The Office of the Vice Chancellor for Research and Engagement provides services in support of the growth and expansion of research and scholarly activity on the Amherst campus. Our goal is to foster collaborative research, innovation, technology commercialization and entrepreneurship by providing expertise, counsel, oversight and access to funding. Visit us at www.umass.edu/research.

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Credits

EDITOR: Karen J. Hayes, Research Liaison and Development
DESIGN: Waterlily Design, Leverett, MA
COVER PHOTO: “Blue Spider” by Edwin P. Chan, Polymer Science and Engineering. This optical micrograph illustrates an example of a wrinkle pattern that develops on a polymer surface.

Alfred Crosby and his doctoral candidate Douglas Holmes found inspiration for novel polymers in the jaws of the Venus flytrap. See story on page 4.
I take pride in this campus’s accomplishments and am pleased to once again offer this annual Report on Research. The credit for another successful year goes to our talented faculty. This diverse set of experts, many of them world-renowned, can accomplish great things on their own but it’s in their connections to others – people, institutions, communities and countries – that they truly excel, each year reinforcing UMass Amherst’s status as a Carnegie Research Extensive university. It’s why we chose the theme Connections for this year’s report.

Meaningful connections are reflected in faculty productivity. More than 1,800 proposals were submitted to public and private funding agencies resulting in excess of $135 million in sponsored activity for the campus in our 2008 fiscal year. While many other universities across the nation saw decreases in their award dollars, UMass Amherst realized a 3% increase, continuing the upward trend we have always experienced as a research institution.

There are many kinds of connections, but the kind our faculty, staff, and students forge build partnerships and alliances that enable the growth of our research enterprise and also enable the transfer of knowledge to the people and communities who can benefit from it. Highlighted in this report are examples of connections which have resulted in prosperous relationships benefitting all who are engaged with them. Many are made possible because of the generous support of our friends and sponsors.

On behalf of the research community, I thank you for connecting to our campus and for your support of UMass Amherst research.

Sincerely,

Paul Kostecki,
Vice Chancellor for Research and Engagement
UMass Amherst classrooms and labs are teeming with faculty and students engaged in creating new knowledge based on what we know about the world. As this scientific inquiry or “connecting the dots” unfolds, breakthrough discoveries in areas such as climate change, energy generation and production, human and animal disease, industrial innovation and human health and well-being are revealed.

ALL THINGS NETWORKED

One can hardly think about “connections” without thinking about networks. And when it comes to networks, the Department of Computer Science at UMass Amherst has all the right connections. The faculty of 40 includes pioneers of the computer networking world: Distinguished University Professor JIM KUROSE*, whose research has helped build the foundation for principled network protocol and sensor network design, and Distinguished University Professor DON TOWSLEY, who has made significant contributions in the modeling, analysis and control of computer and communication networks.

Leaders in their field, funding for Kurose and Towsley accounted for a significant portion of the Department's $15 million in research awards for FY 08. With a number of other department faculty and colleagues in the Department of Electrical and Computer Engineering, UMass Amherst is an acknowledged world-class center of networking research.

While many of their research efforts are aimed at establishing the theoretical foundations of networking, Computer Science faculty are also adept at taking their work out of the lab and into the field. For example, professors DEEPAK GANESAN and PRASHANT SHENOY, both NSF CAREER AWARD recipients, are deploying a solar-powered wireless network on the Fort River in Amherst, MA. They are working with colleagues from The Department of Civil and Environmental Engineering, and Amherst, Hampshire and Mount Holyoke Colleges to use this solar-powered “RiverNet” to observe fish, marine life and monitor water quality on the river. This testbed will also be used by Five Colleges faculty to teach field courses in river science, ecology, hydrology and environmental sensing.

Shenoy is also co-investigator along with Professor BRIAN LEVINE of the Massachusetts Center for Networked Sensing in Challenged Environments (NetSenCE). Funded in part by a 2008 grant from the UMass President’s Science and Technology Fund, the Center is developing affordable,

*Kurose’s textbook, Computer Networking: A Top Down Approach is the most widely used in the field.
“Our society is facing problems that were not even on the radar screen as recently as ten years ago. Research on networks and networked systems can be applied in many important domains, such as emergency preparedness and environmental monitoring.”

– Andy Barto, Computer Science Chair

robust, easily deployable wireless sensor networks and platforms, with an emphasis on marine and terrestrial environments. Partners include UMass Dartmouth, UMass Lowell, the Woods Hole Oceanographic Institution, and connections to other partners continue to be made.

Professors MARK CORNER, EMERY BERGER, BRIAN LEVINE and ARUN VENKATARAMANI are building sophisticated networked systems inside buses, under the sea, and on the shells of turtles. These diverse environments are testbed subjects for disruption-tolerant networks, which allow for routing in networks that are unstable due to factors such as mobility, intermittent power, environmental interference or even malicious intent. These sorts of problems commonly occur when an infrastructure is destroyed by natural disaster or war, but they also occur in wildlife monitoring, sensor networks (for example, radars), and underwater acoustic networks. This research has broad applications to domains such as emergency preparedness, remote sensing and communication in challenging environments.

Networking research in the department doesn’t stop there. Other faculty members are researching networks of intelligent autonomous agents; real-time processing of data collected from networks of sensor devices, such as radio frequency identification (RFID) tags; the analysis of social networks; and theoretical issues concerning the design and use of communication networks. A group of faculty in the department is also developing the software architecture, system control algorithms and theory and underlying substrate of distributed computation for a new generation of data-driven, networked sensors. These sensors – radars in this case – are being developed in the campus’s $40 million National Science Foundation Engineering Research Center –CASA– and will provide scientists the ability to better predict when and where extreme weather events such as hurricanes and flash floods will occur.

“The department has created an outstanding research program in which networking is clearly a strength,” says Professor ANDY BARTO, chair of the department. “We have a wide variety of research collaborations focused on networks that connect the campus with state, local and federal government agencies, private industry, and other academic institutions around the world. Networks are pervasive in life. Our research applies across disciplines and in a number of important arenas.”

“When it comes to networking research, UMass Amherst Computer Science is a great connection to have.”
While seeking an innovative design superior to existing shape-memory polymers, ALFRED CROSBY and his doctoral candidate, DOUGLAS HOLMES, found inspiration in the jaws of the Venus flytrap. Adapting from the flytrap’s engineering, Crosby and Holmes created a surface covered with tiny holes capped by lenses that snap between convex and concave when triggered. This surface can then be made to respond to environmental stimuli – a feature useful for a range of applications from sensors to drug delivery devices.

Flytrap leaflets work by snapping from concave to convex when an object triggers their hairs. The key to its ability to capture prey is the speed and sensitivity of a “snap” transition. For the flytrap, the transition occurs in roughly 100 milliseconds; Crosby and Holmes’ polymer surface can snap in at least 30 milliseconds. Importantly, this speed can be easily adapted for faster or slower transitions depending on the intended use.

The “snap” transition changes the surface from a series of mounds to a series of depressions, a feature with great potential for release-on-command coatings, “smart” adhesives, adaptable optical devices, or responsive reflective surfaces. “This material’s design could allow for the removal of superglues, wallpaper, and paints without toxic solvents, which would be an advantage for the environment,” notes Crosby.

Imagine paint that adheres to a surface but releases on command, or road signs that change their reflectivity with changing weather conditions. These are two potential uses of a novel, responsive material designed by Polymer Science professor Alfred Crosby.
The inspiration for controlling the surface's adhesion properties also comes from nature, mimicking the gecko, a small lizard with pattern-covered toes with enhanced adhesion and release properties. By combining the flytrap's triggering technology with the gecko's adhesion technology, Crosby can engineer polymers as "smart" adhesives by covering the surface lenses with hairs that adhere in the convex position and release when concave.

“This novel surface has many advantages over existing shape-memory polymers,” says Crosby. “The snap-through transition is caused by an elastic instability therefore it requires very small amounts of energy to initiate large changes in geometry. The transition can also be limited to one lens or the entire sheet.”

Crosby and Holmes have used pressure, swelling, and surface chemistry as triggers for the “snap” transition. “Using different materials may lead to surfaces that transition in response to heat, light, and voltage. And changing the size scale would permit use in electronics and nanodevices,” observes Crosby. “There is no reason we can’t take this technology all the way down to the nanometer scale.”

