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innovations

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The Promise of RNAi

6 A Quantum Leap Toward New Treatments for Deadly Skin Cancers

LEFT TO RIGHT:
Chancellor Martin T. Meehan, J.D. **UMASS LOWELL**
Chancellor J. Keith Motley, Ph.D. **UMASS BOSTON**
Chancellor Jean F. MacCormack, Ed.D. **UMASS DARTMOUTH**
President Jack M. Wilson, Ph.D.
Chancellor Robert C. Holub, Ph.D. **UMASS AMHERST**
Chancellor Michael F. Collins, M.D. **UMASS MEDICAL SCHOOL**

ON THE COVER:
Dr. Michael Green, a Howard Hughes Medical Institute (HHMI) Investigator and University of Massachusetts Medical School researcher, with fourth-year graduate student Ryan Serra and fifth-year graduate student Ling Lin.

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"Contributing in areas such as green economy, and leading the world in polymer science, UMass Amherst creates new knowledge for global solutions, which helps drive the Commonwealth's economy."

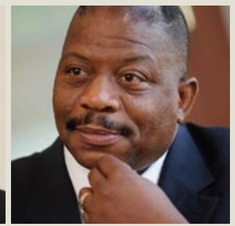
Chancellor Robert C. Holub, Ph.D.
UMass Amherst

"The discoveries and ideas emerging from UMass Dartmouth's labs are creating tomorrow's companies. The students graduating from our campus will be tomorrow's leaders."

Chancellor Jean F. MacCormack, Ed.D.
UMass Dartmouth

"UMass Medical School is not only part of the evolution that is happening in the life sciences, we are leading the way."

Chancellor Michael F. Collins, M.D.
UMass Medical School



"UMass Boston embraces research and development as a cornerstone of our public mission and to sustain our region's economic competitiveness and quality of life."

Chancellor J. Keith Motley, Ph.D.
UMass Boston

"Imagination and invention drive the wheel of innovation. UMass Lowell faculty and student researchers excel in developing innovative, real-world applications of knowledge."

Chancellor Martin T. Meehan, J.D.
UMass Lowell

Welcome to the inaugural issue of *Innovations*.

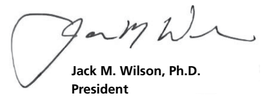
I cannot think of a more fitting name for a publication that will capture and convey what is happening today across UMass—innovation in the classroom, in the lab, in the field, online, and around the world. Innovation is the lifeblood of all we do and must not only be the goal of our efforts, but it must inspire the very way we work together.

"Innovation is the lifeblood of all we do and must not only be the goal of our efforts, but it must inspire the very way we work together."

President Jack M. Wilson, Ph.D.

As educators, we lead the continuous quest for new ideas, new information, and new ways of thinking about and acting on both age-old problems and the challenges of tomorrow. As you will read, breakthrough research and strategic partnerships with industry are building a foundation to meet those challenges. Students and professors are making discoveries that will improve the lives of people across the globe and solve some of our most pressing scientific, social, and economic issues.

By harnessing the spirit and innovation seen across UMass every day, we can continue to fulfill our mission as a public research university—to assist the Commonwealth in advancing its competitive position as a global leader. I am pleased, through this magazine, to share these exciting stories.



Jack M. Wilson, Ph.D.
President

An Appetite for Collaboration

WHEN PROFESSOR SUSAN LESCHINE FIRST RECOGNIZED THAT A HARDY LITTLE MICROBE HAD THE POTENTIAL TO BECOME AN ENVIRONMENTAL HERO, HER SCIENTIFIC CURIOSITY FUSED WITH A CLEAR SENSE OF DUTY.

"If you suddenly have something that has the potential to be very useful, I think all scientists should feel an obligation to seeing it through and seeing whether it can be beneficial," says Leschine, the discoverer of the Q Microbe, a tiny bug that has proven to be amazingly efficient at converting cellulose, non-food plant matter, into engine-firing ethanol.

"Once we recognized that this work could really benefit the world, that it could help reduce carbon dioxide emissions—well, that's huge. I felt an obligation."

Leschine says the Q Microbe is important because it can do so many things: provide a clean alternative to fossil fuels that can be produced in a way that is carbon neutral, help to boost rural economies, and aid the nation's quest for energy independence.

And because of the Q Microbe's appetite for cellulose, there would be no need to consume a source of food, like corn, as can be the case with other biofuels production processes.

Leschine, a professor of microbiology at UMass Amherst, remembers the "eureka moment" in the Q Microbe discovery process.

"We were doing an experiment for a completely different purpose and as we grew the bug on higher and higher amounts of the cellulose, which is the main component of plants and the toughest component to break down, we were shocked to see that it converted the cellulose almost completely into ethanol."

