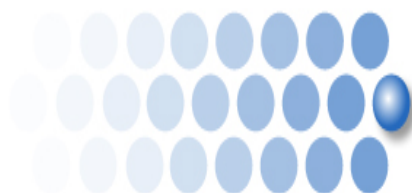


## Research Access Institute Profile

MassNanoTech Institute --*Integrative Research for Nanotech Discovery and Innovation*



MASSNANOTECH  
at the  
University of Massachusetts Amherst



Several years ago, a group of researchers from six science and engineering departments at UMass Amherst came together to build a multidisciplinary program in the groundbreaking field of nanoscience. Their vision is today the Massachusetts Nanotechnology Institute, or [MassNanoTech](#), a campus-wide initiative that brings together over 50 faculty from 8 different departments to engage in innovative nanotechnology projects.

Nanotechnology is the control of materials at dimensions of 1 to 100 nanometers (a nanometer is one-billionth of a meter, or 1/50,000 the thickness of a human hair) and can be used in a range of applications, from computer devices to medical treatments and from renewable energy to mechanical engineering. Using nanotechnology, the entire 29 million-volume collection of the Library of Congress could be stored on a 1-inch square memory chip. Because nanotechnology is a tool, rather than an end in itself, the field lends itself to a high degree of collaboration between many disciplines. “That’s the nature of nanotech,” observes Jeff Morse, the Institute’s Managing Director of the National Nanomanufacturing Network, “and that’s its beauty: because the field is defined by collaboration, we can partner with other researchers on campus to help them build the structures and materials they need.”

MassNanoTech is composed of several integrated research centers and programs, all based on the UMass Amherst campus. These include:

[Center for Hierarchical Manufacturing](#) (CHM), a NSF Nanoscale Science and Engineering Center (NSEC) that specializes in nanofabrication and nanomanufacturing. The CHM is directed by Professor Jim Watkins in Polymer Science and Engineering.

[Nanotechnology Innovation Training Program](#), a NSF-funded interdisciplinary graduate training program (IGERT) in nanotechnology device development, focusing on commercial applications of nanotechnology. This IGERT was the first of its kind at UMass.

[National Nanomanufacturing Network](#) (NNN), founded by UMass Amherst, is a broad alliance of academic, government, and industry partners cooperating to advance nanomanufacturing in the U.S. The only one of its kind in the country, this Network puts the Commonwealth at the center of the national nanotechnology research community. The NNN is directed by Professor Mark Tuominen in Physics.

The MassNanoTech initiatives together with other premier research efforts on campus have established UMass Amherst as a global leader in nanotechnology. These programs include:

[Materials Research Science and Engineering Center \(MRSEC\) on Polymers](#), established in 1973, is built upon the the country’s top polymer science program. It is the longest running NSF MRSEC and is an epicenter of nanomaterials research. The MRSEC

is directed by Professor Tom Russell in Polymer Science and Engineering.

[Fueling the Future Chemical Bonding Center](#), a NSF-funded initiative in renewable energy research that focuses on the basic science, including nanofabrication, of ultra-efficient fuel cell membranes. The Center is directed by Professor Sankaran "Thai" [Thayumanavan](#) in Chemistry.

**Nanoscale Interdisciplinary Research Team Program**, a prestigious NSF research award that UMass Amherst has secured five times since 2001.

Since 1997, researchers at UMass have generated more than \$40 million in funding for nanotechnology projects, resulting in more than 1,600 scholarly publications, and created more than 40 successful industry and government partnerships. In comparison to other Massachusetts research institutions, UMass Amherst ranks 2<sup>nd</sup> in the state in the number of NSF-supported nanotechnology projects. The ground-breaking work of these groups is possible due to the cutting-edge facilities on campus, including a state-of-the-art nanofabrication clean room due to open this fall in the Conte Research Center, the W.M. Keck Foundation Nanostructures lab, the Keck Microscopy lab, a semiconductor VSLI device fabrication facility, a nanomagnetism characterization facility, a nanoimprint lithography lab, a nano-medicine institute. The MRSEC and CHM Centers play a crucial role in establishing and maintaining these essential campus resources.

Through its research activities, MassNanoTech has built productive partnerships with other research groups on campus, such as the [Center for UMass-Industry Research on Polymers](#), as well as many extramural companies and agencies. As a member of the NSF NSEC program, the Institute has working collaborations with dozens of partners, including research universities such as the University of Puerto Rico, UCal Riverside, the University of Indiana, and SUNY Binghamton. With the assistance of UMass Amherst CVIP, the Institute has made available for commercialization over two dozen novel nano/micro technologies. And through the MassNanoTech Partners program, industry affiliates from around the country have the opportunity to gain early access to potentially commercializable research in nanoscale materials and processes, nanoscale electronic devices, and bionanotechnology underway at the Institute.

This coming academic year promises to be another exciting, successful period of growth for the Institute: the CHM has had its highly competitive NSF grant renewed, bringing in three additional years at \$4 million/year in research funds; the launching of the NNN will further establish UMass Amherst's reputation as a national leader in nanotechnology research and development; and the opening of a new nanofabrication facility this fall will enhance UMass Amherst's unique capability to carry out core nanomaterials work.

"Advances in UMass Amherst's research in key nanotech areas are changing the entire field," Morse notes. "Recent developments in highly relevant, highly commercializable areas, such as polymer self-assembly techniques and alternative energy conversion, stem from the range and strength of our researchers' expertise." With the support structure of the Mass NanoTech Institute, that expertise is brought together within a multidisciplinary context that allows it to flourish.

For more information about the Mass NanoTech Institute, visit the Institute's [website](#) or contact Jeff Morse [jdmorse@research.umass.edu](mailto:jdmorse@research.umass.edu) at 413-545-5264.

# New CHM Nanofabrication Facility

- Project Contract: \$2,294,000
- Construction Start: October 2007
- Completion: October 2008

