

**ASSEMBLY STANDING COMMITTEE ON ECONOMIC DEVELOPMENT,  
JOB CREATION, COMMERCE AND INDUSTRY**

**ASSEMBLY STANDING COMMITTEE ON SMALL BUSINESS**

**CHRISTINA P. ORSI**

Associate Vice President for Economic Development, University at Buffalo

**NORMA J. NOWAK, PhD**

Executive Director NYS Center of Excellence in Bioinformatics & Life Sciences  
Co-Director UB Center for Advanced Technology in Big Data & Health Sciences

**JOINT TESTIMONY**

**Joint Oversight Hearing**

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Thank you to Assembly Member Schimminger and to Assembly Member Thiele for inviting us to testify regarding the effectiveness of New York's economic development programs. We are pleased to report that thanks to the University at Buffalo's state-supported programs, we are making significant contributions to both technology advancements and the region's innovation economy.

We would also like to acknowledge and thank our industry partners who have joined us today – Dr. Irfan Khan from Circuit Clinical and Mr. Wayne Bacon from Garwood Medical. They will speak about their companies' collaborations with our state-supported programs.

The University at Buffalo is the largest, most comprehensive public research university in the State University at New York system, and is internationally renowned for academic excellence. A powerful economic engine for Western New York, UB attracts research funds and generates hundreds of inventions, patents and start-up companies, making it the region's center of innovation and the foundation for its competitive workforce.

We are honored to represent UB and the university's state supported, technology-based economic development programs – the New York State Center of Excellence in Bioinformatics & Life Sciences (CBLS), the New York State Center of Excellence in Materials Informatics (CMI) Excellence, the Center for Advanced Technology in Big Data & Health Sciences (UB CAT), the hot spot known as the WNY Incubator Network (WIN) and the Center for Computational Research (CCR) - part of the New York State High Performance Computing Consortium - all of which are supported by NYSTAR, a division of Empire State Development. These critical programs partner our faculty experts and technological assets with industry to facilitate economic growth.

Driving Innovation

In Fiscal Year 2017, UB was awarded over \$401M in grants, mostly from the federal government, bringing new resources to the region. These dollars are spent on research, seeking knowledge that leads to new cures, improved processes, stronger materials, faster computers, smarter software, smaller machines and thousands of other improvements.

UB ranks 59th among U.S. universities for research and development (R&D) activity, according to new data from the National Science Foundation (NSF). Among the nation's public universities, UB ranked 39th and is the highest-ranked public university in New York State.

Research activity has increased significantly at UB over the past decade, with annual expenditures rising by more than \$60 million since 2007-08. (Less than \$340 million was spent that fiscal year.)

UB faculty have contributed to the invention of:

- Implantable battery-operated cardiac pacemaker
- Prostate-specific antigen (PSA) test for prostate cancer
- Photodynamic cancer therapy
- Infasurf lung surfactant
- Pattern recognition software
- Talent™ thoracic stent graft
- Teleradiology 3-D viewer and data transmission system

### Innovation Hub

Recognizing UB's ability to foster collaboration and achieve results, in the spring of this year, New York State awarded the university \$32M to fund the Innovation Hub. The goal is to dramatically accelerate the commercialization of technologies generated from the university, Hauptman-Woodward Medical Research Institute, Roswell Park Comprehensive Cancer Center, Kaleida Health and Jacobs Institute to start and grow more technology companies in Buffalo Niagara.

This five-year, \$32M grant will support the innovation pipeline, startup support, technology investment fund and incubation. Specifically:

- \$13.5M in funding to support all stages of development – a continuum of early stage gap funding
- \$11.5M for programs and support services to move ideas from the lab, clinic and classroom to a start-up
- \$7M for renovations to CBLIS to make an additional 25,000 square feet of space available to Innovation Hub-affiliated start-ups

This investment represents another arrow in our region's quiver to advance discovery, collaboration, commercialization and economic impact.

### Growing the Innovation Pipeline

University alumni number 260,000 around the world, with more than 135,000 of them in New York State driving our talent pipeline.

