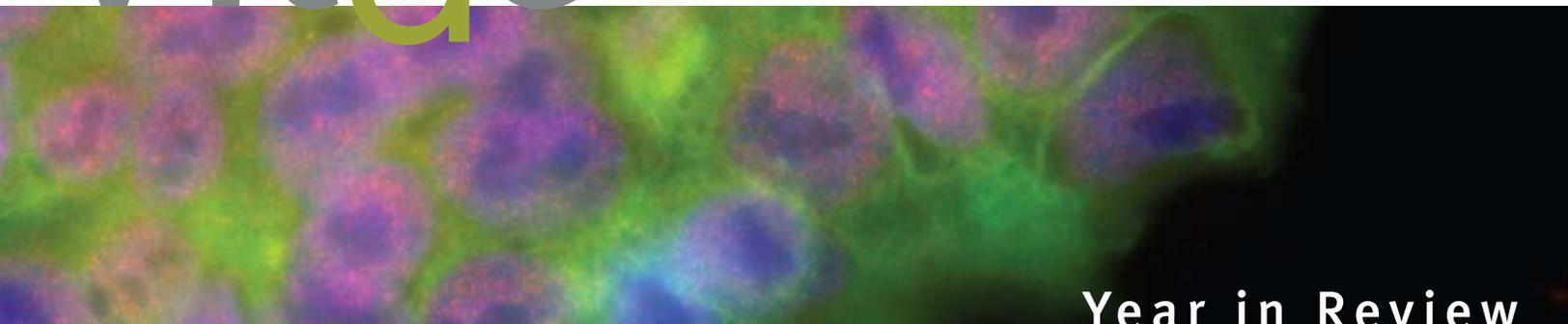




Watch Them Grow

# Vita<sup>ae</sup>:

The Magazine of  
The University of Massachusetts Medical School



Year in Review



Baby's Breath of Life



Educational Experts

## Vital: the plural of life

The name of this magazine encompasses the lives of those who make up the University of Massachusetts Medical School community, for which it is published. They are students, faculty, staff, alumni, volunteers, benefactors and others who aspire to help this campus achieve national distinction in education, research and public service.

As you read about this dynamic community, you'll frequently come across references to partners and programs of UMass Medical School (UMMS), the Commonwealth of Massachusetts' only public medical school, educating physicians, scientists and advanced practice nurses to heal, discover, teach and care, compassionately:

### **Commonwealth Medicine**

UMass Medical School's innovative public service initiative that assists state agencies and health care organizations to enhance the value and quality of expenditures and improve access and delivery of care for at-risk, underserved and uninsured populations.  
[www.umassmed.edu/commed](http://www.umassmed.edu/commed)

### **The Research Enterprise**

UMass Medical School's world-class investigators, who make discoveries in basic science and clinical research and attract more than \$175 million in funding annually.

### **UMass Memorial Foundation**

The charitable entity that supports the academic and research enterprises of UMass Medical School and the clinical initiatives of UMass Memorial Health Care by forming vital partnerships between contributors and health care professionals, educators and researchers.  
[www.umassmed.edu/foundation](http://www.umassmed.edu/foundation)

### **UMass Memorial Health Care**

The clinical partner of UMass Medical School and the Central New England region's top health care provider and employer.  
[www.umassmemorial.org](http://www.umassmemorial.org)

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*UMass Medical School begins participation in a decades-long study of children's health and development, the largest such initiative in U.S. history.*



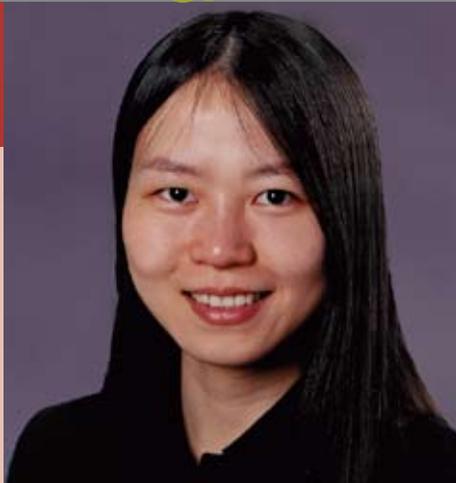
## Baby's Breath of Life 16

*At UMass Medical School, clinicians, basic scientists, engineers and a mathematician team up to help premature babies breathe easy.*



## Educational Experts 21

*Students at UMass Medical School take advantage of many ways to craft curricula and create legacies for future learners.*



Zhiping Weng, PhD, is the founding director of the new Program in Bioinformatics and Integrative Biology.

## New Program Will Study Biological Info for Clinical Research

analyze the information are essential for the success of the Medical School's comprehensive biomedical research endeavor. The program is also crucial for existing faculty research and for the recruitment of additional faculty and graduate students in many disciplines.

Under the direction of Zhiping Weng, PhD, who joins UMMS from Boston University and BU School of Medicine, the program will combine resources and faculty expertise in mathematics, science and engineering to explore and understand biological data through the application and development of computational tools. Initiatives and projects will include new approaches for expanding the use of biological data, including methods to store, organize, analyze and visualize such data.