For those who might be interested, this technology is available for licensing through the campus’s Office of Commercial Ventures and Intellectual Property. See back inside cover for contact information.
While pursuing and valuing all types of research, UMass Amherst fully recognizes that lead funding agencies encourage an interdisciplinary approach to problem solving and discovery. The breadth and depth of expertise that exists on a Research Extensive campus such as UMass Amherst easily allows for combining disciplinary perspectives and techniques for scientific inquiry.

"CREATIVE HEART" FOSTERS MEANINGFUL CONNECTIONS

Ask JOEL MARTIN, Dean of the College of Humanities and Fine Arts, to describe his College and he’ll say it’s the campus’s “creative heart.” A large, diverse College with disciplines such as Architecture, History, Linguistics, Music and Dance, Philosophy, and Theater, its role on campus and in the academic community is also large and diverse. Seen through the lens of history, creative interpretation and sophisticated understanding of complex human differences and conflicts, research and scholarly activity conducted by faculty in the College drive the big ideas that guide our thinking and shape our society. Through reasoned, careful humanistic studies, this work helps us to understand and interpret our world.

“The College of Humanities and Fine Arts (CHFA) is the creative heart of UMass Amherst in large measure because our faculty members are so productive and imaginative,” says Martin. “Indeed, each day I hear from faculty with innovative ideas for enhancing our research, teaching, and community engagement.” Martin was so struck by the synergy between ideas that were proposed to him that, working with a faculty and staff team led by Professor Yemisi Jimoh, he created a plan to connect faculty in a way that would foster interdisciplinary collaboration. Thus, the College’s VISIONING INITIATIVE – a peer reviewed competition to support interdisciplinary research and scholarly activity – was born. Emphasis was placed on fostering connections across multiple faculties in diverse campus units to encourage broader conversation and discovery that might not otherwise occur, but existing initiatives also received support.

“Forty-three proposals were submitted for Visioning grants,” notes Martin. “That represents over 100 faculty members and is a
testament to the energy and creativity that drive this College.” For the proposals that were chosen and funded, outcomes include new research and educational programs, new tools for humanities research, and new models of collaboration in the Humanities and Fine Arts. “There’s no doubt this faculty is talented,” says Martin. “Visioning grants help to bring that talent beyond the boundaries of their specific discipline.”

Increasing connections to the local community and the greater Pioneer Valley region are also fostered through Visioning grants. “The very nature of the Visioning initiative is extroverted,” notes Martin. “It will enable CHFA faculty to move beyond the walls of the College and to apply intellectual and creative energy to move their disciplines in new directions – including creating programs and activities that enhance the lives of people in the local community and beyond.

When the creative heart is engaged, there’s no limit to the connections that can be made,” says Martin.

“The College of Humanities and Fine Arts is the creative heart of UMass Amherst in large measure because our faculty members are so productive and imaginative. Each day I hear from faculty with innovative ideas for enhancing our research, teaching, and community engagement.”

- Joel Martin, Dean, College of Humanities and Fine Arts
What happens when you connect mechanical engineering techniques to biological structures? You learn new things, of course. Finite element analysis is a computer-based technique for predicting the behavior of structures based on principles of mechanics.

It enables engineers to digitally design and optimize anything from automobiles and trains to buildings and bridges. “Finite element analysis is used when experiments are not quick, easy, or feasible,” says IAN GROSSE of the Mechanical and Industrial Engineering Department. “It is used heavily in industry because it saves time, money, and material.”

Now, with a four-year, $982,633 grant from the NSF, Grosse and UMass Amherst biologist ELIZABETH DUMONT have connected engineering to biology and are building BIOMESH, an online resource for researchers who study the behavior of biomechanical systems. Ultimately, Biomesh will become a shared digital resource of finite element models of biological systems such as organs, tissues, skeletons, and even cells from 120 of the most common animals studied by biologists.
UMass Amherst researchers are developing a new resource for biologists studying biomechanics that’s based on engineering principles for product design testing.

such as sunfish, frogs, and rats. Dumont and Grosse hope that Biomesh will empower biologists to incorporate finite modeling as a regular tool in biomechanical research.

In addition to the collection of models, Biomesh will include tools for sharing models and the mechanical property values of various biological materials, tools for visualizing models and results, and utilities supporting the collaborative development of new models and threaded discussions for users.

“This site will be the easiest way for biologists to learn how to do finite element modeling,” says Dumont, who combines data gathered from animals in the field with finite element analysis to study how the physics involved in feeding has affected the evolution of mammal skulls. “How biological structures in animals respond to forces exerted on them is largely governed by the same physics that govern how products respond,” says Grosse. “A skull is a structure. When forces are applied to it, such as muscle forces due to biting, it deforms based on the same physics that govern how a safety helmet deforms during a crash. Newton’s Laws are still Newton’s Laws. They apply in the biological world as well as in the mechanical world.”

Find out more about Biomesh at www.biomesh.org/.
NEW DEVICE LINKS ACTIVITY LEVEL TO HEALTH OUTCOMES

Getting an effective workout means knowing exactly how much energy and effort your body is expending. A team of scientists headed by Patty Freedson, chair of the Department of Kinesiology at UMass Amherst, is partnering with researchers and industry-leaders from around the country to develop a device that can obtain long-term measures of free-living physical activity using a wide range of sensors in a single unit. Their work is being funded by a four-year, $2.1 million grant from the Exposure Biology Program of the National Institutes of Health’s Genes, Environment, and Health Initiative.

The new device will include an accelerometer to measure body motion, a ventilation sensor to record characteristics of breathing, and a sensor to determine if the activity takes place indoors or out. The team is also designing statistical processing methods that combine all of the sensors’ data to estimate the type of physical activity and the amount of energy expended. At the end of the term of the grant, the team expects to have an instrument ready for use in the field.
During the last 10 years, my research has focused on developing methods to capture and interpret movement assessed with wearable devices,” Freedson says. “This project moves the field forward by incorporating several sensors into one small unit. With the added sensors, we will improve our ability to quantify physical activity doses and thus better understand how much activity is needed for specific health outcomes.”

To develop the instrument, the UMass Amherst researchers are working with a private firm, Response Applications LLC of New Hampshire. In addition, the campus’s Office of Research Liaison and Development helped the team establish a partnership with industry leader Actigraph LLC. A physical activity monitor company based in Florida, Actigraph hopes to manufacture the device following its development in Freedson’s laboratory.

In addition to Freedson, the UMass Amherst team includes Professor JOHN STAUDENMAYER, Mathematics and Statistics, and Professor JANE KENT-BRAUN, Kinesiology. Other team members are Professor ROBERT GAO, Mechanical Engineering, now at the University of Connecticut, HAROLD GREELY, from Response Applications, and DAVID BASSETT, Exercise, Sport, and Leisure Studies, at the University of Tennessee.
INNOVATIVE TECHNOLOGY CONNECTS TASTE WITH LOW-FAT FOODS

If you enjoy a rich, flavorful dining experience, low-fat foods are often a disappointment since removing fat reduces the desirable taste, texture, and aroma of the original. However, a team of UMass Amherst researchers, including Food Science professors JULIAN MCCLEMENTS, ERIC DECKER, and YEONHWA PARK, is developing a new technology that could lead to low-calorie foods that taste exactly like the real thing.

“Our goal is to keep the fat in the food, but stop it from being digested by surrounding it with layers of dietary fiber,” says McClements. “Foods produced with these encapsulated fats should have the same qualities as conventional high-fat foods.”

Encapsulated fats can be used in emulsion-based foods such as beverages, sauces, desserts, yogurt, and salad dressings. Fiber could also be used to encapsulate vitamins and antioxidants, enabling them to survive a trip through the stomach and be released in the small intestine for absorption by the body. This process could allow ingredients with proven

Just because food is low-fat doesn’t mean it has to taste bad. A team of Food Science professors at UMass Amherst have developed a new way to keep healthy food flavorful through encapsulation technology.
health benefits but unpleasant taste, like Omega-3 fatty acids, to be included in a wider variety of foods.

To make the encapsulated fats, small droplets are formed by mixing oil, water, and a surfactant in a process similar to making salad dressing. The surfactant coats the droplets and keeps them separate from the water until the fiber is added. Controlling the electrical charges of the surfactant and the fiber molecules makes the oil attract the fiber like a magnet. Other substances, such as proteins, can then be incorporated to provide additional benefits.