UB is cultivating interest among undergraduates in the Science Technology Engineering and Math (STEM) fields, and working to accommodate the increased demand in these fields. Over the past five years, the number of engineering undergraduates at UB has grown by 43% and the

number of engineering graduate students has grown by 44%. UB's School of Engineering and Applied Sciences has just under 15,000 alumni in New York State.

Demand for STEM workers is growing faster than supply. Over the next decade, the US economy will need one million more STEM workers than our higher education system now produces. SUNY estimates that STEM careers are growing 2.5 times faster than other fields in New York. Our School of Engineering and Applied Sciences plays a critical role in meeting the workforce training needs of both New York State and the nation, currently producing approximately 1,100 graduates per year.

### Expanding Experiential Learning

It is an institutional priority that our university community can easily access and connect with meaningful project-based learning and service. To that end, we created the Experiential Learning Network (ELN), a dynamic hub of experiential learning opportunities. The ELN supports curricular initiatives that extend traditional boundaries of community engagement, helping students weave real-world experience into their field of study and research, thereby furthering their academic, career and civic goals.

Additionally, through the NSF-funded Interdisciplinary Science and Engineering Program (ISEP), UB faculty and doctoral students are transforming how science is taught in the Buffalo Public Schools. To date, ISEP has served some 6,000 students in class, in after-school programs and research, as well as hundreds of teachers in professional development.

UB's NYSTAR-funded Centers of Excellence and Center for Advanced Technology contribute significantly and directly to increasing both STEM students AND experiential learning opportunities through several initiatives. A terrific example being the Career Experience Program, which matches undergraduate and graduate students with the opportunity to work for a local life sciences, materials or advanced manufacturing business – at no cost to the company – for about 12 hours a week for 12 weeks in the spring semester. The company identifies a need, develops a position description, students apply through a UB web-based system, and the company selects the student. In FY 2017-18, 49 full-time UB students worked at 41 local life sciences, materials and advanced manufacturing companies, with retention rates of 50% for life sciences, and 57% for materials/advanced manufacturing.

### Economic Impact

UB's overall economic impact in FY 2017 was \$1.6B.

The university's NYSTAR-funded programs yield a significant impact based on the relatively minor investments of public dollars they represent.

In fiscal year 2017-2018, UB's NYSTAR programs:

- Created 622 new jobs,
- Industry partners acquired \$147M in private investment and
- Company revenues increased by \$37M.

Please note that these figures are self-reported by partner companies as part of a comprehensive, annual survey process. Again, these data came directly from companies that benefit from our state-supported and NYSTAR-enabled expertise and technological assets.

In other words, for only \$3.5M, New York State gained 622 private sector jobs in the last fiscal year.

UB leverages this critical NYS support to enable and nurture our region's – and the state's – innovation economy. We are the bridge between academia and industry supporting partnerships to commercialize new technology, advance existing technology and provide pathways for students to experiential learning and jobs. With new programs, policies and incentives focused on facilitating industry engagement and technology commercialization, we make it easy to partner.

UB **Connects** industry to talent, state-of-the-art equipment, and world-class researchers.

UB **Commercializes** our discoveries thanks to business expertise, entrepreneurial support and funds.

UB **Grows** NYS businesses by leveraging resources and knowledge.

We hope we have demonstrated how UB partners with New York State to steward these relatively small, individual program investments to yield tangible results and significant returns for businesses and citizens throughout the state. NYSTAR has networked its programs and centers, which ensures there is communication between experts who can provide companies with a timely and coordinated response to their needs, whether those companies are already in New York, or are out-of-state and looking to relocate. UB and the rest of the universities that comprise the NYSTAR network are proud to continue this vital and game-changing work for our state's economy.

## UB's Center for Advanced Technology in Big Data & Health Sciences (UB CAT)

The UB CAT just completed year one of its ten-year re-designation. Under its new contract, the CAT has worked to focus resources into projects and programs specifically utilizing big data and data analytics to impact health science innovations in New York State. The UB CAT is uniquely positioned to help these companies grow and succeed, largely because of its alignment with and proximity to the NYS Center of Excellence in Bioinformatics and Life Sciences (CBLS), Buffalo Institute for Genomics and Data Analytics (BIG), and Center for Computational Research (CCR). The synergies between these programs, and others under Business and Entrepreneur Partnerships (BEP), enable the UB CAT to reach more companies and offer comprehensive support packages based on their needs. When a company engages with the UB CAT, it gains access to a business development team that works to provide it with the right combination of project funding, faculty expertise, equipment, mentorship, and entrepreneur services.

