

 NY CREATES



NY CREATES /The Big Picture

U.S. Government

Federal agencies that fund and oversee specific programs and centers

New York State

Empire State Development Corporation that funds and oversees programs, and negotiates industry incentive deals

SUNY RF

Contributes financing and provides administrative human resources (staffing, payroll, legal)

Industry

*- Industry Advisory Board guidance
- Contribute funding, staff, background IP for specific projects
- Industry groups (e.g. SEMI)*

NY CREATES

a 501(c)(3)

- Identifies projects
- Solicits grant funding/resources
- Develops facilities, assets
- Leads and administers major Industry/Government/Academic Programs
- Subcontracts projects
- Generates economic, educational, research and workforce benefits

Technology Research & Development

- Partner with universities and research institutions (worldwide, including SUNY) on strategic research thrusts

Economic Development & Commercialization

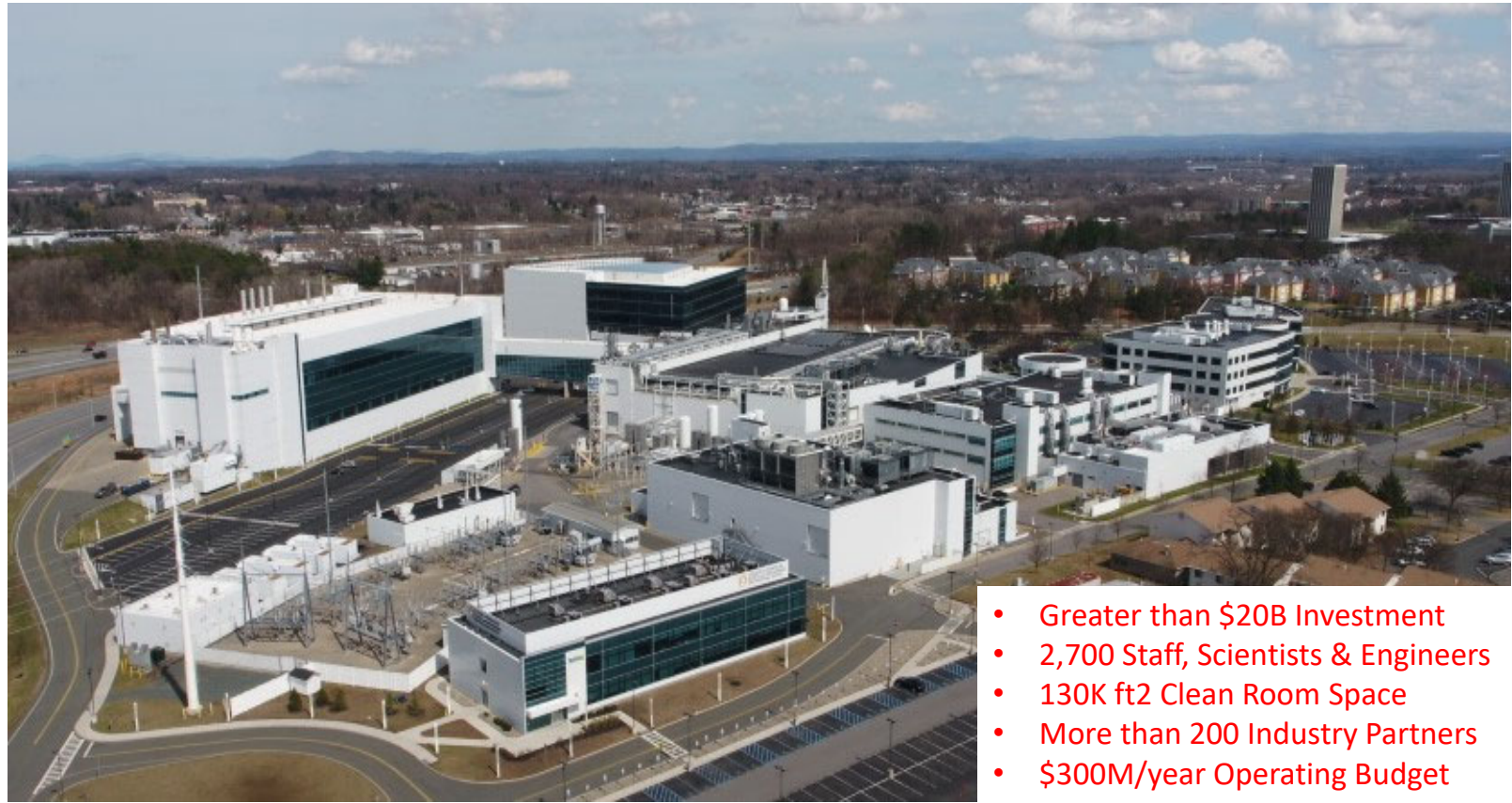
*- Catalyze company growth from start-up to exit through ideation, incubation, and investment.
- Attract talent to NY
- Attract companies to grow in NY*

Workforce Development

- Partner with universities and companies to expand programs with internships, externships, entrepreneurship mentoring, seminars and courses in advanced technology areas