The process can encapsulate a wide range of fats and oils, ranging from orange oil to olive oil, and uses natural fiber obtained from apples, oranges, seaweed, or shellfish. All the ingredients are food-grade, so the technology requires no FDA approval. The droplets remain stable in acidic foods, during freezing, thawing, and cooking, and can handle large amounts of salt.

The encapsulation technology, as applied to the beverage industry, is the foundation for a new company called Wesfolk which was launched by UMass Amherst alumnus, Lewis Geffen, in January 2008 (see story page 33).

Future research by the team will focus on customizing the fiber layers to respond to different environments and testing to determine whether this method can be used also as a delivery system for therapeutic drugs. “It should be possible to develop coatings that release drugs at specific sites within the human body,” says McClements. The benefits for this new food sciences technology thus go beyond simply making ingredients taste better, offering potential health and medical solutions as well.
The Center for Spectator Sport Research (CSSR) at the Isenberg School of Management is working with sports leagues and sponsors to conduct marketing research that helps match commercial brands prevalent in college bowl games and on NASCAR vehicles with the fans that follow individual sports. CSSR director TRACY SCHOENADEL says the center serves two important purposes: it gives sport management students hands-on training in marketing research and it helps build industry partnerships with the campus.

Working with industry partners such as Major League Soccer, Turnkey Sports, New York Redbulls, the Massachusetts Sports Partnership, Dew Action Sports Tour and Reebok, the CSSR divides its research among market studies, customized marketing research, and the creation of strategic marketing plans. For example, Center researchers recently did an eight-nation, brand-image survey for the energy drink Red Bull. The goal was to determine how consumers perceive the beverage and how that information can be used by promoters of different sports in the various countries that were studied.
The Center for Spectator Sport Research conducts customized, retainer-based and syndicated research for members of the spectator sports industry. Center members collaborate with leading sport research organizations to provide educational and training opportunities for industry executives and students.

“Sponsorships can play a brand-defining or re-positioning role, as Michael Jordan did for Nike and perhaps Tiger Woods is currently doing for Buick,” Schoenadel says. “Alternatively, they can be one of the many marketing tools used to build awareness, consideration and some level of affinity. Therefore, it is very important to make sure the brand matches the property, especially by country.”

Schoenadel is a leading authority on sponsorship research, which is a strategic strength of the CSSR. Her 15 years of industry experience includes work as vice president of TNS Sports’ Research Division where she was responsible for the evaluation of sports events and sponsorships. She was also executive director of TNS’ signature product, the industry-leading ESPN Sports Poll.

In addition to the CSSR’s research activities, Schoenadel is working to strengthen industry ties through a guest speakers program, a blog-chat room that serves as a forum for current issues in sport business, and by offering workshops and education programs at industry conferences. “We want to create and strengthen as many relationships as possible between the department and industry,” says Schoenadel. “Ultimately, that means better educational and experiential opportunities for our students and well prepared employees for our industry partners.” Connect to the Center for Spectator Sport Research at www.umasssportresearch.com.
The University of Massachusetts Amherst has a longstanding and valued relationship with the cities and towns of the Springfield region. As one of the original land-grant universities created by the Morrill Act of 1862, UMass Amherst exists to serve the Commonwealth: to educate its citizens, to conduct research relevant to its needs, and to engage in public service to address its challenges.

THE POWER OF CONNECTION: SPRINGFIELD AND UMASS AMHERST

In the fall of 2007, Massachusetts Governor Deval Patrick requested the University of Massachusetts Amherst and the City of Springfield, MA work together to develop specific initiatives and proposals that would lead to UMass Amherst’s undertaking an expanding role in the revitalization and sustained growth of the City of Springfield. The result was the creation of the GREATER SPRINGFIELD – UMASS AMHERST PARTNERSHIP TEAM. With additional representation from the Governor’s Office and the UMass President’s Office, the Partnership Team gives structure and focus to the already strong connections between the
two entities. Projects that result will match the campus’s talents with Springfield’s growth opportunities contributing to the revitalization of the city.

The Green Economy and the Creative Economy are the first two areas being pursued by the Partnership Team. UMass Amherst, with its breadth and depth in advanced energy research, is uniquely positioned to support the growth of the green industry in Greater Springfield. The Creative Economy will be enhanced by leveraging the arts programs and talent that are on campus to develop new performance events and opportunities for students, the community, and visitors in Springfield.

The Partnership Team complements the work of the faculty, many who have spent hundreds of hours in the Greater Springfield community working in the areas of public health and education, in addition to green and creative economy related areas. The power of connection is at work. The report on Greater Springfield/UMass Amherst connections can be found at www.umass.edu/research.
The UMass Amherst School of Nursing and Holyoke Health Center (HHC) have launched a collaborative partnership agreement that formalizes and strengthens the educational, research, and practice opportunities between the two institutions with a focus on meeting the healthcare needs of Western Massachusetts citizens. The practice partnership will be housed in HHC’s newly renovated facility in Chicopee, MA; Chicopee Health Center (CHC).

The heart of the collaboration is a novel health risk assessment, prevention and lifestyle management program called “LifeCharge™” (Take Charge of Your Life Program), created by UMass Amherst School of Nursing Associate Professor JEAN DEMARTINIS, PhD, FNP-BC.

LifeCharge™ is the product of what Dr. DeMartinis describes as, “The missing piece in current lifestyle assessment and management programs.”
Using CardioPulmonary Exercise Testing (CPET) as a foundation, LifeCharge™ is a comprehensive, individualized program that gives DeMartinis and her team the data needed to develop an individualized activity/exercise and/or diet plan for patients intended to effect positive healthy lifestyle change. The team can monitor the management plan or it can be monitored by the patient’s healthcare providers.

“CPET gives us more data about a patient’s metabolic state than standard diagnostic tests such as simple treadmill stress tests and the usual blood work-up,” says DeMartinis. “Our specialized equipment allows us to assess a patient’s individual energy consumption and how his or her body is functioning in terms of metabolism better than anything currently available. We can actually assess potentially ‘why’ patients have activity intolerance and whether or not they are really eating too much or too little and still gaining weight. We can help people stop feeling tired all the time and help them to take charge of their lives for their health!”

LifeCharge™ is the product of what DeMartinis describes as, “the missing piece in current lifestyle assessment and management programs.” This program will round out HHC/CHC’s lifestyle management portfolio which currently consists of Diabetes Management, Healthy Weight and Women, and Chronic Disease Management programs. It will also give providers from both facilities an avenue to refer any patients who could benefit from being monitored in a prevention program such as LifeCharge™.

“We are very excited about bringing the new LifeCharge™ Program on line,” says DeMartinis. “Not only will we reach patients in the community who were not easily reached before, but the facility will serve as a teaching residency site for the campus’s Doctor of Nursing Practice (DNP) Program. The residency or “capstone” component is essential to the successful completion of the DNP,” notes DeMartinis. The facility will also serve as a much needed practice site for UMass Amherst faculty and will allow them to launch projects that require community engagement in a real world setting.

As she looks to the future, DeMartinis sees other connections to be made through this new venture. The collaboration has the potential to expand research in risk assessment and prevention and lifestyle management, including the growth of interdisciplinary research between the School of Nursing, practicing providers in the area, and other campus units including Public Health and Nutrition. “The pursuit of research is definitely on our radar for the future,” says DeMartinis. “In fact, the LifeCharge™ program as a cutting edge new model has the potential to be franchised and adopted on a national level. We are unique in our approach. I don’t know of any other educational institution doing lifestyle assessment and management planning in this way.”
UMass Amherst principal investigators once again exceeded the achievements of previous years, both in proposals submitted and awards received. Proposals submitted in FY08 had a total dollar value more than 13% over that of FY07 proposals. Evident in those proposals are the connections, both internal and external, that drive the campus’s research enterprise.

More than 15% of the proposals submitted in FY08 were as proposed subcontracts with partnering institutions; 50% of those partnering proposals were with other colleges and universities and 21% with industry. Though these two types of sponsors represent the largest proportion of our collaborative proposals, principal investigators are working with sponsors from all categories including health agencies, the Commonwealth of Massachusetts, other states, institutes and associations, non-profits and others. Clearly, campus researchers have expertise that is highly regarded among peer research organizations and sponsors alike.

