma Nowak. Personalizing Head and Neck Squamous Cell Carcinoma Therapy                                     | November 2019 | Community Foundation for Greater Buffalo            |

### Operating Budget

| Operating Budget     | NYSTAR Funding   | Matching Funds     |                    | Total Budget       |
|----------------------|------------------|--------------------|--------------------|--------------------|
|                      |                  | Company Cost Share | Other Sources      |                    |
| Salaries & Fringe    | \$644,730        | \$0                | \$36,608           | \$681,338          |
| Indirect Costs       | \$96,709         | \$0                | \$0                | \$96,709           |
| Equipment            | \$2,717          | \$0                | \$0                | \$2,717            |
| Materials & Supplies | \$5,525          | \$0                | \$666,317          | \$671,842          |
| Tuition              | \$0              | \$0                | \$0                | \$0                |
| Travel               | \$7,449          | \$0                | \$0                | \$7,449            |
| Subcontractors       | \$142,170        | \$0                | \$0                | \$142,170          |
| Other                | \$12,334         | \$0                | \$554,525          | \$566,859          |
| <b>Total</b>         | <b>\$911,634</b> | <b>\$0</b>         | <b>\$1,257,450</b> | <b>\$2,169,084</b> |

### Capital Expenditures

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

### Companies Served and Projects

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 22                    | 16                     | 7                       | 25                                   |



## NYSTAR's Center of Excellence Report (2021)

### **Actual or Anticipated New Products or Processes with Commercial Application**

Not Reported

### **Start-up Companies Formed**

Not Reported

### **Licensing and Other Agreements**

Not Reported

### **Science and Technical Activities with Students**

*Workforce Development:* UB CBLS 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. Dr. Small oversees career education outreach, promotes genomics and bioinformatics education in formal and informal K-12 environments, manages the Career Experience Program, and interfaces with new and growing companies to help fulfill their workforce needs.

Student-Oriented Workforce Development includes:

- **Career Experience Program:** During the reporting period, CBLS funded 20 students to work at local life sciences companies. The students, both graduate and undergraduate, were recruited from various schools within UB, including the Schools of Management, Engineering and Applied Sciences, Medicine, and the College of Arts and Sciences. Students were scheduled to work a total of 144 hours. The COVID-19 pandemic required modifications to the year's program. Some students were able to continue their projects remotely; others shifted to a different project for remote work. Two students finished their projects during the fall semester. Five students were not able to continue working.
- **Science Education Partnership Award (SEPA):** Building on the success of a previous National Institute of Health (NIH) SEPA, Dr. Steve Koury, with Dr. Nowak as Co-Principle Investigator (PI) and Dr. Small as key contributor, submitted and were awarded a new SEPA. The award will support professional development for teachers and experiential learning for students in bioinformatics and wet lab techniques. Planning for the first year of this award has begun.
- **Health Sciences Symposium:** In 2018, Dr. Small organized the first annual Health Sciences Symposium for high school juniors who are part of area Health or Life Sciences Academies. The response to the symposium was overwhelmingly positive and there was requests to make it an annual event. The second annual Health Sciences Symposium was scheduled for March 26, 2020, as a one-day event at The Jacobs School of Medicine and Biomedical Sciences. Concurrent sessions were focused on all aspects of health sciences, including, but not limited to, surgery, nursing, dentistry, research, drug development, and infection control. Over 100 students from four local school districts were prepared to participate. This event was postponed due to the COVID-19 pandemic.
- **Science Exploration Day:** Science Exploration Day (SED) is a science conference for area high school students that is held annually in March. Students spend a day on UB's North Campus attending lectures, demonstrations and hands-on activities from a variety of scientific disciplines. Dr. Small continues her role on the planning committee for this event and secured corporate funding for 300 Buffalo Public School students to attend. She has also been instrumental in recruiting new presenters for sessions. This event was scheduled for March 18 and was postponed due to the COVID-19 pandemic.

## NYSTAR's Center of Excellence Report (2021)

- **Partnership with GEM:** UB's GEM (Genome, Environment and Microbiome) Community of Excellence was initiated in 2015. One of GEM's missions is to increase education and awareness of genomics, the microbiome and the effect of the environment on both. Dr. Small works with both GEM and CBLS on genome and microbiome education in the community and in K-12 schools. Dr. Small has worked with local educators to develop new lessons to encourage genome and microbiome education in schools. This partnership broadens the educational reach already being supported by CBLS. School visits were occurring with Buffalo Public Schools but were suspended due to the COVID-19 pandemic.
- **Research Laboratory High School in Bioinformatics and Life Sciences:** CBLS has supported, from the beginning, the creation of a new high school in the Buffalo Public School District, the Research Laboratory Program in Bioinformatics and Life Sciences. The creation of which was inspired by Genome Day. Dr. Small is a member of the steering committee for the school. In September 2019, the program was officially designated as a high school, and renamed "The Research Laboratory High School" (RLHS).
- **Science Education Fellows:** Drs. Small and Nowak were awarded funding from The Cullen Foundation to pair UB students with Living Environment teachers in Buffalo Public Schools. The fellows contributed to the planning and execution of lessons, providing a new perspective to teaching scientific concepts.
- **High School Student Internships:** During Summer 2019, UB CBLS partnered with the Mayor's Summer Youth Program to employ two young women of color, from RLHS, to work in research labs at The Jacobs School of Medicine and Biomedical Sciences. This was a successful partnership with both students being invited to return to the labs during Summer 2020.
- **Buffalo Niagara Medical Campus (BNMC) Summer Camp:** Dr. Small continues to lead a committee with representatives from Buffalo Manufacturing Works, the Jacob's Institute, and The Buffalo Niagara Medical Campus in planning and implementing the annual BNMC Summer Workshop, summerSTEM, for students entering the Research Laboratory and Math, Science, Technology Preparatory High Schools. This year's program was postponed due to the COVID-19 pandemic.

### Strategic plan

CBLS is focused on supporting business development efforts that result in driving revenue to the Center and support regional economic development. This includes facilitating growth in: (1) commercial revenue from both large and small commercial customers; (2) increasing competitively awarded research and development grants; and (3) increasing facility utilization and new campus developments. The Center will pursue an economic development strategy including, but not limited to:

- Drive economic development through supporting innovation and commercialization.
- Increase and enhance collaborative relationships with state, federal industry, and academic partners.
- Increase corporate and public funding for research and commercialization efforts.
- Provide workforce development, business development & commercialization programming and services.

# NYSTAR's Center of Excellence Report (2021)

## NYS Center of Excellence in Materials Informatics University at Buffalo Alan Rae, PhD

### Technology Focus

Cutting-edge materials science and informatics

### Importance to NYS

University of Buffalo's (UB) New York State Center of Excellence in Materials Informatics (CMI or the Center) has importance to New York State because it leverages the University's cutting-edge materials science, big data analytics, and advanced manufacturing expertise and infrastructure to drive critical R&D activities that directly impact private sector growth.

Together with UB's Center for Advanced Technology (UB CAT) and the New York State Center of Excellence in Bioinformatics & Life Sciences (CBLS), the CMI anchors UB's technology-based economic development (T-BED) infrastructure. These centers provide the platform whereby the University engages with NYS to develop and implement priority projects, like the Buffalo Billion Investment Development Plan's Buffalo Manufacturing Works (\$40M over five years), SUNY Tax-free Areas to Revitalize and Transform Upstate NY (START-UP NY), and other large-scale, public-private partnerships. The three NYSTAR-supported Centers bring critical and unique assets to the region in terms of both technologies and teams with scientific, business development, economic development, finance, and legal expertise.

UB is a comprehensive, research-intensive university and a member of the prestigious Association of American Universities (AAU), an association of 64 elite research universities in the U.S. and Canada. The University's goals broadly encompass academic excellence and engagement with the regional, national, and international communities it serves. This includes advancing science and technology, and the preparation of the next generation of scientists, engineers, and entrepreneurs to drive economic prosperity.

### Purpose

CMI's purpose complements many of UB's and the state's goals. It raises awareness of local industrial capabilities and needs and drives collaboration among UB faculty to address these needs. The Center provides funding opportunities to UB faculty who are partnering with industry to find solutions to materials informatics related challenges and enables student experiential learning opportunities within local companies. The CMI contributes to the University's translational research, which enhances UB's visibility and economic impact, locally, statewide, and globally. In addition, CMI collaborates with several UB initiatives in the fields of advanced manufacturing and materials innovation, including the Sustainable Manufacturing & Advanced Robotic Technologies Community of Excellence, the Research and Education in eNergy, Environment & Water Institute, the Computational and Data-Enabled Science & Engineering Program, and the rapidly growing Department of Materials Design & Innovation.

### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds  | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|-------------|----------------|------------------|---------------|
| 37       | 11            | \$7,775,000        | \$772,584    | \$1,460,928 | \$27,342,903   | \$205,000        | \$37,556,415  |

### Designations and Recognitions

| Awards / Recognition | Date Received | Recognizing Organization | Link |
|----------------------|---------------|--------------------------|------|
| Not Reported         |               |                          |      |

## NYSTAR's Center of Excellence Report (2021)

### Operating Budget

| Operating Budget     | NYSTAR Funding   | Matching Funds     |                  | Total Budget       |
|----------------------|------------------|--------------------|------------------|--------------------|
|                      |                  | Company Cost Share | Other Sources    |                    |
| Salaries & Fringe    | \$688,125        | \$0                | \$579,869        | \$1,267,994        |
| Indirect Costs       | \$103,219        | \$0                | \$0              | \$103,219          |
| Equipment            | \$25,927         | \$0                | \$0              | \$25,927           |
| Materials & Supplies | \$63,224         | \$0                | \$0              | \$63,224           |
| Tuition              | \$8,028          | \$0                | \$0              | \$8,028            |
| Travel               | \$5,876          | \$0                | \$0              | \$5,876            |
| Subcontractors       | \$14,745         | \$0                | \$0              | \$14,745           |
| Other                | \$15,340         | \$0                | \$345,022        | \$360,362          |
| <b>Total</b>         | <b>\$924,484</b> | <b>\$0</b>         | <b>\$924,891</b> | <b>\$1,849,375</b> |

### Capital Expenditures

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

### Commercialization Plan

CMI leverages UB's cutting-edge materials science and informatics scientific expertise to drive innovation and critical R&D activities that directly impact private sector growth in several target industries including, broadly: Advanced Manufacturing, Life Sciences, and Clean Energy.

The Center has established itself as a critical nexus between industry and faculty expertise to solve technical and business-related challenges. CMI, through its business development efforts, connects companies-to-faculty and faculty-to-companies. UB faculty researchers regularly contact the Center seeking new industry collaboration opportunities in domains that align with their interests and expertise.