Dr. Weng is principal investigator of a project grant of the National

Human Genome Research Institute Encyclopedia of DNA Elements (ENCODE) Project, which is a coordinated and multidisciplinary effort to determine the function and location of human genes. As head of the Program in Bioinformatics and Integrative Biology, Weng will direct efforts to make the information gathered from the sequencing of human DNA practical and applicable for clinical research. In addition to recruiting faculty, she will also work with the leadership of the Graduate School of Biomedical Sciences to establish a graduate training program.

“This is an exciting programmatic achievement for UMass Medical School, and we look forward to what will no doubt be Dr. Weng's exceptional scientific contribution to our academic and research community,” said Interim Chancellor Michael F. Collins. ☉

### A new Program in Bioinformatics

and Integrative Biology has been established at UMass Medical School to address one of the most dynamic and central areas in biomedical research today—the ever-increasing quantity of biological information available to scientists. With laboratory databases expanding significantly to include DNA sequences and protein structures, technology and personnel to process and

## UMMS and UMass Memorial Medical Center Go Tobacco-Free

**UMass Medical School** and UMass Memorial Medical Center announced in 2007 that their campuses will become tobacco-free by Tuesday, May 27, 2008, prohibiting the use of all tobacco products on school and Medical Center properties, including parking facilities. The Tobacco-Free Initiative also provides a range of resources to encourage and support individuals who already smoke in their efforts to quit.

The announcement was made on the 30th anniversary of the American Cancer Society's annual Great American Smokeout by Dean of the School

of Medicine and Executive Deputy Chancellor and Provost Terence R. Flotte, MD, and UMass Memorial Medical Center President Walter H. Ettinger Jr., MD, MBA. “This is a milestone in the history of these two institutions and in the history of public health in Central Massachusetts,” said Dr. Flotte. “We have a responsibility to create a healthy environment for our patients, employees, students and visitors, and we're committed to doing just that.”

A key component of this plan is the commitment of UMMS and UMass Memorial energy and resources to

make this policy successful. “As health care professionals, we recognize how challenging it can be to quit, and that's why we're placing such an emphasis on quitting by supporting resources like smoking cessation counseling and nicotine replacement,” said Dr. Ettinger.

Representing a watershed for these two institutions and for public health in Central Massachusetts, UMMS and UMass Memorial join the growing number of health care institutions who are responding to the well-documented health risks of smoking and second-hand smoke by going tobacco-free. ☉

## Massachusetts Funds Stem Cell Bank and Registry at UMass Medical School

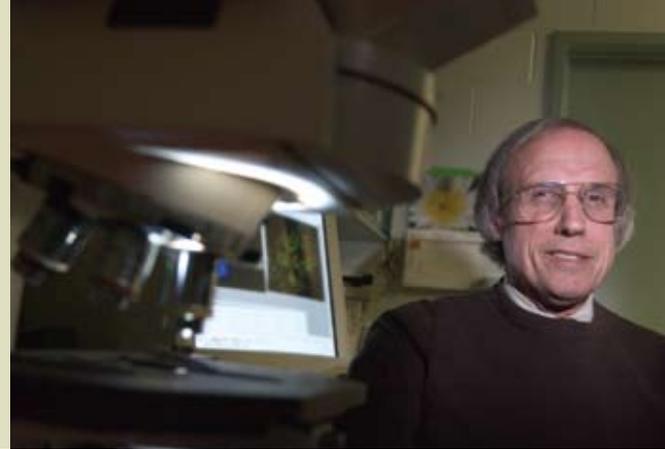
### There is widespread agreement

in the scientific community that human embryonic stem cell research holds enormous promise for discovering therapies, perhaps even cures, for some of the most debilitating diseases. With more than \$8.2 million in funding from the Board of the Massachusetts Life Sciences Center (MLSC) in 2007 to launch the Massachusetts Human Embryonic Stem Cell (hESC) Bank and the Massachusetts hESC Registry at UMass Medical School, the institution is primed for national and international prominence in the disbursement of stem cell lines and the dissemination of stem cell information. The funding firmly establishes the leadership role UMMS is destined to play in making Massachusetts Governor Deval L. Patrick's ambitious Life Sciences Initiative a reality.

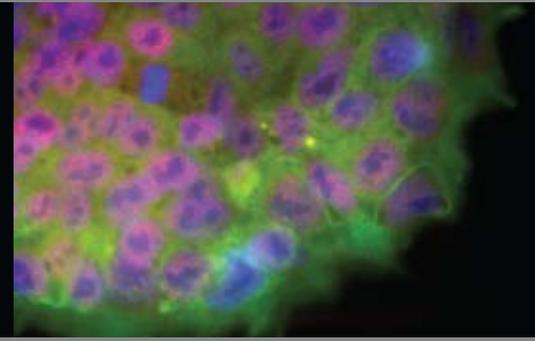
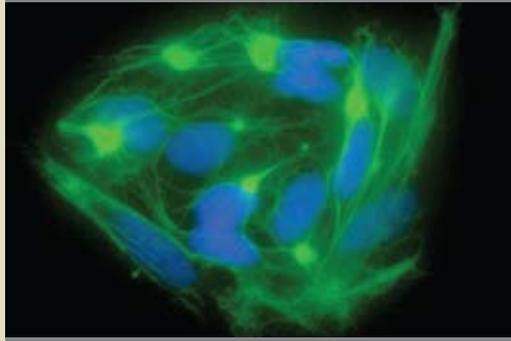
"We are so gratified by the Center's confidence in UMass Medical School's ability to bring both of these critical projects to fruition," said Interim Chancellor Michael F. Collins. "With the expertise of our faculty in basic science research involving stem cells, and faculty and administrative commitment to facilitate the integration of stem cell research in academic institutions and the private sector, we have what it takes to develop the programs and infrastructure to support national and international stem cell investigations."