Research awards in FY08 reached a new high exceeding $135 million, an increase of 3% in dollars awarded and 5% in the number of awards. Federal funding increased 15% over FY07 and represented 69% of the overall funding, up 7.5% from last year. Industry sponsorship rose 6% to stay at a steady 10% of the total dollar amount received.

The active connections and collaborations between campus departments are also evident in the fact that $23 million, or 17% of the total award dollars received in FY08 were for multidisciplinary proposals.

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**FY08 SPONSORED RESEARCH SNAPSHOTS**

- Proposals Submitted: 1,847
- Proposal Dollars: $248,613,799
- Awards: 1,194
- Award Dollars: $135,318,332
- Research Expenditures: $126,000,000

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*Go to umass.edu/research for full report*
DISTRIBUTION OF AWARDED DOLLARS BY SPONSOR CATEGORY

Total Awards: $135,318,332

- Industry 10%
- Non-Profit (Private) 13%
- Commonwealth of MA 7%
- Other State & Local Govts. <1%

DISTRIBUTION OF AWARD DOLLARS ACCEPTED FROM FEDERAL AGENCIES

Total Awards: $93,226,867

- NSF 47%
- DHHS 21%
- DOD 7%
- USDA 2%
- SBA 2%
- EPA 2%
- DoEd 1%
- DOC 1%
- Other 2%

DISTRIBUTION OF AWARD DOLLARS ACCEPTED FROM THE PRIVATE SECTOR

Total Awards: $31,588,483

- Industry 42%
- Foundations 14%
- Other Colleges & Universities 19%
- Institutes & Associations 13%
- Health Agencies 6%
- Other Sponsors 6%

TRENDS IN INDUSTRY-SPONSORED RESEARCH AWARDS

- 2004
- 2005
- 2006
- 2007
- 2008

$0
$2,000,000
$4,000,000
$6,000,000
$8,000,000
$10,000,000
$12,000,000
$14,000,000
Research conducted by UMass Amherst faculty, staff and students has a broad reach. This is evident in the variety of disciplines it impacts, in our nationally recognized faculty, and in the formal exchange programs and research agreements the campus has with 102 universities and colleges in 36 countries outside the U.S.

**REDSUCING HUMAN/ELEPHANT CONFLICT**

Ask Professor CURT GRIFFIN, Natural Resources Conservation, how he came to follow the movements of elephants throughout Africa and he’ll tell you his Fulbright scholarship was to blame. In 1997, Griffin and his family travelled to South Africa on his Fulbright to assist members of the Natal Parks Board on a number of wildlife protection and conservation issues. While there, he made a connection to someone from Botswana who, when he heard about Griffin’s expertise in endangered species management, wanted him to do survey work on an elephant migration corridor to help shed light on why some local populations were being negatively impacted by elephants and why others seemed to be clear of confrontation.

“After we did the work on that first corridor in 1999, I was able to get funds to grow the program,” says Griffin. With the aid of graduate student ALFRED KIKOTI, a native of Botswana, Griffin is tracking the seasonal movements of 50 elephants across migratory corridors in the Kalahari Desert. Because the elephants being tracked are herd matriarchs, Griffin’s team is able to gather data on nearly 900 animals.

“We study movements of elephant herds in order to identify existing migratory paths,” says Griffin. “Knowing where these corridors are means the government can protect them and work with surrounding communities to develop strategies for co-existence. How and where landowners locate their houses and farms in relation to these protected areas can help reduce incidences of human/elephant conflict.”
UMass Amherst wildlife researchers tracking elephant migrations in Africa are helping to decrease incidences of human/elephant conflict and increase harmony between this endangered species and the people who live among them.

In July of 2008, Griffin and Kikoti returned from six weeks in Tanzania where they were able to identify five new migration corridors. “Working with Alfred and other students from the countries we are surveying is important,” says Griffin. “It’s a way for these countries to build capacity - to build the educated workforce needed to sustain and grow these programs from within native communities.”

As part of their work, Griffin and his team use satellite technology to track herd migrations via Global Position Systems, or GPS. “It’s the same satellite technology used to track down stolen vehicles,” notes Griffin. Only outfitting the elephants with GPS devices is a little more exciting. To collar the elephants, Griffin and his colleagues must sedate them from a helicopter and then work quickly, within 10-12 minutes, to place the collar on the pachyderm before the sedation antidote is given and the elephant awakens.

Griffin’s work with elephants extends beyond the borders of migration corridors. In 2004 he and his former Ph.D. student, Mike Chase, founded Elephants Without Borders, a nonprofit group dedicated to understanding the ecology and behaviors of elephants and developing elephant conservation programs. The program has made numerous contributions to both ecological and public policy research related to elephant protection.
BREAKTHROUGH BIOFUELS PROCESS CONNECTS “GREEN” WITH GASOLINE

GEORGE HUBER, Chemical Engineering professor, is using his NSF CAREER award to change the face of biofuels. Huber, who holds the John and Elizabeth Armstrong Professional Development Professorship, specializes in catalytic processes, materials and reactors for biomass conversion to fuels, developed a quick and efficient approach for converting cheap and abundant biomass sources into gasoline components, or “green gasoline.” The gasoline variant produced in Huber’s lab has a number of advantages in the world of biofuels – namely it’s inexpensive to produce, it can fit into existing fuel production use and infrastructure, and his approach represents a breakthrough in the way biomass is converted.

Working with graduate students TORREN CARLSON and TUSHAR VISPUTE, Huber uses solid, recyclable catalysts and a moderate amount of heat to treat cellulose from plant material which is then rapidly cooled. The result is a liquid containing a number of compounds found in gasoline, such as toluene and xylenes. Because the resulting product is hydrocarbon based, it can be used in existing automobile engines. The process to produce this “green gasoline” is quick – it takes about 2 minutes to complete.

“George Huber’s new process for the direct conversion of cellulose to gasoline aromatics is at the leading edge of the new ‘Green Gasoline’ alternate energy paradigm that NSF, along with other federal agencies, is helping to promote.”

– JOHN REGALBUTO, DIRECTOR, NSF CATALYSIS AND BIOCATALYSIS PROGRAM
Huber’s process is green in other ways – so green that it literally leaves no carbon footprint. For one, it’s highly efficient which means it uses very little energy. In fact, the process produces heat which can then be captured and used to generate electricity. And because the process is successful with a variety of biomass feedstocks, the fuel can be made from low-cost cellulosic materials such as wood chips, corn husks or other agricultural waste. Because these products are cheap and abundant, it opens up opportunities to reduce biofuels production using food crops, allaying fears that biofuels production will raise the cost of food. All of these factors add up to savings at the gas pump. Huber suggests that when the technology is ready for commercial application, the price of a gallon of gas could drop significantly.

“We are currently working on understanding the chemistry of this process and designing new catalysts and reactors for this single step technique,” says Huber. “This fundamental chemical understanding will allow us to design more efficient processes that will accelerate the commercialization of green gasoline.”

The importance of Huber’s work has been recognized in a number of ways. He received one of this year’s Technology Development grants from the UMass System’s Office of Commercial Ventures and Intellectual Property, which recognizes faculty who take technology invented on campus to the next level of commercialization. And Huber’s student, Torren Carlson, led a UMass Amherst student team to 3rd place and a $15,000 prize in the 2008 Ignite Clean Energy (ICE) competition at Olin College. Organized by the MIT Enterprise Forum of Cambridge, ICE is a competition that rates clean energy business plans developed by student and professional teams.

Huber’s research is also featured in an April 2008 report sponsored by the Department of Energy, the NSF and the American Chemical Society called “Breaking the Chemical and Engineering Barriers to Lignocellulosic Biofuels: Next Generation Hydrocarbon Biorefineries” and can be found at www.ecs.umass.edu/biofuels/Images/Roadmap2-08.pdf.
RELATIONSHIPS THAT INFLUENCE HEALTH

Research being conducted by social psychologist PAULA PIETROMONACO and developmental psychopathologist SALLY POWERS, director of the UMass Amherst Center for Research on Families, is making clear the connection between a healthy relationship and a healthy body. By identifying the human factors, especially within the context of marital relationships that might lead to physical vulnerabilities, their research could provide medical experts with new tools to help reduce the emotional burdens of cancer and risks for cancer progression.