CMI annually funds faculty/industry collaborative applied research activities through its Faculty-Industry Applied Research Program (FIAR) with industry. The objective is to align university research expertise and resources with industry needs and commercial interests. This alignment is a critical criterion in vetting and evaluating funding proposals. To date, 33 FIAR projects, totaling approximately \$1,162.5K, have been awarded to faculty with industry collaborations in the following Target Industry Sectors:

|                        |  |
|------------------------|--|
| Clean Energy           | Light emitting diodes, photovoltaics, supercapacitors, fuel cells, batteries, thermoacoustic energy generation                               |
| Life Sciences          | Drug delivery, tattoo removal, UV infection control, MRI contrast agents, photoacoustic imaging, flexible wearable electronics and sensors   |
| Semiconductors         | New CMOS-compatible devices, electronics for extreme environments, quantum computing, quantum transistors                                    |
| Environmental          | Surfactants, water filtration & gas separation membranes, drag reducing marine coatings, ceramic fiber characterization, degradable polymers |
| Additive Manufacturing | Liquid metal jet printing, AM CAD analytical SW, postprocessing technologies   |
| Industrial Controls    | Wireless-enabled and printable sensors, RFID   |

## NYSTAR's Center of Excellence Report (2021)

### Competencies (People)

- The CMI works with over 100 materials research faculty with extensive funding from federal agencies and private industry with expertise in domains such as:
  - Development of advanced nanomaterials for a range of applications, including quantum dots, plasmonic nanostructures, graphene, new types of carbon nanotubes, and upconverting nanoparticles
  - Additive manufacturing
  - Ceramics, glass, and thermoelectric materials
  - Clean energy technologies such as LED materials and lighting technologies, energy conservation building products, solar energy, photovoltaic materials, fuel cells, water-to-hydrogen nanomaterials, and batteries
  - Coatings for optical, medical, and industrial applications
  - Gas processing, purification, separation, air handling and filtration
  - Industrial processes and process equipment
  - Product life cycle/preventative maintenance prediction and optimization
  - Medical, medical products, devices, medical imaging, drug delivery
  - First-principles modeling, molecular simulation of materials, computational fluid dynamics, coupled multiphysics modeling including electromagnetism
  - Optics, photonics, lasers
  - Semiconductors and electronics, novel 2D electronic materials
  - Superconducting materials for energy and quantum devices
  - Wireless materials and infrastructure
  - Sensors
- The CMI's core team includes:
  - Highly experienced scientific and commercialization executive staff dedicated to NYS focused technology-based economic development
  - Technical business development staff with over 25 years of business-to-business, manufacturing, sales, management and business development expertise
  - Operational staff with expertise administering ESD's NYSTAR contracts

### Capabilities (Infrastructure)

CMI connects the below assets, directly and indirectly, to industrial clients and prospects as a normal part of its day-to-day operations:

- CMI Instrument facility (<http://www.buffalo.edu/cmi/resources/shared-equipment-software.html>), which includes:
  - Transmission electron microscopy
  - Focused ion beam microscopy and fabrication (housed within cleanroom, see Engineering Equipment and Instrumentation Portal or EQUIP links below)
  - Scanning electron microscopy (housed within cleanroom, see below)
  - Electron beam lithography (housed within cleanroom, see below)
  - Cryogenics (liquid helium and nitrogen)
  - Circular dichroism spectrometry
  - Automated materials synthesis setup
  - Automated microwave reactor system
  - Electrospray deposition setup
  - High-temperature furnaces and related materials processing equipment

## NYSTAR's Center of Excellence Report (2021)

- UB's Science and Engineering Equipment and Instrumentation Portal or EQUIP of Shared Facilities (<http://www.buffalo.edu/shared-facilities-equip.html>), which includes:
  - Davis Hall Cleanroom, with complete semiconductor device fabrication capabilities: <http://www.buffalo.edu/shared-facilities-equip/facilities-equipment/Cleanrooms.html>
  - Digital Manufacturing Laboratory, with diverse additive manufacturing equipment: <http://www.buffalo.edu/shared-facilities-equip/facilities-equipment/digital-manufacturing-lab.html>
  - Materials Characterization Laboratories (<http://www.buffalo.edu/shared-facilities-equip/facilities-equipment/MaterialsCharacterizationLabs.html>)
  - South Campus Instrumentation Center: <http://www.buffalo.edu/shared-facilities-equip/facilities-equipment/MaterialsCharacterizationLabs/locations/SouthCampusInstrumentCenter.html>
- UB's Center for Computational Research (CCR): <http://www.buffalo.edu/ccr.html>
- Center of Excellence in Document Analysis and Recognition (CEDAR) and the Center for Unified Biometrics and Sensing (CUBS): <http://cubs.buffalo.edu/>
- Clinical and Translational Research Center: <http://www.buffalocr.org/about/>
- Sustainable Manufacturing & Advanced Robotic Technologies (SMART) Community of Excellence: <http://www.buffalo.edu/sustainablemanufacturingandadvancedrobotictechnologies.html>
- The Research and Education in eEnergy, Environment & Water (RENEW) Institute: <http://www.buffalo.edu/renew.html>
- The Computational Data-Enabled Science & Engineering (CDSE) Program: <http://www.buffalo.edu/cdse/about-us.html>
- Chemistry Instrumentation Center: <http://chemistry.buffalo.edu/facilities/chemistry-instrumentation-center/>
- BioXFEL – Biology with X-ray Free Electron Lasers: <https://www.bioxfel.org/>
- Buffalo Manufacturing Works: <http://buffalomanufacturingworks.com/>

### Companies Served and Projects

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 65                    | 7                      | 7                       | 23                                   |

### Actual or Anticipated New Products or Processes with Commercial Application

| Patent Name                   | Inventor | Patent Number | Description   |
|-------------------------------|----------|---------------|---|
| Cooling Hydrogel              | Ren      | 62/984, 599   | The invention is a composite material that can be cooled down to subzero temperatures and offers a high degree of cold retention (more than ice) while retaining its flexibility at those temperatures. The composition raw materials are nontoxic, readily available and cost effective. |
| Energy Generation and Storage | Thundat  | 63/011,845    | Apparatus and method for harnessing mechanical energy such as environmental vibrations and converting and storing that energy into direct current (DC) electricity, all within a single device.   |
| Passive Cooling and Radiator  | Gan      | 63/011,954    | A transparent polymer imbedded with a solar reflective material enabling radiative cooling of coated roofing materials for buildings, vehicles, LED lighting and solar panels.  |

## NYSTAR's Center of Excellence Report (2021)

### Start-up Companies Formed

| Company Name | City | Product/Service | Sector |
|--------------|------|-----------------|--------|
| Not Reported |      |                 |        |

### Licensing and Other Agreements

| Project Title  | Inventor/PI                           | Licensing or Industry Partner                   |
|--|---------------------------------------|---|
| Development of metal nitride superconductors for future generation of superconducting qubits   | Quanxi Jia, Hao Zeng                  | Sunny Clean Water LLC<br>Applied Materials Inc. |
| Rapid-Prototyping Magnetic Metamaterials for Vibration Control                                 | Mostafa Nouh<br>Shenqiang Ren         | ITT Enidine<br>Buffalo Manufacturing Works      |
| Harnessing Materials Informatics to Accelerate the Development of Restorative Dental Materials | Baishakhi Mazumder<br>Olga Wodo       | Ivoclar Vivadent, Inc.                          |
| Capacitance-Based Three-Dimensional Metal Printing Monitoring Technology                       | Deborah Chung                         | Norsk Titanium US Inc.                          |
| Rapid-Prototype Writable/Printable Flexible Electronics Based Chemical Sensor                  | Shenqiang Ren                         | Tapecon   |
| Ultrahigh Performance Supercapacitor Using Two-dimensional CN Crystals                         | Huamin Li, Fei Yao<br>Kristofer Reyes | Custom Electronics Inc.                         |
| Combinatorial metal-organic polyhedral materials as MRI contrast agents                        | Janet Morrow<br>Timothy Cook          | Ferric Contrast Inc.                            |

### Science and Technical Activities with Students

- Buffalo Niagara Medical Campus Summer Workshop:** CMI annually collaborates with CBLs, Buffalo Manufacturing Works (BMW) and the Buffalo Niagara Medical Campus (BNMC) to host a STEM summer workshop. The workshop is open to students from the Buffalo Public Schools who are entering 9<sup>th</sup> grade in the fall; priority is given to students entering The Research Laboratory High School, PS #366. The students spend time with different entities on the campus and participate in hands-on science and engineering activities. The workshop concludes with a poster session, during which each student presents his/her favorite experiment or activity. Students are also be exposed to the many careers that exist on the Medical Campus. This program has been offered for five years but was suspended in 2020 due to the COVID-19 Pandemic.
- Research Laboratory High School After School Program:** The Research Laboratory High School (RLHS) is an application-based Buffalo Public School District High School. Dr. Small served on the planning committee to establish the school and continues to serve as a STEM curriculum advisor. She leads the inquiry-based after school program and has been awarded a contract by the district to continue that programming for the 2021-2022 academic year.
- Science Exploration Day:** This is an annual event that takes place on UB's North Campus. Rural, urban and suburban schools from around the region are invited to send students to participate in this STEM conference, full of activities, experiments and lectures. Students have the opportunity to see functional research laboratories and sophisticated equipment, including electron microscopes. Dr. Sandra Small is on the planning committee and serves as a liaison between Buffalo Public Schools (BPS) and Science Exploration Day, securing sponsorship money for BPS students to attend.

### Strategic Plan

The CMI's broad focus and mission lies at the cross-functional intersection between advanced materials research and the leading edge of applied computational materials engineering. The launch of UB's

## NYSTAR's Center of Excellence Report (2021)

Department of Materials Design and Innovation (MDI) in 2016 created an enhanced interdisciplinary alignment between the CMI and UB's research expertise. The result of the graduate-level focused MDI department is a closely integrated resource and partner that elevates CMI to operate as a unique technology nexus within NYS that will progress into a powerful asset; and that enables advancements in new materials development and commercialization outcomes that do not exist elsewhere in the U.S or globally.

The UB MDI is a new, forward-leaning, interdisciplinary department with a new paradigm for materials science research and education. The department's mission is focused on advancing data driven discovery methods, accelerating discovery and design of new materials and processes, and addressing society's toughest challenges. MDI is centered on establishing knowledge discovery in materials science by harnessing the tools of information and data science. It addresses the societal needs for significant acceleration of design and discovery of new materials, emergent properties and processing strategies that impact a broad range of technological applications, including advanced manufacturing and biosciences/technology in a socially responsible manner. MDI aims to use this informatics approach to meaningfully and seamlessly connect bench science with computational science methods.

The critical needs the CMI address, with and through the MDI and UB, broadly, include: access to advanced analytical instrumentation; a wide range of capabilities for modeling, simulation and computational analysis of materials; materials synthesis and process development; and access to materials research faculty that are highly renowned internationally. These areas of expertise support the research, design, development, testing, processing, and prototyping of new materials and also facilitate the study and characterization of challenges industries face with current materials.

The CMI's strategy for expanding its existing base of companies includes business development and scientific participation in materials and related engineering symposia, events and trade expositions across NYS and nationally.



## NYSTAR's Center of Excellence Report (2021)

### Center of Excellence in Nanoelectronics and Nanotechnology (CENN) SUNY Polytechnic Institute Fatemeh (Shadi) Shahedipour-Sandvik

#### Technology Focus

Nanoelectronics and nanotechnology, mostly focused on transitioning New York State companies to commercialize semiconductor and related technologies such as integrated photonics, power electronics, and neuromorphic computing (Artificial Intelligence or AI hardware).

#### Importance to NYS

As one of NY's most innovative and ambitious high-tech initiatives, the State University of New York Polytechnic Institute (SUNY Poly) and its Colleges of Nanoscale Science and Engineering (CNSE) are home to the New York State Center of Excellence in Nanoelectronics and Nanotechnology (CENN). With tens of billions of dollars in combined high-tech investments, CENN has been an integral part in establishing the most advanced nanotechnology research, development, and deployment complex in the world.

During this reporting period, the CENN continues to work with the New York Center for Research, Economic Advancement, Technology, Engineering and Science (NY CREATES) to collaborate with NY based industry and universities in continuance of its mission and objectives as defined in the Center of Excellence Program statute.

#### Purpose

CENN's dual mission is to enable a robust innovation pipeline by supporting applied research, while operating manufacturing scale-up facilities to enable the commercial deployment of this innovation is key to catalyzing a nanotechnology eco-system that has resulted in significant job creation and private sector investment. The manufacturing scale-up facilities that are supported by the CENN at SUNY Poly's CNSE include the only fully-integrated, 300mm computer chip pilot prototyping and demonstration lines within 135,000 square feet of Class 1 capable cleanrooms. This fully-integrated research, development, prototyping, and educational facility provides NYS companies of all sizes strategic support through outreach, technology acceleration, business incubation, pilot prototyping, and test-based integration support.

#### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings  | Govt Funds | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|---------------|------------|----------------|------------------|---------------|
| 13       | 0             | \$877,619          | \$134,052,008 | \$896,417  | \$0            | \$0              | \$135,826,044 |

#### Designations and Recognitions

| Awards / Recognition | Date Received | Recognizing Organization | Link |
|----------------------|---------------|--------------------------|------|
| Not Reported         |               |                          |      |

## NYSTAR's Center of Excellence Report (2021)

### Operating Budget

| Operating Budget     | NYSTAR Funding   | Matching Funds**   |               | Total Budget     |
|----------------------|------------------|--------------------|---------------|------------------|
|                      |                  | Company Cost Share | Other Sources |                  |
| Salaries & Fringe    | \$53,502         | \$0                | \$0           | \$53,502         |
| Indirect Costs       | \$8,025          | \$0                | \$0           | \$8,025          |
| Equipment            | \$34,180         | \$0                | \$0           | \$34,180         |
| Materials & Supplies | \$118,320        | \$0                | \$0           | \$118,320        |
| Tuition              | \$370            | \$0                | \$0           | \$370            |
| Travel               | \$696            | \$0                | \$0           | \$696            |
| Subcontractors       | \$21,292         | \$0                | \$0           | \$21,292         |
| Other                | \$69,798         | \$0                | \$0           | \$69,798         |
| <b>Total</b>         | <b>\$306,183</b> | <b>\$0</b>         | <b>\$0</b>    | <b>\$306,183</b> |

\*\* SUNY Poly was overmatched prior to this period so no match is reported.

### Capital Expenditures

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

### Companies Served and Projects

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 14                    | 18                     | 4                       | 6                                    |

### Actual or Anticipated New Products or Processes with Commercial Application

| Patent Name   | Inventor          | Co-inventor               | Patent Number | Description  |
|---|-------------------|---------------------------|---------------|--------------|
| Integrated Photonics including Germanium            | Douglas Coolbaugh | Thomas Adam, Gerald Leake | 10,295,745    | Not Reported |
| Integrated Photonics Including Waveguiding Material | Douglas Coolbaugh | Thomas Adam, Gerald Leake | 10,571,631    | Not Reported |

### Start-up Companies Formed

| Company Name | City | Product/Service | Sector |
|--------------|------|-----------------|--------|
| Not Reported |      |                 |        |

### Licensing and Other Agreements

| Project      | Inventor | Licensing Partner |
|--------------|----------|-------------------|
| Not Reported |          |                   |

### Science and Technical Activities with Students

CENN NanoEducation efforts have focused on the construction and operation of facilities that support the growth of an industry centric workforce pipeline that focuses on the following three areas: 1) Engagement; 2) Enrichment; and 3) Education. The CENN NanoEducation efforts have allowed SUNY Poly to develop robust programs and activities that address the needs of the regional workforce by creating a continuous supply of interested and excited students with the appropriate aptitude to succeed in the high-tech

## NYSTAR's Center of Excellence Report (2021)

workforce. The following are examples of the programs that have had successes during this reporting period.

### Back to School Expo

On September 21, 2019, the SUNY Poly CENN joined sponsors that included Albany Med, National Grid, PriceChopper, Linium and SI Group at the 10<sup>th</sup> Anniversary of the Back to School Expo at the Empire State Plaza Convention Center. The expo had the largest attendance yet with over 5,000 attendees, where SUNY Poly staff spoke to at least 1,000 potential students and workforce development program attendees. Events like these are critical to not only establishing the pipeline of students in the STEM fields in general, but the nano and semiconductor related areas specifically.

### NanoCareer Days

During this reporting period, CENN helped support SUNY Poly to host more than 250 people at four events from over a dozen high school and middle schools from across the state. This very successful program provides over 1,000 students a glimpse at a career in nano, plus the opportunity to participate in guided experiments. Additionally, it shows these students that not every career within a high-tech field or facility like SUNY Poly requires advanced degrees and that there are several Certificate and Associates Degree programs that would allow the students to succeed in this type of environment. Once someone enters a high-tech industry, it is likely that they will continue on to new opportunities within that field and develop their own pathway to success.

### National Nano Days 2019

NanoDays is an annual, nationwide festival of educational programs about nanoscale science and engineering and their impact on society. NanoDays events are organized by participants in the Nanoscale Informal Science Education Network and take place at science museums, research centers and universities across the country from Puerto Rico to Hawaii. NanoDays engages people of all ages in learning about this emerging field of research, which holds the promise of developing revolutionary materials and technologies. During part of the local public school spring break April 22 - 26, 2019, the SUNY Poly CENN supported several events that helped to bring nanotechnology education to a range of K-12 educational facilities across the state, including Riverdale Neighborhood House (Bronx), Albany Police Athletic League, Spring Vacation Camp, and the Children's Museum of Science and Technology.

### Tech Valley High School – Camp Innov@tion

CENN continues to support the Tech Valley High School (TVHS) that is co-located on the SUNY Poly Albany Nanotech Complex in an effort to expand and strengthen the educational pipeline in nanotechnology related fields. This one-of-a-kind educational enterprise provides high school students with a prestigious opportunity to gain access to the world of nanotechnology that few, even at the collegiate level, are provided while also providing the workforce development required to continue the growing nanotechnology industry in NYS. During this reporting period, SUNY Poly helped facilitate three separate week-long technology themed innovation summer camps: Technology Innovations the week of July 15, 2019; Biomedical Innovations the week of July 22, 2019; and Transportation Innovations the week of July 29, 2019. At each week-long camp session, TVHS hosted approximately 40 6<sup>th</sup> and 7<sup>th</sup> grade students.

### Albany High School NanoHigh

CENN continues to support nanoscale enrichment programs in a variety of ways but most notably through the established NanoHigh program in partnership with Albany High School (AHS) in its Engineering and Nanotechnology Exploration Program. The goal of the program is to immerse AHS seniors in a professional atmosphere to provide a unique educational experience and provide the students with an in-depth introduction to potential career areas. In partnership with SUNY Poly, AHS seniors are introduced to

## NYSTAR's Center of Excellence Report (2021)

potential career paths in Nanoscience, Nanoengineering, and Nanobioscience through daily, on-site instruction and research activity.

### The 15-Love Program's Summer Sessions

The 15-LOVE Program has successfully completed over two decades of programming in the Capital Region. Representatives from the SUNY Poly CENN shared exciting science, technology, engineering, and mathematics-focused (STEM) concepts as part of a weekly summer program at Albany-based 15-LOVE. Children from local public and charter schools took part in hands-on, nano-centered activities each week. During July 2019 on five consecutive Wednesdays, 20 children attended the program at SUNY Poly.

### 15 Love Healthy Futures Club

Continuing SUNY Poly's annual spring and summer STEAM programming with 15 Love, the CENN supported monthly STEM concepts as taught through art. Some of the programs included: a focus on Binary Code and Data Storage, where the children made floating magnet byte messages and designed their own agamographs (kinetic images); and the focus of another was on wind energy, where the students made pinwheels and wind socks.

### SUNY Poly Summer Internship Program

The CENN continued efforts to support the SUNY Poly Summer Internship Program reinforcing the educational initiatives that are preparing NY's workforce for a growing number of high-tech career opportunities. The summer 2019 internship program, which ran from July – August, hosted a class of 43 of the best and brightest students in the nanotechnology related fields from across the country. This program emphasizes the important efforts the CENN makes to catalyze high-tech growth and connect businesses with a world-class workforce, SUNY Poly is proud to see heightened interest in this prestigious internship experience by undergraduates from across NY. The students spent the summer immersed in unparalleled nanotechnology-based education and research.

### Additional SUNY Poly Hosted Industry-Oriented Education and Training Events

Throughout the reporting year CENN has supported SUNY Poly to host scores of other industry-orientated educational events that are not already listed here. These events have hosted more than 10,000 people during this reporting year and include, but are not limited to the following: Several Nano Career Days for various local school districts; Mohonasen High School CAT Program; IBM Take Your Children to Work Day; Liberty Partnership Program Empire Summit: Young Scholars; American Chemical Society Event; TEL Take your Child To Work Day; Cohoes High School Future Pathways; PV Workshop; IBM Z-Systems Workshop; Park Systems Symposium; IC Fab Workshop; SESA Mini Conference; Tech Valley Summer Camp (New Visions, BOCES); SEMI High Tech University: Teacher Training; IEEE Nanotechnology Symposium; UAlbany African Student Association; CNSE Take Your Child To Work Day; Capstone Presentations; and SEMI High Tech University.

# NYSTAR's Center of Excellence Report (2021)

## Center of Excellence: Advanced Energy Research and Technology Center Stony Brook University David Hamilton

### Technology Focus

Energy with a focus on efficiency, conservation, renewable energy and nanotechnology applications for new and novel sources of energy.

### Importance to NYS

The Advanced Energy Research and Technology Center (AEC) is a partnership of academic and research institutions, energy providers, industry, and government. The mission of the AEC is to increase the efficiency of current energy systems, while promoting the adoption of alternative and renewable sources to reduce NY's carbon footprint. The AEC conducts cutting edge research and development of new technologies to generate, transmit, distribute, store and manage energy. This includes alternative and renewable sources, which is accomplished by accelerating deployment of new technologies and providing education and training to disseminate the skills necessary to implement, maintain and capitalize on enhanced functionalities. As the state's designated Center of Excellence in Energy, the AEC facilitates cross collaboration of researchers, industry and energy subject-matter experts throughout the state. This collaboration culminates in the bi-annual Advanced Energy Conference, attracting 2000+ attendees with 500+ public and private companies participating, and 40 colleges and universities engaged. The AEC is housed in NY's first LEED Platinum research facility and located at the Stony Brook University Research and Development Park, which currently supports 150 energy projects and 10 major research and training centers.

### Purpose

The fundamental purpose of the AEC is to lead research, development, deployment, and work force development efforts in reliable, economical, and plentiful sources of clean energy for a sustainable economy. AEC's researchers and companies perform cutting edge research in energy storage (up to and including grid scale applications), energy harvesting, alternative and renewable energy sources, transmission and distribution systems, energy efficiency and conservation; and Smart Grid infrastructure, systems and devices.

AEC also:

- Builds the infrastructure needed to advance energy research, technology development, commercialization and deployment;
- Provides workforce development programming and multidisciplinary educational opportunities including K-12, undergraduate, graduate, and professional offerings;
- Accelerates commercialization of new energy technologies through start-up ventures and established industry partners;
- Promotes the success of existing energy providers, utilities and technology companies in the region and the growth of energy industry regionally and around the state; and
- Establishes and maintains long-term collaborative relationships with federal, state, industrial, and academic partners.

### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds  | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|-------------|----------------|------------------|---------------|
| 7        | 10            | \$1,181,500        | \$205,000    | \$1,218,947 | \$0            | \$143,000        | \$2,748,447   |

## NYSTAR's Center of Excellence Report (2021)

### Designations and Recognitions

| Awards / Recognition  | Date Received | Recognizing Organization                                   | Link  |
|---|---------------|--|---|
| Gary Halada, Associate Professor - Induction into the Stony Brook University Chapter of the National Academy of Inventors       | 5/2019        | National Academy of Inventors                              | <a href="https://www.stonybrook.edu/commcms/nai/index.php">https://www.stonybrook.edu/commcms/nai/index.php</a>   |
| Anurag Purwar, Associate Professor - Induction into the Stony Brook University Chapter of the National Academy of Inventors     | 5/2019        | National Academy of Inventors                              | <a href="https://www.stonybrook.edu/commcms/nai/index.php">https://www.stonybrook.edu/commcms/nai/index.php</a>   |
| Vladimir Samuilov, Assistant Professor - Induction into the Stony Brook University Chapter of the National Academy of Inventors | 5/2019        | National Academy of Inventors                              | <a href="https://www.stonybrook.edu/commcms/nai/index.php">https://www.stonybrook.edu/commcms/nai/index.php</a>   |
| National Offshore Wind Research and Development Consortium  | 5/2019        | National Offshore Wind Research and Development Consortium | <a href="https://www.innovateli.com/at-offshore-consortium-7m-is-blowing-in-the-wind/">https://www.innovateli.com/at-offshore-consortium-7m-is-blowing-in-the-wind/</a> |

### Operating Budget

| Operating Budget     | NYSTAR Funding   | Matching Funds     |               | Total Budget       |
|----------------------|------------------|--------------------|---------------|--------------------|
|                      |                  | Company Cost Share | Other Sources |                    |
| Salaries & Fringe    | \$576,956        | \$0                | \$0           | \$576,956          |
| Indirect Costs       | \$86,543         | \$0                | \$0           | \$86,543           |
| Equipment            | \$0              | \$0                | \$0           | \$0                |
| Materials & Supplies | \$0              | \$0                | \$0           | \$0                |
| Tuition              | \$0              | \$0                | \$0           | \$0                |
| Travel               | \$0              | \$0                | \$0           | \$0                |
| Subcontractors       | \$0              | \$0                | \$0           | \$0                |
| Other                | \$0              | \$1,006,961        | \$0           | \$1,006,961        |
| <b>Total</b>         | <b>\$663,499</b> | <b>\$1,006,961</b> | <b>\$0</b>    | <b>\$1,670,460</b> |

### Capital Expenditures

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

### Companies Served and Projects

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 4                     | 0                      | 7                       | 11                                   |

## NYSTAR's Center of Excellence Report (2021)

### Actual or Anticipated New Products or Processes with Commercial Application:

| Patent Name   | Inventor                | Co-inventor   | Patent Number | Description  |
|---|-------------------------|---|---------------|--|
| Porous Graphene Based Composite Membranes for Nanofiltration, Desalination and Pervaporation                  | Benjamin Hsiao          | Benjamin Chu, Hongyang Ma, Zhe Wang                     | 10,272,392    | Nanofibrous membranes that include graphene and/or graphene oxide barrier layers on a nanofibrous supporting scaffold, which have a very thin barrier layer with high selectivity, high throughput, low fouling, and are long lasting. |
| Highly porous fibrous network materials for gas filtration  | Benjamin Chu            | Benjamin S. Hsiao, Hongyang Ma                          | 10/315,155    | Membranes using a highly porous cellulose nanofibrous barrier layer with a highly porous (surface-charged) substrate for filtering a gas, fumes, bacteria, viruses, dusts, and particulate matters.                                    |
| Hole blocking, electron transporting and window layer for optimized CuIn(1-x)Ga(x)Se <sub>2</sub> solar cells | Nanditha M. Dissanayake | Matthew Eisaman, Ahsan Ashraf, Nancy Goroff, Xiuzhu Ang | 10,333,017    | Thin-film photovoltaic devices and methods for their use and manufacture.  |
| Gold nanoparticles-enhanced proton exchange membrane fuel cell  | Hongfei Li              | Miriam Rafailovich, Cheng Pan                           | 10,361,437    | A proton exchange membrane fuel cell that includes platelet-shaped nanoparticles.  |
| Co-current loop thermosyphon heat transfer system for sub-ambient evaporative cooling and cool storage        | Jon Longtin             |   | 10,436,519    | A co-current loop thermosyphon system and method for operation.  |
| Elastic membrane-based membrane bioreactor with high-efficiency for fouling control                           | Benjamin Chu            | Benjamin S. Hsiao, Ying Su                              | 10,532,322    | Elastic microfiltration membranes to be used in a membrane bioreactor. Due to the elastic nature of the membranes, removal of fouling materials is improved, increasing the efficiency and longevity of the membranes.                 |
| Hybrid electrolytes for group 2 cation-based electrochemical energy storage device                            | Kenneth J. Takeuchi     | Esther S. Takeuchi, Amy C. Marschilok                   | 10,566,632    | Novel electrolytes that have utility in electrochemical storage devices, such as batteries.  |

### Start-up Companies Formed:

| Company Name | City | Product/Service | Sector |
|--------------|------|-----------------|--------|
| Not Reported |      |                 |        |

### Licensing and Other Agreements

| Project                | Inventor            | Licensing Partner      |
|------------------------|---------------------|------------------------|
| Solar Panel Technology | Dr. Alexander Orlov | Superclean Glass, Inc. |

### Science and Technical Activities with Students

AEC's Advanced Energy Conference attracts almost 2,000 participants and sponsors a Call for Posters supported by over 100 undergraduate and graduate students.

## NYSTAR's Center of Excellence Report (2021)

The AEC has held the following training programs during the reporting period:

| <b>Training Program</b>  | <b>No. trained</b> |
|--------------------------|--------------------|
| Fireside Chat with USPTO | 27                 |
| HR 101                   | 13                 |
| Insurance 101            | 12                 |
| Immigration 101          | 10                 |
| Accounting 101           | 16                 |
| NextGen Cleantech        | 342                |

The Garcia Program hosts a research program for college undergraduate and rising seniors. The Research Experience for Undergraduates (REU) program is a seven-week summer program where undergraduate students work in teams with high school students, high school teachers, graduate students and post docs on specific research projects of their interest. Many of the REU participants were former high school students who returned for multiple summers. Some students prefer to continue working on the same project with the goal of eventual publication, while others opt to sample different projects and gain experience in diverse fields.

### **Strategic plan**

Develop true partnership of academic institutions, research institutions, energy providers and industrial corporations; and innovative energy research, education and technology deployment with a focus on efficiency, conservation, renewable energy and nanotechnology applications for new and novel sources of energy.

### **Core Functions**

- Support NYSTAR mission and requirements as a NYS Center of Excellence
- Foster research collaboration with industry
- Provide business assistance and technology support programs
- Maintain state of the art energy-focused research facility
  - Shared user-facilities
  - Business incubator space
  - Research labs
- Facilitate academic-research-government partnerships
- Conduct recurring Advanced Energy Conference



## NYSTAR's Center of Excellence Report (2021)

### **Center of Excellence in Wireless and Information Technology (CEWIT) Stony Brook University Dr. Satya Sharma**

#### **Technology Focus**

Wireless and Information Technology

#### **Importance to NYS**

Stony Brook University's Center of Excellence in Wireless and Information Technology's (CEWIT or the Center) researchers are developing technologies to support secure, fine-grained management and access control of enterprise scale Internet-of-Things (IoT) systems utilizing modern mobile and cryptography technology. CEWIT has research and development strengths in a wide range of areas that are best aligned with a number of target industry sectors including, but not limited to, healthcare and medical technologies, transportation and logistics, finance and e-commerce, homeland security and national defense, energy and utilities, among others. Additional, areas of expertise include paradigm-shifting data-centric wireless communication that achieves low loss, low latency, one-to-many data exchange critical in edge computing environments including vehicles, drones, and IoT devices, and smart sensing technologies.

To best capitalize on the IT revolution, spur economic growth, advance scientific research and develop the technologies of tomorrow, CEWIT has accrued over 65 associated faculty members, and engaged over 200 graduate and undergraduate students. CEWIT has created a powerful intellectual property portfolio resulting in hundreds of patents. Since its inception, the Center has worked hard to build strategic alliances and business partnerships among the academic, scientific, and business communities. Our partners include some of the world's best known and most sophisticated giants of wireless and information technology. The Center is building on these achievements and has laid the foundation for R&D partnerships with its partners and sponsors, and other internationally known research institutions.

CEWIT has established itself as a leader in applied research and technology development in Machine Learning and AI. The newly established SMART Cluster (Strategic Machine-Learning Acceleration and Ray Tracing Cluster) is a dual use GPU Cluster (Graphic Processing Unit), for both machine-learning and visualization, which is the fastest among NYS academic institutions. It dramatically boosts productivity of deep learning and visualization applications than ever before and is the first hardware-accelerated ray-tracing cluster for real-time cinematic-quality of 1.5 billion pixels. It is an asset to companies for smart manufacturing to financial to high tech, in need of powerful AI-enhanced computational capabilities, dramatically accelerated machine learning training and inference, high-end visual computing and analytics, and accelerating of data-intensive and computer-intensive processes.

#### **Purpose**

CEWIT has two main purposes: conduct research and commercialize it. CEWIT aims to create an ecosystem and culture that will continue to drive innovation through large and small advances derived from joint research programs, cooperative development of platform technologies, reciprocal out-licensing of companies' intellectual property, and through the promotion of leadership skills to foster collaborative relationships.

CEWIT offers unique and much-needed technical assistance and strategic advice to small and medium sized companies in the region as well as many startups and incubator companies in the ecosystem. The integration of the Centers' Business Development and Entrepreneur in Residence (EIR) supports these efforts and includes providing aid in the creation of new businesses and helping entrepreneurs sort out their operating business model and funding options, time horizons and viability, and how to gain leverage by application of the University's intellectual and material assets.

NYSTAR's Center of Excellence Report (2021)

**Impacts**

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds  | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|-------------|----------------|------------------|---------------|
| 44       | 21            | \$3,794,853        | \$98,000     | \$3,467,876 | \$0            | \$73,500         | \$7,434,229   |

**Designations and Recognitions**

| Awards / Recognition  | Date Received | Recognizing Organization  | Link  |
|---|---------------|---|---|
| Steven Skeina: Fellow   | 2019          | American Association for the Advancement of Science                   | <a href="https://www.aaas.org/fellows">https://www.aaas.org/fellows</a>   |
| Steven Skeina: Distinguished Alumni Award   | 2019          | School of Engineering and Applied Science, University of Virginia     | <a href="https://engineering.virginia.edu/about/history/uva-engineering-award">https://engineering.virginia.edu/about/history/uva-engineering-award</a> |
| Arie Kaufman: Visualization Academy Best Paper  | 2019          | IEEE  | <a href="https://tc.computer.org/vgtc/awards/visualization-academy">https://tc.computer.org/vgtc/awards/visualization-academy</a>                       |
| Klaus Mueller: Best Paper Award   | 2019          | EuroVis Conference  | N/A   |
| Ken Dill: The Raymond and Beverly Sackler International Prize in Biophysics                   | 2019          | Tel Aviv University   | N/A   |
| Ken Dill: Max Delbruck Prize in Biological Physics  | 2019          | American Physical Society   | N/A   |
| Fan Ye: Best Paper Award Runner-up  | 2019          | ACM/IEEE IoTDI conference   | N/A   |
| Benjamin Hsiao: Elected Member, University of Connecticut, Academy of Distinguished Engineers | 2019          | University of Connecticut   | N/A   |
| Benjamin Hsiao: - The Creativity Prize  | 2020          | The Prince Sultan bin Abdulaziz International Prize for Water (PSIPW) | N/A   |
| Anurag Purwar, National Academy of Inventors Member   | 2019          | Stony Brook Chapter National Academy of Inventor                      | N/A   |
| Anurag Purwar: ASME Outstanding Student Section Advisor Award                                 | 2020          | American Society of Mechanical Engineers (ASME)                       | N/A   |

**Operating Budget**

| Operating Budget     | NYSTAR Funding   | Matching Funds     |                    | Total Budget       |
|----------------------|------------------|--------------------|--------------------|--------------------|
|                      |                  | Company Cost Share | Other Sources      |                    |
| Salaries & Fringe    | \$851,388        | \$0                | \$0                | \$851,388          |
| Indirect Costs       | \$127,708        | \$0                | \$0                | \$127,708          |
| Equipment            | \$0              | \$0                | \$0                | \$0                |
| Materials & Supplies | \$0              | \$0                | \$244,374          | \$244,374          |
| Tuition              | \$0              | \$0                | \$0                | \$0                |
| Travel               | \$0              | \$0                | \$0                | \$0                |
| Subcontractors       | \$0              | \$0                | \$0                | \$0                |
| Other                | \$0              | \$0                | \$788,409          | \$788,409          |
| <b>Total</b>         | <b>\$979,096</b> | <b>\$0</b>         | <b>\$1,032,783</b> | <b>\$2,011,879</b> |

