



LEAD THE WAY WITH MANUFACTURING USA

ENGAGE YOUR BUSINESS IN NEW TECHNOLOGIES AND INDUSTRIES

WEBINAR

WEDNESDAY, FEBRUARY 21, 2018 • 1PM-2PM





Alyson Slack
FuzeHub
Host and Moderator



Adrian Cosma
FuzeHub
Presenting on: Clean Energy Smart
Manufacturing Innovation Institute
(CESMII)



Terry Clas
Empire State Development
Presenting on: American Institute for
Manufacturing Integrated Photonics (AIM
Photonics)



Kevin Kelley
REMADE Institute



Scott Miller
NextFlex



John Wen
Rensselaer Polytechnic Institute
Presenting on: The Advanced Robotics
Manufacturing Institute



ManufacturingSM USA



**MEP • MANUFACTURING
EXTENSION PARTNERSHIP®**



**NEW YORK
STATE OF
OPPORTUNITY.**

**Division of
Science, Technology
& Innovation**



NEW YORK
Manufacturing
Extension Partnership

A Division of Empire State Development



Kevin Kelley

Director, Sustainability & Business Development





Collaborative Consortium

Universities, companies, national labs, industry trade associations and foundations



Early-Stage Applied Research & Development

Key industrial platform technologies that could reduce embodied energy and carbon emissions



National Impact

Train the U.S. workforce on breakthroughs in manufacturing and related fields

ADVANCE TECHNOLOGY DEVELOPMENT THAT:

- Enables greater utilization of secondary feedstocks which require less energy to produce for key materials
- Reduces primary materials consumption while achieving better than cost and energy parity for key secondary materials
- Promotes widespread application of new technologies across multiple industries that expand material recycling, recovery, remanufacturing and reuse

	 DESIGN FOR RE-X	 MANUFACTURING MATERIALS OPTIMIZATION	 REMANUFACTURING AND END-OF-LIFE REUSE	 RECYCLING AND RECOVERY	 SYSTEMS ANALYSIS AND INTEGRATION	
CROSS-CUTTING THEMES	Materials Processing and Recovery Techniques	<ul style="list-style-type: none"> • Process modifications for secondary feedstock (SF) * • Link SF contaminants & mfg defects * • In-plant reuse of scrap • Reduce In-process losses 	<ul style="list-style-type: none"> • Component repair/restoration * • Surface cleaning * • Disassembly methods 	<ul style="list-style-type: none"> • Sorting and separation technologies • Contaminant removal * • Cleaning processes * • Complex scrap liberation • Reprocessing technologies • Increase SF w/o impacting MPs 		
	Characterization, Qualification, and Inspection	<ul style="list-style-type: none"> • Secondary feedstock (SF) material properties (MPs) * 	<ul style="list-style-type: none"> • SF specifications and qualification * • Real-time characterization of SFs * • Material cleanliness measurement * • Material traceability standards 	<ul style="list-style-type: none"> • Non-destructive inspection/evaluation • Contaminant/cleanliness measurement * • Condition assessment 	<ul style="list-style-type: none"> • SF specifications and certification * • Sensing technologies: SF characterization * • Sensing technologies: SF cleanliness * • Sensing technologies: sorting 	
	Simulation and Engineering Analysis Tools	<ul style="list-style-type: none"> • Design for Re-X trade-off analysis * • Design for Re-X methods & tools 	<ul style="list-style-type: none"> • Thermodynamic, kinetic, and process modeling & simulation * • Embodied energy analysis * 	<ul style="list-style-type: none"> • Reusability/reliability assessment * • Assessment of efficiency opportunities * 	<ul style="list-style-type: none"> • Thermodynamic modeling of material separation and recovery * • Waste logistics models • Tune primary feedstock/scrap ratio • Design tools to ↑ MRF efficiency 	<ul style="list-style-type: none"> • Life-cycle assessment (LCA) tools & databases * • Embodied-energy databases
	Value Chain Integration and Impact	<ul style="list-style-type: none"> • Evaluation of design for Re-X return on investment (ROI) * 	<ul style="list-style-type: none"> • Supply chain analysis * • Cross-industry SF utilization * 	<ul style="list-style-type: none"> • Reverse logistics networks * • Assess core condition/residual value 	<ul style="list-style-type: none"> • Material collection mechanisms * • Recycling economic driver determination * • Waste stream mapping • Waste stream data sharing • Industry & SF supplier collaboration * 	<ul style="list-style-type: none"> • Material flow analyses (MFA) & scenarios * • Techno-economic analysis of secondary material markets * • Technical performance metrics • Project impact calculation • High-impact opportunities
	Workforce Development	Training and activities relevant to each of the four levels of workers the Institute will address (i.e. Pre-collegiate/Secondary, Technician/AAS, Post-Secondary STEM, and Continuing Professional Education and Certification) and each of the nodes.				