Funded by a $2.29 M, five-year grant from the NIH's National Cancer Institute, Pietromonaco and Powers are surveying healthy couples over the early years of marriage to determine how spouses’ expectations and beliefs about relationships, together with their physiological stress reactions when they disagree, predict later risks for depression and anxiety. “From a cancer perspective,” says Pietromonaco, “it is important to understand the biobehavioral mechanisms underlying the link between attachment and depression.” Depression rates are four times higher in cancer patients than in the general population and depression affects adjustment during both diagnosis and treatment. At the same time, physiological stress reactions predict not only a greater risk of depression but also faster tumor growth and poor survival rates for some forms of cancer.

Pietromonaco’s research has already shown that beliefs about romantic relationships and partners forecast physiological stress reactions by increasing levels of the stress hormone cortisol when couples disagree. Higher cortisol levels are associated with clinical depression and disruptions in cortisol are related to physical health consequences such as impaired immune functioning, increased risk of breast and colon cancers, and poorer survival among breast cancer victims.

“This study will help us better understand the basic processes through which spouses may influence each other’s health,” notes Pietromonaco. It also will provide a strong foundation for examining those processes in couples in which one partner is at high risk or has been diagnosed with cancer and to build new intervention strategies to then help couplescope with cancer.
SEEKING SUCCESS IN SCIENCE EDUCATION

Professor JOHN CLEMENT has made a career out of unraveling the mysteries behind what behaviors contribute to struggle or success in learning science and math. The author of two new books published in 2008 on the subject, Clement’s work connects the thinking processes underlying the learning and doing of science with the end goal of using this research to improve science instruction at all educational levels.

Clement’s books, “Creative Model Construction in Scientists and Students: The Role of Imagery, Analogy, and Mental Simulation”, and “Model Based Learning and Instruction in Science” published by Springer Dordrecht, are just the latest contributions he’s made to the field.

Clement received the Distinguished Contributions to Science Education through Research Award from the National Association for Research in Science Teaching (NARST) in 2005. The award is granted annually to an individual who has made a continuing contribution, provided notable leadership, and had substantial impact on science education through research sustained over a period of at least 20 years.

One of Clement’s contributions was to uncover learning difficulties experienced by science students. He found that students who could solve problems using complicated formulas sometimes did extremely poorly on very basic qualitative problems. Their responses revealed that these students tended to hold “alternative conceptions” that are opposed to what scientists have found to be true, for example, the incorrect idea that a heavy object falls more rapidly in a vacuum than a light object. He also uncovered a considerable number of positive intuitions students possess that are in agreement with scientific theory and that can be used as starting points for instruction. By using experiments and classroom discussions to first draw out and then contrast these two kinds of beliefs, science teachers can promote students’ thinking and inquiry skills as well as their deeper understanding of science topics.

“This kind of basic research on students’ learning difficulties in science education has led to the development of curricula that are now being used by thousands of teachers around the country, underlining the importance of the long term effects of research for changing practices in the field,” explains Clement. Clement, a Professor in the Teacher Education and Curriculum Studies Department, School of Education, conducts the interdisciplinary portion of his research in conjunction with colleagues from psychology, physics, computer science and engineering through the campus-based Scientific Reasoning Research Institute (SRRI – srrri.umass.edu). Faculty researchers in this internationally known center have been conducting research on reasoning and cognitive processes involved in the learning of science and math for more than 20 years.
Connecting to the Commonwealth

From Adams to Woods Hole and all points in between, faculty, staff and students at UMass Amherst are serving Massachusetts’ communities.

A recent survey of faculty activity uncovered that more than one thousand UMass Amherst-led projects are impacting 280 communities across the Commonwealth. And more are on the horizon.

“I am committed to doing everything possible to ensure that UMass continues to bring the best students, the most renowned faculty, and the next world-changing ideas to our Commonwealth.”

- Deval Patrick, Governor of Massachusetts

UMass Amherst strengthens the Commonwealth strategically through endeavors such as the Life Sciences and Clean Energy initiatives. For example, the Pioneer Valley Life Sciences Institute – a partnership with Baystate Health Systems in Springfield, MA – has boosted the region’s visibility and competitiveness in the life sciences. A study conducted in February 2008 by the UMass System Clean Energy Working Group is building awareness about how campus and System researchers generate the foundational knowledge underpinning next-generation clean energy technologies which contributes to their related public policies, including: off-shore wind power; low-cost, high-efficiency photovoltaic materials and fuel cells; cellulosic biofuels; “green” gasoline; and zero-energy homes and buildings. Serving the Commonwealth in this capacity is part of the campus’s land-grant mission.

In addition to the Clean Energy report, the campus issued two reports on its connections to the Commonwealth and to Greater Springfield. The reports are available online at: www.umass.edu/research.

LIFE SCIENCES INITIATIVES CONNECT TO CAMPUS

On June 16, 2008, Governor Deval Patrick signed into law a bond bill for capital improvements that will direct $1 billion over ten years towards the life sciences sector in Massachusetts. The bill will have a
Researchers at UMass Amherst are one step closer to demystifying the intricacies of the human brain by analyzing images using state of the art equipment. Thanks to a partnership with the COOLEY DICKINSON HOSPITAL in Northampton, MA, campus researchers now have access to their own brain imaging facility located just a few blocks away. The shared facility in Amherst is used by Cooley Dickinson Hospital for medical diagnostic purposes and one day a week the facility is reserved for faculty and students to conduct research.

Psychology Professor JERROLD S. MEYER says the functional Magnetic Resonance Imaging or “fMRI” machine allows researchers to see soft tissue, such as muscle or brain tissues, in detail in three dimensions and to see changes as they occur. Researchers worldwide use fMRI to better understand how the inner workings of the human brain enable people to perceive and attend to the world around them, to think and reason, and to feel emotions.

The UMass Amherst Office of Research provided initial funding for the facility including funds for additional hardware and software to enhance the device’s research capabilities and seed funding (see page 38 for a listing of current awards) for researchers to collect pilot data that will be used to pursue external funding.
A new EPA-funded collaboration between UMass Amherst and other regional partners is helping to clean up the 410 miles of the Connecticut River, from the Canadian border to Long Island Sound.

AREGIONAL WATERSHED PARTNERSHIP

Things are looking up for the more than two million people who call the Connecticut River Valley home thanks to a new regional partnership that draws upon UMass Amherst environmental expertise to help clean up the Connecticut River.

For years, water quality problems – due to bacteria and chemicals from industry, agricultural runoff, erosion and sedimentation, sewer overflows, and urban storm water – have prevented the River from meeting state and federal water quality standards for recreation, wildlife habitat, and the safe consumption of fish. Now, through the work of the new Tri-State Connecticut River Targeted Watershed Initiative, Connecticut River Valley residents and the millions who visit the region annually to enjoy its natural beauty – will be able to fully benefit from this precious natural resource.

Researchers in the Massachusetts Water Resources Research Center (WRRC) at UMass Amherst are playing a vital role in the EPA-funded initiative, which is coordinated by the Pioneer Valley Planning Commission and engages over twenty other regional and federal partners besides UMass Amherst including the Connecticut River Joint Commissions, Franklin Regional Council of Governments and the United States Geological Survey. Funding for the project stems from the Targeted Watershed Initiative, a $13 million program of the EPA.

The Initiative's tactics include real-time water quality monitoring, bank erosion stabilization, inventive financing for controlling urban runoff, smart growth tools to protect public water supplies, and low impact development tools to control agricultural runoff. Additionally, the project will employ bacteria monitoring in historically disadvantaged urban areas to alert users of health conditions and to provide data for elected officials in developing ordinances to address potential contamination sources. Each task also includes extensive public outreach, both online and on the streets, to educate the public and serve as a model for similar activities elsewhere on the River.

The Massachusetts Water Resources Research Center is part of the campus's Environmental Institute – a gateway to UMass Amherst interdisciplinary research expertise in areas such as water and watersheds, contaminants, sensing of the environment, climate change, and renewable energy.
SCIENCE AND TECHNOLOGY INITIATIVES FUND

Sponsored by the UMass President’s Office, S&T grants support multi-campus initiatives that strengthen the University’s research and development bases, deepen ties with Massachusetts industry and research institutions, leverage external resources, and contribute to economic growth in the Commonwealth.