NYSTAR's Center of Excellence Report (2021)

**Capital Expenditures**

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

**Companies Served and Projects**

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 13                    | 12                     | 12                      | 53                                   |

**Actual or Anticipated New Products or Processes with Commercial Application**

| Patent Name   | Inventor       | Co-inventor  | Patent Number            | Description  |
|---|----------------|--|--------------------------|--|
| System and Method for 3D Facial Scanning  | Xianfeng Gu    |  | Unpublished-Confidential | 3D image scanner for real-time, dynamic 3D surface imaging, using projected structured light to reconstruct depth and texture information of the object.   |
| System and Method for Visual Analysis of Dominance Hierarchies                            | Ivan Chase     | Darius Coelho, Klaus Mueller                                 | Unpublished-Confidential | Provides a visual analytics system to inspect the formation and maintenance of dominance hierarchies in small groups.  |
| HOLMES Real-time APT Detection through Correlation of Suspicious Information Flows        | Birhanu Eshete | Rigel Gjomemo, Sadegh Momeni, R. Sekar, V.N. Venkatakrishnan | Unpublished-Confidential | Detects advanced Persistent Threats (APT) campaigns using new and efficient techniques.  |
| Computer-Accessible Medium for Processing Brain Images and Extracting Neuronal Structures | Saeed Boorboor | Arie Kaufman   | 16/994,885               | Computer-accessible medium for processing brain images and extracting neuronal structures with wide-field microscopy   |
| Risk Adjusted Mortality Rate Using Automated Determination of Patient Co-Morbidities      | Mark Henry     | I.V. Ramakrishnan  | PCT/US20/45403           | Automated determination and decision support of patient's co-morbid conditions (co-morbidities), for improving hospital risk adjusted metrics (e.g., mortality rates, etc.) by accurately and efficiently identifying a patient's co-morbid conditions (co-morbidities) using electronic health records (EHRs) in real-time. |
| System and Method for Prostate Visualization and Cancer Detection                         | Arie Kaufman   | Joseph Marino  | IN202048224481           | Medical imaging systems and methods for diagnosing prostate cancer.  |
| System and Method for Toothbrush Monitoring Using Magneto-Inductive Coil Sensor           | Shan Lin       |  | PCT/US2020/038594        | A method and system for tracking, recognizing and analyzing tooth-brushing activities and selectively modifying tooth brushing activities to improve a user's compliance of tooth brushing techniques  |

NYSTAR's Center of Excellence Report (2021)

|   |                     |   |                          |  |
|---|---------------------|---|--------------------------|--|
|   |                     |   |                          | recommended by dental professionals and to improve the user's oral hygiene results   |
| System and Method for Identifying Fractures in Digitized X-Rays   | Imin Kao            | Fazel Khan, Jafar Khan, P.E., Sajid Khan  | PCT/US20/36564           | A computer software algorithm that reads digitized x-rays and identifies if there is a fracture present on any given x-ray.  |
| System, Method and Computer-Accessible Medium for Generating Multi-Class Models From Single-Class Datasets  | Konstantin Dmitriev | Arie Kaufman  | PCT/US20/34959           | An exemplary system, method, and computer accessible medium for multi-class segmentations from single-class datasets   |
| System and Method to Quantify Tumor Infiltrating Lymphocytes for Clinical Pathology Analysis, Molecular Correlation and Reconstruction in Digitized Tissue Images | Rebecca Batiste     | Rajarsi Gupta, Le Hou, Tahsin Kurc, Alexander Lazar, Vu Nguyen, Arvind Rao, Joel Haskin Saltz, Dimitrios Samaras, Ashish Sharma, Ilya Shmulevich, Pankaj Singh, Vesteynn Thorsson, John Van Arnam, Tianhao Zhao | 16/762,326               | A system and method associated with clinically processing, analyzing, and analyzing tumor-infiltrating lymphocytes (TILs) based on prediction, spatial analysis, molecular correlation, and reconstruction of TIL information associated with copious digitized pathology tissue images. |
| X-ray Imager Using Storage Phosphor   | Adrian Howansky     | Anthony Lubinsky, Wei Zhao  | Unpublished-Confidential | A method for making radiological or other x-ray images using a storage phosphor plate and simple readout system with a novel color-discriminating fiber optic plate.   |
| System and Method for Tracking Human Behavior Real-Time With Single Magnetometer Sensor and Magnets   | Shan Lin            |   | PCT/US2020/029710        | Method and system for tracking, recognizing and analyzing driving behaviors and selectively modifying driving behaviors to avoid potential traffic accidents.  |
| System and Method Associated with User Authentication Based on an Acoustic-Based Echo-Signature   | Fan Ye              | Bing Zhou   | 16/754,416               | A system and method associated with generating an acoustics-based echo-signature, a unique echo-based print associated with an original user of a device that is implemented during prediction for authentication of the current user of a device.                                       |
| System, Method, and Computer-Accessible Medium for Subsurface Capillary Flow Imaging By WaveLength-Division-Multiplexing Swept-Source Optical Doppler Tomography  | Wei Chen            | Congwu Du, Yingtian Pan   | 16/755,702               | A system, method, and computer accessible medium for generating images of three-dimensional anatomical flow maps.  |

NYSTAR's Center of Excellence Report (2021)

|   |                       |   |                          |  |
|---|-----------------------|---|--------------------------|--|
| System and Method for Electronic Health Records Management Using Blockchain   | Alevtina Dubovitskaya | Rohit Shukla, Fusheng Wang, Zhigang Xu, Pratik Sushil Zambani                     | 62020003360.8            | An apparatus and methods for detecting ionizing radiation for use as a hybrid sensor for x-ray imaging.  |
| Ultra-Low Power Core for Lightweight Encryption   | Yasha Karimi          | Emre Salman, Milutin Stanacevic, Tutu Wan, Huang Yuanfei                          | PCT/US2020/022522        | Processing units and methods for operating the same that include an ultra-low power core for lightweight encryption  |
| System, Method, and Computer Accessible Medium for Virtual Pancreatography  | Konstantin Dmitriev   | Arie Kaufman  | 16/626,662               | A method, and computer-accessible medium for virtual pancreatography   |
| Attenuated Influenza Viruses and Vaccines   | Bruce Futcher         | Steffen Mueller, Steven Skiena, Eckard Wimmer, Chen Yang                          | 16/436,475               | Highly attenuated influenza viruses and vaccines and methods for generating the same   |
| Network Community Detection Based on Ricci Flow   | Jie Gao               | Yu-Yao Lin, Chien-Chun Ni   | Unpublished-Confidential | Computer-based systems configured for one or more novel technological applications for community detection on complex network                                |
| System and Method for Spinal Restoration  | Daniel Birk           | Nilanjan Chakraborty, Qiaode Ge, I.V. Ramakrishnan, David Rubenstein, T Venkatesh | Unpublished-Confidential | An innovation in current spinal surgery and treatment today paradigm of spinal decompression using simple mechanical tools.                                  |
| System and Method Associated with Predicting Segmentation Quality of Objects in Analysis of Copious Image Data                                    | Yi Gao                | Tahsin Kurc, Joel Haskin Saltz, Sampurna Shrestha, Si Wen, Tianhao Zhao, Wei Zhu  | 16/605,404               | System and method associated with predicting segmentation quality of objects used in analysis of copious image data including image data at the patch level. |
| Machine Learning System and Method for Using Electronic Health Records to Predict Disease State   | Janos Hajagos         | Richard Moffitt, Sina Rashidian, Joel Haskin Saltz, Mary Saltz, Fusheng Wang      | Unpublished-Confidential | A machine learning system and method that uses patient data to predict diseases.   |
| System and Method for Eye Gaze-based Assistive Devices  | Furqan Baig           | Karl Bezak, Hongyi Duanmu, Sina Rashidian, Fusheng Wang, Xia Zhao                 | Unpublished-Confidential | The system and methods enable patients with speaking and movement disabilities to connect, communicate using a smart device                                  |
| Co-current Loop Thermosyphon Heat Transfer System for Sub-Ambient Evaporative Cooling and Cool Storage  | Jon Longtin           |   | 10,436,519               | A co-current loop thermosyphon system and method for operation thereof.  |
| Synthesis and Incorporation of Graphene and/or Metallized or Metal Oxide-Modified Graphane to Improve Organic Solar Cells and Hydrogen Fuel Cells | Andrew Chen           | Li Hongfei, Rebecca Isseroff, Miriam Rafailovich                                  | 10,700,282               | A composition used to form the active layer of a solar cell or hydrogen fuel cell.   |

## NYSTAR's Center of Excellence Report (2021)

|  |                 |   |            |  |
|--|-----------------|---|------------|--|
| Intralipid as a Contrast Agent to Enhance Subsurface Blood Flow Imaging  | Congwu Du       | Yingtian Pan, Hugang Ren                | 10/531,803 | A method of imaging blood vessels or blood flow in blood vessels in an animal that uses lipid solutions.   |
| System, Method, and Accelerator to Process Convolutional Neural Network Layers   | Monaj Alwani    | Michael Ferdman, Peter Milder           | 10,726,330 | System, method, and accelerator to process a convolutional neural network.   |
| Modular frame connectors and system utilizing same   | Jonathan Bellon | Qiaode Ge, Apoorva Godse, Anurag Purwar | 10,561,958 | A clip system and method for joining plates using the system of clips.   |
| System and method for generating a progressive representation associated with subjectively mapped virtual and physical reality image data. | Arie Kaufman    | Qi Sun, Li-Yi Wei                       | 10,403,043 | A system and method for immersion of a user into virtual reality allowing natural and safe human locomotion within a circumscribed physical environment. |

### Start-up Companies Formed

| Company Name        | City            | Product/Service                                     | Sector                |
|---------------------|-----------------|---|-----------------------|
| Orchid Imaing, Inc. | Stony Brook, NY | 3D scanners and advanced 3D image analysis software | Hardware and software |

### Licensing and Other Agreements

| Project                 | Inventor      | Licensing Partner |
|-------------------------|---------------|-------------------|
| The Decision Space Map. | Klaus Mueller | Akai Kaeru, LLC   |

### Science and Technical Activities with Students

**Hack@CEWIT:** CEWIT's annual student hackathon is specifically designed in conjunction with core industry partners, sponsors, and member entrepreneurs to select scenarios that will have a direct, real-world application to their product portfolios, providing students the opportunity to work on industry-relevant IoT and microservices solutions. The hackathon's tech talk and deep dive workshop schedule, as well as Industry Hacker Guru or mentorship program continues to promote STEM education by introducing students to a range of new technologies and possibilities, while building positive, encouraging relationships with companies in the STEM fields. The 2020 Hack@CEWIT program offered students from all across NYS and many other states an immersive hands-on learning experience by delivering instructive content on relevant STEM topics, including hardware builds, software skills and a wide range of hot topics in technology. Program instructors include members of CEWIT's many industry partners, university faculty, and other technical experts who, through this three-day program, made voluntary contributions to advancing STEM education and fostering interest in STEM careers.

Through CEWIT's vast partner networks and connections, many K-12 and college-level students obtained internships at participating companies as well as in CEWIT, working with our affiliated faculty and startup companies in the incubator space. CEWIT also hosted student groups from the community to tour the facility and learn about our R&D activities on an ongoing basis. For example, over each of the past four years, Dr. Fusheng Wang, who is a professor of the Departments of Computer Science and Biomedical Informatics, offered a National Science Foundation-sponsored summer research program called Computer Science and Informatics Research Experience (CSIRE) to 30+ high school students. Dr. Wang also mentored a finalist in the Regeneron Science Talent Search.