The registry and bank are two separate but complementary infrastructure programs that are fundamental to the advancement of today's cutting-edge biomedical research. The stem cell

registry is a key to advancing the field of hESC research by aiding the free and timely flow of information between providers of lines and researchers, and between researchers and the broader life sciences community. "Our goal for the registry is to go beyond the listing to include detailed information about the



Gary Stein, PhD, (above) directs the new Stem Cell Bank and Registry. Funding for the facilities brings prominence for UMass Medical School in the disbursement of stem cell lines and the dissemination of stem cell information. Pictured below left are H9 human embryonic stem cells from the lab of Jeanne Lawrence, PhD, professor of cell biology. At right are H1 hES cells from the Lawrence lab. Both images are courtesy of John Butler, Department of Cell Biology.



lines," explained Gary Stein, PhD, the *Gerald L. Haidak, MD, and Zelda S. Haidak Professor of Cell Biology* and chair of cell biology. Tapped to direct the new facilities, Dr. Stein has recruited two new assistant professors of cell biology to staff the registry; they are charged with identifying and compiling information about National Institutes of Health-approved and other stem cell lines, including current and future publications.

The bank will ensure quality control for each line held, as well as catalogue each line's known properties. In addition, the

bank will train visiting as well as UMMS investigators and extend its activities to K-12 science education outreach.

Beyond advancing potentially lifesaving research, centralized, comprehensive stem cell facilities at UMMS offer enormous potential for economic development in Massachusetts.

"Agreements are already being configured with several biotechnology and pharmaceutical companies that want to have their lines included in the registry," Stein noted. "We believe the stem cell enterprise here will help attract and retain stem cell researchers and companies in Massachusetts." ©

## Results Reveal Silencing of Gene Responsible for Huntington's Disease

### Investigators from UMass

Medical School, Massachusetts General Hospital and Alnylam Pharmaceuticals, Inc. in Cambridge, reported in October 2007 a novel treatment for Huntington's disease (HD), a debilitating, inherited neurodegenerative disorder, caused by the *huntingtin* gene, that affects approximately 30,000 people in the United States; another 150,000 are considered at risk for inheriting the illness from a parent with HD. Research revealed that the use of chemically synthesized small interfering RNAs (siRNAs), the molecules that mediate RNA interference (RNAi), silenced *huntingtin* and provided a therapeutic benefit. The findings appeared in the *Proceedings of the National Academy of Sciences* (PNAS).

In the preliminary study, researchers discovered that the RNAi therapeutic reduced the expression of mutant *huntingtin* and was well tolerated after direct administration into the central nervous system. The pre-clinical study demonstrated that siRNA, when injected, targeted *huntingtin* and improved disease symptoms, including reduction in neuronal pathology and prolonged and improved motor behavior. Huntington's disease causes neurological degeneration and is characterized by rapid, jerky body movements and the loss of normal mental abilities.

The researchers believe these findings will promote the advancement of RNAi therapeutics to treat patients with HD.

RNAi was identified by Howard Hughes Medical Institute Investigator and *Blais University Chair in Molecular Medicine* Craig C. Mello, PhD, a discovery for which he shared the 2006 Nobel Prize.

"Patients afflicted with this genetic disease are otherwise destined to an irreversible deterioration of neuronal function," said Neil Aronin, MD, professor of medicine, cell biology and physiology at UMMS. "While more work is needed to advance this approach, the mechanism of action for RNAi therapeutics defines a promising therapeutic strategy that could slow or halt disease progression." 🌐



## Zamore among Top Cited Authors Worldwide

**Phillip D. Zamore, PhD**, the *Gretchen Stone Cook Chair in Biomedical Sciences* and professor of biochemistry & molecular pharmacology, was recently named among the top 25 authors of high-impact papers in molecular biology and genetics. *Science Watch* ranked authors in the top one percent of most cited papers in their fields between 2002 and 2006. Dr. Zamore is number 18 on the list, with eight high-impact papers cited 1,802 times, with an average 225 citations per paper.

*Science Watch* draws from *Essential Science Indicators*, Thompson Scientific's index of journals that analyzes and tracks trends in research. "Citations have the virtue of reflecting the judgments that scientists themselves make in selecting and acknowledging the published research that they view as most significant and useful," said *Science Watch* editor Christopher King. "Clearly, Dr. Zamore's papers on RNA interference and related topics are wielding notable influence in ongoing research and demonstrating that he and his colleagues have been in the thick of the action in recent biochemistry."