EDX Magnetics is a small Utah company (<10 employees) that has been selected for a \$1.1M Foundational Project through REMADE

- Goal to improve nonferrous metal separation and recycling through the utilization of time-varying magnetic fields (electrodynamics sorting technology)
- Anticipating to advance the sorting of ultra fine aluminum scrap particles while upscaling throughput processing beyond lab speeds
- Projecting to promote cost parity for secondary materials, improve energy efficiency, and reduce primary feedstock consumption

SMALL & MEDIUM COMPANIES

- REMADE membership provides options specifically for small/medium size companies
- Offers same benefits as large corporations without the higher cost impact
- 58% of current REMADE industry membership consists of small/medium size companies



Interested in joining REMADE? Complete our [Membership Inquiry Form](#)

Kevin Kelley

Director, Sustainability & Business Development

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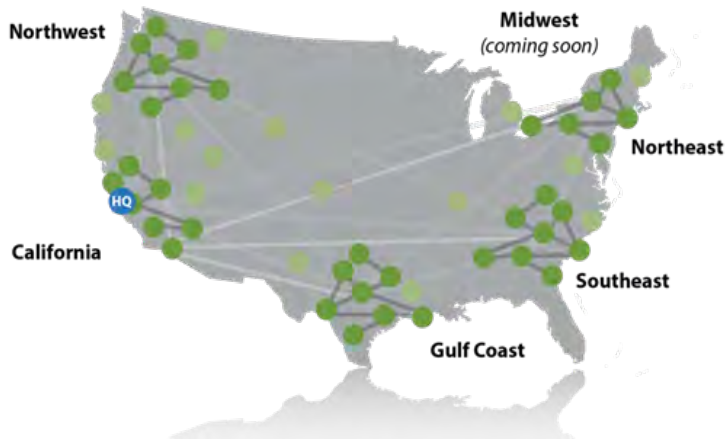


Adrian Cosma
Embedded Smart Manufacturing
Lead, Northeast





Clean Energy Smart Manufacturing Innovation Institute (CESMII)



Advanced technology

- Sensors
- Controls
- Platforms
- Models

Workforce Development

- Curriculum Development
- Certifications
- Training
- Nationwide strategy

Impact

- Energy
- Productivity
- Optimization
- Performance
- New business models

Economic Development

- Improve jobs
- Energy sustainability
- Competitiveness
- Innovation

- **Mission is to revitalize US Manufacturing**
- **National Network, supported by DOE**



So what is Smart Manufacturing?

“Smart Manufacturing is a practice that empowers businesses to envision and plan for the future by leveraging data and information to facilitate decision making for implementation”



As a manufacturer have you thought.....

- I have all this data but it is in over a dozen different databases.
- What does all this data even mean?
- I'd like to be able to predict when a component will fail.
- That recall last year was devastating.
- How can I make better and real-time decisions?
I do not have time to wait for data analysis.



Business Practices

- Operational Value
- Flexible processes
- Quality management
- Reduction in variance
- Consensus on metrics