CHM Nanofabrication Laboratory

The CENTER FOR HIERARCHICAL MANUFACTURING (CHM), a $16 million NSF Nanoscale Science and Engineering Center, was one of the first projects to receive a grant from the President’s Office S&T fund. The CHM continues to build on that foundation of support and recently opened a new Nanofabrication Laboratory. Housed in the Silvio O. Conte National Center for Polymer Research, and part of the Mass NanoTech Institute (MNT) at UMass-Amherst, this new facility brings state-of-the-art nanofabrication processes to the campus. Funded through a $5 million grant from the State of Massachusetts, the facility infrastructure has recently been completed, and installation of the new equipment is underway.

The Nanofabrication Laboratory enhances research capabilities within the CHM and MNT by providing new capabilities to control critical feature patterning and replication, conduct three-dimensional integration of multiscale structures, combine a range of thin film materials and coatings through conformal deposition, ultimately resulting in integrated nanoscale systems, one of the key goals for researchers in the CHM.

Intelligent Transportation System Collaborative Launches Online Certification Program

Transportation is an essential contributor to economic well-being and economic development. Leading industries in Massachusetts depend on a smoothly operating transportation system. To that end, the University Collaborative for Intelligent Transportation Systems is developing a new online certificate program to help develop the workforce needed to manage the Commonwealth’s and the nation’s need for safe, efficient and environmentally sound transportation of people and goods. Coursework in the certificate program will concentrate on Electronic Payment Systems (EPS) and sensor technology; traffic management, signals and controls; Advanced Traffic Information Systems (ATIS), and Fleet Management Systems (FMS).

Formed in July 2007 and funded by a UMass President's Office S&T initiatives grant, the Collaborative connects transportation professionals in the Commonwealth's private and public sectors with the academic community around development and education of Intelligent Transportation Systems. Professor MARGUERITE ZARRILLO at UMass Dartmouth, Professor JOHN COLLURA at UMass Amherst, Professor NATHAN GARTNER at UMass Lowell and Professor TOMAS MATERDEY at UMass Boston direct the system-wide, interdisciplinary center.

FY08 UMASS PRESIDENT’S S&T INITIATIVE AWARDS

• UMass NanoMed Institute (Amherst/Lowell/Worcester) – T.J. MOUNTZIARIS, Electrical and Computer Engineering
• Massachusetts Center for Networked Sensing in Challenged Environments (Amherst/Dartmouth/Lowell/Woods Hole Oceanographic Institute) – BRIAN LEVINE and PRASHANT SHENOY, Computer Science
• UMass Amherst Wireless Center for Excellence – DENNIS GOECKEL, Electrical and Computer Engineering
• University Collaborative for Intelligent Transportation System (Amherst/Boston/Dartmouth/Lowell) – JOHN COLLURA, Civil and Environmental Engineering
• UMass Institute for Stem Cell Research and Regenerative Medicine (Amherst/ Worcester) – SAM BLACK, Veterinary and Animal Sciences; PAUL KOSTECKI, Vice Chancellor for Research and Engagement
CREATIVE ECONOMY FUND

CREATIVE ECONOMY GRANTS FY08

- "Dance in Three Stages" - PEGGY SCHWARTZ, Music and Dance
- "Benchmarking South Coast and Pioneer Valley Creative Economies" - JOEL MARTIN, Dean of the College of Humanities and Fine Arts (with EILEEN PEACOCK, Dean of the College of Business, UMass Dartmouth, and UMass Donahue Institute)

Sponsored by the UMass President’s Office, Creative Economy grants promote initiatives which support the contributions of the arts, humanities and social sciences to the social and cultural fabric of the Commonwealth and thus to the overall strength of its economy.

Campus Alumni Play Active Role in Valley’s Creative Economy

A survey conducted of UMass Amherst College of Humanities and Fine Arts (CHFA) graduates living in the Pioneer Valley reveal that they are actively involved in the creative economy of Western Massachusetts through their jobs and as volunteers and financial supporters of cultural organizations.

Most important, almost half of these alumni report they’d not be living in the Pioneer Valley had they not attended UMass Amherst. The study, which was funded by a Creative Economy grant to the College’s Dean, Professor JOEL MARTIN and shared with UMass Dartmouth, found that 52 percent of respondents work in creative industries, with 14 percent identifying themselves as independent artists, musicians, craftspeople, actors, writers, designers and media arts professionals. Another 13 percent are employed in the support system for the creative sector, working with school arts programs, arts centers, funding agencies and service organizations. Seventeen percent of respondents are employed by cultural organizations in the Pioneer Valley.

“The results of this survey demonstrate the key role our graduates play in promoting the vitality of the region’s cultural landscape, first by electing to live here and second by contributing actively as citizens and creative people,” says Joel Martin, dean of the College of Humanities and Fine Arts. “At virtually every level and throughout the area, CHFA graduates are enhancing the quality of life in the region.”
ALUMNUS LEWIS GEFFEN STARTS SOMETHING NEW

Alumnus LEWIS GEFFEN has a personal and professional passion for entrepreneurship. As a corporate attorney in the Boston office of law firm Mintz Levin, Geffen represents technology-based companies in all stages of development, from newly-formed start ups to large public companies. He counsels clients on their growth and development, including finding venture capital and other private financing, technology licensing, mergers and acquisitions, strategic alliances and public offerings. When asked by representatives from UMass Amherst during a luncheon meeting how he’d like to connect back to campus, Geffen knew he wanted to focus on promoting technology commercialization efforts by the campus.

“There’s a great deal of interesting technology on campus, much of it with commercial potential,” says Geffen. “But compared to Greater Boston, institutions located in a different part of the state, such as UMass Amherst, face quite a challenge gaining visibility among the networks of entrepreneurs, industry, capital sources and service organizations that support innovation and enterprise. I could relate to that challenge and wanted to help the campus find a way to tell their technology story,” says Geffen.

When approached about supporting the development of a podcast series that would market the campus’s most interesting commercialization opportunities, Geffen agreed to fund the series through a generous donation to the Vice Chancellor for Research and Engagement Technology Development Fund. The series TechCast at UMass Amherst (www.umasstechcast.org) was launched in early 2008 and gets the word out about campus technology to multiple constituencies, including the Boston area venture networks.

“It’s a small step in getting technology coming out of UMass Amherst labs the attention it deserves,” notes Geffen. “The opportunity matched well with my experience and background.” Geffen has a B.A. in Communications from UMass Amherst and a J. D. from Harvard Law School.

At the time that discussions were underway about TechCast, Geffen found another way to help UMass Amherst and to feed his budding personal interest in innovation and enterprise. While reviewing the campus’s technology portfolio, he came across a suite of food science related inventions that he thought might be the basis of a company. With the campus’s support, Geffen put together a team to evaluate the potential applications and markets for the technology. The findings were positive and Geffen launched his new company in January of 2008 called Wesfolk (see description on page 35). Working with staff in Commercial Ventures and Intellectual Property (CVIP—the campus’s tech transfer office), a technology licensing option and sponsored research agreement were executed between Wesfolk and the campus to further develop the technology towards commercialization of technology useful in the food and beverage industry. “The results of the sponsored research look very promising,” says Geffen. “Seeing new endeavors get off the ground is a passion for me. It’s why I get up in the morning. The fact that I can also help the campus fulfill its mission of transferring knowledge into the marketplace makes it all the more satisfying. Connecting back to the campus has been a great experience for me.”
UMass Amherst strives to achieve excellence in a broad range of research areas, and to transfer the results of that work into the marketplace. The Office of Commercial Ventures and Intellectual Property (CVIP) is responsible for technology transfer, including the identification, protection and marketing of technology created by campus researchers.

CVIP strives to create a customer-friendly system that enables faculty, staff and students to secure industry sponsored research funds and patent their inventions. In FY08, CVIP logged a record 56 invention disclosures and filed 33 U.S. Patent Applications on the behalf of its constituency. During the past calendar year, 11 new U.S. Patents were awarded to UMass Amherst inventors (see Patent Recognition Awards, page 36). Technologies developed at

UMass Amherst produced $700,000 in royalty income, over $1 million in industry sponsored research funding from licensees, and an additional $2 million in sponsored research funding associated with patented, but not-yet-licensed technologies.

In January 2008, TechCast @ UMass Amherst (www.umasstechcast.org) made its debut. This podcast series, funded by alumnus Lewis Geffen, showcases the breakthrough discoveries of UMass Amherst researchers and the partnerships that create new products and businesses. The premier episode featured microbiology Professor SUSAN LESCHINE, Amherst entrepreneur JEF SHARP and local venture capitalist TRIPP PEAKE discussing the formation of SunEthanol, a spinoff biofuels company developing cellulosic ethanol technology.