## NYSTAR's Center of Excellence Report (2021)

### **Strategic plan**

CEWIT's mission is to conduct first-class interdisciplinary research and development in wireless and information technology; foster new enterprise development; and address the skilled technology worker shortage. It is a next generation research and educational facility to lead, initiate, foster, and manage the transfer of technologies from the research laboratory to the marketplace, and to facilitate interaction between companies and university faculty and students.

CEWIT'S objectives are to assist companies in creating high quality jobs within NYS, assist companies in developing core competencies and new businesses, expand sponsored research and development programs, maximize the commercial potential of university research, provide students with opportunities to develop hands-on skills, and optimize operational efficiency.

# NYSTAR's Center of Excellence Report (2021)

## Syracuse Center of Excellence in Environmental and Energy Systems Syracuse University Dr. Eric A. Schiff (interim)

### Technology Focus

Energy and Environmental Systems

### Importance to NYS

Syracuse Center of Excellence in Environmental and Energy Systems (SyracuseCoE) develops industry-university teams to shape projects, attract external funding, commercialize new products, and establish relationships with global leaders as strategic partners related to project development. It offers technical expertise, outreach opportunities to connect industry with undergraduate and graduate students, and economic development programming to bring their capabilities and competencies to bear on industry challenges. Key capabilities and competencies include: 1) advanced building systems; 2) clean and renewable energy; and 3) water resources.

### Purpose

SyracuseCoE engages academic and industry partners to accelerate development and commercialization of innovations for healthier buildings and cleaner, greener communities.

SyracuseCoE develops industry-university teams to shape projects, attract external funding, commercialize new products, and establish relationships with global leaders as strategic partners related to project development. It offers technical expertise, outreach opportunities to connect industry with undergraduate and graduate students, and economic development programming to bring their capabilities and competencies to bear on industry challenges. Key capabilities and competencies include advanced building energy and environmental systems, clean and renewable energy, and water resources.

### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|------------|----------------|------------------|---------------|
| 74       | 39            | \$599,460          | \$85,000     | \$360,139  | \$4,574,080    | \$904,795        | \$6,523,474   |

### Designations and Recognitions

| Awards / Recognition | Date Received | Recognizing Organization | Link |
|----------------------|---------------|--------------------------|------|
| Not Reported         |               |                          |      |



## NYSTAR's Center of Excellence Report (2021)

### Operating Budget

| Operating Budget     | NYSTAR Funding   | Matching Funds     |                    | Total Budget       |
|----------------------|------------------|--------------------|--------------------|--------------------|
|                      |                  | Company Cost Share | Other Sources      |                    |
| Salaries & Fringe    | \$608,819        | \$0                | \$178,584          | \$787,403          |
| Indirect Costs       | \$91,322         | \$0                | \$11,174           | \$102,496          |
| Equipment            | \$0              | \$0                | \$0                | \$0                |
| Materials & Supplies | \$31,714         | \$0                | \$3,640            | \$35,354           |
| Tuition              | \$0              | \$0                | \$0                | \$0                |
| Travel               | \$8,108          | \$0                | \$2,373            | \$10,481           |
| Subcontractors       | \$23,633         | \$0                | \$196,127          | \$219,760          |
| Other                | \$30,417         | \$0                | \$650,592          | \$681,009          |
| <b>Total</b>         | <b>\$794,013</b> | <b>\$0</b>         | <b>\$1,042,490</b> | <b>\$1,836,503</b> |

**Federal Funding Included: \$272,091**

### Capital Expenditures

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

### Companies Served and Projects

| # of Companies served | # of projects on-going | # of projects completed | # of students engaged with companies during reporting period |
|-----------------------|------------------------|-------------------------|--|
| 20                    | 47                     | 31                      | 60   |

### Actual or Anticipated New Products or Processes with Commercial Application

| Patent Name  | Inventor         | Co-inventor    | Patent Number | Description  |
|--|------------------|----------------|---------------|--|
| Technology Innovation for IoT and Data Analytics   | Joe Casper       | Chris Nolan    |               | IoT Technology for Sports Lighting System  |
| Fan Aerodynamics for Energy Efficiency and Noise Reduction                                     | Thong Dang       | Mehmet Sarimut |               | The invention is for a "Compact, high-efficiency air handling unit for residential HVAC systems".                                |
| Development of Novel Quartz Crystal Microbalance Sensors for Environmental Signature Detection | James T. Spencer | Fred Schlereth |               | Potentially of great use for the rapid and reliable detection of a wide variety of chemical and biological analytes.             |
| Aft Rotor Ducted Wind Turbine  | Ken Visser       |                | 10563635      | The aft mounted rotor maximizes potential power output from a ducted turbine, and optimizes air flow, creating more electricity. |

### Start-up Companies Formed

| Company Name         | City         | Product/Service                 | Sector       |
|----------------------|--------------|---------------------------------|--------------|
| <b>BloomOptix</b>    | Syracuse, NY | Harmful Algae Bloom Detection   | Environment  |
| <b>M3 Innovation</b> | Syracuse, NY | LED Sports Lighting / Royalties | LED Lighting |

## NYSTAR's Center of Excellence Report (2021)

### Licensing and Other Agreements

| Project             | Inventor   | Licensing Partner   |
|---------------------|------------|---------------------|
| Small Wind Turbines | Ken Visser | Clarkson University |

### Science and Technical Activities with Students

During the period, SyracuseCoE faculty, staff and students participated as guest speakers and facilitators in area high school science classes and hosted classroom tours of specific labs at SyracuseCoE. SyracuseCoE hosted faculty engagements with community-based STEM organizations, including the Museum of Science and Technology (MOST) and summer science camps. SyracuseCoE offered frequent tours of the LEED Platinum facility to many K-12 schools and community college classes from throughout Central New York. Tours and in-person engagements with students were placed on hold in mid-March 2020, due to the COVID-19 pandemic.

### Strategic plan

SyracuseCoE strategically targets opportunities for innovations that improve indoor environmental quality and energy efficiency in buildings; provide clean and renewable energy; and improve resilience to storms, grid blackouts, epidemics, and other disasters in urban communities. In addition, SyracuseCoE targets opportunities to engage NYS firms in four key industry sectors: clean technology; digital and electronic devices; advanced manufacturing; and research and engineering services. In the five-county Central New York region alone, firms in these four sectors employ more than 15,000 workers.

# NYSTAR's Center of Excellence Report (2021)

## Center of Excellence in Data Science University of Rochester Walt Johnson, PhD

### Technology Focus

Data Science

### Importance to NYS

The Center of Excellence in Data Science (CoE) is part of a unified strategy to establish the region and the State of New York as a hub for new talent and a leader in analyzing and commercializing the limitless uses of data to improve quality of life and fuel economic growth.

### Purpose

The CoE leverages and further supports the data science expertise at the University of Rochester's Goergen Institute for Data Science (GIDS) with faculty across disciplines of computer science, medicine, brain and cognitive sciences, biomedical engineering, optics, electrical and computer engineering, chemistry, business, biology and other fields.

The CoE is focused on developing and expanding industry partnerships by applying data science in three primary domains: Health Analytics; Artificial Intelligence & Cognitive Science; and Cyber-physical Systems.

Additionally, the CoE is committed to the development of new data science methods, tools, and infrastructure to drive discovery across these domains and many others, building upon our core strengths surrounding imaging and optics.

The CoE is capitalizing on University infrastructure and expertise in data science and high-performance computing, while leveraging collaborations with other academic partners, industry, and government agencies. Thanks to support from NYS and IBM, the University is already among the most powerful university-based supercomputing sites in North America. Major investments have developed an outstanding high-performance computing infrastructure to support data science research and analytics.

### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds  | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|-------------|----------------|------------------|---------------|
| 14       | 11            | \$1,529,857        | \$1,556,960  | \$1,473,990 | \$13,500,000   | \$23,000         | \$18,083,807  |

### Designations and Recognitions

| Awards / Recognition | Date Received | Recognizing Organization | Link |
|----------------------|---------------|--------------------------|------|
| Not Reported         |               |                          |      |

NYSTAR's Center of Excellence Report (2021)

**Operating Budget**

| Operating Budget     | NYSTAR Funding     | Matching Funds     |                  | Total Budget       |
|----------------------|--------------------|--------------------|------------------|--------------------|
|                      |                    | Company Cost Share | Other Sources    |                    |
| Salaries & Fringe    | \$824,949          | \$0                | \$630,947        | \$1,455,896        |
| Indirect Costs       | \$123,742          | \$0                | \$94,642         | \$218,384          |
| Equipment            | \$8,975            | \$0                | \$0              | \$8,975            |
| Materials & Supplies | \$5,839            | \$0                | \$0              | \$5,839            |
| Tuition              | \$5,350            | \$0                | \$0              | \$5,350            |
| Travel               | \$6,712            | \$0                | \$3,031          | \$9,743            |
| Subcontractors       | \$0                | \$0                | \$0              | \$0                |
| Other                | \$51,707           | \$0                | \$7,587          | \$59,294           |
| <b>Total</b>         | <b>\$1,027,274</b> | <b>\$0</b>         | <b>\$736,207</b> | <b>\$1,763,481</b> |

**Capital Expenditures**

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total      |
|-----------------------------|----------------|---------|---------------|---------|------------|
| Stabilized HeNe Laser       | \$4,376.80     | \$0     | \$0           | \$0     | \$4,376.80 |

**Companies Served and Projects**

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 14                    | 3                      | 9                       | 14                                   |

**Actual or Anticipated New Products or Processes with Commercial Application**

| Patent Name   | Inventor       | Co-inventor                       | Patent Number | Description   |
|---|----------------|-----------------------------------|---------------|---|
| Perimetry Based Training Location Assessment  | Krystel Huxlin | Matt Cavanaugh                    |               | Software developed to assess Humphrey Visual Fields, a clinical measurement standardly used in Ophthalmology, to determine regions of the visual field likely to recover in patients affected by Homonymous Hemianopia.   |
| Efficacy of visual training for recovering sight in stroke patients                         | Krystel Huxlin | Matt Cavanaugh                    |               | A method of automatically changing the location of training for a psychophysical training program. This method monitors patient performance between sessions, adjusts the following sessions to a new location that would be better served by the training, or keeps the location identical if additional training is needed. |
| Feature-based attention modification to visual retraining technology for cortical blindness | Krystel Huxlin | Matt Cavanaugh<br>Marisa Carrasco |               | A visual training program which includes a feature-based attention cue at fixation during retraining of cortically blind fields in patients suffering from Homonymous Hemianopia.   |
| Multimodal microscopy for the identification of microplastics on nanomembranes              | Wayne Knox     | Jim McGrath,<br>Greg Madjeski     |               | The capture of micromaterials on membranes is an opportunity in the area of microplastics. This invention would use heat, birefringence, and/or   |

NYSTAR's Center of Excellence Report (2021)

|                                   |               |                                       |                 |  |
|-----------------------------------|---------------|---------------------------------------|-----------------|--|
|                                   |               |                                       |                 | intrinsic fluorescence to identify the types of plastics inexpensively.  |
| Absolute Linear-In-K Spectrometer | Changsik Yoon | Jannick Rolland-Thompson, Aaron Bauer | Appl # 62834568 | A detector system for Fourier spectroscopy such as a spectral domain optical coherence tomography instrument includes a diffractive optic for diffracting the interfering light into angularly dispersed wavenumbers, a prism for reduces an on-linear angular dispersion among the wavenumbers, and a focusing optic for on-verting the angularly dispersed wavenumbers from the prism into spatially distributed wavenumbers along a detector having an array of pixels. A field lens between the focusing optic and the detector has a freeform surface for more evenly distributing the wavenumbers along the array of pixels. |

**Start-up Companies Formed**

| Company Name | City          | Product/Service                | Sector |
|--------------|---------------|--------------------------------|--------|
| Parverio     | Rochester, NY | Microplastic test and analysis |        |

**Licensing and Other Agreements**

| Project      | Inventor | Licensing Partner |
|--------------|----------|-------------------|
| Not Reported |          |                   |

**Science and Technical Activities with Students**

Not Reported.