"My technician, Tom Warnick, got the data from the experiment and came into my office to show it to me and said, 'You're not going to believe this.' It was a big surprise. It was a real eureka moment."

The Q Microbe, which is actually a strain of the soil-dwelling bacterium *Clostridium phytofermentans*, was harvested from soil near the shores of the Quabbin Reservoir and in 2002 was recognized as a novel organism. The microbe was contained in a soil sample Warnick gathered as he hiked along the Quabbin, the 400-billion gallon reservoir that provides water to Greater Boston.

Noted for its appetite for all things cellulose—including switchgrass, wood pulp, and corn plant waste—the Q Microbe is highly efficient at converting biomass to ethanol. And it does so in a carbon-neutral process that doesn't require the additional enzyme treatments that usually accompany bioethanol production.

Professor Susan Leschine, Research Assistant Thomas Warnick, and student Audrey Miller.

The microbe is unusual in its ability to consume a wide variety of plant material. It breaks down cellulose with ease, the notoriously tough molecule that's the primary component of plant biomass. Leschine's team surveyed the microbe's dietary preferences, feeding it everything from wood pulp waste to sugar cane bagasse, the plant matter that's left over once sugar cane is crushed. Pectin, starch, xylan, and other plant polymers that can be difficult to digest were no problem for the voracious Q.

The breathtaking promise of the Q Microbe has led to the creation of a company, now known as Qteros, that is seeking to bring the production of cellulosic ethanol to the marketplace.

> "Once we recognized that this work could really benefit the world...well, that's huge. I felt an obligation."
>
> **Professor Susan Leschine,** UMass Amherst

Leschine serves as chief scientist of the Marlborough-based company, which employs 25 people and is working to develop the technology and production processes needed to make the concept a biofuels reality.

The licensing of the Q Microbe technology represents another success story for UMass Amherst's industrial relations and technology transfer programs, working in collaboration with the system Office of Commercial Ventures and Intellectual Property. Technology licensing helped to generate $41 million in intellectual property income in Fiscal Year 2007, making UMass a national leader in the area. In addition, the Massachusetts Technology Transfer Center showcased Q Microbe technology at its 2008 Clean Energy Conference.

A member of the UMass Amherst community since 1976, Leschine says her breakthrough was made possible by a culture of collaboration that exists on the campus, particularly in the biofuels cluster, which has rapidly become one of the University's signature research areas.

"This didn't just come out of my lab; it is the result of interactions with other people on campus who were interested in biofuels. We have on the Amherst campus groups of investigators who are working very hard on the basic science but with an eye toward seeing how discoveries may be used, seeing innovation through to the marketplace. This is a prevalent idea."

Leschine says collaboration is "essential to driving science" and has been critical to her work.

"This would not be happening if it weren't for my collaborations with microbiologists, including experts in genome science; with biochemists, who understand the enzymes produced by the microbe; and with cellular engineers and process engineers," she notes. "So this sort of work cuts across colleges and disciplines. Collaboration will drive basic research and innovation."

Nanotechnology:
From Science Fiction to Safe, Profitable Production

THREE ENGINEERING PROFESSORS—JOEY MEAD, JULIE CHEN, AND CAROL BARRY—HAVE MADE UMASS LOWELL A LEADING CENTER OF RESEARCH IN NANOMANUFACTURING.

Starting with a vast knowledge of plastics engineering and materials processing, leavened by pure persistence and grit, the trio has created the environment for more than 40 faculty and 100 students to engage in research that breaks new ground every day.

"Materials behave in unique and unusual ways at the nanoscale," says Mead, so new processes of manufacturing have to be invented, crossing chemistry, physics, engineering, and biology. At the same time, "We work to build safe practices into the production processes, from the beginning," says Chen, with parallel research on health and environmental impacts.

"A comprehensive educational program is a key part of our mission," says Barry, including seminars and courses, teacher/student workshops, and programs with the Museum of Science.

UMass Lowell is a partner (with Northeastern University and the University of New Hampshire) in one of only four NSF Centers for Nanomanufacturing Research in the country, and has been named a Massachusetts Center of Excellence for Nanomanufacturing, dedicated to university-industry research. Since inception the Center has received more than $24 million in public and private funding.

Nanomedicine, nanomaterials, nanoelectronics, nanosensors, and environmental health and safety—the promise is vast, both for improving existing products and creating those as yet unimagined, and the heart of the effort is here in Massachusetts.

UMass Lowell Nanomanufacturing Center Directors Joey Mead, Julie Chen, and Carol Barry.

The Promise of RNAi

A QUANTUM LEAP TOWARD NEW TREATMENTS FOR DEADLY SKIN CANCERS

"If this becomes an effective treatment, a large fraction of the people who die from melanoma and colon cancer might be cured."