Enabling Technologies

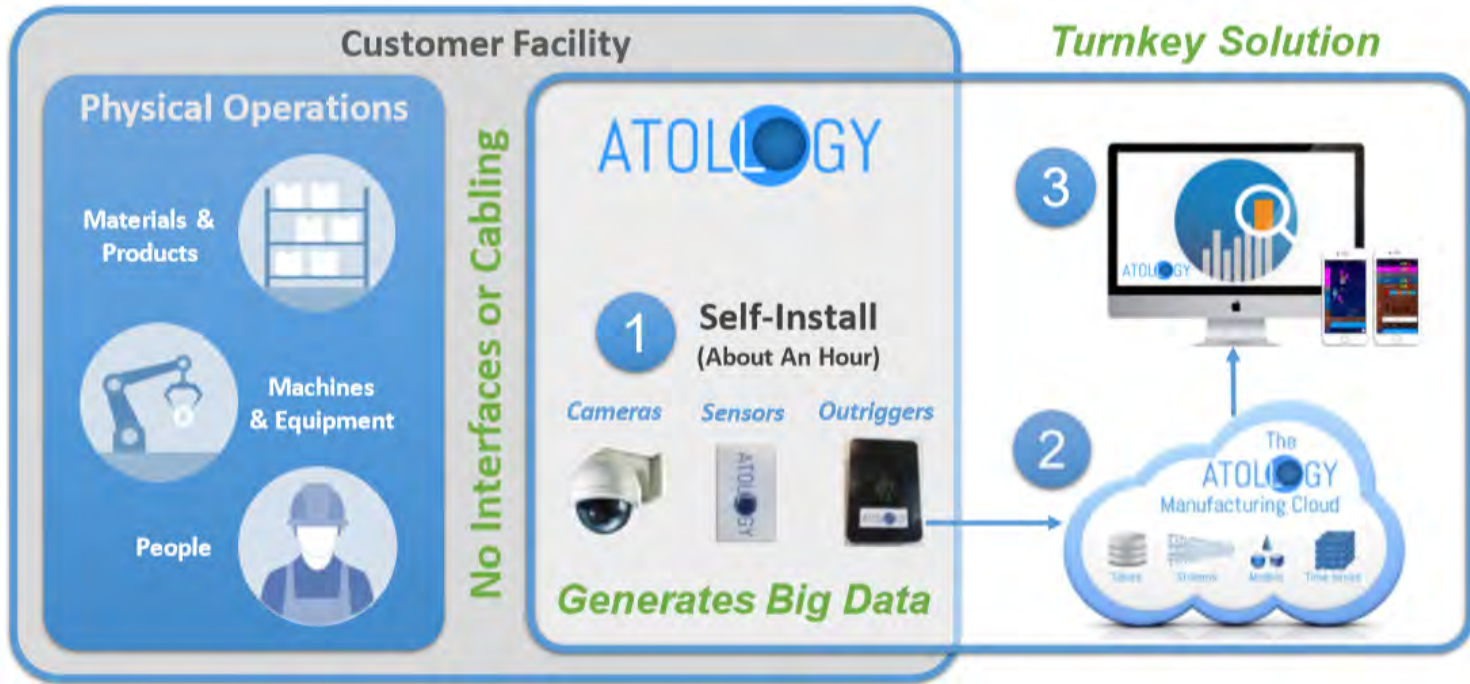
- Sensors
- Wireless communication
- Software defined networks
- Data Analytics

Workforce development

- On-line training
- Smart Worker
- Education
- Knowledge base

The Smart Manufacturing deployment





Non-Intrusive = No Disruption or Risk to operations



Composite Analytics – Representative Customer Example

Combining Sensors & Computer Vision to ID Work Bottlenecks



This work station is idle because of problems in the feeding working station.

This work station is running at half the standard rate.

The rate varies widely from shift to shift and from operator to operator



Client Business Readiness Checklist

Internal business drivers

Typically: Business Goals -> Business Objectives -> Business Strategy

Business goals/objectives/strategy identified

Process improvement needed

Unit costs high and need to manage OPEX

Manual process (eg. customer thinking of ERP)

External business drivers

Typically: Competition | Supply Chain | Regulations (eg. AS 9100 or ISO 13485)

Need to comply with new regulations

Market needs are becoming "tighter"

Cost of technologies dropping

Greater demand for products

If one or more boxes are checked
Then the client is a candidate for smart manufacturing implementation



Take the **Smart Manufacturing Assessment** to begin your SMART journey

Take Our SMART Status

Manufacturing Assessment

Start Your Assessment

It's quick, it's easy and it's free.



Contact info

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CESMII NE Regional Manufacturing Center is located at RPI

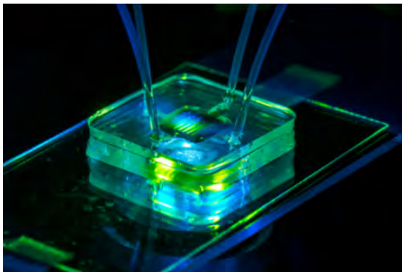


Terence Clas

**Business Development - Photonics
NY State: Empire State Development -
Science, Technology & Innovation Div.**



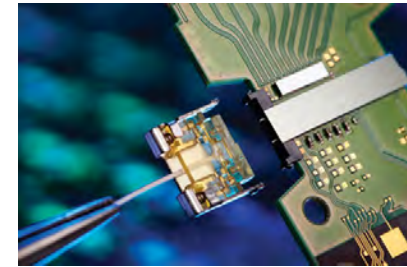
Create a national institute supporting the end-to-end integrated photonics manufacturing ecosystem in the U.S. by expanding upon a highly successful public-private partnership model with open-access to world-class shared-use resources and capabilities



Photonics starts with photons, or particles of light. It is the science of creating, moving, detecting and measuring photons.