In the last year, the UB CAT business development and marketing teams have worked to coordinate and enhance outreach in order to connect with new companies locally and across the state. A detailed overview of business development and marketing efforts is provided in section 4.9, and highlights include a new web-based marketing initiative for the CAT, sponsorship and participation in Buffalo Business First's Executive Forum on Big Data Analytics, in addition to strong STEM outreach in the Buffalo City School District.

During the 2017-18 project period, the UB CAT funded nine collaborative applied research projects between various New York State companies and UB faculty. For the current reporting period, the program yielded \$58.3 million dollars in non-job impacts and 136 new jobs across New York State.

## NYS Center of Excellence in Bioinformatics & Life Sciences

The New York State Center of Excellence in Bioinformatics & Life Sciences (CBLS) leverages the University's expertise and the Center's 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 state's economies. The Center empowers entrepreneurs to launch new companies, it enables the growth of existing firms, and it serves to attract relocating and expanding businesses.

Together with 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), the CBLS anchors UB's technology-based economic development (T-BED) infrastructure, providing the platform whereby the University engages with New York State to develop and implement priority projects like the Buffalo Institute for Genomics & Data Analytics (BIG), Buffalo Manufacturing Works (BMW), Start-Up NY and other large-scale, public-private partnerships. These Centers bring critical and unique assets to the region in terms of both technologies as well as teams with scientific, business development, economic development, finance and legal expertise.

In Fiscal Year 17-18, the CBLIS is responsible for \$45.7M in total non-job impacts and 156 new jobs. As of June 30, 2018, the CBLIS was home to 16 co-located companies, and UB's Start-Up NY program, which is headquartered at the Center, had registered over 100 companies.

A significant event to note during the reporting period is that UB was awarded the Innovation Hub Award for \$32M from Empire State Development. This award will convert the CBLIS into an incubator for new start-ups that are spun out of the University and our partner institutions. Space should be ready by 2020. In addition to the incubator, the award will support entrepreneurial programming, outreach and coaching. The award will also provide funds for Proof of Concept/very early stage and a Pre-seed/Equity Investment.

### NYS Center of Excellence in Materials Informatics

In 2017 and 2018, the Center for Materials Informatics (CMI) continued its mission of facilitating the use of Informatics by New York companies in materials development, product development and process control. We supported cutting edge programs with regional companies, career experience internships and participated in key New York statewide events.

In materials development, UB's Professor Johannes Hachman and Kitware Inc. made significant progress developing a suite of software to allow data-driven design of chemical systems. Professor Ed Furlani and Clean Slate UV Inc. improved equipment for rapid UV disinfection of medical phones and tablets. Professor Rahul Rai and Moog Inc. developed in-process image analysis to improve quality control and reliability of 3D printed metal components for aerospace and automotive applications.

26 Career Experience UB interns found fulfilling work with local companies in local industries and as a result nine jobs were created or retained. Outreach to K-12 students included Advanced Manufacturing Day, Buffalo Manufacturing Works 3D Print Competition, Science Exploration Day, BNMC Summer Camp and BNMC Open House Day.

In Fiscal Year 17-18, the CMI was responsible for \$36.7M in total non-job impacts and 66 new jobs. In addition, CMI participated actively in NYSTAR, Fuzehub and other statewide meetings including the Advanced Energy Conference in New York City in March 2018. Local events including 43N and Bright Buffalo were also supported.

Building relationships with partners throughout the region is also a priority directly and through UB's BEP (Business and Entrepreneur Partnerships). External partners include Buffalo Manufacturing Works, Alfred University and Insyte Consulting (Manufacturing Extension Partnership). Internal partners include the Western New York Incubator Network, Center for Computational Research, Center for Entrepreneurial Leadership, Science and Engineering Shared Equipment Facilities, and the NSF i-Corps program.