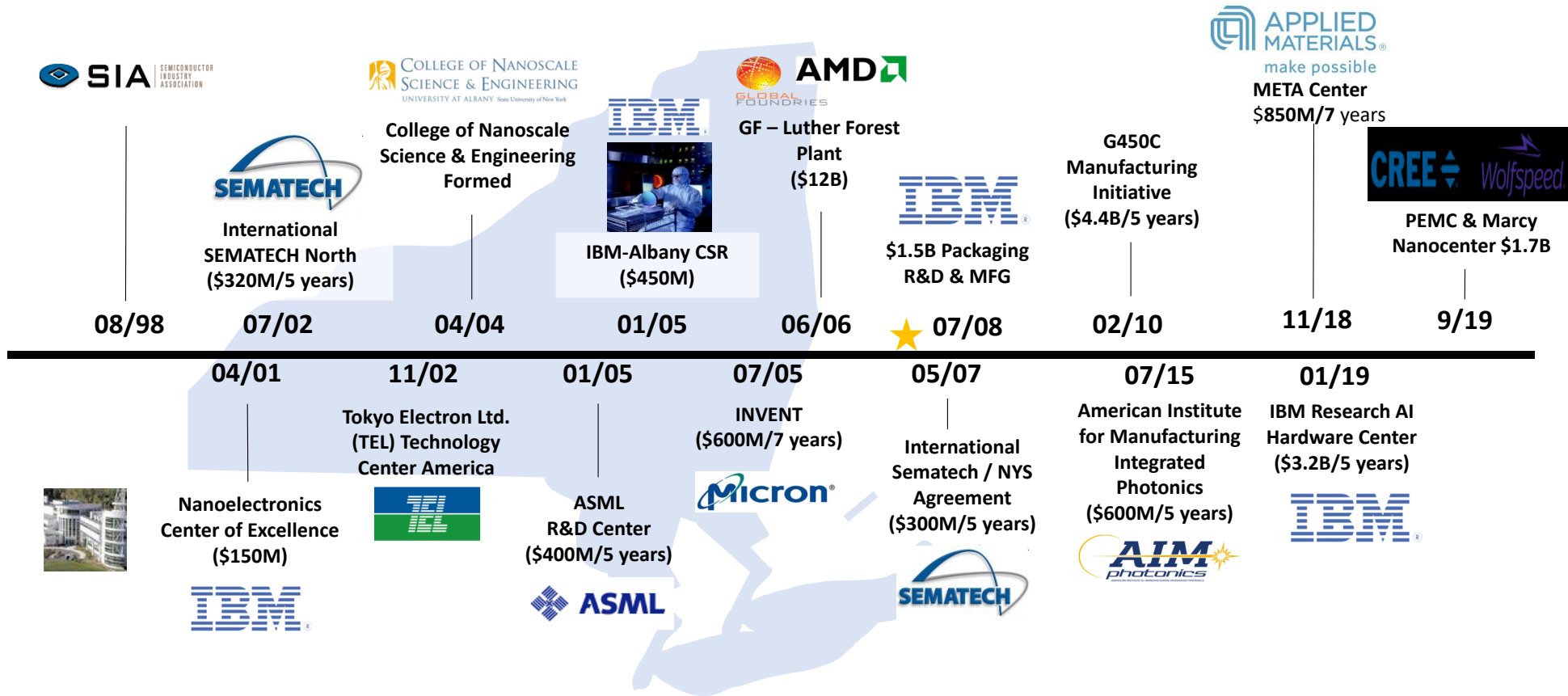
NY CREATES /Albany NanoTech Accelerating Collaboration

- NY CREATES bridges R&D, Education, Industry and Government.
- Albany NanoTech Complex is one of the most advanced facilities of its kind in the World co-located with a University.
- Doug Grose as President oversees NY CREATES' research operations, industry partnerships, and economic development initiatives.