"It is a tremendous honor and an affirmation of the incredibly hard work done by my students and postdoctoral fellows," said Zamore. "As scientists, we aspire to contribute to our understanding of how living things work. To have our peers acknowledge our contribution by citing our papers is a huge honor." 🌐

Dr. Phillip Zamore's published research wields influence with his peers in molecular biology and genetics, according to a *Science Watch* ranking.

## Doubeni Receives NIH Support to Study Cancer Health Disparities

### A faculty member of the UMass

Medical School Department of Family Medicine & Community Health was awarded a prestigious Mentored Career Development Grant from the National Institutes of Health's National Cancer Institute in the fall of 2007. The research and career development activities of Assistant Professor Chyke Doubeni, MD, MPH, will be supported by a five-year, \$707,695 grant under the guidance of nationally renowned senior scientists, including several from UMMS as well as from the University of Virginia School of Medicine, Group Health Cooperative in Seattle and Harvard School of Public Health. The award allows Dr. Doubeni to continue research activities started in 2004 concerning cancer health disparities with a focus on colorectal cancer.

The award represents a significant milestone for the department and the Cancer Research Network, a national consortium of research centers that are affiliated with 14 geographically dispersed integrated health care systems; UMMS is a member of the network. "This is the first career development award received by faculty in Family Medicine & Community Health or the Cancer Research Network," said department Chair Daniel H. Lasser, MD, MPH. "Chyke's application was received enthusiastically and was funded at its first submission, a reflection of the strengths of both the network and department in training investigators for health services research."

The goal of Doubeni's research is to contribute to current national efforts to

reduce or eliminate the disproportionate burden of colorectal cancer among vulnerable populations. Research training activities supported by this award will lay the foundation for a long-term career goal of designing system-based interventions aimed at eliminating cancer health disparities. Research projects will be conducted under the auspices of the Cancer Research Network.

Doubeni and colleagues have contributed important findings regarding cancer

screenings and follow-up before. In 2006, Doubeni was lead author on a study published in the journal *Cancer* that found that only one in three breast cancer survivors continues to receive recommended surveillance mammograms annually in the five years after cancer treatment, despite dramatically increased risk of recurrence or new malignancy. Doubeni and his colleagues examined mammography use among 797 women over a five-year period. ©

Chyke Doubeni, MD, MPH, (left) confers with colleague Linda Weinreb, MD, professor of family medicine & community health and pediatrics. With support from the National Institutes of Health, Dr. Doubeni will join national efforts to reduce or eliminate the disproportionate burden of colorectal cancer among vulnerable populations.





## Major Clues Discovered about How Schizophrenia Develops

“We’ve known that schizophrenia is a developmental disease, and that something happens in the maturation of the prefrontal cortex.... Now we’re beginning to find out what it is, setting the stage for better ways of preventing and treating it.”

– Schahram Akbarian, MD, PhD

The research of Schahram Akbarian, MD, PhD, and colleagues reveals that the development of schizophrenia may be related to genetic activities in the brain.

### Results of research published

in the October 17, 2007, issue of the *Journal of Neuroscience* by Associate Professor of Psychiatry Schahram Akbarian, MD, PhD, graduate student Hsien-Sung Huang and colleagues, show that schizophrenia may occur, in part, because of a problem in an intermittent on/off switch for a gene involved in making a key chemical messenger in the brain. The researchers found that the gene is turned on at increasingly high rates during normal development of the prefrontal cortex, the part of the brain involved in higher functions like thinking and decision-making—but that this normal increase may not occur in people with schizophrenia.

The study was funded by the National Institutes of Health’s National Institute

of Mental Health (NIMH) and National Institute of Child Health and Human Development.

The gene *GAD1* makes an enzyme essential for production of the chemical messenger called GABA. The more the gene is turned on, the more GABA synthesis can occur, under normal circumstances. GABA helps regulate the flow of electrical traffic that enables brain cells to communicate with each other. It is among the major neurotransmitters in the brain.

Abnormalities in brain development and in GABA synthesis are known to play a role in schizophrenia, but the underlying molecular mechanisms are unknown. In this study, scientists discovered that defects in biochemical reactions that regulate gene activity, such as turning genes on and off so that they can make substances like the *GAD1* enzyme, are involved.

“This discovery opens a new area for exploration of schizophrenia,” said NIMH Director Thomas R. Insel, MD. “Studies

have yielded very strong evidence that schizophrenia involves a decrease in the enzymes, like *GAD1*, that help make the neurotransmitter GABA. Now we’re starting to identify the mechanisms involved, and our discoveries are pointing to potential new targets for medications.”

Finding more precise molecular targets for development of new schizophrenia medications is a key effort, because it can lead to more effective treatments with fewer side effects. Clozapine and other current antipsychotic medications are effective for many patients, but not all, and they can cause side effects severe enough that some people choose to stop treatment.

“We’ve known that schizophrenia is a developmental disease, and that something happens in the maturation of the prefrontal cortex during this vulnerable period of life. Now we’re beginning to find out what it is, setting the stage for better ways of preventing and treating it,” Dr. Akbarian said. ©

## Lian Receives Prestigious MERIT Award

**The National Institutes of Health (NIH)** recently recognized Jane B. Lian, PhD, professor of cell biology, for her research project *Synthesis of Osteocalcin in Bone* by awarding the Method to Extend Research in Time (MERIT) Award. The award is given to an investigator who has an excellent record of scientific productivity from previous research, and provides continuous support and a grant extension, eliminating the administrative burdens associated with the grant renewal process. Dr. Lian has received continuous funding from the NIH for this project since 1976, and with the MERIT award, will receive \$1.9 million over five years.

