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.

MISSION & SCOPE

MASH Mid-Atlantic SEMICONDUCTOR HUB

Penn
University of Pennsylvania

Comprising four major facilities, the Singh Center for Nanotechnology is vital to the research and educational programs at the University of Pennsylvania and are leveraged by partner institutions and local industry within the Mid-Atlantic region.

Unifying these central resources fosters the exchange of scientific ideas and the development of nanoscale science and technology, brings together crosscutting capabilities and the staffing to support these tools, and provides the modern infrastructure necessary to establish a regional center for nanotechnology.

QNF: fabrication

QUATTRONE NANOFABRICATION FACILITY

The Quattrone Nanofabrication Facility (QNF) operates a ~11,000 sq.ft. cleanroom with cutting-edge equipment, including electron-beam and optical lithography, deposition techniques, processing tools, metrology, and device characterization. Additionally, QNF offers a complementary facility for soft lithography for soft materials and laser micromachining, catering to diverse materials processing, microfluidics, and lab-on-chip activities. To complete the cycle, QNF provides backend equipment for device packaging and hybridization, encompassing wire bonding, wafer bonding, electrical testing, and wafer dicing.

CONTACT: QNF Director, Eric Johnston, ericdj@seas.upenn.edu

SOFT LITHO: fabrication

SOFT LITHOGRAPHY LAB

The QNF Soft Lithography Lab facilitates PDMS device fabrication for microfluidics and microcontact printing. Equipped with essential tools like an ABM mask aligner and Anatech barrel asher, the lab provides photoresist, PDMS, and necessary supplies. The lab addresses the growing demand for miniaturized liquid-based assays in research, diagnostics, and sample analysis. Soft lithography enables diverse applications, including particle separation, cell culture, chemical mixing, and organ mimetics. It is also instrumental in non-fluidic devices like micro-contact printing and cellular force measurement, exemplified by microfabricated culture devices for long-term neuronal studies.

CONTACT: QNF Director, Eric Johnston, ericdj@seas.upenn.edu

NCF: characterization and measurement

NANOSCALE CHARACTERIZATION FACILITY

The Nanoscale Characterization Facility (NCF) at the Singh Center offers cutting-edge electron- and ion-beam analysis tools. The facility includes an integrated sample preparation laboratory with complete sample coating and plasma cleaning capabilities and cryogenic TEM sample preparation equipment. A computer suite for offline image and data analysis and office and meeting space for staff and industrial users round out the facility in the Singh Center.

CONTACT: NCF Director, Douglas Yates, dmyates@seas.upenn.edu

SLPF: microscopy

SCANNING AND LOCAL PROBE FACILITY

The Scanning and Local Probe Facility (SLPF) is a comprehensive user facility of scanning probe microscopes and confocal Raman microscopes allowing characterization of morphology, mechanical properties (friction, stiffness, adhesion), electrical properties (surface potential, conductivity, piezoelectric force), and chemical structure in over a range of environment. Some instruments combine techniques, such as fluid cell AFM + fluorescence microscopy for in situ measurements and AFM + Raman for tip-enhanced spectroscopy.

CONTACT: SLPF Director, Matt Brukman, mbrukman@seas.upenn.edu

KEY MASH CONTACTS

	NAME	TITLE	DETAILS
PennState	**Daniel Lopez**	Liang Professor of Electrical Engineering Director, Nanofabrication Lab, Materials Research Institute	dlopez@psu.edu (814) 867-1575
	Osama Awaldelkarim	UNESCO Chair Professor Director, Center for Nanotechnology Education and Utilization	ooa1@psu.edu (814) 863-1773
	Shannon Munro	Vice President for Workforce Development Pennsylvania College of Technology	smm20@pct.edu (570) 320-2400
	Mark Threeton	Professor of Education, Associate Director of PPDC	mdt177@psu.edu (814) 863-5361
	Priya Baboo	Senior Director of Corporate and Industry Engagement, College of Engineering	pzb104@psu.edu (814) 863-9142
Penn	**Mark Allen**	Scientific Director, Singh Center for Nanotechnology	mallen@seas.upenn.edu (215) 898-5901
	Gerald Lopez	Director, Business Development Singh Center for Nanotechnology	lopezg@seas.upenn.edu (215) 573-4041
NYU	**Nina Gray**	Assistant Vice Provost for Research	graya01@nyu.edu (212) 998-2304
	Kurt Becker	Vice Dean for Research, Innovation and Entrepreneurship	kurt.becker@nyu.edu (646) 997-3608
University of Delaware	**Jamie Philips**	Chair, Department of Electrical and Computer Engineering	jphilli@udel.edu (302) 831-2128