Dr. Michael R. Green,
University of Massachusetts Medical School

In 2008, nearly 62,500 people in the United States were diagnosed with melanoma, and the great risk is that this dreaded form of cancer will metastasize and become a death sentence—as it did for almost 8,500 Americans last year.

Melanocytes—the pigment-producing cells in your skin—can develop into either moles or melanoma cells. If you have a mole (that does not bear the signs of cancer), you lucked out because of defenses that have evolved over millennia to help prevent you from developing melanoma. Instead of growing into a cancer, your melanocytes stopped dividing and you ended up with a small benign lesion or mole.

Michael Green, M.D., Ph.D., a Howard Hughes Medical Institute (HHMI) Investigator and University of Massachusetts Medical School (UMMS) researcher, and his colleagues wanted to understand why some melanocytes divide uncontrollably and turn into melanoma cells and others go into hibernation as a result of the body's natural protection mechanism and become moles.

Now, thanks to their breakthrough, this life-saving answer may be close at hand.

To understand these processes, Dr. Green's team of researchers set out to identify genes involved in melanoma prevention. They conducted a genome-wide survey by inserting small bits of RNA—the molecule that carries out DNA's instructions for making proteins—into cells to selectively turn off different genes.

This method takes advantage of RNA interference (RNAi), a mechanism for blocking gene activity, which has been central to groundbreaking research at UMMS. Scientists realize that if RNAi is used to shut down disease-causing genes, then development of a new class of treatments may result.

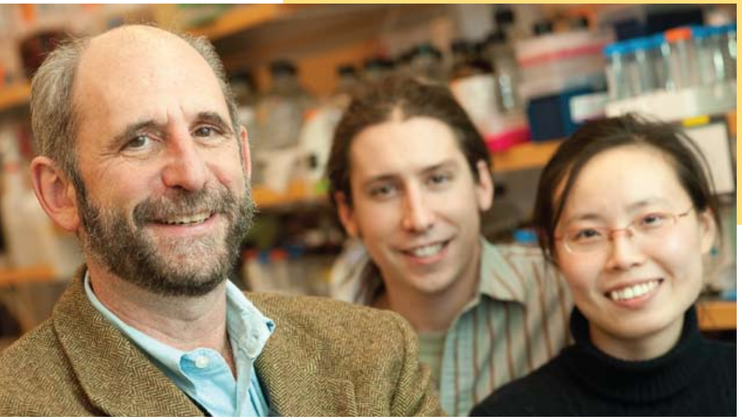
Dr. Green and his team identified 17 genes that are required to keep a melanocyte from becoming a melanoma cell. One of these genes, called IGFBP7, stood out because it was actually a secreted protein. Secreted proteins don't stay inside their cells—they move into the blood and on to other cells. The team discovered that IGFBP7, when added to melanocytes cultured in the lab, caused these cells to stop dividing, much like what happens to melanocytes in a mole. But when it was added to cultured melanoma cells, they got an unexpected and exciting result: IGFBP7 caused these cells to "commit suicide." Dr. Green and his team went on to show that injecting IGFBP7 into mice could stop the growth of melanoma in these small lab animals.

These findings raise the intriguing possibility that IGFBP7 could be used as a treatment for melanoma in humans. But Dr. Green doesn't think the possibilities end there.

"The ultimate goal of these studies is to see if IGFBP7 can also be used to treat people who have metastatic melanoma, which is currently untreatable," Dr. Green said. Malignant melanoma is treatable if caught in the early stages, but it's the more advanced, metastatic melanoma that is untreatable and has a poor prognosis.

In addition to melanoma and other cancers, RNAi-based therapeutics might be able to silence genes involved in neurodegenerative diseases—such as ALS, infectious diseases, as well as autoimmune diseases such as diabetes—by controlling abnormal cell division and protein production within cells.

RNAi was discovered by UMass faculty member and 2006 Nobel Laureate and National Academy of Sciences member Craig Mello and Andrew Fire of the Carnegie Institution of Washington (now at Stanford University). Prior to this landmark discovery, researchers used chemical methods to shut down genes, a task that took a great deal of laboratory time and slowed research.



Dr. Michael Green with graduate students Ryan Serra and Ling Lin.

"At UMass Medical School, we pride ourselves on having excellent research facilities. Most universities do not have such an extensive resource."

Dr. Michael R. Green, University of Massachusetts Medical School

The RNA interference (RNAi) Institute (see sidebar)

When Dr. Green and his colleagues wanted to perform a genome-wide survey for their melanoma research, they used a plasmid library, housed at the UMMS RNAi Core Facility. They knew that a small change in BRAF—a protein instrumental to cell division—can cause melanocytes to stop growing.