Lian's research has focused on osteocalcin, a bone-specific calcium binding protein. The osteocalcin gene, which she identified in 1975, is a marker for mature bone-forming cells known as osteoblasts. By isolating bone cells and creating a culture system for osteoblasts to progress through different stages of bone development, molecular factors regulating osteocalcin have been identified for their roles in promoting bone formation. Through these significant research milestones, Lian and others have laid the groundwork for clinicians to treat metabolic bone disorders and observe the effects of treatments. ©



"With every [NIH] funding period, my colleagues and I have been able to reach significant milestones," said Jane Lian, PhD, above.

## Board of Higher Education Funds UMMS Student Outreach

**The Massachusetts Board of Higher Education (BHE)** has awarded a three-year grant of \$500,000 from the Science, Technology, Engineering & Math (STEM) Pipeline Fund to UMass Medical School's Regional Science Resource Center. The Pipeline Fund is designed to increase student interest and teacher preparation in STEM subjects.

The grant is part of a larger \$3.2 million grant announced by the BHE to support collaborative projects that bring together K-12, higher education, businesses and community organizations to address regional education and workforce needs.

The Medical School will lead efforts to develop a communications plan to increase the awareness of STEM careers

and career pathways among middle school students, parents, teachers, and guidance counselors in Central Massachusetts. Students will have access to role models and career mentors and participate in the development of student-friendly messages about STEM. Partners in this effort include the Colleges of Worcester Consortium, EcoTarium, Fitchburg State College, Mount Wachusett Community College, Quinsigamond Community College, Worcester Polytechnic Institute and school districts in Fitchburg, Lunenburg, Worcester, and others.

"We simply have to do a better job communicating to students and their parents that strong academic training in STEM fields is essential to career

success in the future. This project moves us along this path," said Patricia F. Plummer, chancellor of the BHE. ©

Sandra Mayrand, pictured with students in a Regional Science Resource Center lab below, is lead partner on the BHE grant as director of the RSRC.



# Vitagene: Year in Review

## Recognizing UMass Medical School Service and Expertise



Richard Aghababian, MD

David Kaufman, MD

Kathleen Biebel, PhD

Steven Bird, MD

David Chad, MD

Mary Costanza, MD

The *Worcester Business Journal* chose two members of the UMMS community as “Health Care Heroes.” **Richard Aghababian, MD**, founding chair and professor of emergency medicine and associate dean for continuing medical education, was recognized for his leadership in advances in emergency medicine. **David Kaufman, MD**, clinical associate professor of medicine and surgery and associate dean for medical education, was honored for improving critical care.

**Kathleen Biebel, PhD**, research assistant professor of psychiatry, was one of *Worcester Business Journal's* “40 Under 40,” recognized for her commitment to program and policy developments for parents suffering from mental illness and their families.

The Society for Academic Emergency Medicine recognized **Steven B. Bird, MD**, assistant professor of emergency medicine, with a 2007 Young Investigator Award.

Professor of Neurology and Pathology **David Chad, MD**, received the Muscular Dystrophy Association’s Lou Gehrig Humanitarian Award, for extraordinary personal and public support of finding a

cure for amyotrophic lateral sclerosis.

The Worcester District Medical Society honored **Mary E. Costanza, MD**, professor of medicine, as Community Clinician of the Year. **Wayne B. Glazier, MD**, clinical assistant professor of surgery, was awarded the Dr. A. Jane Fitzpatrick Community Service Award, while **Guenter L. Spanknebel, MD**, associate professor of medicine, received the Career Achievement Award.

**Stephen J. Doxsey, PhD**, professor of molecular medicine, biochemistry & molecular pharmacology and cell biology, was a recipient of the President’s Public Service Award, presented annually by the University of Massachusetts President’s Office. Dr. Doxsey is co-founder of the UMass Laboratories for Worcester Area High Schools program, which brings students to campus for hands-on research experiences.

Professor of Cell Biology and Neurology **Susan B. Gagliardi, PhD**, is the first recipient of the Master Teacher Award presented by the International Association of Medical Science Educators.

**Romolo J. Gaspari, MD**, associate professor of emergency medicine, was

one of nine recipients nationally of the American College of Emergency Physicians National Faculty Teaching Award.

The Donor Champion Award of the New England Organ Bank was presented to **Stephen O. Heard, MD**, professor and chair of anesthesiology, for his advocacy of organ donation. UMass Memorial Medical Center also received a Medal of Honor from the U.S. Department of Health and Human Services recognizing excellence in identifying and recovering organs for transplant.

Associate Professor of Medicine **JeanMarie Houghton, MD, PhD**, was recognized as one of the country’s most talented rising scientific stars with the Presidential Early Career Award for Scientists and Engineers, the highest



JeanMarie Houghton, MD, PhD



Richard Irwin, MD



Wayne Glazier, MD



Guenter Spanknebel, MD



Stephen Doxsey, PhD



Susan Gagliardi, PhD



Romolo Gaspari, MD



Stephen Heard, MD

honor bestowed by the U.S. government on these professionals.

