

# In brief

## Economic Development



### UMASS: AN EMERGING R&D RESOURCE FOR THE COMMONWEALTH

As Ray Stata, Chairman of Analog Devices, has rightly reminded us, Massachusetts has the highest concentration of scientists and engineers of any state in the country. Ours is a science- and technology-driven economy. Research and development is at the core of the economic competitiveness of the state and each of its diverse regions.

Clearly, the Commonwealth is blessed with some outstanding private research institutions. Since its organization as a five-campus system a little more than a decade ago, the University of Massachusetts has emerged as a major resource for research and development, as well.

Consider the following:

- The five UMass campuses conducted \$295 million of R&D in the past fiscal year—more than double the \$140 million level of just a decade ago.
- As a system, the university ranks #3 in R&D in Massachusetts and #4 in New England.
- UMass is the leading source of R&D in the Merrimack Valley, the South Coast, and central and western Massachusetts, and it is home to successful incubators in Lowell and Fall River.
- The system generated \$15 million in technology license income in fiscal year 2002, up from \$500,000 in 1996, ranking us among the top 25 universities in the United States.
- According to *Science* magazine, the #1 scientific breakthrough of 2002 was RNA interference (gene silencing), the result of research at UMass Worcester.

- According to the Institute for Scientific Information, two of the 10 most highly cited life scientists in the world are UMass Worcester faculty.

The university is the home of numerous internationally recognized departments and centers, ranging from polymers and computer science at Amherst and vaccine development and diabetes at Worcester to plastics at Lowell, marine science at Dartmouth, and environmental science at Boston.

While we already house a number of NSF- and NIH-sponsored centers, we are also excited that Amherst has recently made a strong proposal to NSF for an engineering research center for collaborative adaptive sensing of the atmosphere, and Lowell is a partner with Northeastern University in seeking designation of an NSF research center in nanotechnology manufacturing.

We accept the challenge outlined for us by the Massachusetts High Technology Council and Mass Insight to develop UMass into a “leading-edge technological university.” As the above data and the remainder of this report indicate, we are well on our way. With continued public and private support, there is no doubt we will achieve this goal in the years ahead.

Sincerely,

William M. Bulger  
President

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# Advanced Materials

## **NSF-Sponsored Materials Lab at UMass Amherst**

With 30 years of dedicated research in the field of polymers, UMass Amherst houses one of the world's largest academic polymer research centers and awards approximately 15 percent of all polymer science Ph.D.s in the country. In 1973, an NSF-sponsored Materials Research Laboratory was established to conduct polymer research on campus. This organization thrives today as an NSF-supported Materials Research Science and Engineering Center (MRSEC). MRSEC supports fundamental research in polymer science and engineering and related fields and is the only center of this type in the nation dedicated solely to the study of polymers. The center unites the efforts of 34 faculty members from six university departments and has research collaborations and outreach programs with more than 12 other institutions. In 2002, the center received a six-year, \$12.24 million grant from the NSF.

Contact: Thomas P. Russell, Director, MRSEC (413)577-1516

## **UMass Lowell Top-Ranked in Plastics Education and Research**

The UMass Lowell plastics engineering program, including its preeminent doctoral program, holds distinction as the largest and best established in the United States. A valuable resource to industry, UMass Lowell conducts over \$1.5 million in plastics R&D annually and works with industry partners such as Moldflow, Nypro, Lucent,

Gillette, and Cargill Dow. UMass Lowell is also home to the National Science Foundation Biodegradable Polymer Research Center, a partnership of industrial scientists, government laboratories, and researchers dedicated to exploratory and applied research on biodegradable polymers. Center Director Stephen McCarthy helps direct the Institute for Plastics Innovation, which works with industry to solve pressing issues such as lowering manufacturing costs and promoting reliability of product design.

Contact: Stephen McCarthy, Director, Biodegradable Polymer Research Center (978)934-3417

## **UMass Dartmouth a National Leader in Textile Research**

With the help of a federal grant from the National Textile Center (NTC), faculty members at UMass Dartmouth are undertaking research projects of global significance to the textile industry. Established in 1990 by Congress, through the Department of Commerce, the NTC funds scientific proposals that promise to further research in the textile industry and help keep America competitive. UMass Dartmouth attained membership in NTC as one of only seven U.S. universities supported by the center. It conducts close to \$1 million in R&D annually. UMass Dartmouth has developed R&D partnerships with organizations such as Quaker Fabrics, Natick Labs, and Hyperion.

