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WHAT'S NEXT??
UMASS ZOOM SUMMIT: ADVANCED MANUFACTURING

The University of Massachusetts is pleased to extend an invitation to a "zoom summit" in Advanced Manufacturing on **January 25, 2021 from 3:30-5:00 pm**. We will introduce industry leaders, their colleagues in business strategy and government relations, to some of the most important breakthroughs of recent years in **five key fields within advanced manufacturing**.

In the final hour, we invite you to discuss **grand challenges** that will shape this field in the next decade. Accomplished scientists, from across the five campuses of the University of Massachusetts will be on hand to discuss the most pressing translational questions in the post-COVID period.

Major research breakthroughs (30 minutes):

Additive Manufacturing

- Only system for printing 2-component multi-materials on demand
- With Raytheon, a new decision support software tool to help designers when additive manufacturing should be used
- With DOE, 3D-Printed Metal Architectures for Catalytic and Electrochemical Applications

Materials in manufacturing

- Researchers with UML NextFlex invented substrate for flexible tunable antennas (smaller than rigid antennas, small electronics)
- Multifunctional natural fiber composites, reinforced with carbon fibers to be tougher and damage-sensing
- With Army Research Lab, Light-weight Armor using Nanomaterial-based Metamaterials

Biomedical Manufacturing

- UML Soft Robotics NSF EFRI grant; Massachusetts Biomanufacturing Center; Biomanufacturing Innovation Institute
- Manufactured wearable biosensor system with wireless network for remote detection of life-threatening events in newborns.
- Swabs made with UMD electro-flocking are preferred by FDA in COVID testing kits (ordered 20M). Collect more, reduce false negatives.
- In under two weeks, UMA researchers and nurses design COVID face shields and make available for mass production.

Roll-to-roll Manufacturing

- Nano-scale self-assembly techniques for advanced manufacturing were pioneered at UMass
- R2R-nanomanufactured biosensor patch that can monitor a soldier's stress level
- R2R production of omniphobic surfaces for, e.g., bio/chem-protective clothing and self-cleaning tents

Manufacturing Automation

- With Pratt & Whitney, Digital twin of the supply chain
- With NIST, In-situ Data Registration and Fusion for Powder Bed Fusion Additive Manufacturing

- Heterogeneous integration of semiconductor devices, elastomers and liquid metal for smart medical devices and micro robots

Grand Challenges (60 minutes):

Our most accomplished researchers will be on hand for a back-and-forth discussion of these five pressing problems. We will foreground where we're going in these domains, but are curious to learn, is this where you are headed? Are there other directions to consider?

Breakout group 1: Manufacturing 2030: agile, responsive, instant, customized, adaptive

- Requires AI, robotics, 3D printing, flexible automation, to create individualized/custom products on demand
- Manufacturing plan for pandemic, to avoid kinds of supply chain issues we see during COVID-19
- Examples:
  - A Predictive Analytics-Based Approach to Represent Digital Thread across Product Lifecycle (UMA)
  - Modeling the Roll-to-Roll Soft Lithography Printing Process through Deep Learning and Real-time Sensing (UMA)
  - 3D printing of multimaterials to rapidly change the material and product properties (UML)

Breakout group 2: Manufacturing 2030: Green/Sustainable manufacturing

- Creating products that do not harm the environment
- Grows from work of many faculty involved in REMADE Manufacturing USA Institute for sustainable manufacturing
- Example:
  - Meg Sobkowicz-Kline's (UML Plastics Engineering) work using high-speed extrusion to make plastics more recyclable, as well as enzymatic degradation strategies**.**

Breakout group 3: Manufacturing 2030: 3D printing on an industrial scale

- Making additive manufacturing faster, more predictable, with "born-qualified" materials
- Ongoing work with NIST to develop standards and protocols for additive manufacturing is one first step
- Examples:
  - A Framework to Manage Data Associated with Additive Manufacturing Geometry and Process
  - Scalability of Roll-to-Roll (R2R) Cold Spray and R2R AM Processes
  - Investigation of 3D part quality and heterogeneous printing using multiple processes or multi-materials

Breakout group 4: Manufacturing 2030: Integration of biological and non-biological manufacturing

- Combining organic and inorganic materials to, for example, put antibodies on a sensor
- Examples:
  - Integrated Wearable Electronics
  - Patterned polymer surfaces to control deposition of antibodies or for anti-biofouling

Breakout group 5: Manufacturing 2030: Collaborative robots in manufacturing

- Industrial robots built to work alongside humans, safely and productively
- In collaboration with UML NERVE Center using robots for manufacturing

Register here: https://www.eventbrite.com/e/advanced-manufacturing-registration-132713316101