At the 62nd Annual Meeting of the Massachusetts Thoracic Society, **Richard S. Irwin**, MD, professor of medicine, was presented the society's highest honor, the Henry D. Chadwick Medal, for his contributions to pulmonary medicine.

**Jane Lochrie**, MD, associate clinical professor of medicine, received the Katherine F. Erskine Award in Medicine & Science from the YWCA of Central Massachusetts for her achievements in improving life in the Worcester community, especially for women and girls.

The Central Massachusetts Division of the American Heart Association (AHA)

recognized **Thomas D. Manning**, deputy chancellor for Commonwealth Medicine and Strategic Facilities Planning, with its Heart of Gold Award.

On World AIDS Day, seven leaders in research, treatment and prevention of HIV in women and children were recognized by the Web site [womenchildrenhiv.org](http://womenchildrenhiv.org), including **Katherine F. Ruiz de Luzuriaga**, MD, professor of pediatrics and molecular medicine. Dr. Luzuriaga is renowned for her research focused on mother-to-child transmission of HIV.

Vice Chancellor for University Relations **Albert Sherman** was the first recipient of the Lifetime Achievement Award from the Jewish Community Relations Council of Boston and the Massachusetts Association

of Jewish Federations at their 10th Annual Legislative Reception.

Associate Dean for Medical Education **Henry Tulgan**, MD, received the first Robert Razskowski, MD, PhD, Hero Award of the ACCME (Accreditation Council for Continuing Medical Education). The award recognizes individuals who have provided exemplary and long-term volunteer service to the ACCME.

**Kathleen E. Walsh**, MD, assistant professor of pediatrics, received the Robert Wood Johnson Foundation Physician Faculty Scholar Award, which helps young physicians develop their careers in academic medicine with funds up to \$300,000 over three years. ©



Jane Lochrie, MD



Thomas Manning



Katherine Ruiz de Luzuriaga, MD



Albert Sherman



Henry Tulgan, MD



Kathleen Walsh, MD

Since arriving at the University of Massachusetts Medical School in the summer of 2007 from the University of Massachusetts Boston, I have experienced a rapid and exciting transition from one dynamic campus to another. Our medical school is in the midst of a tremendous moment in its history and is well positioned to embark on its next phase of growth, expansion and prominence.

## MESSAGE FROM MICHAEL F. COLLINS, MD

Recent news revolves around the commonwealth's life sciences initiative. If this is the state's "life sciences" moment, with a ten-year, \$1 billion life sciences initiative advancing on Beacon Hill, then UMass Medical School is the "life sciences institution" playing a prominent role in strengthening the state's position as a global leader.

In February 2008, the Massachusetts House of Representatives unveiled its version of the life sciences legislation that embraces the framework of Governor Patrick's proposal, but directs a portion of the funding to specified capital investments and programs. Within those investments, the University of Massachusetts is identified as a critical partner in strengthening the state's life sciences cluster.

Over \$200 million is directed toward the University, with \$90 million to support the Medical School's Advanced Therapeutics Cluster. Bringing together an interdisciplinary group of research faculty and physician scientists in three interconnected research clusters—stem cell biology, RNA biology and gene therapy—the Advanced Therapeutics Cluster will promote novel approaches to the development of innovative therapeutics. The House proposal also creates the \$40 million Dr. Craig C. Mello Small Business Equity Investment Fund in recognition of our Nobel Laureate's seminal scientific contributions.

The Medical School's prominence in the commonwealth's life sciences initiative underscores the cutting-edge science taking place here by outstanding faculty who make substantial contributions to biomedical knowledge. Also, it underscores the confidence the Legislature has placed in our institution as the state's public medical school.



That confidence is, again, clearly visible in the Massachusetts Senate's newly filed health care legislation that identifies our Medical School as the commonwealth's partner in addressing the primary care shortfall. Our school's national distinction stems in large measure from our leadership in primary care education and training. We are called upon once again to lead in this area that is so critical to the health of those we serve.

The future at UMass Medical School unfolds through basic and translational science research and primary care initiatives, as well as through the diligent efforts of our faculty, clinicians and students. In this annual report, you will read about the contract the Medical School received to help carry out the largest long-term exploration of children's health and development ever conducted in the United States. You will meet a multidisciplinary team of experts dedicated to preventing infant apnea, a serious condition for some premature infants. Further, you will learn that our students contribute in significant ways to their education by serving as partners with their teachers in curriculum development.

We could not carry out our mission at the Medical School without the essential participation of our clinical partner, UMass Memorial Health Care. Recognizing our shared destiny, we are actively engaged in a joint strategic planning effort to more fully fuse our paths to a nationally recognized academic health center. In a future publication, we will provide more information on this major effort.

