MISSION & SCOPE

MASH Mission & Scope

MASH will support the CHIPS and Science Act to enhance America's strength in semiconductors and microelectronics and promote economic development.

The goal of MASH is to create the world's largest nanofabrication, packaging, and characterization facility by linking and enhancing the facilities in the region. The MASH "distributed" network of facilities will support technology transition to manufacturing and offer redundancy of resources and immediate access to a huge amount of technical expertise in semiconductors.

MASH will focus on helping the semiconductor industry to transition materials into systems, which is a critical industrial need of many emerging applications such as advanced communications, non-volatile memory, More than Moore devices, Industrial Internet of Things, artificial intelligence, edge computing, wireless communications, quantum devices, environmental sustainability, and materials and substrates.

MASH activities will center around three cross-cutting areas: Si-adjacent technologies, advanced packaging, and virtualization of semiconductor processes.

MASH will develop skills-based educational and workforce development plans to provide companies with an agile system to meet staffing requirements, and at the same time, enhance racial and socioeconomic diversity.

MASH will be a hub for regional and national activities to promote professional education and training, educate the public on semiconductors and microelectronics, share and coordinate materials standards, identify funding opportunities, and build networks and technology road maps.

MASH Mid-Atlantic SEMICONDUCTOR HUB

UNIVERSITY OF MARYLAND

The University of Maryland's researchers and modern facilities are well known for experience and innovations in semiconductor chip design and architecture, nanofabrication, hardware security and cybersecurity, neuromorphic chips with capabilities inspired by biology, micro devices, including medical devices, sensors and sensor components, advanced materials for microelectronics, improving the reliability of microelectronics, and microelectronic components in larger systems for energy efficiency and a more electric future.

CALCE: microelectronics packaging

CENTER FOR ADVANCED LIFE CYCLE ENGINEERING

CALCE has been serving the electronics industry for more than 35 years as a resource and knowledge base for the development of reliable, safe, and cost effective products. It is supported by more than 300 of the world's leading companies. CALCE provides test and failure analysis services and conducts fundamental reliability science research. Research areas include: reliability assessment of components, packaging materials, interconnections, and assemblies; testing and simulation-based failure analysis; electronic product development; life cycle cost; technology tradeoff analysis; thermal management; power electronics; accelerated testing; soft capillarity and wetting; micro-nanoscale transport; parts selection and management; uprating; polymers; prognostics and health management; electrical contacts; passive components; counterfeit detection and mitigation; intersections among thermal-fluid sciences, interfacial transport phenomena, and renewable energy; and supply chain policies.

NanoCenter: chip design & manufacturing

The Maryland NanoCenter includes the FabLab (a class 1000 clean room) and the AIM Lab (dedicated to the characterization of structure and composition for a broad spectrum of hard and soft materials and biological systems with nanometer resolution). Additional shared equipment is located in partner labs across campus, covering the gamut of research necessities. NanoCenter facilities are available for use by faculty, students, industry, and government researchers.

LAB: advanced chip manufacturing

SEMICONDUCTOR TECHNOLOGY

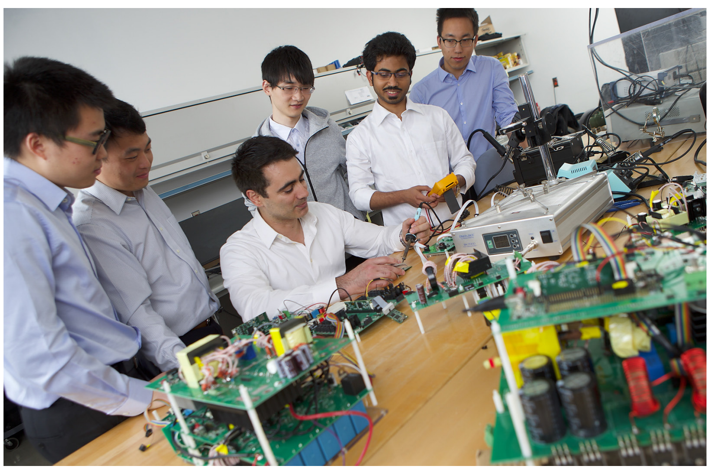
UMD research is advancing semiconductor chip technology in chip design, building chips with new sensing capabilities and addressing challenges in chip manufacturing. Projects take advantage of expertise in hardware architecture, advanced integrated circuits, and biochips. Maryland is active in projects sponsored by the Department of Defense, DARPA (including JUMP 2.0), Intel, Northrop Grumman, SRC, NSF, NIST, AFOSR and ONR (including MURIs), and the Army Research Lab (ArtIAMAS).