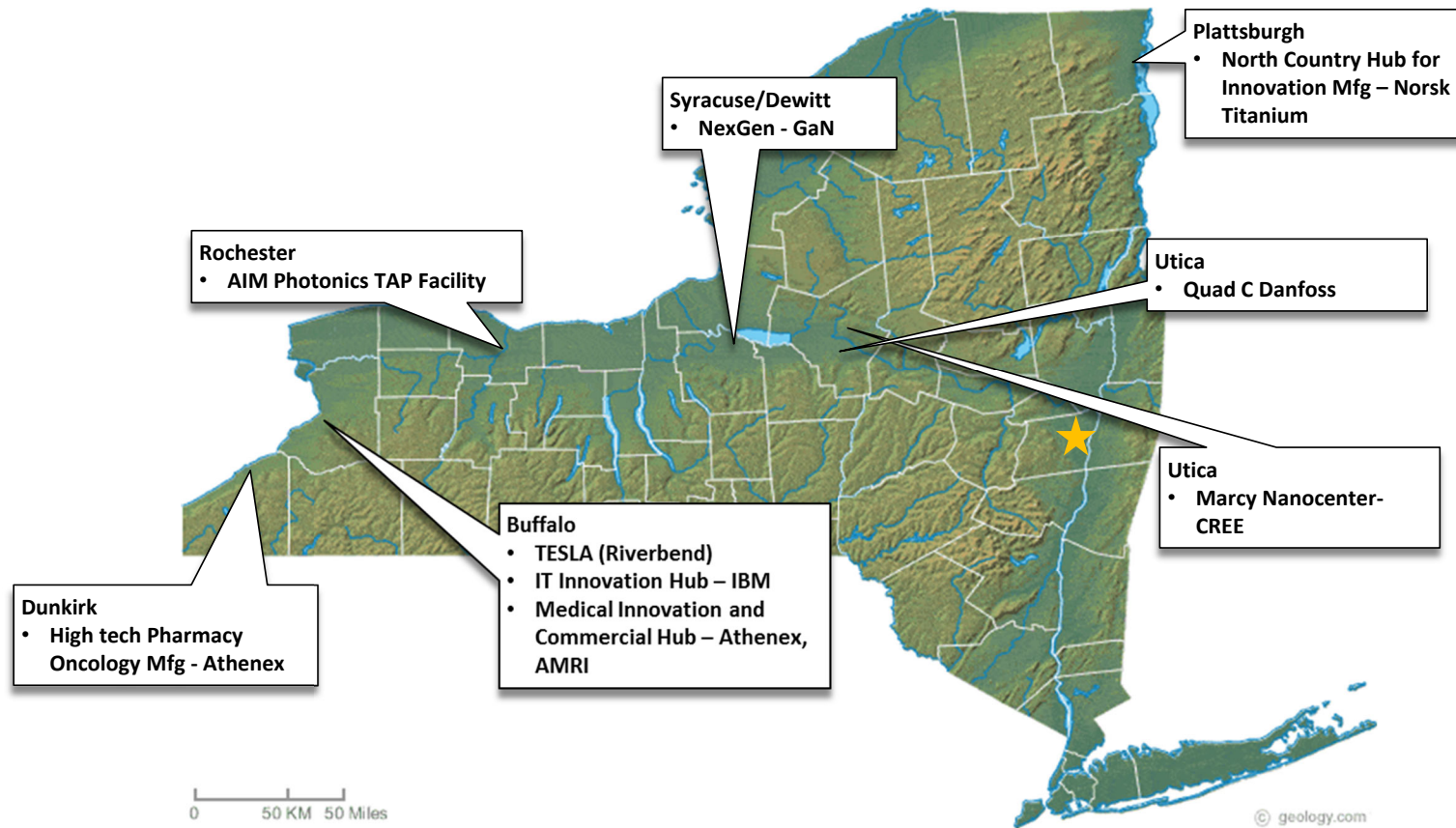


- Greater than \$20B Investment
- 2,700 Staff, Scientists & Engineers
- 130K ft² Clean Room Space
- More than 200 Industry Partners
- \$300M/year Operating Budget

NYCREATES/Major R&D Initiatives



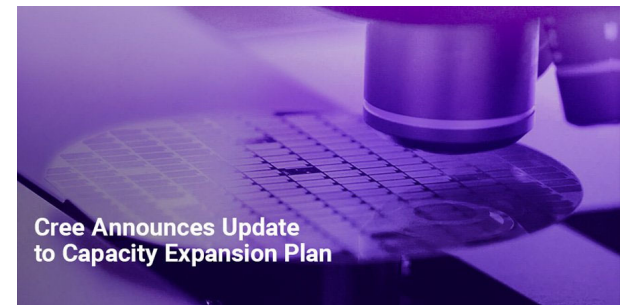
NYCREATES/SUNY Poly Site Portfolio – NY State



NYC REACTS / Major Manufacturing and Technology Initiatives

Cree/Wolfspeed
Announces Update to
Capacity Expansion
Plan - Company to
Build World's Largest
Silicon Carbide Device
Manufacturing Facility
in New York

- Total Investment of \$1.7B, \$500M from NYS
- Greater than 620 new high paying Jobs to Mohawk Valley
- Strategic partnership utilizing PEMC at Albany Nanotech Complex



NY CREATES / Center for Semiconductor Research

- The Center for Semiconductor Research (CSR) is the state-of-the-art 300mm shared semiconductor processing line