Michael F. Collins, MD  
*Interim Chancellor, University of Massachusetts Medical School*  
*Senior Vice President for the Health Sciences,*  
*University of Massachusetts*



## Watch Them Grow

*UMass Medical School begins participation in a decades-long study of children's health and development, the largest such initiative in U.S. history.*

By Alison M. Duffy

## The shelves in Marianne

Felice's office bookcase sag under the weight of four enormous binders crammed with charts, maps, statistical reports and timelines flagged by numerous and colorful Post-it notes. The binders will serve as an operations manual of sorts for the next two decades and beyond, as the University of Massachusetts Medical School carries out its role in the National Children's Study (NCS), the largest long-term exploration of children's health and development ever conducted in the United States.

Beginning in the summer of 2009, Dr. Felice, chair of pediatrics at UMMS and physician-in-chief of the UMass Memorial Children's Medical Center, and her team will be aided by a small army of field researchers, environmental experts, obstetricians, pediatricians, nurses and community leaders to recruit 1,000 infants from Worcester County—before they're born or, in some cases, even conceived—and closely track them until their 21st birthdays. The data the team collects about the children's health and environments will be vast. Children from Worcester County will be part of a cohort of 100,000 enrolled over the

course of five years through 105 sites across the country in an unprecedented effort to provide vital new insights into the effects of environmental and genetic factors on human growth, development and disease. Conclusions of the NCS are expected to help the United States set environmental, social and health policy that will affect millions of people for generations to come.

"It's difficult to overstate the magnitude of this study," said Felice, principal investigator of the UMMS arm of the NCS, called the Massachusetts Child Health Indicators and Life Determinants (Mass CHILD). Felice and her team were awarded a highly competitive NCS contract in October 2007 that will provide \$16.2 million for the first five-year phase of the study, during which UMMS will hire staff, establish laboratory and office space, engage the community and hospitals and recruit participants. UMMS was the only institution in the Commonwealth of Massachusetts to win its own NCS contract.

The NCS was "born in response to growing concerns, arising in the late 1990s among a number of federal health agencies, about how environmental

exposures might be contributing to increases in autism, learning disorders, asthma, obesity, diabetes and other illnesses," said Peter Scheidt, MD, medical officer for the NCS, a joint endeavor of the National Institute of Child Health and Human Development, the Centers for Disease Control and the Environmental Protection Agency. "We simply did not have sufficient data to pinpoint suspected links." Congress asked the Department of Health and Human Services to collaborate on a longitudinal study to discover those links through unparalleled data collection.

The NCS had to be large enough, the populations diverse enough, to derive the statistical power to answer certain hypotheses with conviction. All childhood and adolescent experiences, all ethnic and socioeconomic groups, and all environmental and geographic influences had to be taken into account. Worcester County, like the other NCS sites, was identified through a scientifically rigorous probability sample that represents the nation as a whole.

In turn, the number and type of samples the NCS will take is mind-boggling:



A study this large and complex requires expert leadership, a proven track record in conducting public health research and the technical and logistical know-how to mobilize resources

to collect and manage precious data. While Chair of Pediatrics **Marianne Felice, MD**, will be the "face" of the project in the community and will have overall responsibility for it, the Mass CHILD leadership team includes the following UMMS faculty who together possess the public health research acumen to do the job:



**Thomas J. McLaughlin, ScD**, is the co-principal investigator of Mass CHILD and responsible for direct oversight of all research activities related to the project. He has been involved in the

conceptualization and design of the NCS since 2000. A professor of pediatrics and psychiatry, McLaughlin is also director of the Division of Clinical Research in the Department of Pediatrics and has vast experience as a health services researcher and biostatistician. He is also an expert in longitudinal research design and analysis of longitudinal data, especially in the area of mental health and behavioral disorders, making him well suited to guiding an enormous research project with so many moving parts.



Assistant Professor of Pediatrics **Onesky Aupont, MD, MPH, MA, PhD**, is the study director and operations manager for the project. Prior to joining UMMS, Aupont trained in health

service research and maternal and child health and was a community prevention specialist and immunization coordinator for the state's Department of Public Health. He will oversee the day-to-day management of Mass CHILD and direct the activities of all the staff members. Mass CHILD expects to hire the equivalent of 85 full-time employees and will occupy space on the Hoagland-Pincus campus of the Medical School.

nearly two million biological and environmental specimens, beginning with genetic samples from each parent and including ultrasounds recorded during pregnancy, cord blood samples and other materials taken at the time of birth. As the children grow, samples of the air they breathe, the soil, dust and water they touch (and ingest) from in and around their homes, daycare centers and schools will be gathered. As the study tracks each participant, it will also examine the child's overall health, eating and exercise habits, TV viewing patterns, friendships, family size and composition, emotional stressors, socioeconomic status and spatial factors, such as the child's proximity to green space, bodies of water and highways. Through the collection of materials and the completion of detailed questionnaires and home visits during pregnancy (and prior to conception), at birth, throughout growth and into young adulthood, NCS will create a complete picture of childhood in the United States.

"Winning a contract of this magnitude is truly a milestone in UMass Medical School's history," said Executive Deputy Chancellor and Provost Terence R. Flotte, MD, dean of the School of Medicine. He noted that the Medical School's growing

## Quick Facts: National Children's Study

Funding for the 22 study centers and the study's initial phase is a result of a \$69 million appropriation from Congress in fiscal year 2007 and is expected to increase for subsequent phases over the life of the study. Seven vanguard centers were named in 2005 and will begin recruiting mothers this summer; additional contracts are to be awarded at a later date, but will likely total no more than 35 to 40 centers to collect data from all 105 counties, which together are representative of the entire U.S. population.