"We were looking for genes that, when turned off, would allow cells to overcome the growth arrest and begin dividing, as they would in cancer," Dr. Green said. "In our libraries we have small RNAs that allow us to turn off, one by one, every single human gene."

"At UMass Medical School we pride ourselves on having excellent research facilities," he said. "Most universities do not have such an extensive resource."

Moving Forward

Dr. Green hopes that through collaboration with other world-class UMass researchers and the use of the comprehensive resources available at UMMS, he can soon advance his research into the clinical phase.

The Drug Development Group (DDG) at the National Cancer Institute (NCI), which is interested in developing promising lead compounds into clinical trials, is currently working with Dr. Green and his team to move through the required pre-clinical phase.

During the pre-clinical phase, researchers must produce the protein according to Good Manufacturing Practices (GMP) standards and perform a series of toxicology studies to show that treatment is safe for clinical trials.

If treatment proves successful, researchers believe the IGFBP7 protein could be used against other forms of cancer with an activated BRAF mutation, such as colon cancer.

"If this becomes an effective treatment, a large fraction of the people who die from melanoma and colon cancer might be cured," Dr. Green said. "To my knowledge, we're the only research institution that's discovered this protein and its effects and the only laboratory or university that is trying to turn it into a medicine to treat melanoma."

For more information:

To learn more about Dr. Green's research or to support research at the UMass Medical School, please contact the UMass Memorial Foundation at 508-856-5520, giving@umassmed.edu, or www.umassmed.edu/foundation.

If you have a question or concern about a mole or something on your skin, please see your doctor.

To locate a physician at UMass Medical Center, call 800-431-5151 or visit http://www.umassmemorial.org/

DR. CRAIG C. MELLO

DR. VICTOR AMBROS

DR. MELISSA MOORE

DR. PHILLIP ZAMORE

THRIVING RESEARCH COMMUNITY ATTRACTS LEADING RESEARCHERS TO UMASS MEDICAL SCHOOL

RNA interference (RNAi), gene silencing by double-stranded RNA, was uncovered in 1998 by Nobel Laureate Craig C. Mello, Ph.D., HHMI Investigator and the Blais University Chair in Molecular Medicine at UMass Medical School, in collaboration with Andrew Fire, Ph.D., of the Carnegie Institution of Washington (now at Stanford University). Since their discovery, the technology of RNAi has been widely adopted. Scientists realize that if RNAi is used to shut down disease-causing genes, then development of a new class of therapeutics can result.

UMMS is in the process of establishing **the RNA interference (RNAi) Institute** to capitalize on its expertise in the field of RNAi-based gene silencing. The institution's scientists, who represent the world's largest critical mass of talent, are mobilized to continue development of powerful RNAi technologies. The vision for the Institute emphasizes clinical and translational research and, ultimately, developing the next generation of therapeutics. A cornerstone of the University's life sciences initiative, the RNAi Institute works in conjunction with the **Center for Stem Cell Biology and Regenerative Medicine** and the **Gene Therapy Center** to combat diseases on a genetic level. Together, these centers form the UMMS Advanced Therapeutics Cluster (ATC).

The Advanced Therapeutics Cluster is attracting leading researchers from across the country. Within the past year, Victor Ambros, Ph.D.—a National Academy of Sciences member in whose Harvard University lab Dr. Mello completed his doctorate research in the 1980s—left Dartmouth Medical School to join UMMS. In 1993, Dr. Ambros identified microRNAs—very short RNA strands that regulate the production of proteins for specific genes—a discovery for which he was named a co-recipient of the 2008 Lasker Award for Basic Medical Research. Since then, he has identified genes for several microRNAs involved in animal development, and he is currently working to understand the role of these strands in human disease.

In 2008, Melissa Moore, Ph.D., an HHMI Investigator and professor of Biochemistry & Molecular Pharmacology, joined UMMS from Brandeis University. Dr. Moore is interested in pre-mRNA splicing, or modification of RNA after transcription. This work aids in understanding protein development and could have clinical applications in the future.

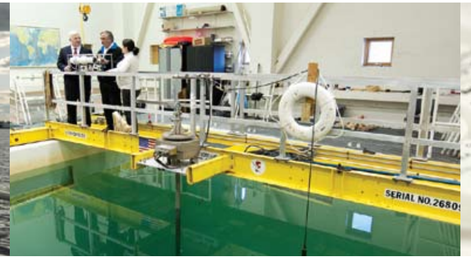
"The strength of RNAi as a technology is that, first and foremost, it is amazing biology. The extraordinary depth of RNAi biology research at UMass Medical School makes us a unique place to translate RNAi into a human therapy. And the breadth of research interests here means that partnerships between clinicians and basic researchers form naturally, based on mutual enthusiasm for using RNAi to transform medicine," said Phillip D. Zamore, Ph.D., HHMI Investigator, Gretchen Stone Cook Chair in Biomedical Sciences, and professor of Biochemistry & Molecular Pharmacology.