Photonics technology includes sources of light such as lasers, LEDs, waveguides to guide light such as fiber optics, and a variety of opto-electronic devices that encode digital information onto optical signals and convert optical signals to electrical ones



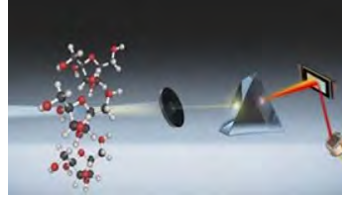
Integrated photonics: Devices are fabricated as an integrated structure onto the surface of a flat substrate. Photonic circuits can now process and transmit light in similar ways to how electronic integrated circuits process and transmit electronic signals.



**Data Centers
Telecomm**



**RF Analog
Applications**



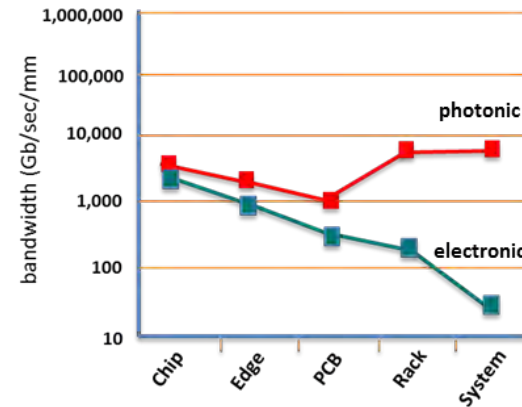
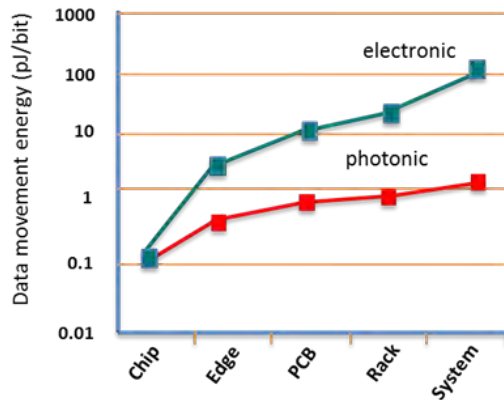
**Sensors for
Medical Apps.**



**Sensors for
Autonomous**



**Image Array
Technologies**

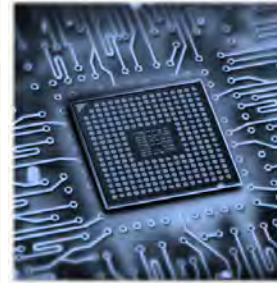


Markets Goals/Objectives:

- How much data (Gb) can be sent at what speed (sec) over what distance (mm) using what power (pJ/bit) at what cost (\$)?
- Photons are advantaged vs. electrons

Applications / Systems Company

- to get proven integrated photonics product solutions
 - port product designs into a highly advanced, scalable manufacturing supply chain
 - use low volume production capabilities & scale to volume production as required
 - test & verify new architectures & system designs
 - leverage integrated photonics product capabilities in respect to cost, power consumption, performance, weight & footprint
 - ...
- to eventually market unique applications / systems with differentiating signatures



Product Company

- to get prototypes & low volume manufacturing services
 - leverage advanced product design-in capabilities
 - elaborate novel product designs using cost effective multi-project-wafer, assembly & packaging capabilities
 - retrieve / gather product performance data
 - leverage advanced processing capabilities, develop novel functionalities & features
 - use low volume manufacturing capabilities & scale to volume production as required
 - ...
- to eventually market proven, novel high performance integrated photonics product

Why companies join AIM Photonics.....