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## **Amherst Hosts Leading University/Industry Partnerships on Polymers and Nanotechnology**

The Center for UMass/Industry Research on Polymers (CUMIRP) is the oldest continuously operating NSF-supported cooperative research center in the country. Founded in 1980, the center's mission is to stimulate innovation in polymer science and engineering by promoting, coordinating, and funding research collaborations between UMass and industry. CUMIRP and the Materials Research Science and Engineering Center provide a conduit for the transfer of technology among academic, industrial, and government laboratories. Recently, CUMIRP expanded its research to include a Hierarchical Polymers Cluster to focus on self-assembling and hierarchical nanostructured polymer and polymer-inorganic hybrid materials. More than 40 companies and government agencies, including Honeywell, MeadWestvaco, Bayer, GE Plastics, Natick Labs, and the Federal Aviation Administration, are tied into the polymer research effort at the university. Research support, corporate fellowships, and unrestricted gifts total approximately \$1.9 million per year. This accounts for nearly one-third of all research support for the polymers faculty.

Contact: James D. Capistran, Director, CUMIRP (413)577-1518

# Information

## TECHNOLOGY

### **Leading Center in Information Retrieval Housed at Amherst**

The Center for Intelligent Information Retrieval (CIIR) at UMass Amherst is one of the leading information retrieval research labs in the world. Founded in 1992 with an NSF grant, the CIIR develops tools that provide effective and efficient access to large, heterogeneous, distributed, text and multimedia databases. The center has designed novel techniques for improving information retrieval using probabilistic models. CIIR developed Inquiry, one of the most powerful early search engines for the World Wide Web (which it licensed to Infoseek) and the search engine currently used on the White House home page. CIIR has more than 100 current and former corporate and government sponsors, including Lotus Development, Lockheed Martin, and the U.S. Library of Congress.

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### **UMass Lowell an Emerging Leader in Bioinformatics**

UMass Lowell has launched a bioinformatics program that engages the computer science, math, chemistry, and biology departments, along with a philosophy professor and a bioinformaticist from UMass Medical School. UMass Lowell provides a training and research program in which computer scientists can acquire biological expertise and life scientists can master programming and related skills to promote more effective communication between these populations. Dr. Georges Grinstein, the director of the Center for Bioinformatics and Computational Biology at UMass Lowell, is also founder and

director of research at AnVil Informatics, Inc., a venture capital-backed Burlington company that specializes in data visualization for bioinformatics. Development of the company was based on technology licensed from UMass Lowell. Dr. Grinstein and colleagues at UMass Lowell and UMass Medical School are jointly pursuing an NIH planning grant in preparation for an application to become a Center of Excellence in Bioinformatics.

Contact: Louis Petrovic, UMass Lowell  
Research Foundation (978)934-2577

### **Amherst Computer Science Research Drives the Internet**

Research advances from the Computer Networks Research Group in the computer science department at UMass Amherst have helped shape today's Internet as well as the networks of tomorrow. The group's research focuses on the design and analysis of network protocols — the rules that govern how computers, routers, and other network components interact with one another. Many of today's key standards for Internet telephony and multimedia protocols grew out of Ph.D. research within their group, which has also developed protocols for multicast communication and Internet multimedia streaming. Its research allows network designers to better understand today's networks and to design tomorrow's. Past and present industry collaborators include Alphatech, AT&T, IBM, Intel, Lucent, Nokia, Nortel, Northrop Grumman, and Sprint. Research has also been funded by the National Science Foundation and the Defense Advanced Projects Research Agency.

Contact: Don Towsley, Professor of  
Computer Science (413)545-0207

“The leaders of the state's high tech economy are committed to initiatives that strengthen the leading-edge technological capabilities of the UMass system.”