TRENDS IN DISCLOSURES, PATENTS FILED AND ISSUED, LICENSES EXECUTED

- Invention Disclosures
- Patent Applications Filed
- Patents Issued
- Licenses Executed

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During FY08, the campus increased its efforts in assisting faculty, students, alumni and outside entrepreneurs start new businesses. Commercialization in the form of these “spinoffs” creates a number of economic benefits including innovative products and services, research opportunities on campus, and new jobs within the local community.

**DEXREX**
As students at UMass Amherst, DEREK LYMAN and RICHARD TORTORA founded Dexrex (www.dexrex.com) to simplify and advance text-based communication. Dexrex has developed a complete online service intended to better preserve and organize instant messaging (IM) conversations.

**ENGINEERED RESPONSE**
Engineered Response is developing a helmet subsystem that will detect a crash and send the location of the accident to emergency services if the wearer is unresponsive. The subsystem is called the Wireless Impact Guardian (WIG), and was developed by UMass Amherst student BRYCEN SPENCER. Engineered Response was recently awarded $15,000 in the UMass Amherst Innovation Challenge (www.umass.edu/innovation).

**MPF LLC**
MPF LLC (www.succulence.com) was co-founded by Food Science Professor HERBERT HULTIN to commercialize patented technologies that substantially improve the quality and utilization of low value meat proteins. MPF is managed by co-founders STANLEY HULTIN and Drs. TYRE LANIER, and HORDUR KRISTINSSON who continue development of the technology with meat industry clients.

**PA TECHNOLOGIES**
PA Technologies, LLC (www.patechllc.com) was co-founded by chemistry Professor ROBERT WEIS, managing partner TIM SHROUT and two UMass Amherst alumni, DR. ANTHONY SHROUT and DR. EDWARD ESPOSITO. Located in Amherst, PA Tech practices an innovative combination of protein engineering and chemical self-assembly to alter the way in vitro signaling assays are performed. The firm foresees this technology becoming a novel platform for drug discovery.

**SUNETHEANOL**
SunEthanol (www.sunethanol.com) continues to grow rapidly as it successfully transforms the novel ethanol producing organism C. phytofermentans (the Q Microbe) into a technology platform for sustainable biofuels production. Founded by Jattra Ventures, LLC, to commercialize a discovery made by Microbiology Professor SUSAN LESCHINE, SunEthanol has raised over $3.5 million capital investment from leading VC’s and has created 22 jobs in the Amherst area.

**THERAPEUTIC SYSTEMS**
Created by Mechanical Engineering PhD student BRIAN MULLEN, Therapeutic Systems specializes in mental healthcare solutions (www.therapeuticsystems.com). Its first product, a novel Deep Pressure Touch Stimulation (DPTS) vest, was found to help children with autism and ADHD manage their symptoms. Therapeutic Systems recently won an NCIIA E-team grant and the UMass Amherst Innovation Challenge $50,000 grand prize, which will fund a commercial-quality prototype DPTS vest (www.umass.edu/innovation).

**WESFOLK CORPORATION**
Wesfolk was founded in January 2008 by alumnus LEWIS GEFFEN to commercialize a portfolio of scientific work conducted by Food Science Professors ERIC A. DECKER, D. JULIAN MCCLEMENTS and JOCHEN WEISS. The new company is developing emulsions that are engineered to produce oxidatively stable lipid delivery systems capable of antibiotic and/or antimicrobial end-use beverage applications. Working with the Food Science Department, Wesfolk is investigating encapsulation technologies for the stabilization of omega-3 fatty acids.
CVIP PATENT RECOGNITION AWARDS

The CVIP Patent Recognition Award program sponsored by the Vice Chancellor for Research and Engagement recognizes both campus inventors who have been recently granted U.S. patents and faculty members who have impressive records in patenting technology throughout their careers.

PATENTS ISSUED 2007

THOMAS BOYLE (Plant, Soil and Insect Science): PP 18177 & 18221 Cactacia plant named ‘Harmony’ and Cactacia plant named “Elise”

E. BRYAN COUGHLIN (Polymer Science and Engineering): USP 7,173,096 Cross-Linked Polycyclooctene

THOMAS RUSSELL (Polymer Science and Engineering): MARK TUOMINEN (Physics) and ANDREI URSACHE (Physics): USP 7,189,435 Nanofabrication

THOMAS RUSSELL (Polymer Science and Engineering): and MARK TUOMINEN (Physics): USP 7,190,049 Nanocylinder Arrays

LLOYD SEMPREVIVO (Veterinary and Animal Sciences): USP 7,204,983 Lypoglycan Compositions and Methods of Treating Parasitic Infections

SUSAN CUMBERLEDGE (Biochemistry and Molecular Biology): USP 7,223,853 Secreted Frizzled Related Protein, SFRP, Fragments and Methods of Use Thereof

MICAH ADLER (Computer Science): USP 7,254,633 Probabilistic Packet Marking

ISRAEL KOREN, C. MANI KRISHNA, and CSABA ANDRAS MORITZ (Electrical and Computer Engineering): USP 7,278,136 Reducing Processor Energy Consumption Using Compile-Time Information

WAYNE BURLESON (Electrical and Computer Engineering): USP 7,279,939 Circuit for Differential Current Sensing with Reduced Static Power

UMASS SYSTEM TECHNOLOGY DEVELOPMENT GRANTS

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UMASS AMHERST AWARDS

KEVIN FU (Computer Science): “Zero-Power Telemetry for Implantable Medical Devices” - Assistant Professor Kevin Fu researches safety and security aspects of implantable medical devices, which include pacemakers, implantable cardioverter defibrillators (ICDs), insulin pumps, stomach bands, cochlear ear implants, etc. Current generations of these devices can communicate wirelessly, to give medical personnel easy access to essential patient data. Professor Fu is assessing the risks to patient safety from equipment malfunction because of wireless miscommunication or even intentional hacking. Using the CVIP Award grant funds, he is currently developing a prototype device to demonstrate his “zero-power security” technology.

GEORGE HUBER (Chemical Engineering): “Green Gasoline from Catalytic Fast Pyrolysis of Lignocellulosic Biomass” - Assistant Professor George Huber is a well recognized expert in the field of bio-fuels research (see related article, page 25). The urgent need for environmentaly responsible and economically viable alternate fuels makes his work especially relevant. Professor Huber is developing, with the CVIP grant, a bench-top reactor that demonstrates this Catalytic Fast Pyrolysis technology. The technology enables a one-step conversion of various types of biomass into gasoline-grade aromatic compounds. He is also researching the effects of different catalysts, reactor designs and biomasstypes on the composition of the final product.

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MICAH ADLER (Computer Science): USP 7,254,633 Probabilistic Packet Marking

ISRAEL KOREN, C. MANI KRISHNA, and CSABA ANDRAS MORITZ (Electrical and Computer Engineering): USP 7,278,136 Reducing Processor Energy Consumption Using Compile-Time Information

WAYNE BURLESON (Electrical and Computer Engineering): USP 7,279,939 Circuit for Differential Current Sensing with Reduced Static Power

UMASS SYSTEM TECHNOLOGY DEVELOPMENT GRANTS

The UMass System Commercial Ventures and Intellectual Property (CVIP) Technology Development Fund was established by the President’s Office in 2004 to provide UMass researchers with supplemental funding to advance previously disclosed University technologies towards commercialization. Two of the eight awards for 2008 went to faculty on the Amherst campus.

UMASS AMHERST AWARDS

KEVIN FU (Computer Science): “Zero-Power Telemetry for Implantable Medical Devices” - Assistant Professor Kevin Fu researches safety and security aspects of implantable medical devices, which include pacemakers, implantable cardioverter defibrillators (ICDs), insulin pumps, stomach bands, cochlear ear implants, etc. Current generations of these devices can communicate wirelessly, to give medical personnel easy access to essential patient data. Professor Fu is assessing the risks to patient safety from equipment malfunction because of wireless miscommunication or even intentional hacking. Using the CVIP Award grant funds, he is currently developing a prototype device to demonstrate his “zero-power security” technology.