"The extraordinary depth of RNAi biology research at UMass Medical School makes us a unique place to translate RNAi into a human therapy."

Phillip D. Zamore, Ph.D.

RNAi Core Facility

UMMS also houses a world-class, extensive library of plasmids—DNA molecules independently capable of replicating within a cell. Each plasmid contains what's called a small hairpin RNA—an RNA that's directed against the product of a gene. A hairpin RNA can knock out the function of any gene in the genome.



Sea Power

"Renewable energy built New England. The energy in the ocean will be a big part of this region's energy future."

John R. Miller, Director of Operations, Advanced Technology & Manufacturing Center

FOR CENTURIES THE OCEAN HAS DEFINED AND SUSTAINED MASSACHUSETTS, ITS VITAL ROLE CAPTURED IN THE VERY MONIKER OF THE COMMONWEALTH: THE BAY STATE.

Building on a tradition of cutting-edge ocean research and innovative partnerships with industry, UMass Dartmouth, earlier this year, opened a Marine Renewable Energy Center (MREC) that will help Massachusetts secure a leadership position in the growing field of marine renewable technologies, which transforms rising waves, rushing currents, and flowing tides into electrical power. Their predictability and reliability give these sources an advantage over solar and wind—the tide still goes in and out on a cloudy day. The Center unites industry partnerships at the school's Advanced Technology and Manufacturing Center with the nationally recognized faculty of the School for Marine Science and Technology (SMAST), Department of Estuarine Ocean Sciences, Department of Fisheries and Oceanography, and the College of Engineering.

By bringing together expertise and capacity across disciplines, the Center is a unique resource. Slated to be the first location in the U.S. for marine renewable testing and demonstration, the Center will provide research, technical assistance, modeling, analysis, permitting assistance, and incubator start-up space for the full portfolio of marine renewable energy—wave, tidal, current, and off-shore wind. Two firms are already taking advantage of the Center's incubator space and on-hand faculty expertise.

Future plans call for development of an off-shore test site. Envisioned for Muskeget Channel between Martha's Vineyard and Nantucket, this site could position Massachusetts as a hub for this industry.

In October 2008, the Center received $250,000 from the Massachusetts Technology Collaborative's Renewable Energy Trust, and, prior to that, $160,000 from the UMass President's Science and Technology Initiatives fund, which seeds funding for faculty research that contributes to economic development in the Commonwealth.

Supplying renewable energy is not the only demand the future will place on the ocean. To help map the best way to ensure the broadest sustainable use of this resource, the UMass Boston McCormack Graduate School of Policy Studies is now home to the Massachusetts Ocean Partnership (MOP). With an $8.2 million grant from the Gordon and Betty Moore Foundation and funding from the UMass President's Office, the MOP will help draft a comprehensive ocean management plan that will balance often-competing priorities of development, fishing, shipping, recreation, conservation, renewable energy, and more.

The promise and the potential of the sea has never been greater for the Commonwealth, and UMass is at the center of optimizing those opportunities into the future.

For more information, contact John R. Miller, Director of Operations, Advanced Technology & Manufacturing Center, at 508-910-9830.

Left to right: John Miller (photo courtesy of *Mass High Tech*); the SMAST acoustic-optic test facility; water samples in the lab; graduate student Jennifer Benson; Brian Howes, Professor and Director of SMAST's Coastal Systems Program, Jennifer Benson, and Ember Ray, Business Intern for Ocean Renewable Power Company

Going Green, Getting Creative

THE ADAGE THAT THE ROAD TO ECONOMIC DEVELOPMENT RUNS THROUGH UMASS IS TAKING ON NEW—AND "GREEN"—MEANING IN SPRINGFIELD.

The recently launched Greater Springfield–University of Massachusetts Amherst Partnership will establish Springfield as a center of green industry, while also boosting its creative economy. The Partnership will grow these innovative sectors by expanding, strengthening, and strategically aligning the teaching and research efforts of the University, while actively involving area businesses, neighboring communities, and other academic and research centers in the region.

More than 100 years ago, Greater Springfield significantly contributed to the growth of manufacturing, catapulting the industry into a new age. Today, the Partnership combines that regional tradition with the advanced research capabilities of UMass Amherst, placing a particular spotlight on energy conservation and green fuel production. The Partnership will also combine the artistic resources of UMass Amherst with the vast talent found throughout Greater Springfield. The resulting artistic and performance energy will bring community participation and contribute to the vibrant downtown revitalization.

Announced in November 2008, the Partnership received a $150,000 federal grant from the Economic Development Administration and matching funds from the University and the City of Springfield, bringing the total initial funding to more than $320,000.