Manufacturing Company

- to gain access to integrated photonics wafer / assembly / packaging technology manufacturing know how
 - elaborate / evaluate advanced manufacturing processing capabilities, gain heterogeneous process integration knowledge
 - gather insights to manufacturing
 - prove manufacturability before transferring processes into volume production
 - ...
- to eventually license proven, high performance integrated photonics manufacturing technologies



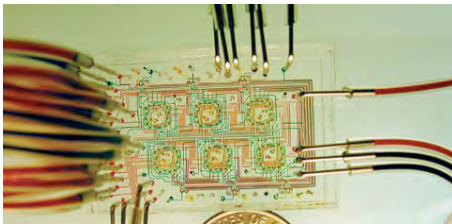
Equipment Company

- to test your tools in a manufacturing environment
 - elaborate advanced integrated photonic processes
 - retrieve / gather associated performance data
 - test novel materials
 - enhance tool capabilities & performance
 - improve thruput, reliability, maintainability
 - ...
- to eventually market proven, high performance integrated photonics equipment

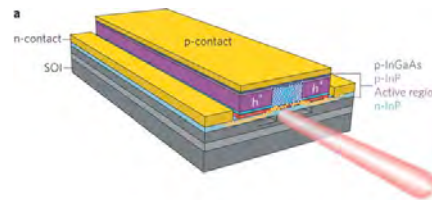


Chem/Bio Sensors

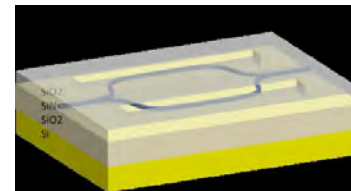
Sampling systems:



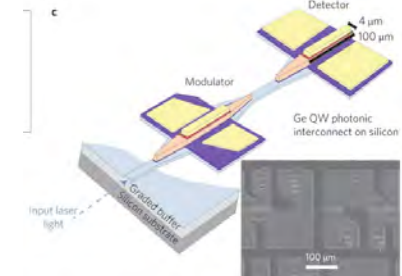
Source:



Transducer



Detector:

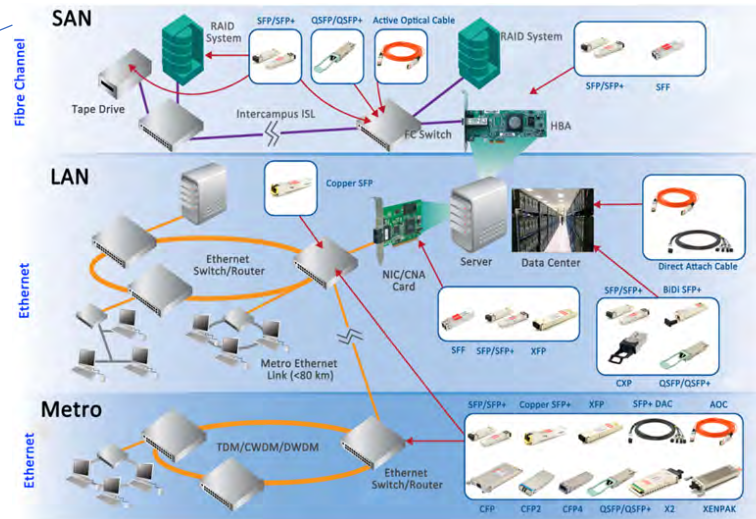


Chem/Bio Product

- Sensitive to one copy of target per arbitrary volume of sample
- No sample preparation
- No external reagents
- Rapid response
- Total selectivity
- Inexpensive



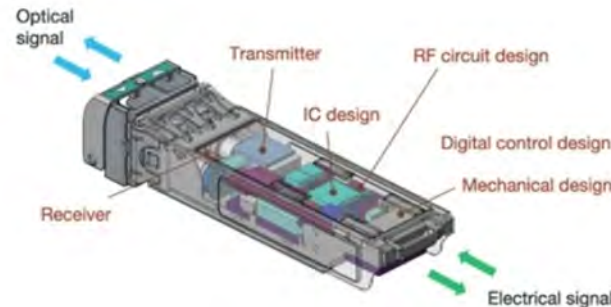
Data Centers / Telecomm Market



Data Centers / Telecomm Product

Transceiver:

Utilizing an Integrated photonic chip and micro assembly/packaging to achieve the speed and performance requirements of 5G transmission rates



<http://www.aimphotronics.com/>



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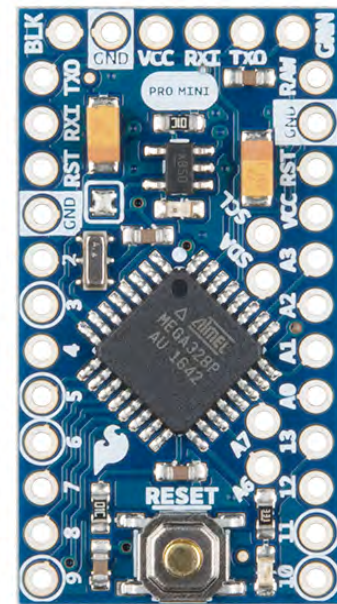