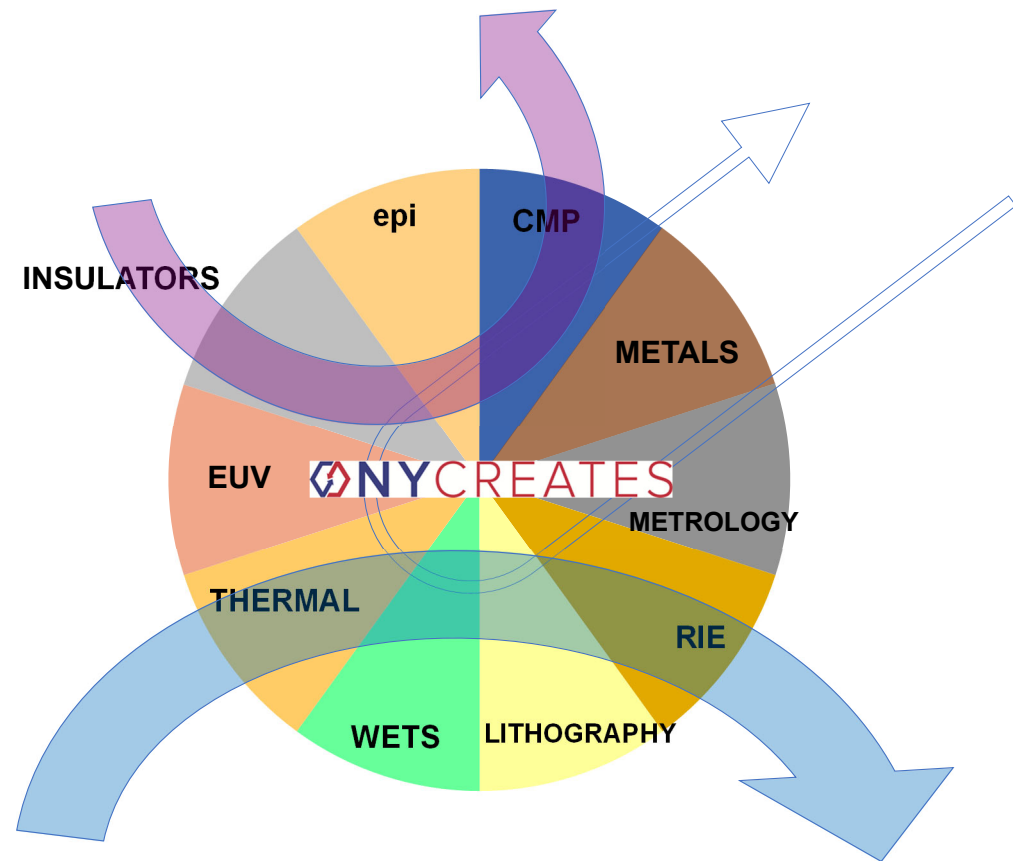


- Primary partnership with the IBM Development Alliance for advanced R&D and device manufacturing
- Additional site partnerships with leading equipment suppliers for joint development, tool, and process support



NYCREATES/Center for Semiconductor Research

- Industry technology, equipment and supply chain leaders leverage the state-of-art CSR fab
- NY CREATES team provides:
 - Process development across all sectors
 - Integration and data analysis
 - Operational execution
 - Flexible work scope

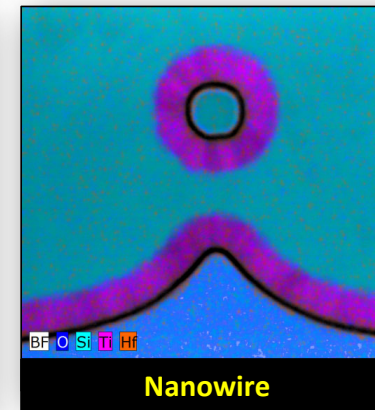
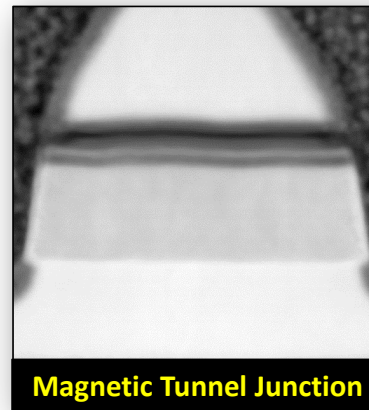
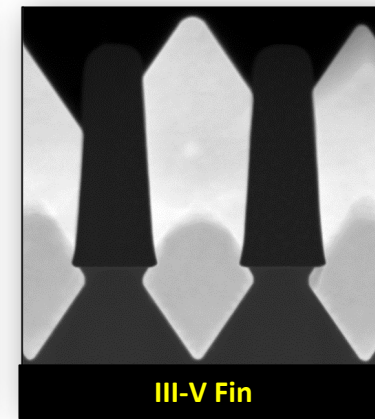


□ **Structures and Devices:**

- Planar FET & finFET
- Nanowire/Nanosheet
- Self-aligned contact integration
- High aspect-ratio trapping

□ **Materials**

- SiGe, Ge
- Ultra low-k dielectrics
- Cobalt and Ruthenium local interconnect
- Ru and other novel barrier materials
- Al₂O₃, HfO₂ dielectrics
- Magnetic memory films
- MgO tunnel dielectrics