By August 2009, the Partnership will complete an inventory of strengths, needs, and resources. Next, with the resulting detailed plan in hand, Greater Springfield and the University will, with unprecedented collaboration, create a regional growth center based on two sectors that define economic innovation.

"The Partnership between Greater Springfield and UMass Amherst will help further engage the University and its research, teaching, and outreach capacities with the community of Springfield, which is the chief engine of economic growth and a key cultural center in western Massachusetts," said Henry M. Thomas III, UMass Trustee and President and Chief Executive Officer of the Urban League of Springfield. "This is the right thing to do for the people of the Commonwealth."

Liberia—Building Toward Peace and Prosperity

A DEEPENING PARTNERSHIP BETWEEN UMASS AND LIBERIA IS PROVING TO BE A MODEL OF EFFECTIVE GLOBAL ENGAGEMENT.

Clockwise from above: U.S. journalist and UMass participant Vanessa Gezari works with Liberian journalist Mae Azango at an interview session in Buchanan city; Dr. Jonathan Spector with medical student during a health fair; Liberian President Dr. Ellen Johnson-Sirleaf meeting a delegation of UMass-led American workforce development experts; Left to right, Sonia Trzmielina, Katherine Luzuriaga, M.D., Mohan Somasundaran, Ph.D. with Dr. Khalipha Bility, Director of the Liberian National AIDS Control Program on a visit to Dr. Luzuriaga's laboratory.

After 14 years (1989—2003) of civil war, the scale of need in Liberia is almost limitless. Commonly listed among the poorest nations in the world, Liberia is struggling to rebuild its basic infrastructure, public institutions, economy, healthcare system, civic culture, and more. In the midst of such deprivation, a deepening partnership between UMass and Liberia is proving to be a model of effective global engagement.

The University's broad, multi-strategy engagement with Liberia was formalized with a Memorandum of Understanding signed by UMass and the University of Liberia in 2007. Priorities to date are public health, journalism, and job development—critical needs as Liberia develops the foundation for a peaceful and prosperous future.

In the area of public health, UMass Medical School (UMMS) faculty are collaborating with colleagues to open a clinical and HIV/AIDS laboratory at the John F. Kennedy (JFK) Hospital, the major teaching hospital of the University of Liberia. The lab will provide much needed laboratory services to enhance patient care and will serve as a teaching and training center.

UMass Medical School faculty travel to Liberia regularly, offering peer-to-peer professional development and direct service to those in need. Dr. John Sullivan, professor of Molecular Medicine and Pediatrics and Vice Provost for Research, pioneered the development of nevirapine —a revolutionary drug for the prevention of mother-to-child transmission of HIV—and introduced Liberian physicians and healthcare workers to this concept. Dr. Katherine Luzuriaga, professor of Molecular Medicine and Pediatrics and Associate Provost for Global Health, and Donna Gallagher, R.N., Co-Director, Global Health, are working with a non-governmental organization (NGO), HEARTT (www.heartt.net), to develop pediatric and nurse training programs at JFK, which are desperately needed.

Truth is often called the first casualty of war, and many have asserted that war has robbed Liberia of independent news organizations capable of meaningful reporting. The Center for Democracy and Development at the McCormack Graduate School of Policy Studies, UMass Boston, is working with Liberia media outlets and organizations to provide a range of professional experiences and contacts with U.S.-based and international organizations.

This U.S. State Department-funded initiative, conceived by its citizen exchange program, hopes to broaden the perspectives of the Liberian media with respect to covering stories dealing with anti-corruption efforts, culture/gender/ethnic identity issues, and general issues related to economic development, in addition to strengthening the financial situation of the Liberian media itself.

Exchange programs offer opportunities for Liberians to participate in workshops, site visits, and internships with U.S. media organizations and to meet with potential funders like the World Bank. In a media environment with so little retail advertising available, outside financial assistance is critical. Lawrence Randall, Executive Director of the Liberia Media Center, credited the exchange with helping him "understand the workings of the donor sector as well as international agencies working to support media."

Future objectives include preparing journalists for the 2011 presidential election, "the most important in Liberian history," says Michael Keating, McCormack associate director and senior fellow.

The third, and newest, component is a workforce development partnership between Massachusetts and Liberia. In June 2008, a delegation of educators, national and regional government officials, and NGOs visited Massachusetts, meeting with counterparts who were interested in helping revive the Liberian economy. They toured job training, workforce development, and business development initiatives that could serve as models or potential partners for efforts in Liberia.

A Life of Learning

CADY COLEMAN, 48, IS NOW TRAINING FOR AN INTERNATIONAL SPACE STATION MISSION SLATED FOR LATE 2010, ALTHOUGH SHE IS A BACKUP FOR A JULY 2009 MISSION.

As Cady Coleman sees it, the life of an astronaut is a life of learning.