**Strategic plan**

Not Reported.

NYSTAR's Center of Excellence Report (2021)

**CoE in Healthy Water Solutions**  
**Clarkson University/ SUNY ESF**  
**Stefan Grimberg/Steven Shaw (co-directors)**

**Technology Focus**

Clean Water

**Importance to NYS**

New York State enjoys an abundance of clean, fresh water that serves as a basis for recreation, tourism, agriculture, fishing and manufacturing. The streams, rivers, lakes, and coastal waters provide habitat for a wide array of aquatic plants and animals. As such, the quality of life and economy rely heavily on access to protected and clean waters. The mission of the Center of Excellence in Healthy Water Solutions (the Center) is to generate solutions that help protect and improve waters for sustainable, natural environments, healthy populations, resilient communities, and sound economies. To fulfill that mission the Center is sponsoring faculty teams to develop innovative technologies to mitigate emerging contaminants such as Perfluorooctane sulfonic acid (PFOS) and harmful algae blooms. The Center is actively supporting commercialization efforts of start-up companies addressing critical water treatment challenges.

**Purpose**

The Center provides access to state-of-the-art analytical facilities to quantify contaminants in natural and treatment waters. In addition, the Center provides access to a range of experts to characterizing natural and engineered water systems. The Center is further providing training opportunities for students in industry through its internship program and is developing workforce development programs for water and wastewater treatment operators.

**Impacts**

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|------------|----------------|------------------|---------------|
| 0        | 0             | \$0                | \$0          | \$0        | \$0            | \$0              | \$0           |

\*\*No impacts reported – first year of designation was primarily spent standing up the CoE.

**Designations and Recognitions**

| Awards / Recognition | Date Received | Recognizing Organization | Link |
|----------------------|---------------|--------------------------|------|
| Not Reported         |               |                          |      |

**Operating Budget**

| Operating Budget     | NYSTAR Funding  | Matching Funds     |                 | Total Budget    |
|----------------------|-----------------|--------------------|-----------------|-----------------|
|                      |                 | Company Cost Share | Other Sources   |                 |
| Salaries & Fringe    | \$7,155         | \$0                | \$18,946        | \$26,101        |
| Indirect Costs       | \$1,073         | \$0                | \$0             | \$1,073         |
| Equipment            | \$0             | \$0                | \$0             | \$0             |
| Materials & Supplies | \$1,915         | \$0                | \$0             | \$1,915         |
| Tuition              | \$0             | \$0                | \$0             | \$0             |
| Travel               | \$4,910         | \$0                | \$0             | \$4,910         |
| Subcontractors       | \$1,497         | \$0                | \$0             | \$1,497         |
| Other                | \$150           | \$0                | \$0             | \$150           |
| <b>Total</b>         | <b>\$16,700</b> | <b>\$0</b>         | <b>\$18,946</b> | <b>\$35,646</b> |

## NYSTAR's Center of Excellence Report (2021)

### Capital Expenditures

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

### Companies Served and Projects

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 2                     | 5                      |                         | 10                                   |

### Actual or Anticipated New Products or Processes with Commercial Application

| Patent Name  | Inventor | Patent Number | Description   |
|--|----------|---------------|---|
| Electrochemical process to mitigate Harmful Algae Blooms (HAB) | Yang     |               | Invention has been disclosed and nonprovisional patent has been filed |

### Start-up Companies Formed

| Company Name | City | Product/Service | Sector |
|--------------|------|-----------------|--------|
| Not Reported |      |                 |        |

### Licensing and Other Agreements

Projects below were supported by the Center even through no licensing agreements have been formalized yet.

| Project   | Inventor            | Licensing Partner |
|---|---------------------|-------------------|
| Developing advanced scientific capabilities and new economic opportunities from harmful algal bloom detection using remotely-sensed imagery | Mountrakis & Smith  |                   |
| Defluorination and adsorption of PFAS in Wastewater   | Leem, Yoo, and Yang |                   |
| Flocculation and Removal of Harmful Cyanobacteria from water using surface-engineered polymers  | Krishnan & Romarao  |                   |
| Electrochemical process to mitigate Harmful Algae Blooms (HAB)  | Yang                |                   |
| Hydrodynamic Cavitation with Hydrogen Peroxide Addition to Mitigate Harmful Algae Blooms (HAB)  | Stephen Shaw        |                   |

### Science and Technical Activities with Students

Faculty within the Center are actively involved in a partnership program with Canton Central Schools. Through this program, Clarkson University's students develop lesson plans for middle and high-school classes focusing on the value of diverting food waste from the solid waste stream to recover energy and/or nutrients. Students learn how excessive nutrients impact water bodies and innovative ways to manage them. Through the partnership between Clarkson University and the Canton Central School District, the Center has trained 36 college students and taught more than 821 K-12 students on the benefits of resource recovery and the need to reliably generate a "contaminant free" organic feedstock for resource recovery.

## NYSTAR's Center of Excellence Report (2021)

### **Strategic plan**

The vision of the Center is to ensure a healthy and sustainable future through the protection and conservation of water resources, while the Center's mission is to generate solutions that help protect and improve waters for sustainable natural environments, healthy populations, resilient communities, and sound economies.

This center has identified research focus areas (harmful algal blooms and per-and polyfluoroalkyl substances or PFAS treatment), funded a portfolio of projects with potential for private industry partnerships and/or commercialization, and initiated an external advisory council. The Center is currently in the process to develop a comprehensive strategic plan to ensure that its vision and mission can be achieved.



# NYSTAR's Center of Excellence Report (2021)

## Center of Excellence in Digital Game Development The NYU Game Center at New York University Naomi Clark

### Technology Focus

Software and Digital Media -- Games

### Importance to NYS

The Center of Excellence in Digital Game Development's (the Center) efforts are primarily targeted at small business development and workforce development. Part of our strategy is to raise the profile of the presence of the game industry in New York State, nationally and globally. In 2020, along with the other CoEs in Digital Game Development, the Center is working on a joint initiative at the Game Developer's Conference in San Francisco,. This is a substantial shift in outreach initiatives, and the Center anticipates it will highlight the presence of game developers in NYS and encourage companies to move to or expand in the area.

### Purpose

The Center's goal is to support and grow companies working to make games in NYS. The NYU Game Center is a program with more than 250 undergraduate and graduate students enrolled, working to complete degrees in game design. The Center also runs a game-specific Incubator and a free event series open to the public. Through both of those initiatives, the Center has a strong network of local and international companies in and around game development. The Center is an incredible resource for companies looking to hire students with backgrounds in technical and artistic aspects of game design. For both, Take-Two and the companies engaged through Internship Matching Program, the Center provides companies access to students who are eager to gain experience in the industry, and companies provide students with the professional training they need to thrive in the game industry. Similarly, in partnership with the Bigglesworth Family Foundation and building off of experience running a project incubator, the Center has significant experience in evaluating which teams and projects are most likely to succeed with continued funding.

### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|------------|----------------|------------------|---------------|
| 5        | 2             | \$33,342           | \$36,075     | \$0        | \$125,250      | \$2,643          | \$197,310     |

### Designations and Recognitions

| Awards / Recognition                          | Date Received | Recognizing Organization | Link  |
|---|---------------|--------------------------|---|
| 3 <sup>rd</sup> Ranked School for Game Design | 3/3/2020      | The Princeton Review     | <a href="https://www.princetonreview.com/press/game-design-press-release">https://www.princetonreview.com/press/game-design-press-release</a>   |
| Various                                       | 2020          | Various                  | <a href="https://gamecenter.nyu.edu/launches-awards-and-accomplishments-game-center-community-2020-highlights/">https://gamecenter.nyu.edu/launches-awards-and-accomplishments-game-center-community-2020-highlights/</a> |

## NYSTAR's Center of Excellence Report (2021)

### Operating Budget

| Operating Budget     | Matching Funds   |                    |                  | Total Budget     |
|----------------------|------------------|--------------------|------------------|------------------|
|                      | NYSTAR Funding   | Company Cost Share | Other Sources    |                  |
| Salaries & Fringe    | \$83,802         | \$0                | \$141,239        | \$225,041        |
| Indirect Costs       | \$0              | \$0                | \$33,756         | \$33,756         |
| Equipment            | \$0              | \$0                | \$0              | \$0              |
| Materials & Supplies | \$0              | \$0                | \$0              | \$0              |
| Tuition              | \$0              | \$0                | \$0              | \$0              |
| Travel               | \$0              | \$0                | \$2,903          | \$2,903          |
| Subcontractors       | \$0              | \$0                | \$0              | \$0              |
| Other                | \$81,940         | \$0                | \$67,084         | \$149,024        |
| <b>Total</b>         | <b>\$165,742</b> | <b>\$0</b>         | <b>\$244,982</b> | <b>\$410,724</b> |

### Capital Expenditures

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

### Companies Served and Projects

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 17                    | 10                     | 7                       | 35                                   |

### Actual or Anticipated New Products or Processes with Commercial Application

| Patent Name  | Inventor | Co-inventor | Patent Number | Description |
|--------------|----------|-------------|---------------|-------------|
| Not Reported |          |             |               |             |

### Start-up Companies Formed

| Company Name      | City         | Product/Service                                     | Sector                   |
|-------------------|--------------|---|--------------------------|
| Eat Melon Studios | Brooklyn, NY | Tabletop & digital games (Nothing to See Here game) | Software & Digital Media |
| Ice Toad Studio   | Brooklyn, NY | Digital games (AiliA game)                          | Software & Digital Media |
| Solimporta LLC    | Brooklyn, NY | Digital games (despelote game)                      | Software & Digital Media |

### Licensing and Other Agreements

| Project      | Inventor | Licensing Partner |
|--------------|----------|-------------------|
| Not Reported |          |                   |

### Science and Technical Activities with Students

The Center held The Future Game Designer's Program, from February – May 2020, a free 14-week program for local high-school students from under-represented backgrounds in the game industry. Sixteen students completed over 100 hours of game design and development coursework.

Additionally, the Center held the Summer High School Program for Game Designers in January and February, which is an intensive (remote) summer course for high school students around the world. Sixteen students earned six-college credits in game design and development coursework and learned about careers in the game industry.

## NYSTAR's Center of Excellence Report (2021)

### **Strategic plan**

The Center is a program with more than 250 undergraduate and graduate students enrolled, working to complete degrees in game design. The Center is an incredible resource for companies looking to hire students with backgrounds in technical and artistic aspects of game design. For both, Take-Two and the companies the Center works with in its Internship Matching Program, it provides companies access to students who are eager to gain experience in the industry, and companies provide students with the professional training they need to thrive in the game industry. Similarly, the Center's partnership with the Bigglesworth Family Foundation, thanks to the Center's experience running a project incubator, it has significant experience in evaluating which teams and projects are most likely to succeed with continued funding.

# NYSTAR's Center of Excellence Report (2021)

## Center of Excellence in Digital Game Development Rensselaer Polytechnic Institute Benjamin Chang, Director

**Technology Focus** Digital Game Development, Analog Game Design, Virtual Reality, Augmented Reality, Artificial Intelligence

### Importance to NYS:

Games are a transformative medium, a new way of telling stories, and a new way to connect. In 2020, the digital games market was estimated at over \$85B in the U.S. with global revenues of nearly \$180B. The pandemic has highlighted the importance of games as a way to bring people together virtually and has accelerated what was already a rapidly growing industry. Game technologies drive innovation beyond entertainment, from applications of virtual reality to game-based learning to the Graphics Processing Unit (GPU) computing revolution. Console games, PC games, mobile games, e-sports, and virtual reality experiences are all part of this continually evolving sector, while analog tabletop games are also experiencing a resurgence. Independent game developers, or "indies", continue to push the medium with creativity and innovation. New York is home to a strong and growing community of game studios and has all the ingredients to become a global hub.