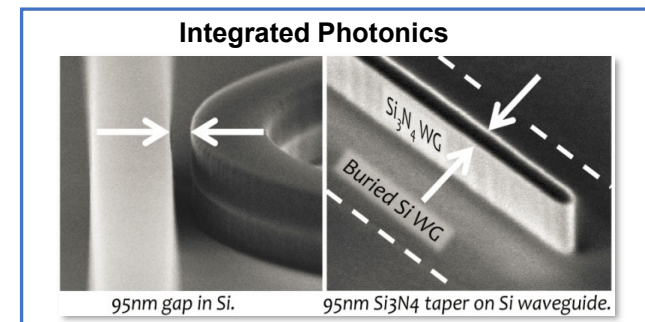
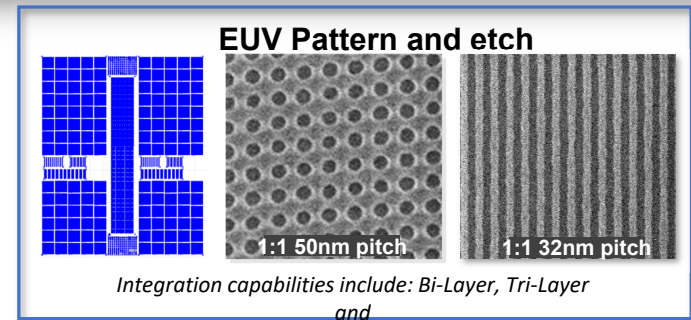
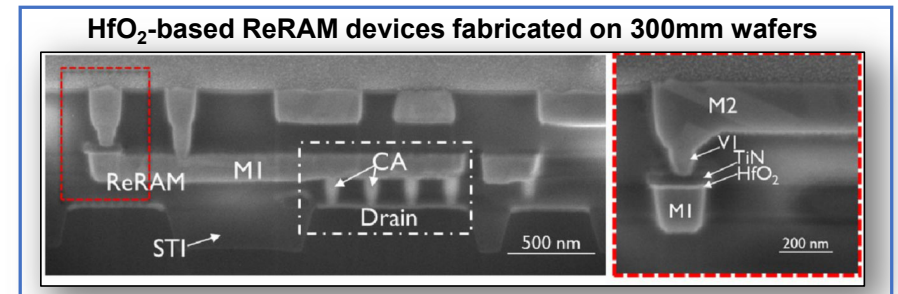
NY CREATES / Emerging Technology R&D at NY CREATES

- Strategic R&D Portfolio

- Advanced Computing Research
 - AI & Neuromorphic Computing
 - Quantum Technologies
- Integrated Photonics AIM Photonics
- Power Electronics
- Exploratory Initiatives
 - RF/Analog
 - Nano/Bio
 - Memory Platforms Supporting AI
 - Materials Discovery and Integration

- Opportunities for Collaboration

- Nano/Micro Cluster Development
- Academic MPW for Undergrad EE
- Corporate Venture Exchange



NY CREATES/Corporate Venture Exchange Results

- Corporate Venture Exchange Oct. 15th-16th ZEN Bldg.

The mission for the exchange is three-fold:

- Accelerate Technology Commercialization!
- Introduce early-stage technology companies in the Advanced Electronics space to equity funding sources.
- Facilitate relationships between Regional Innovation Ecosystem Members in Northeast North America and New York to large Corporate Venture Organizations operating in the Advanced Electronics arena.

Corporate Venture Orgs Participated

Applied Ventures, Intel Capital (virtual), TEL Ventures, LAM Capital, Ngrid Invest, NYS Innovation Fund

- Target Investment \$2M-\$100M

Target Company Parameters (Note! \$500 fee for Companies)

- ✓ Advanced Electronic (AE) Device Driven
Smart Grid, Medical Devices, Autonomous Operations, Advanced Communications, Sensor Arrays, AI Device Tech, Edge Compute Aps, Fabless IC Companies, Defense Technologies, etc.
- ✓ **23 Companies Participated**
- ✓ **To Date 26 Follow-on Meetings most Still Active**
- ✓ **2020 Program 3 Live CVEs, added 5 Corporate Venture Orgs., Semi-Monthly Webinars**

LaMar Hill President's Office NY CREATES at lhill@sunypoly.edu

A unique organization, a valued partner

NY CREATES is a non-profit R&D and innovation hub, and a commercialization accelerator headquartered in Albany, NY

- *Long-term research horizon, driven by well-structured milestones*
- *Imbued with urgency to help accelerate partner technology companies through ideation, incubation and investment stages*
- *Team of fabrication technology experts with cumulative decades of IC industry experience*
- *Leveraging a state-of-the-art 300mm wafer fab, exploiting synergies in technology R&D*

300mm wafer fab is unique – not because of size, but because it enables performance:

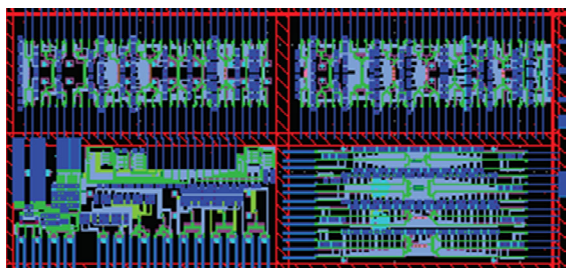
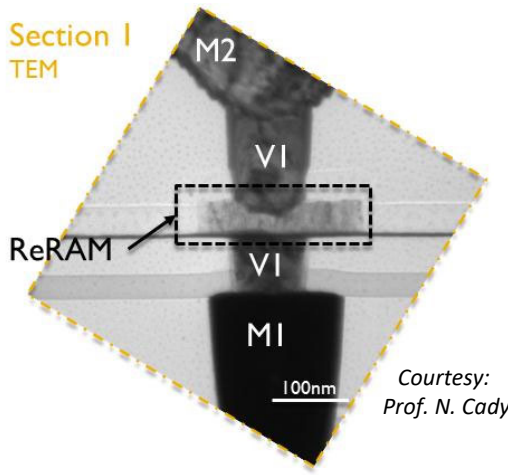
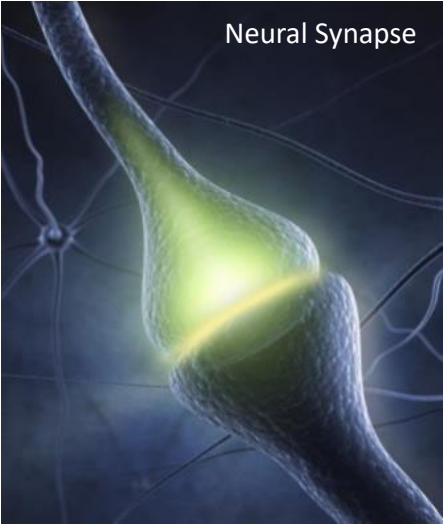
- 300mm tools are the current pinnacle of IC process technology – offering the best performance, the best materials and interfaces, and the best process control now known
- Enables technology de-risking at ‘near-true’ scale - technology at 300mm is readily transferred to high volume fabs
- The only non-profit 300mm technology partner from sea to shining sea!

Neuromorphic Computing / AI

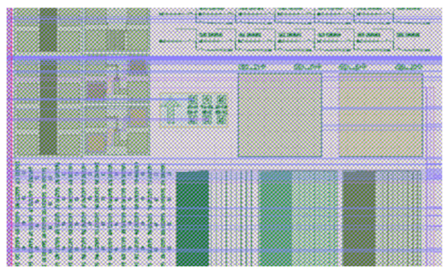


Many candidate technologies:

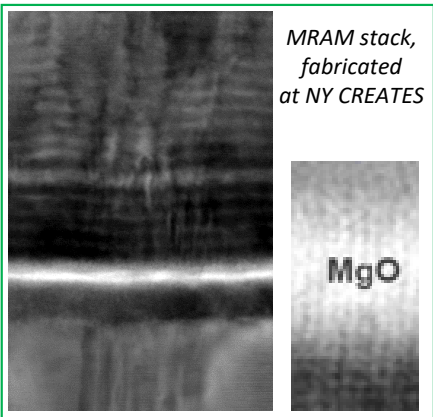
- Resistive RAM (+ Nate Cady, AFRL, industry)
- Magnetic RAM (+ industry)
- Superconducting Optoelectronics (+ AFRL, NIST)
- Photonics & Quantum Optics (+ AFRL, industry)
- Ferroelectric RAM (+Cady, TTCA)
- Phase-Change memory (PCM) by others leveraging Albany fab



Photonic neural network circuits fabricated by AIM Photonics with AFRL-Rome



Portion of cryo-optoelectronics chip designed with NIST Boulder, for fab by NY CREATES



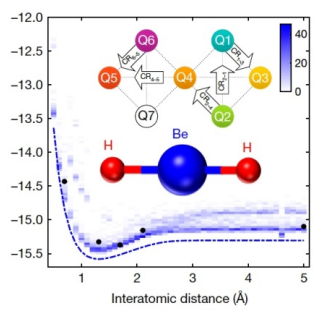
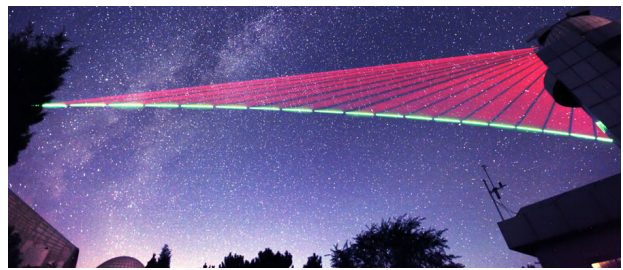
NeoN Robot Ready to Explore and Learn

UT Knoxville faculty partner with Nathaniel Cady

THE UNIVERSITY of TENNESSEE **UT** KNOXVILLE

Quantum Technologies

- Quantum speed up of specific computational problems
- Quantum simulation / quantum chemistry
- Quantum Sensing (inertial navigation, prospecting, ...)
- Quantum encrypted communications and QKD



$$A\vec{x} = \vec{b}$$

$$A = \frac{1}{4} \begin{pmatrix} 15 & 9 & 5 & -3 \\ 9 & 15 & 3 & -5 \\ 5 & 3 & 15 & -9 \\ -3 & -5 & -9 & 15 \end{pmatrix}$$