For her two space shuttle missions, Coleman needed to be ready to conduct an array of demanding scientific experiments and was responsible for deploying the $1.3 billion Chandra telescope.

"Happily, I pushed the button at the right time," Coleman noted with a chuckle.

Looking back at the road that took her to NASA and to the launching pad at Cape Canaveral, Coleman remembers a pivotal step that occurred on the Amherst campus.

"I remember calling someone I knew from ROTC who was already in the Air Force and wanted to be an astronaut as well. We ended up being partners in this endeavor and are both astronauts today. I can specifically remember making that phone call from the basement in Goessmann," Coleman said, referring to a campus science building.

> "What I learned at UMass (Amherst) was how to learn—how to step back and look at the big picture." Cady Coleman, UMass Amherst Ph.D. '91

Today, as she prepares for a six-month mission on the International Space Station, Coleman is always learning, with topics ranging from the rarified science of space travel to pragmatic, living-in-space matters.

"I'm developing plumbing and electrical skills. My husband is pretty excited about that. I'm taking emergency medicine courses as well."

When Cady Coleman thinks about learning, she thinks of the University of Massachusetts.

"What I learned at UMass was how to learn—how to step back and look at the big picture. The skills I learned at UMass, I use every day as an astronaut," said Coleman, who earned her doctorate in polymer science in 1991.

The idea of becoming an astronaut first crossed Coleman's mind when she was an undergraduate at MIT. Sally Ride, the first American woman in space, spoke on campus, and in the mind of a young undergraduate, this was the perfect career: fusing a love for science with an impulse to explore.

"It became clear that if you wanted to be an astronaut, you needed a professional degree, so the next thing became finding a world-class place to study polymer science. For me, that was UMass. And when I was at UMass, I became attentive to applying to the astronaut program."

Minutewoman in space: Astronaut Cady Coleman made her crew mates, and the world, aware of her college basketball passions when she flew Space Shuttle Columbia into space in October 1995, her first of two shuttle missions

When NASA looked at the application of the young woman with degrees from MIT and UMass—who set endurance records on the centrifuge—the answer was "Yes," and Coleman reported to the Johnson Space Center in 1992.

Three years later, on October 20, 1995, Coleman was part of a crew that flew the Space Shuttle Columbia into orbit for a 15-day mission focused on microgravity experimentation. The UMass graduate studied how liquids behave in low gravity, producing findings that have influenced the design of space vehicles.

In 1999, Coleman was back in space, again on Columbia, for a five-day mission that included deploying the Chandra X-ray Observatory.

"That telescope is still out there and is still sending images back and has expanded our view of the universe in ways that are astounding. We're learning more about black holes and dark matter. Everything you see about black holes on CNN probably comes from Chandra. I was thrilled and proud to be part of the team that deployed it. I love the fact that it's alive and real. It's like the birth of a child."

Coleman, 48, is now training for an International Space Station mission slated for late 2010, although she is a backup for a July 2009 mission.

What would it be like to spend six months in space?

"I think of it as the most amazing and exciting opportunity I could imagine. I see the Space Station as the next step in returning to the moon and eventually going on to Mars. I really doubt that I will be one of the people who goes to the moon or to Mars, but for the next generation to do that, we need people who are figuring out how to live in space."

Coleman—who lives in western Massachusetts with her husband, glass artist Josh Simpson, and their son, Jamey—when not in Houston or training in other parts of the world, says UMass played a major role in her life and is shaping a better future.

"The future of our planet is very exciting, but at the same time, it is daunting and challenging. We have some very large problems to solve, and we need the next generation to be ready to solve those problems—and the way you do that is to get an education at an institution like the University of Massachusetts."

pedals for progress™
Putting used bikes to good use.™

Finding a second life in developing-world countries for old bicycles is the mission of Dave Schweidenback, UMass Dartmouth '76, and his New Jersey–based non-profit Pedals for Progress (P4P). Since Schweidenback founded it in 1991, P4P has shipped 117,000 used bicycles to 32 countries, from El Salvador to Ghana to Moldova.

More than just transportation, a bicycle can be the key to holding a job, getting goods to market, going to school, and more. "I've always approached this as an economic development program," said Schweidenback. "You can get a job once you have some way to get there," he said.

With Americans buying more than 22 million new bikes a year, most replacing still-functional bikes, the potential supply to countries in need is vast.

P4P's impact has resulted in numerous awards. Most recently, Dave was honored as one of CNN's 2008 "Heroes."

To learn more, go to www.p4p.org.

COOPERATION, NOT COMPETITION, CAUSES EVOLUTIONARY LEAP

Distinguished University Professor at UMass Amherst Lynn Margulis has been singled out in *100 Greatest Science Discoveries of All Time* by Kendall Haven.