Most importantly, the relationship with UB's Department of Materials Design and Information, the USA's leading informatics center, provides access to faculty who are the thought leaders in this rapidly developing field.

In order to manage the diverse programs CMI developed a comprehensive strategy and implementation plan which will evaluate progress against goals developed in partnership with the Industrial Advisory Board and other stakeholders.

CMI is grateful for the continuing support of NYSTAR and the New York Legislature and pledges to continue to support the growth of this most important technology-enabling tool to benefit New York State manufacturers.

### Western New York Innovation Hot Spot

The WNY Innovation Hot Spot, which operates as WIN (WNY Incubator Network) is a NYSTAR supported consortium managed by UB, which has grown to include ten incubators spanning the five county WNY region.

WIN assists the roughly 200 incubated ventures in Western New York by connecting them with the vast resources, expertise, and facilities at the University at Buffalo. Moreover, WIN brings together incubator directors from across the WNY region to connect, collaborate, and share best practices.

Business incubators add tremendous vitality and resiliency to the regional economy by serving companies at their earliest – and most vulnerable – stages. In this context, WIN programs are designed to complement and enhance, rather than compete with, entrepreneurial services throughout WNY.

Since this initiative was launched at the University at Buffalo in 2014, WIN has:

- Connected dozens of incubator companies with UB talent via internships, competitions, consulting opportunities, speaking engagements, and enhanced career fair opportunities,
- Certified 22 incubator clients to leverage *NYS Innovation Hot Spot* tax incentives, adding money back to their balance sheets to fuel additional growth,
- Paired 27 incubator clients with outside experts to lead them past milestones in their scalable development through our *Embedded Consultants* program,
- Launched *Buffalo Student Sandbox* – WNY’s first accelerator program – to help more than 40 teams of disruptive student entrepreneurs take giant leaps forward,
- Piloted and expanded *Inclusive Launch*, a first of its kind diversity outreach program that provides crucial learning opportunities for underrepresented students while also providing incubator ventures with vital infusions of diversity,
- Coached dozens local ventures in our *Pitch Prep* series before they competed in the 43North & Bright Buffalo Niagara competitions.

Since program inception in 2014, ventures served by these initiatives have created more than 175 jobs for Western New Yorkers, grown revenues by more than \$8M, brought almost \$7M in federal funds to Western New York, and raised almost \$25M in venture capital. Remember – these are dramatic achievements for ventures that simply did not exist just a few years ago.

One final example is that of 3AM Innovations, which has progressed from part-time idea to surging incubator venture in the last three years. Residing in WIN partner incubator Z80 Labs,

3AM has grown to include a team of seven, boasts six formal advisors, and has established 12 official partnerships.

While still with his previous employer, founder Patrick O'Connor worked with incubator and WIN staff to focus on customer validation from the company's earliest days. The company would move on to leverage WIN's SBIR/STTR assistance program, which links applicants to professional grant writers to submit more competitive applications.

O'Connor is volunteer firefighter in suburban Buffalo who grew tired of waiting for industry to develop the necessary safety tools for first responders. His technology is a wearable device that creates a real-time mesh network that allows first responders to track and locate their members inside of buildings.

Moving on to seek additional funding sources, 3AM leveraged WIN's Pitch Prep program, which helps incubator companies prepare to approach investors for the first time. 3AM has gone on to raise more than \$500,000 in outside funding, and is approaching an additional round in the next several months.

3AM continues to leverage programs from WIN and other ecosystem partners, recently participating in WIN's "Startup Alley", which helps incubator companies hire University at Buffalo students by subsidizing and promoting their participation in on-campus career fairs. Its founding team has successfully tapped numerous entrepreneurial support programs, including START-UP NY, Z80 Labs, LaunchNY, and critically, the NYSTAR-funded Center of Excellence in Materials Informatics.

The company continues to emerge as a shining example a founder's determination, smart public investments in impactful programs, and a surging interest in regional entrepreneurship, all coming together to enable economic growth in Western New York.