### Purpose

The Center of Excellence in Digital Game Development (the Center) works to grow the games industry in New York State, establish the Capital Region and the state as a hub in the global games industry, and advance research in games. The Center leverages the expertise of Rensselaer's Games and Simulation Arts and Sciences Program, and works with industry partners, community organizations, economic development agencies, and other partners.

The Center's activities and collaborations include: incubators and entrepreneurship programs; public events; internships; mentoring; STEM and STEAM educational programs; teacher training; game jams and hackathons; graduate student research in games; and exhibitions at trade shows and conferences. The Center and associated faculty advance research in games, including game AI, virtual reality, educational and serious applications of games, wargaming, historical simulation, and the connections between visualization, perception, and cognition.

### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|------------|----------------|------------------|---------------|
| 6        | 0             | \$371              | \$50,340     | \$12,000   | \$3,000        | \$1,200          | \$66,911      |

### Designations and Recognitions

| Awards / Recognition   | Date Received | Recognizing Organization  | Link  |
|--|---------------|---------------------------|---|
| Best American Civil War Board Wargame <i>Chancellorsville 1863</i> by Maurice Suckling |               | Charles S. Roberts Awards | <a href="https://charlieawards.wordpress.com/">https://charlieawards.wordpress.com/</a>   |
| #19 Top Game Design College Program internationally                                    | 3/21          | Princeton Review          | <a href="https://www.princetonreview.com/college-rankings/game-design">https://www.princetonreview.com/college-rankings/game-design</a> |

## NYSTAR's Center of Excellence Report (2021)

### Operating Budget

| Operating Budget Description | NYSTAR Funding   | Matching Funds     |                  | Total Budget     |
|------------------------------|------------------|--------------------|------------------|------------------|
|                              |                  | Company Cost Share | Other Sources    |                  |
| Salaries & Fringe            | \$61,876         | \$0                | \$69,239         | \$131,115        |
| Indirect Costs               | \$0              | \$0                | \$0              | \$0              |
| Equipment                    | \$0              | \$0                | \$4,314          | \$4,314          |
| Materials & Supplies         | \$12,499         | \$0                | \$26             | \$12,525         |
| Tuition                      | \$18,070         | \$0                | \$9,730          | \$27,800         |
| Travel                       | \$3,884          | \$0                | \$140            | \$4,024          |
| Subcontractors               | \$30,000         | \$0                | \$0              | \$30,000         |
| Other                        | \$43,502         | \$0                | \$130,328        | \$173,830        |
| <b>Total</b>                 | <b>\$169,831</b> | <b>\$0</b>         | <b>\$213,777</b> | <b>\$383,608</b> |

### Capital Expenditures

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reported                | \$0            | \$0     | \$0           | \$0     | \$0   |

### Companies Served and Projects

| # of Companies Served | # of projects on-going | # of projects completed | # of students engaged with companies |
|-----------------------|------------------------|-------------------------|--------------------------------------|
| 12                    | 3                      | 4                       | 15                                   |

### Actual or Anticipated New Products or Processes with Commercial Application

| Patent Name  | Inventor | Co-inventor | Patent Number | Description |
|--------------|----------|-------------|---------------|-------------|
| Not Reported |          |             |               |             |

### Start-up Companies Formed

| Company Name     | City     | Product/Service   | Sector        |
|------------------|----------|---|---------------|
| Pine Drake Games | Troy, NY | Digital games with unique style, adventure, and puzzles   | Digital Games |
| Toothpike Games  | Troy, NY | Digital games with analog inspiration; emergent narrative | Digital Games |

### Licensing and Other Agreements

| Project      | Inventor | Licensing Partner |
|--------------|----------|-------------------|
| Not Reported |          |                   |

### Science and Technical Activities with Students

The Center works with local partners to foster student interest in not just the fun of playing games, but the technical innovation, imagination, and teamwork involved in creating games.

The Center supported the Questar III BOCES Summer Stem Research Institute, which gives teachers hands-on experience in industry or research labs. In 2019 and 2020, the Center supported teachers studying the field of videogames, including programming, art, English Language Arts, creative writing, math, and physics. The teachers worked with Albany game studio Vicarious Visions. After completing the two-year program,

## NYSTAR's Center of Excellence Report (2021)

teachers developed new curriculum for their school districts and published a website with curriculum modules integrated with NYS standards; and the program received the Champions of Change award from the NYS Boards Association.

### **Strategic plan**

The broad focus and mission of the Center is to advance research in games, and support and grow the games industry in the Capital Region. The Center works closely with local companies, economic development entities, and community groups to identify needs and opportunities.

The overall strategy includes: (1) the talent pipeline; (2) supporting new companies and independent developers; (3) promoting the work of developers in the Capital Region and the outstanding games made in NY; (4) advancing research in games and connecting research to industry; and (5) expanding opportunity and diversity in games.

## NYSTAR's Center of Excellence Report (2021)

### Center of Excellence in Digital Game Development - MAGIC Center Rochester Institute of Technology Dr. David Long, Center Director

#### Technology Focus

Digital media research, production and publication, including games, film, augmented reality, virtual reality, and more.

#### Importance to NYS

The Rochester Institute of Technology's Center for Media, Arts, Games, Interaction & Creativity (MAGIC) fosters collaboration between the academic research community and the business and technology sectors, while developing and commercializing new media and technologies; promoting investment in digital media production in New York State; helping to create and/or expand technology-related businesses and employment; and retaining a highly educated student workforce.

#### Purpose

MAGIC utilizes resources, equipment, facilities, and personnel to grow the digital media field and specifically the games industry in NYS. This is accomplished by fostering community and talent in K-12; supporting students who are interested in publishing games through the Maker Program; supporting indie developers through the Community Incubator Program; showcasing and playtesting games being developed in the community at the annual Rochester Game Festival, at conferences/festivals and events in around NYS and across the country (virtually); and creating and retaining jobs in digital media production.

#### Impacts

| New Jobs | Retained Jobs | Increased Revenues | Cost Savings | Govt Funds | Non-Govt Funds | Capital Improv's | Total Impacts |
|----------|---------------|--------------------|--------------|------------|----------------|------------------|---------------|
| 0        | 0             | \$0                | \$0          | \$0        | \$0            | \$29,000         | \$29,000      |

#### Designations and Recognitions

| Awards / Recognition                              | Date Received | Recognizing Organization                   | Link  |
|---|---------------|--|---|
| Vicarious Visions/RIT Memorandum of Understanding | July 2020     | Vicarious Visions (Blizzard Entertainment) | <a href="https://www.rit.edu/news/rits-magic-center-and-vicarious-visions-sign-agreement-expand-collaborations">https://www.rit.edu/news/rits-magic-center-and-vicarious-visions-sign-agreement-expand-collaborations</a> |
| Epic Games "Megagrant"                            | December 2020 | Epic Games                                 | <a href="https://www.rit.edu/news/professor-driving-multidisciplinary-research-real-time-technology">https://www.rit.edu/news/professor-driving-multidisciplinary-research-real-time-technology</a>                       |

## NYSTAR's Center of Excellence Report (2021)

### Operating Budget

| Operating Budget     | NYSTAR Funding   | Matching Funds     |                  | Total Budget     |
|----------------------|------------------|--------------------|------------------|------------------|
|                      |                  | Company Cost Share | Other Sources    |                  |
| Salaries & Fringe    | \$179,495        | \$0                | \$213,501        | \$392,996        |
| Indirect Costs       | \$26,924         | \$0                | \$0              | \$26,924         |
| Equipment            | \$5,177          | \$0                | \$0              | \$5,177          |
| Materials & Supplies | \$1,668          | \$0                | \$0              | \$1,668          |
| Tuition              | \$0              | \$0                | \$0              | \$0              |
| Travel*              | -\$15,553        | \$0                | \$0              | -\$15,553        |
| Subcontractors       | \$0              | \$0                | \$0              | \$0              |
| Other                | \$42,367         | \$0                | \$77,671         | \$120,038        |
| <b>Total</b>         | <b>\$240,078</b> | <b>\$0</b>         | <b>\$291,172</b> | <b>\$531,250</b> |

\*Refund of canceled GDC hotel due to COVID

### Capital Expenditures

| Capital Equipment Purchases | NYSTAR Funding | Federal | Other Sources | In-kind | Total |
|-----------------------------|----------------|---------|---------------|---------|-------|
| Not Reporte                 | \$0            | \$0     | \$0           | \$0     | \$0   |

### Actual or Anticipated New Products or Processes with Commercial Application

| Reporting Period | Published Game Name      | Inventor     | Patent Number | Description |
|------------------|--------------------------|--------------|---------------|-------------|
| 2020             | Tengam (Nintendo Switch) | David Kilmer | N/A           | Video Game  |

### Start-up Companies Formed

| Company Name       | City          | Product/Service |
|--------------------|---------------|-----------------|
| Possum House Games | Rochester, NY | Video games     |

### Science and Technical Activities with Students

MAGIC continues to engage the K-12 population by raising awareness of career opportunities in the digital media fields and specifically the games industry. Outreach efforts for the reporting period included multiple K-12 workshops (in person and virtual) as well as with several community organizations, including The Strong Museum and ROC Game Dev and hosting the annual Rochester Game Festival.

### Strategic plan

MAGIC is a resource for the RIT and Rochester communities and beyond. The Center leverages state-of-the-art facilities, professional and academic networks, faculty and student expertise in digital media research and production. MAGIC provides unique facilities that are available for film, games, and interactive media design. MAGIC facilities were built for delivering hands-on curriculum in game design, 2D and 3D animation, filmmaking, and digital design. RIT students learn using the same hardware and software platforms found in industry while honing their technical and creative skills. A fully outfitted sound stage and post-production studios further enhance experiential education opportunities and permit faculty to introduce real-world film, animation, and digital media workflows to the classroom.

MAGIC's activity and engagement in the community spans the physical studio and post-production spaces to co-work suites available to host companies for long-term engagements. MAGIC's strengths and strategic



## NYSTAR's Center of Excellence Report (2021)

priorities are: teaching; scholarship; exhibition; entrepreneurship; and commercial and economic development. MAGIC is a catalyst for economic growth throughout the Rochester region and NYS. Students are hired to work as co-ops/interns and full-time employees at MAGIC to develop their own intellectual property as well as research, and contracted for-hire services in digital media production for external clients wishing to engage with RIT. MAGIC facilities serve to showcase the creative output of RIT students and faculty and provide a performance platform for the campus and the Rochester community. We also serve as a premier campus event space for academic and community activities associated with the MAGIC core mission.

MAGIC provides a home for start-up incubation and the commercialization of digital media products. Students bring their ideas and are supported with funding, business start-up mentorship, and access to a full suite of technical tools. Core to entrepreneurial support is the MAGIC Maker Program, a competitive program that allows students to pitch digital media product ideas and earn both experiential education co-op credit and start-up funding for publication and commercialization. The Center supports indie developers in the Rochester community through the Community Incubator Program, a program that was modeled after the successful student Maker Program.

MAGIC was built in collaboration with RIT's nationally ranked academic programs from the School of Film and Animation, School of Interactive Games and Media, and School of Design. Faculty from all three programs live and work in the building, developing curriculum and engaging students at the undergraduate and graduate levels. MAGIC is an RIT-designated Research Center of Excellence housed within the Office for the Vice President of Research and is also home to the Frameless Labs [initiative](#).