America's Flexible Hybrid Electronics Manufacturing Institute

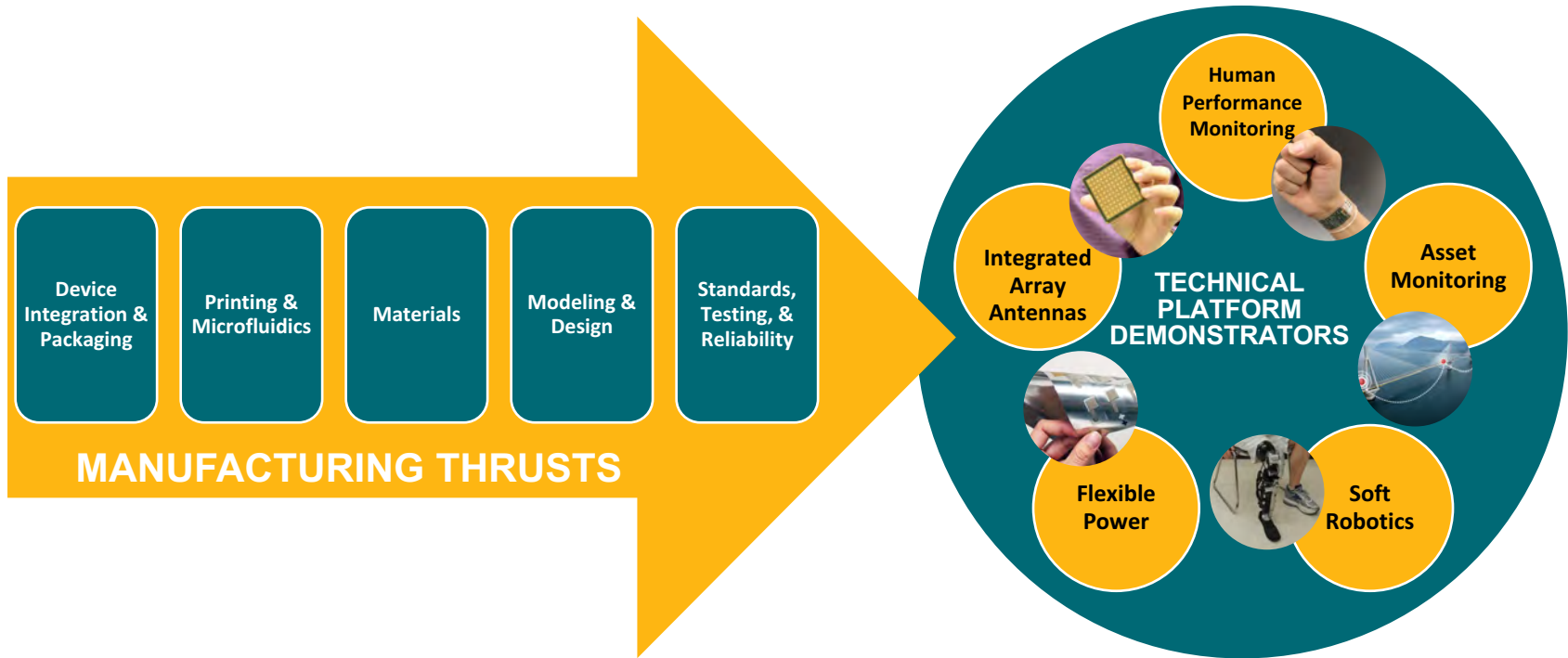
NextFlex's mission is to accelerate the growth of the American manufacturing ecosystem for flexible hybrid electronics.



Flexible hybrid electronics integrates printed and additively manufactured circuit elements with bare integrated circuit chips (die), enabling thin, flexible, lightweight systems with equivalent functionality to rigid printed circuit boards.