**CHRIS ANDERSON**  
**President,**  
**Massachusetts**  
**High Tech Council**

## **UMass Dartmouth Leads System Efforts in Marine Science**

The School for Marine Sciences and Technology (SMAST) at UMass Dartmouth educates researchers and scholars who contribute to basic research and apply that research to resource management and economic development issues. With an active grant portfolio of \$15 million, SMAST's research programs focus on climate change, coastal systems science, estuarine ecology, fisheries management systems, fisheries oceanography, marine ecosystem dynamics modeling, observational oceanography, ocean engineering, and scallops management. SMAST offers both M.S. and Ph.D. programs in marine sciences and technology through the UMass System Marine Science Graduate School. SMAST occupies a two-story structure with 15 laboratories and a 100,000-gallon fresh- or seawater acousto-optic test tank, and provides flow-through seawater to all laboratories. The school has cooperative arrangements with Sippican, Inc., in Marion, MA, and the Naval Undersea Warfare Center in Newport, RI.

Contact: Brian Rothschild, Dean, School for Marine Science and Technology  
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## **Environmental Collaborative Launched by UMass Boston**

Since founding its first Ph.D. program in environmental sciences in 1982, UMass Boston has been expanding its expertise on the environmental front. The recently launched Environmental Collaborative represents a range of environment-related research, academic programs, and public service activities that take place across the campus's six colleges. UMass Boston's programs in this area span from K-12 environmental science education initiatives through Ph.D. programs in environmental sciences and marine sciences and technology. Faculty expertise includes chemistry professor Dr. John Warner, a recognized leader in green chemistry, who designed the first Ph.D. program in that discipline. In 2002, UMass Boston received more than \$4 million of R&D funding for environmental work from the National Science Foundation, the Office of Naval Research, the Department of Defense, and the National Oceanographic and Atmospheric Administration.

Contact: Paul Fonteyn, Provost and Vice Chancellor for Academic Affairs  
(617)287-5600

## **UMass Researchers Build South Pole Receiver**

A team of researchers, led by UMass Amherst, has built a receiver to map the location and amount of nitrogen plus, one of the galaxy's basic components. According to project director Sigfrid Yngvesson, this capability will provide a new perspective on stellar, chemical, and galactic evolution. The receiver was designed at UMass Amherst in collaboration with the Submillimeter-Wave Technology Laboratory (STL) of UMass Lowell. Other collaborators include the Harvard-Smithsonian Center for Astrophysics and the University of Arizona. Receiver installation was completed in January 2003, and it stands ready to capture galaxy signals. Researchers expect that the specialized receiver will be further developed for other uses, ranging from implementation aboard spacecrafts to monitoring of the earth's atmosphere. Three grants totaling \$1.9 million from NASA and the National Science Foundation support this project.

Contact: Sigfrid Yngvesson, Professor of Electrical and Computer Engineering  
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“UMass has campuses that are spotted around the state. They really are the lynchpin for the creation of new technologies, new jobs, new industries, in different parts of the state.”

**TOM HUBBARD, Vice President, Massachusetts Technology Collaborative**

## **UMass System Partners with Natick Labs**

The U.S. Army Soldier Systems Center, known locally as Natick Labs, plays a key role in strengthening soldiers' combat effectiveness. Natick Labs is responsible for the research, design, and development of food, clothing, and equipment needed by soldiers across diverse environments. UMass and Natick Labs have shared a formal partnership since early 2001 that realizes over \$1 million annually for the university. The partnership includes joint efforts in research, education, training, and other workforce initiatives. Natick Labs benefits from UMass expertise in such areas as advanced materials at UMass Lowell, textiles at UMass Dartmouth, and food and exercise sciences at UMass Amherst. Employees there have also taken advantage of customized training programs and online graduate education offered by the university. Fully 15 percent of Natick's workforce are UMass alumni. President Bulger and Natick Labs Director Phil Brandler recently renewed this partnership by signing a two-year memorandum of understanding.

Contact: Karin McCarthy, Director of Corporate Relations, UMass Office of the President (617)287-7039

## **U.S. Army Supports Submillimeter Wave Technology Lab at UMass Lowell**

The UMass Lowell Submillimeter-Wave Technology Laboratory (STL), principally under U.S. Army support, has been the major innovator of technology that provides scale-model radar measurement capability at frequencies up to several terahertz (THz). Effective operation of THz radars, which can fully simulate present microwave radar systems,

has necessitated STL's development of new THz radiation sources, detectors, optical components, and materials. Stable, long-term sponsorship and numerous technological innovations of the staff have made STL a national and local resource for projects involving the THz region of the electromagnetic spectrum. STL is presently in the third year of a five-year, \$25.2 million program awarded by the U.S. Army. With strong endorsement from Congressman Marty Meehan, the Radar Modeling Program received a \$2 million Congressional award in 2001 and an additional \$2 million the following year.