$$\vec{b} = \frac{1}{2}(1, 1, 1, 1)^T$$

$$\vec{x} = \frac{1}{32}(-1, 7, 11, 13)^T$$

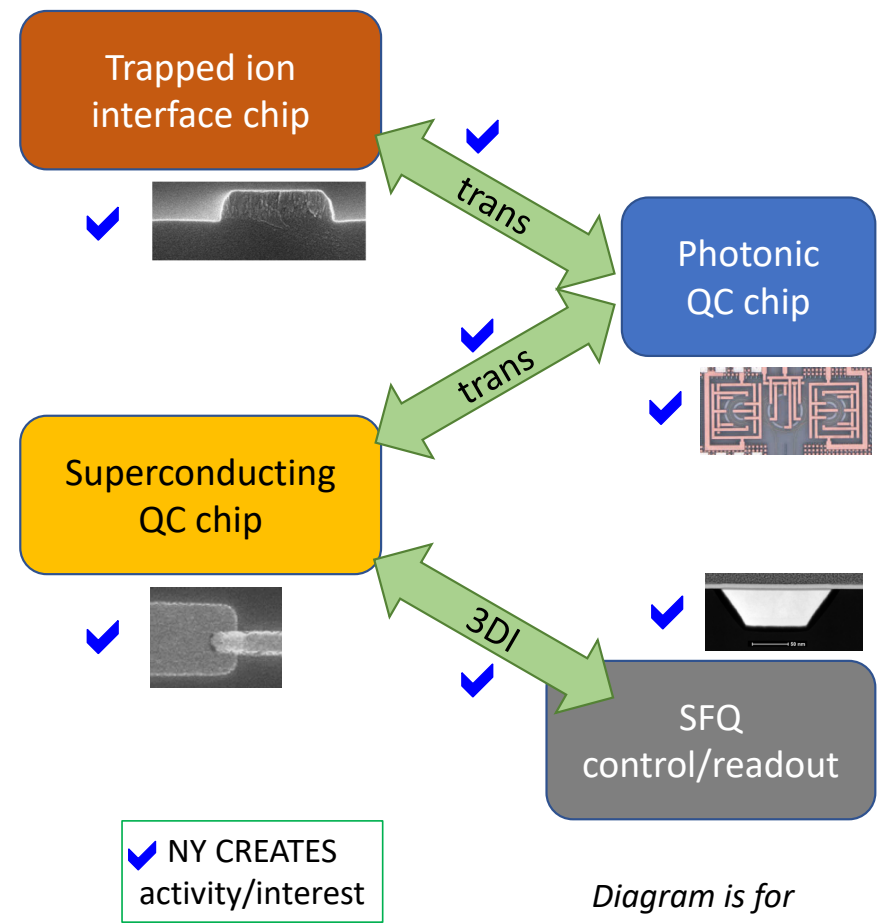
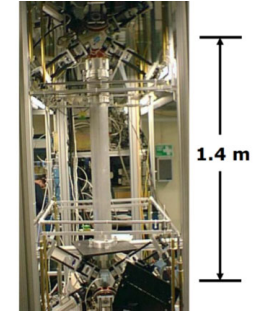
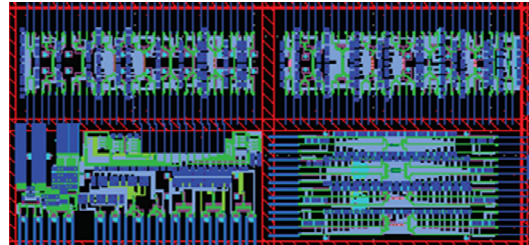


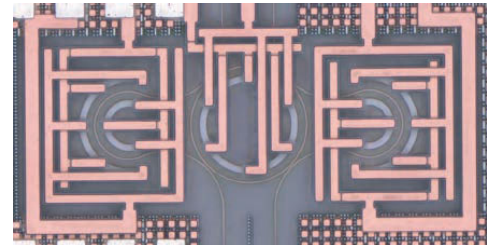
Diagram is for illustrative purposes

Integrated Photonics

- **Communications:** data-center, RF transceiver, chip-to-chip
- **Sensing:** LIDAR, ultra-sensitive detectors for industry, basic science, security, medical diagnostics
- **Computing:** Matrix algebra accelerators, neural networks, Quantum information processing