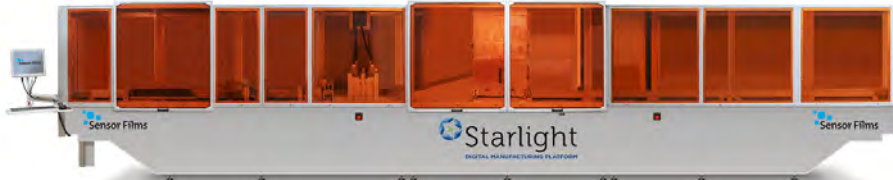
NEXT FLEX



Focus covers the complete ecosystem from materials to manufacturing tools & processes to design & modeling to demonstrator products PLUS workforce development.

NEXT FLEX

FHE Prototype and Production Equipment



Printed X-Band Antenna



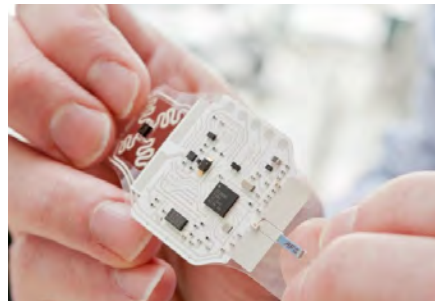
Flexible Smart Asset Monitor



Changing Your World One Flexible Chip at a Time



Equipment for FHE Materials and Product Prototyping



MEYER BURGER



NEXT FLEX



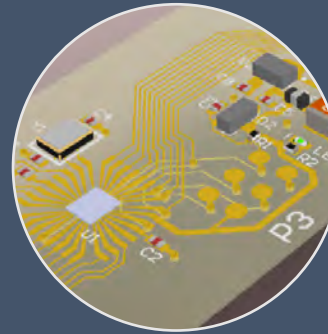
Membership

- Shape technical roadmaps & project directions
- Access technical information from funded projects
- R&D IP license to project IP
- Participate in funded projects
- Contract work at Tech Hub at preferred rates
- Assign staff to Tech Hub



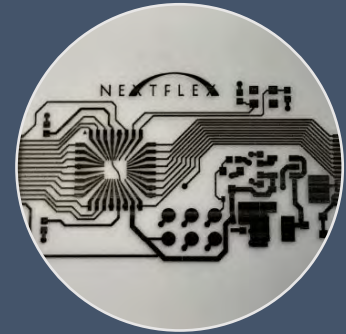
Workshops

- Gain technical insight on focused FHE topics
- Engage with other members of the ecosystem
- Share challenges and learn how others solve them



Sponsored R&D

- Engage leaders in the field to solve your most challenging problems
- Work at Technology Hub, member-sites, or non-members
- Competitively bid or pre-selected performers
- Flexible terms
- Confidentiality



Prototyping & Mfg

- Rigid-to-FHE conversion or completely new designs
- Low volume and one-off manufacturing
- State of the art tools and capabilities
- Expert industry professionals
- Serve DoD and commercial needs
- Confidentiality



John Wen
Head, Industrial & Systems Eng.
Rensselaer Polytechnic Institute



Rensselaer

ARM aims to address these challenges:

Limited use of robotics in manufacturing

Lack of common, safe and easy-to-implement robotics software and hardware components force expensive customizations

Lack of skilled workers

Top issue for many manufacturers
 Mismatch between skill sets and job openings
 Lack of trade education for robotics jobs
 Manufacturing not perceived as good career path



Technology development










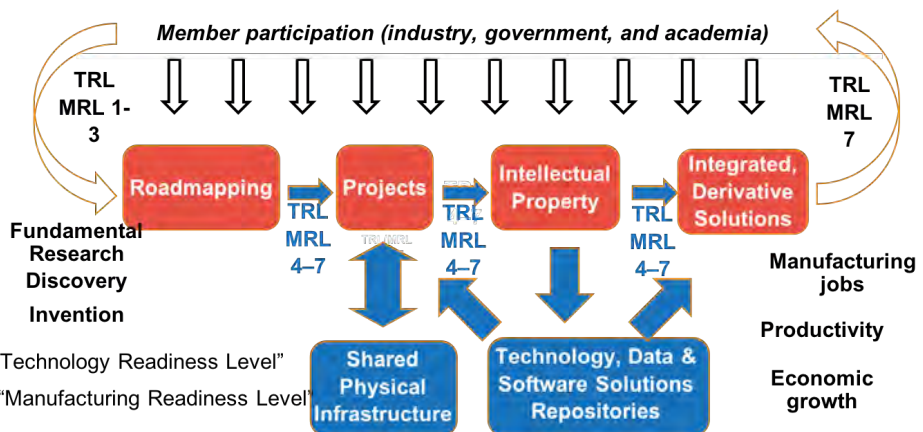
Workforce development



Building the right ecosystem

Industry Sectors

 Aerospace	 Automotive	 Electronics
 Food & beverage	 Logistics	 Textiles & apparel
		 Composites



TRL = "Technology Readiness Level"
 MRL = "Manufacturing Readiness Level"

Move beyond today's manufacturing robots – expensive, single-purpose, hard to program, Isolated from humans.