GEORGE HUBER (Chemical Engineering): “Green Gasoline from Catalytic Fast Pyrolysis of Lignocellulosic Biomass” - Assistant Professor George Huber is a well recognized expert in the field of bio-fuels research (see related article, page 25). The urgent need for environmentaly responsible and economically viable alternate fuels makes his work especially relevant. Professor Huber is developing, with the CVIP grant, a bench-top reactor that demonstrates this Catalytic Fast Pyrolysis technology. The technology enables a one-step conversion of various types of biomass into gasoline-grade aromatic compounds. He is also researching the effects of different catalysts, reactor designs and biomasstypes on the composition of the final product.
INTERNAL GRANTS

FACULTY RESEARCH/HEALEY ENDOWMENT GRANTS

Offered by the Office of Research and Engagement with matching support from schools, colleges and departments, this internal grant program enhances the development of research and creative activities and gives an excellent snapshot of research projects on campus.

FY08 FRG/HEALY RECIPIENTS

MARC ACHERMANN (Physics): “Ultrafast Carrier Dynamics in Organic Photovoltaic Materials”

SOFIYA ALHASSAN (Kinesiology): “The Preschool Structured Outdoor Playtime Trial”

JUAN ANGUITA (Veterinary and Animal Sciences): “Phagocyte p38 MAP Kinase Activity during Lyme Borreliosis: Characterization of cd11b-dnp38 Transgenic Mice”

SANJAY ARWADE (Civil and Environmental Engineering): “Preliminary Experiments on the Structural Application of Metal Foam”

JOSEPH BLACK (English): “The Renaissance Library of the Sidneys of Penshurst Place”


BARRY BRAUN (Kinesiology): “Optimizing Exercise to Oppose Insulin Resistance and Prevent/Manage Type-2 Diabetes”

RICHARD CHU (History): “Catholic, Sangley, Mestizo: Negotiating “Chinese” Identities in Colonial Manila”

TANYA FERNANDO (English): “Primitivism in Modernist Dance”

JOHN FRANSCSO (Education – TECS): “A Study of Teacher Content Knowledge for Teaching”


TAMEKA GILLUM (Public Health): “Examining Dating Violence Among Sexual Minority Youth”

GREGORY GRASON (Polymer Science and Engineering): “Soft Sphere Packing: Towards a Theory of Structured Amphiphile Self-Assembly”

KRISTA HARPER (Anthropology): “Visualizing Environmental Justice and Community Development”

BRIAN KANE (Natural Resources Conservation): “Implementing a Shade Tree Research Plot on Campus”

JACQUE KURLAND (Communication Disorders): “Treatment Effects on Neural Plasticity in Chronic Aphasia”

JESSE MAGER (Veterinary and Animal Science): “Conditional Deletion of Yin-Tang 1 in the Male Germline”

ANDREW PAPACHRISTOS (Sociology): “Network Dynamics and the Evolution of Organized Crime in Chicago, 1918 to 1998 – A Pilot Study”

CHUL PARK (Civil and Environmental Engineering): “Phenotypic Characteristics of Activated Sludge Generated under Different Feeding Conditions and Implications for Wastewater Treatment Performance and Sludge Treatment”

ERIK ROSENFELDT (Civil and Environmental Engineering): “Regenerating Spent Zeolites Used to Remove Endocrine Disrupting Compounds from Drinking Water”

JENNIFER ROSS (Physics): “Optical Tweezing to Measure Microtubule Flexibility”

BRIAN UMBERGER (Kinesiology): “A Model for Predicting Skeletal Muscle Energy Consumption”

RUI WANG (Computer Science): “Real-time Image Synthesis Using Pre-captured Illumination Datasets”

WILMORE WEBLEY (Microbiology): “Elucidating the Role of Chlamydia in the Initiation of Neonatal Asthma”
INTERNAL GRANTS

ARMSTRONG FUND FOR SCIENCE

John and Elizabeth Armstrong established the Armstrong Fund for Science in 2006 to recognize researchers with aggressive research visions. Grants are made from this fund administered by the Office of Research and Engagement on an annual basis through a competitive process.

(Yeonhwa Park, Frederick J. Francis Professor of Food Science) is the recipient of this year’s Armstrong Fund for Science award. Dr. Park’s work combines stem cell research and food science in a project investigating molecular mechanisms that affect bone formation. The long term goal of the project is to develop dietary and supplement-based interventions to reduce bone loss, a strategy that would help to prevent osteoporosis.

MRS-MRI PILOT RESEARCH GRANT PROGRAM

This competitive grant program administered by the Office of Research and Engagement provides seed funds to encourage the development of magnetic resonance imaging- and spectroscopy-based (MRI-MRS) research projects on the UMass Amherst campus (see related story, page 29).

2008 MRS-MRI PILOT RESEARCH GRANT AWARDS

KYLE CAVE (Psychology): “Localizing the Control of Visual Attentional Focus”

MATT DAVIDSON (Psychology): “Interactions between Estrogen and Physical Activity on Emotional Self-regulation abilities”

JANE KENT-BRAUN (Kinesiology): “Skeletal Muscle Perfusion by Functional MRI: Application to Aging”

JACQUIE KURLAND (Communication Disorders): “Neural Plasticity after Intensive Language Therapy in Chronic Aphasia”

BRIAN UMBERGER (Kinesiology): “Validation and Sensitivity Analysis of a Human Muscle-Joint Model”

(from l-r) Elizabeth Armstrong, Yeonhwa Park and John Armstrong
RESEARCH LEADERSHIP IN ACTION (RLA)

This competitive grant program administered by the Office of Research and Engagement supports the development of sponsored activities and scholarship through the hosting of high-profile annual events providing opportunities for collaboration with external partners. All internal funds are matched with new sources of external funds.

2007/2008 RLA GRANT RECIPIENTS

MICHAEL HENSON (Chemical Engineering): “First Annual Conference on Cellulosic Biofuels”


VENTURA R. PEREZ (Anthropology): “Landscapes of Violence: Conflict and Trauma through Time”

JOHN KINGSTON (Linguistics): “12th Laboratory Phonology Conference”

STEPHEN SCHREIBER (Art): “Association of Collegiate Schools of Architecture Fall Meeting”

PUBLIC SERVICE ENDOWMENT GRANTS (PSEG)

The Public Service Endowment Grant Program enhances the public service mission of the University. It supports special projects that deliver public services through collaborative activities that engage the campus with the community.

2008 PSEG RECIPIENTS

ALAN FELDMAN (Education– TECS): “Supporting Novice Mathematics Teachers”

MICHAEL LAVINE (Mathematics and Statistics): “STATCOM, Statistics in the Community”

DONNA ZUCKER (Nursing): “The Hepatitis C and HIV Prevention and Risk Reduction in Community Corrections Programs”

SAMUEL F. CONTI FACULTY FELLOWSHIPS

The Samuel F. Conti Faculty Fellowship is a co-investment program of the Deans and the Vice Chancellor for Research and Engagement which honors faculty from across the campus for outstanding accomplishments and potential for continued excellence in research and scholarly or creative activity. Conti Fellows are honored annually at the Research Recognition Dinner held every May. Nominated by their peers, Conti Fellows receive a cash award and a year’s leave of absence to concentrate on their work. The campus has supported Conti Fellows since 1981 and the list of past recipients is a who’s who of outstanding UMass Amherst faculty.

2008 SAMUEL F. CONTI FACULTY FELLOWS

DANIEL R. ANDERSON (Psychology)

NANCY R. FOLBRE (Economics)

DONALD F. TOWSLEY (Computer Science)
AWARDS FOR OUTSTANDING ACCOMPLISHMENTS IN RESEARCH AND CREATIVE ACTIVITY

The Awards for Outstanding Accomplishments in Research and Creative Activity are given, since 2005, to faculty members in recognition of their achievements and current campus initiatives that bring national and international renown to UMass Amherst.

2008 RECIPIENTS

SOREN BISGAARD
Eugene M. Isenberg Professor of Integrative Studies and Technology Management

LAURIE R. GODFREY
Professor of Anthropology

VICTOR R. LESSER
Professor of Computer Science

THOMAS J. MCCARTHY
Professor of Polymer Science and Engineering

DAVID JULIAN MCCLEMENTS
Fergus M. Clydesdale Professor of Food Science

GEORGE N. PARKS
Professor of Music and Dance

DONALD F. TOWSLEY
Distinguished Professor of Computer Science
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