KEY MASH CONTACTS

MASH Mid-Atlantic SEMICONDUCTOR HUB

	NAME	TITLE	DETAILS
PRINCETON UNIVERSITY	**Alex Norman**	Executive Director Princeton Materials Institute	an8759@princeton.edu (609) 258-6855
	Barry Rand	Associate Professor of Electrical and Computer Engineering	brand@princeton.edu (609) 258-7692
	Richard Register	Director, Materials Institute	register@princeton.edu (609) 258-4692
BOSTON UNIVERSITY	**David Bishop**	Head of the Division of Materials Science & Engineering	djb1@bu.edu (617) 353-8899
	Alice White	Professor and Chair, Mechanical Engineering	aew1@bu.edu (617) 353-2814
COLUMBIA UNIVERSITY	**James Hone**	Chair, Department of Mechanical Engineering	jh2228@columbia.edu (212) 854-3304
	Samar Kaukab	Director of Strategic Research Development	sk4578@columbia.edu (212) 854-2996
UNIVERSITY OF MARYLAND	**Pamela Abshire**	Professor, Electrical and Computer Engineering	pabshire@umd.edu (301) 405-6629
	Ankur Srivastava	Professor & Director Institute for Systems Research	ankurs@umd.edu (301) 405-0434
UNIVERSITY OF THE DISTRICT OF COLUMBIA 1851	**Pawan Tyagi**	Professor of Mechanical Engineering & Director of ME Graduate Program	ptyagi@udc.edu (202) 274-6601

MARKETING COMMUNICATIONS

	NAME	TITLE	DETAILS
PennState	**Jennifer McCann**	Marketing Director, Materials Research Institute MASH Communications Manager	jmm96@psu.edu (814) 867-4173
	Kimberly Brue	Assistant Vice President Research Communications	kimberly.brue@psu.edu (814) 865-6042
Penn	**Lee Ozier**	Program Coordinator Singh Center for Nanotechnology	ozierd@seas.upenn.edu
NYU	**Joseph Tirella**	Senior Director of Executive Communications	jvt8915@nyu.edu (212) 998-6796
University of Delaware	**Tracey Bryant**	Senior Director for Research Communications	tbryant@udel.edu (302) 831-8185
Princeton University	**Steven Schultz**	Director of Engineering Communications	sschultz@princeton.edu (609) 258-3617
Boston University	**Rachel Lapal Cavallario**	Associate VP, Public Relations	rlapal@bu.edu (617) 353-7628
Columbia University	**Michele Hoos**	Executive Director of Communications, Engineering	mfh2107@columbia.edu (212) 305-0820
University of Maryland	**Institute for Systems Research**	Resources for the Media	mediainfo@umd.edu (301) 405-6602
University of the District of Columbia 1851	**Leeaan Hall**	Vice President for Marketing & Communications	leeann.hall@udc.edu (202) 934-5047
	Andrea Williams	Assistant Vice President for Marketing & Communications	andrea.williams@udc.edu (202) 274-5177

MASH

Mid-Atlantic SEMICONDUCTOR

HUB

WANT TO LEARN MORE?

JOIN OUR NEWSLETTER

KEEP INFORMED
GET INVOLVED

www.mash-semiconductors.org

CHIPSAct@psu.edu

MASH

Mid-Atlantic SEMICONDUCTOR

HUB

Partnering for a Strong American Semiconductor Future