Contact: Jerry Waldman, Director, STL (978)934-4770

## **Botulism and Bioterror Studied at UMass Dartmouth**

Dr. Bal Ram Singh, a chemistry and biochemistry professor at UMass Dartmouth, is combating bioterrorism by developing an antidote to botulism. A botulism researcher for 15 years, Dr. Singh received a \$1.1 million grant from the U.S. Army Medical Research and Material Command to conduct a three-year study. Botulism leads the list of biological warfare threats. It attacks the nervous system and, if untreated, causes respiratory failure and death. Dr. Singh's research encompasses the design of diagnostic tools (biosensors) and the development of a protective vaccine for the botulism toxin. His laboratory has joined with Harvard Medical School to establish a Regional Center of Excellence in Biodefense as part of a national initiative to establish at least 10 such centers across the country.

Contact: Paul Vigeant, Assistant Chancellor for Economic Development (508)999-9143

## **World's Largest Microwave Sensing Lab Based at Amherst**

As the world's largest academic laboratory of its kind, the Microwave Remote Sensing Laboratory (MIRSL) at UMass Amherst plays a leading role in developing unique microwave and millimeter wave remote sensing systems. Such sensors can observe the earth's surface through clouds and rain 24 hours a day, allowing scientists to assess geophysical processes synoptically over extended time periods and under a wide variety of atmospheric conditions. MIRSL radars are used worldwide to study the detailed structure of hurricanes, tornadoes, and other geophysical phenomena. The lab has benefited greatly over the past decade from special relationships with Digital, General Electric, Hewlett-Packard, Hughes, Raytheon, Lockheed Martin, Sun Microsystems, Tektronix, United Technologies, and others. These companies have shared ideas and provided equipment and funds to develop MIRSL sensors and facilities over the years.

Contact: David McLaughlin, Director, MIRSL (413)545-2725

# Life Sciences

## **#1 Scientific Breakthrough of the Year Found at UMass Medical School**

UMass Medical School faculty member Craig Mello's work in gene silencing has been hailed by *Science* magazine as the number one "Breakthrough of the Year." Dr. Mello, a Howard Hughes Medical Institute Investigator, has also won the prestigious Award in Molecular Biology from the National Academy of Sciences, presented annually to a young scientist for a notable finding. These honors recognize the work of Dr. Mello and colleague Andrew Fire, Ph.D., of the Carnegie Institution of Washington, in the discovery of RNA interference, a process by which a particular form of RNA can silence targeted genes. This discovery, which *Science* magazine says is "prompting biologists to overhaul their vision of the cell and its evolution," will have far-reaching implications for future research and product development. To date, 24 licenses for this technology have been negotiated.

Contact: John L. Sullivan, Director, Office of Research (508)856-1572

## **UMass Lowell Center Promotes Biomanufacturing**

The Massachusetts Bioprocess Development Center at UMass Lowell helps biotechnology companies make the transition from research and development to the manufacture of bio-

pharmaceuticals for the treatment of chronic diseases. The interdisciplinary R&D and education center assists start-up biotech companies in developing procedures that can become validated, compliant manufacturing processes. The center also acts as a test site for evaluating new process technology, helping high-tech equipment developers improve their products. The center has recently worked with Boston Life Sciences in Boston and Marathon Biopharmaceuticals in Hopkinton.

Contact: Carl Lawton, Director, Massachusetts Bioprocess Development Center (978)934-3158

## **Medical School Receives \$7.5 Million NIH Grant for AIDS Drug Development**

Celia A. Schiffer, Ph.D., an assistant professor of biochemistry and molecular pharmacology at UMass Medical School, has been selected to lead a five-year, \$7.5 million NIH program grant to fight drug-resistant HIV. While many strides have been made in AIDS treatment, the HIV virus mutates rapidly, resulting in strains that lessen the effectiveness of existing medications. Dr. Schiffer will direct a multidisciplinary team of investigators from Stanford University Medical Center, the University of North Carolina School of Medicine, the University of Maryland, MIT, and the Center for Advanced Research in

Biotechnology. A UMass Medical School lab for the Program in Chemical Biology will serve as the program's core facility.