FACILITIES

MEII: energy storage & materials

MARYLAND ENERGY INNOVATION INSTITUTE

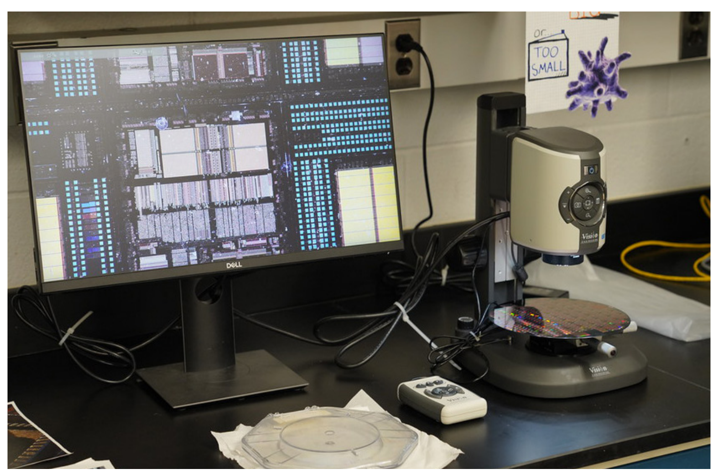
The scientists of the Maryland Energy Innovation Institute are actively pursuing materials science advances. Special areas of interest include: chemical energy conversion, electrochemical energy, energy efficiency, power systems, renewables, and energy systems safety and reliability. Research areas include atomic layer deposition and thin films, materials for batteries and energy storage devices, power electronics and microinverters, and renewable and efficient energy.



MEMS: sensors & actuators

MICROELECTROMECHANICAL SYSTEMS

Sensors are an important part of many microelectronic devices. UMD researchers have decades of expertise developing sensors for many different purposes, from detecting bio materials and explosives in public spaces, to finding pathogens inside the human body. They also are developing new kinds of sensors with enhanced capabilities based on neuromorphic and biological ideas. Projects include general sensors, medical sensors, and neuromorphic sensors. The MEMS Sensors and Actuators Laboratory was established in January 2000 and focuses on application-driven technology development using micro-nano-bio engineering approaches. Its "systems integration" approach provides holistic solutions for real-world use. This lab specializes in in-situ biomedical and clinical applications, specifically toward gastrointestinal diagnostics, biofilm monitoring and inhibition, and platforms for investigating gut-brain interactions. This research is complemented by efforts in energy storage, harvesting, and conversion to provide power for the desired embedded, self-sustaining MEMS sensors and actuators. Devices incorporate system-oriented design elements relying on MEMS materials and fabrication technology, novel biosensing and biofabrication processes, microelectronics integration, and 3D-printed packaging techniques.



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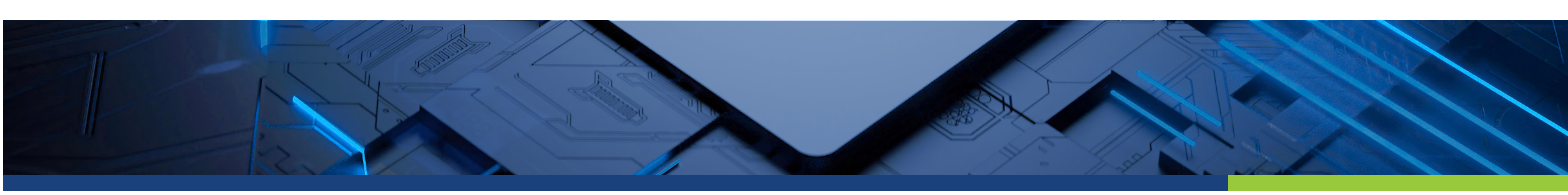

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