Margulis is recognized for her groundbreaking theory of Complete Evolution. As Margulis argues, cooperation rather than competition accounts for the "survival of the fittest." Margulis cites symbiotic relationships between organisms as the source of major evolutionary leaps forward.

At first received skeptically by colleagues in 1967, Complete Evolution is now widely recognized to fill gaps in Darwin's theory. In the book, Haven says, "More than any scientist since Darwin, she has forced a radical revision of evolutionary thinking. Like Copernicus, Galileo, Newton, and Darwin before her, Margulis has uprooted and changed some of science's most deeply held theorems and assumptions."

GOKIDS SUPPORTS FITNESS AND LEARNING IN BOSTON PUBLIC SCHOOLS

GoKids, a new research/community initiative on the UMass Boston campus, is changing the way people think about exercise. Throw away your old ideas about gym. No jumping jacks or chin-ups here. GoKids turns high-tech into high energy.

According to GoKids Director Dr. Kyle McInnis, "Interactive games such as lighted walls and computerized dance pads help get kids engaged and moving." Exercise becomes play. The result, says McInnis, is that "heart rates were high but their perceived levels of exertion were modest, which could result in longer exercise times and more calories burned compared to more traditional forms of exercise."

A partnership with Boston Public Schools seeks to achieve daily physical activity goals while simultaneously making an impact on academic performance. "Imagine," says McInnis, "if in the process of educating and motivating our youth to get physically fit, we can also teach math or science concepts and such higher-learning skills as teamwork and communication."

www.gokids-boston.org/

A BREAKTHROUGH IN LOU GEHRIG'S DISEASE RESEARCH

A team of researchers lead by Robert H. Brown Jr., M.D., D.Phil., the new Chair of Neurology at the University of Massachusetts Medical School and UMass Memorial Medical Center, has discovered a new gene whose mutations cause familial amyotrophic lateral sclerosis (ALS), a fatal neurological disorder commonly known as Lou Gehrig's disease.

The breakthrough, which will lead to new cellular models of ALS and could accelerate the search for a treatment for the devastating disease, was documented in the February 27 issue of *Science*.

Brown, an internationally known researcher and physician who discovered the first genetic link to familial ALS more than a decade ago while at Harvard Medical School and Massachusetts General Hospital, joined UMass Medical School in October. "UMass represents the most promising environment in which to apply RNAi and other technologies to develop advanced therapies for ALS and other devastating diseases," Brown said.

UMass Medical School Chancellor Michael F. Collins, M.D., FACP, heralded Brown's appointment, saying it ushered in "an exciting new era in translational medicine at UMass Medical School."

"The opportunities for advancing his research among our scientific community are immense. We are at the center of an evolution in the life sciences, and innovative leaders like Dr. Brown are a key reason why we'll be successful."

A NUTRITIONAL APPROACH TO DELAY THE ONSET OF ALZHEIMER'S DISEASE

A powerful combination of vitamins and other nutrients is proving to be a potent weapon in the fight against Alzheimer's, memory loss, and dementia.

UMass Lowell researchers developed and tested the non-pharmaceutical supplement, and have published their findings that MemoryXL can delay the degeneration of those suffering from Alzheimer's. It can also boost the memory of healthy adults, with reported gains as great as 20%.

In October, UMass Lowell Biological Sciences Professor Thomas Shea received $240,000 from the Massachusetts chapter of the National Alzheimer's Association to fund a three-year study to determine if MemoryXL can also delay the onset of Alzheimer's.

UMass Lowell Chancellor Marty Meehan said Shea's research "combined scientific rigor with an eye on the end result." Not only has his work increased knowledge of Alzheimer's, "but he's doing even more to improve the brain functioning and quality of life for patients."

The Alzheimer's research team included, front, from left, Nursing Asst. Professor Ruth Remington, Professor Thomas Shea, and Professsor Eugene Rogers; Back, Professor Mark Hines, chair of the Biological Sciences Department; Professsor Robert Nicolosi of the Clinical Laboratory and Nutritional Sciences Department; and Elizabeth Goodrow Kotyla, research associate with the Center for Health and Disease Research.

NATIONAL WEATHER SERVICE AND OLYMPIC SAILING TEAMS USE UMASS OCEAN MODEL

Dr. Changsheng Chen, a professor at UMass Dartmouth's School for Marine Science and Technology, and his team have developed an ocean computer model used around the world for the last decade to simulate coastal and open ocean currents. Known as FVCOM, the model is used by the National Weather Service to predict storm surges and flooding and by state and federal officials to manage fisheries. It was used by the 2008 Canadian Olympic Sailing Team to analyze currents off the coast of China and help the team plot strategy during the most recent Summer Olympic Games.

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Students gather for a study session in UMass Boston's Campus Center