Technical Thrusts

- Collaborative Robotics
- Robot Control: Learning, Adaption and Repurposing
- Dexterous Manipulation
- Autonomous Navigation and Mobility
- Perception and Sensing
- Testing, Verification, & Validation

Initial Project Call Topics:

- Topic 1: Identifying and Packing Objects
- Topic 2: Unloading and unpacking objects
- Topic 3: Transport and Delivery through a Complex, Crowded Floor
- Topic 4: Inspection of Non-standard Materials
- Topic 5: Tracking and Traceability of Components
- Topic 6: Surface Treatments
- Topic 7: Manipulating Compliant Materials

Composites Structure Assembly

- Challenges: Large, heavy, curved loads, structural flexibility, high precision alignment requirement
- Project Goal:
 - Demonstrate safe, robust, efficient robotically assisted fixtureless precision blade assemble
 - Develop sensor-based robot control software for manipulation of large, heavy, flexible loads.



Multiple NYS companies

3D Robotic Sensor Development

- Challenges: Robot-assisted 3D quality inspection in hard-to-reach locations
- Project Goal:
 - Integrated 3D robot scanning
 - Intelligent inspection



Small NYS company

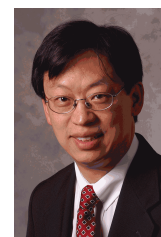
- Engage with ARM-NY team for discussion
- Tell us your needs and aspirations (technical, EWD, business)
- Join membership, participate in roadmapping, and join in responses to project calls



Advanced Robotics for Manufacturing Institute

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- Elena Garuc elena@fuzehub.com
- Alyson Slack Alyson.Slack@esd.ny.gov

	Membership Level	Annual Dues		R&D Projects
		Cash	In-Kind*	
Industry	Platinum Member	\$100K	\$250K	Lead and participate
	Gold Member	\$50K	\$100K	Lead and participate
	Silver Member	\$25K	NA	Participate
	Bronze Member (< 500 employees)	\$5K	\$10K	Participate
	Startup (pre-revenue; < 15 employees)	-	\$2.5K	Participate
University Non-Profit	Core Member	\$15K	\$200K	Lead and participate
	Supporting Member	\$5K	\$15K	Participate
	Educational Partner	-	\$15K	Access to EWD programs



Q&A

Contact the Presenters



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**The Advanced Robotics
Manufacturing Institute**



View the Presentation

This presentation recording and PDF will be available tomorrow at:

www.fuzehub.com/webinar-mfgusa

Empire State Development's Manufacturing Technology Advancement Grants

- Grants of up to \$50,000 each, requiring 20% cost share
- Manufacturers and non-profits may apply
- Projects must involve adoption or advancement of technologies in:
 - Integrated photonics
 - Digital manufacturing
 - Additive manufacturing
 - Composites

Guidelines and application information at:

<https://esd.ny.gov/manufacturing-and-defense-grants>



**Division of
Science, Technology
& Innovation**

A Division of Empire State Development



FUZEHUB'S MISSION

To drive New York State competitiveness in manufacturing by helping companies discover, navigate, and leverage the state's extensive innovation ecosystem.

- **FuzeHub is New York's Statewide Manufacturing Extension Partnership (NY MEP) Center**
- **Increase the awareness of expertise and capabilities** available to companies throughout the state
- **Leverage expertise in-house or through partnerships** to assess company needs, then connect them with capable resources and track/monitor follow up.
- **Use a unique mix** of technology, resources, manufacturing expertise and special events to assist manufacturers.
- **Coordinate statewide projects** and other strategic initiatives guided by NYS and the needs of small to medium-sized enterprises.



For assistance visit www.fuzehub.com and make a request; one of our specialists will respond to your request in 24 to 48 hours.

Keep the conversation going

FuzeHub is on LinkedIn, Twitter, Google+ , Facebook
info@fuzehub.com

Get the latest NYS manufacturing news delivered directly to your inbox.

Sign Up Here: fuzehub.com/fuzehub-email-notification-signup



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