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## **Kennedy and Zerhouni Hail UMass Amherst/Baystate Alliance**

The Baystate Medical Center-University of Massachusetts Amherst Biomedical Research Institute in Springfield brings together the full capabilities of a major research university with one of the largest teaching hospitals in the United States. In late 2002, U.S. Senator Edward M. Kennedy and National Institutes of Health Director Elias Zerhouni joined UMass and Baystate Medical Center officials for the formal opening of the institute, a \$12 million initiative and the first of its kind in western Massachusetts. The institute's initial research clusters are being established in areas of breast cancer, computer analysis of medical imagery, degenerative disorders of nerve and muscle, medical device innovation, and clinical trial research. Its modern research space has core facilities, along with fully equipped surgical suites and additional space for expansion or business incubation.

Contact: Dr. Lawrence Schwartz, Director, Biomedical Research Institute (413)545-1545

**"The quality of life-science research at UMass is world class—rivaling that of MIT, Harvard, and WPI—and is of particular value to the Commonwealth."**

**TOM SOMMER, President, MassMedic**

**Worcester Faculty Lead  
Cutting-Edge Diabetes Research**

Aldo Rossini, MD, chief of the Division of Diabetes at UMass Medical School, was recently awarded the American Diabetes Association's highest honor, the 2003 Banting Medal for Scientific Achievement. Dr. Rossini directs the Diabetes Endocrine Research Center at the school, one of only 12 such centers in the country established by the NIH. He is an international leader in research on Type 1 (juvenile) diabetes. He is joined at UMass by Michael Czech, Ph.D., chair of molecular medicine. Dr. Czech, the 2000 Banting Medal recipient, researches Type 2 (adult onset) diabetes. Dr. Czech and colleague Silvia Corvera, MD, are also principal UMass Medical Center investigators for the Diabetes Genome Anatomy Project, a \$10 million NIH-funded project to mine the wealth of information provided by the Human Genome Project. The medical center is partnering on this project with the Joslin Diabetes Center, the Dana-Farber Cancer Institute, Children's Hospital, and MIT.

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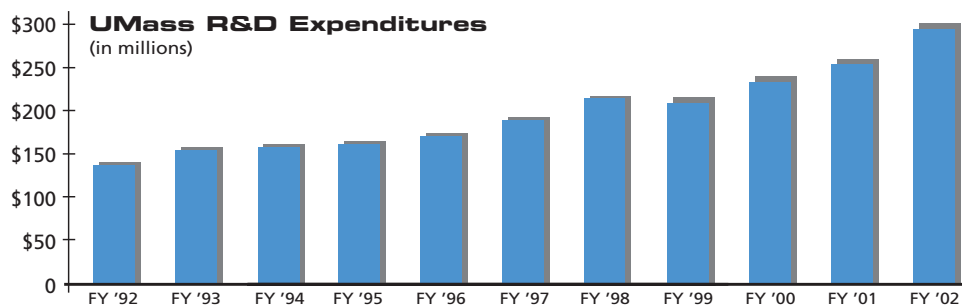
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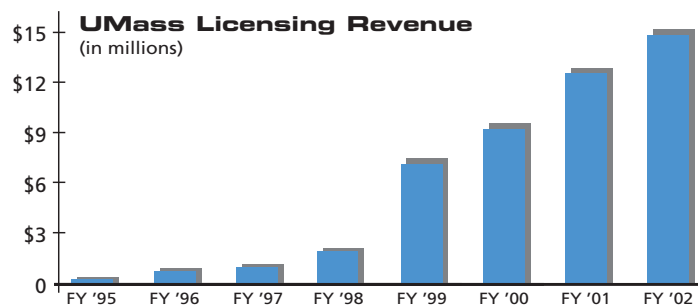
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UMass ranks #3 in Massachusetts and #4 in New England in annual university R&D expenditures.



UMass ranks among the top 25 universities in the United States in generating technology licensing income.