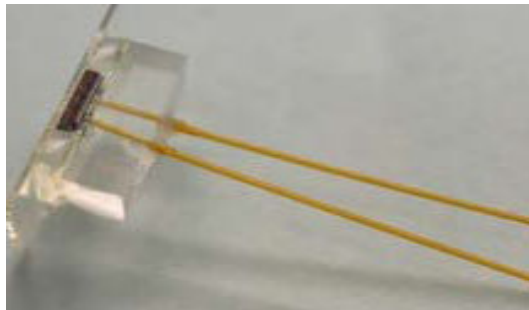


Neural networks fab'ed by AIM for AFRL & partners

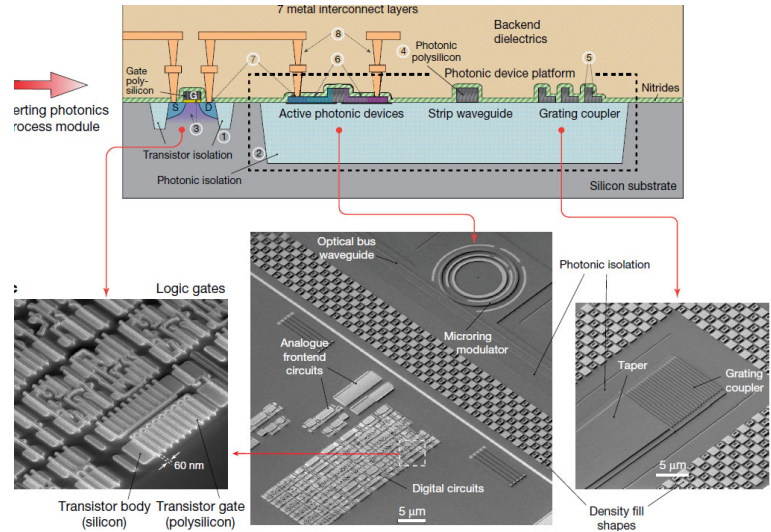
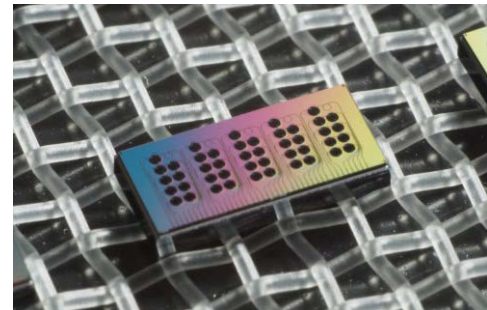


Photon qubit source fab'ed by AIM for AFRL

Disposable biosensor for U. of Rochester



PIC Microfluidic chip

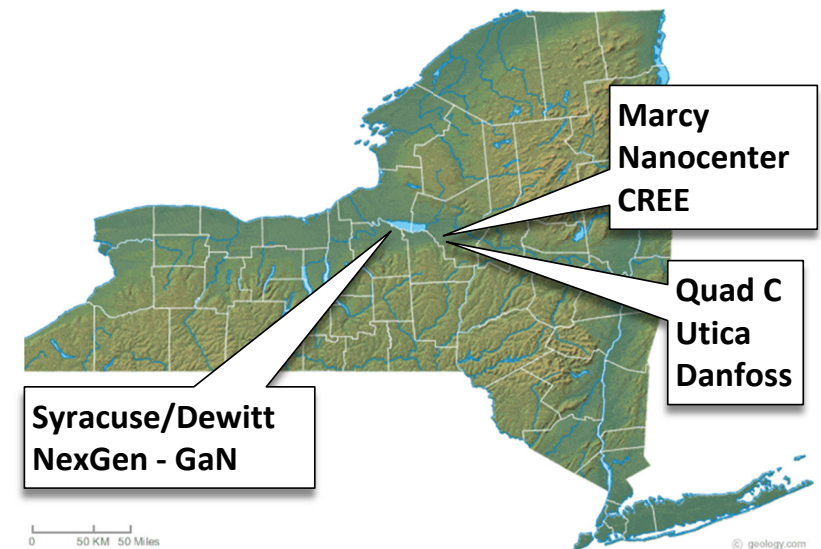
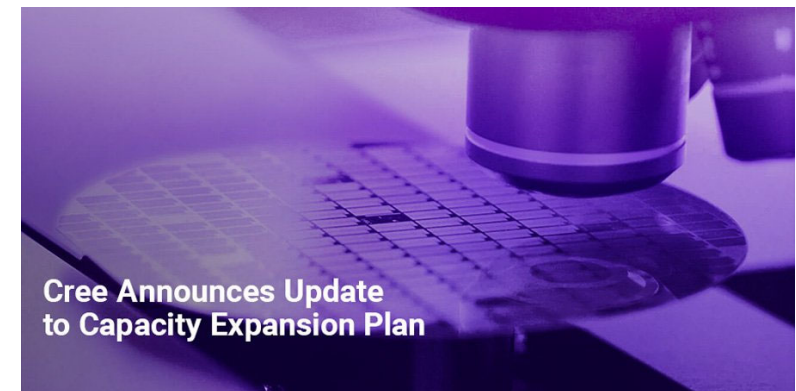


Nature 556 (2018) – featuring AIM Photonics technology

Dr. Benjamin L. Miller: Professor of Biomedical Engineering
NY CREATES Co University of Rochester Medical Center

Wide bandgap Electronics

- CREE developing world's first 200 mm SiC power electronics facility in NY
- NY PEMC tooling in Albany fab being used by Cree for process bring-up/transfer at 150 mm scale
- Danfoss growing its power-electronics packaging operations in NY
- NEXGEN working on GaN-on-GaN in Syracuse, NY
- Heterogeneous integration of wide bandgap electronics with other chip technologies of increasing interest



NYC CREATES /A Global Resource

- Our Engagement Model is Completely Flexible
- We have a Strong Network of Collaborators
- We can Access Resources
- Come and Work with Us