In New England, other counties selected for the study include New Haven County in Connecticut, which will be managed by Yale University; and Providence County in Rhode Island, to be overseen by Brown University. Litchfield County in Connecticut, Bristol County in Massachusetts and Cumberland County in Maine have not yet been assigned to Study Centers.

The NCS is expected to issue another Request for Proposals this year for sites that have not yet been assigned, including the New England sites and others. UMass Medical School is poised to bid for Bristol County and Cumberland County and is already discussing the possibility with counterparts at UMass Dartmouth's School of Nursing and researchers at the Maine Medical Center to test the waters. "We hope that by the time the RFP is issued, we'll have our Mass CHILD feet firmly under us and will be in a position to tackle one or two additional counties," said Thomas McLaughlin, ScD, co-principal investigator.



**Janet Hardy, MPH, MSc, PhD,** a perinatal epidemiologist, has been dedicated to the NCS since 2002 when she participated as an invited member of the first NCS Study Assembly. Her primary

research focus lies in medication safety and other environmental hazards in pregnancy in relation to maternal well-being, teratogenic and adverse neurodevelopmental outcomes in children. With Tiffany Moore Simas, MD, MPH, she will co-lead the efforts to engage all 11 hospitals at which women in Worcester County deliver their infants. Dr. Hardy will supervise the five hospital negotiators to be hired for the project and ensure that relevant hospitals are involved and participating in the project.



**Tiffany A. Moore Simas, MD, MPH,** an assistant professor of obstetrics & gynecology and pediatrics, has conducted an array of research studies related to pregnancy, including biomarkers connected to

risk of preeclampsia and screening for domestic violence. With Janet Hardy, MPH, MSc, PhD, she will co-lead the initial efforts at hospital engagement. She will also oversee all obstetrics activities, working with the ultrasonography unit and the nurses and nurse midwives who will conduct prenatal visits at home and in clinic, and will coordinate neonatal exams in collaboration with Felice.



**Judith K. Ockene, PhD, MEd, MA,** is the senior advisor on all survey activities. A professor of medicine and chief of the Division of Preventive and Behavioral Medicine and the *Barbara*

*Helen Smith Chair in Preventive and Behavioral Medicine*, Ockene is principal investigator of the UMMS site for the national Women's Health Initiative, a longitudinal health study whose findings surprised the medical world and reversed the thinking surrounding hormone replacement therapy in postmenopausal women.

reputation in clinical and translational research makes it uniquely positioned to accept this challenge. “Each of the faculty involved in this study exemplify our proud tradition of primary care education, our reputation for methodical research and our close community involvement. We are an institution with both an undeniably strong track record in public health research and an undeniably strong relationship with the community

from which mothers will be sought.”

Preliminary calculations estimate that Mass CHILD will need to knock on approximately 13,000 doors to successfully identify 1,000 women who are in their first trimester of pregnancy or who may become pregnant over the four-year enrollment period. Mass CHILD has contracted with the National Opinion Research Center (NORC),

based at the University of Chicago and specializing in social science research in the public interest, to assist UMMS in household screening, enrollment of participants, and computer-assisted interviews both in-person and via telephone. Although NORC will recruit, train and manage most local field staff, UMMS will oversee nurses and medical staff who will obtain the biological samples and clinic and hospital data. Collected data will be downloaded daily to a national processing center, and laptops provided by NCS will be purged nightly to ensure the protection of personal health information.

The success of the study hinges not only on the recruitment of mothers, but on the retention of their children for more than 20 years of tracking. The task of community engagement will be shared by several Mass CHILD team members, but the bulk of it will sit on the shoulders of Linda Churchill, the community liaison officer. Churchill, who has coordinated public health research with UMMS for 20 years, is well known to women across the region for her role in recruiting participants for the Women’s Health Initiative (WHI).

“I learned from the WHI to engage study participants person by person, neighborhood by neighborhood,” said Churchill. “Over the course of 21 years we will forge very close relationships and become part of the family as we watch these children grow.” Working through community organizations and physicians’ offices and supported by opinion leaders from throughout the region—community activists and advocates, local elected officials, neighborhood businesspeople and community physicians—Churchill and the Mass CHILD team will build awareness of and enthusiasm for the study. Her efforts will be helped by the Medical School’s considerable history

“Winning a contract of this magnitude is truly a milestone in UMass Medical School’s history. Each of the faculty involved in this study exemplify our proud tradition of primary care education, our reputation for methodical research and our close community involvement.”

– Executive Deputy Chancellor and Provost Terence Flotte, MD



Professor of Pediatrics and Molecular Medicine **Katherine Ruiz de Luzuriaga, MD**, is the laboratory director of Mass CHILD and responsible for overseeing all laboratory functions and quality

assurance. Dr. Luzuriaga is widely respected for her patient-oriented research focused on mother-to-child transmission of HIV and has extensive experience in the design, conduct and provision of laboratory support in clinical trials involving mothers and children. She will supervise the senior research associates responsible for overseeing collection, processing and shipment of specimens to ensure that NCS receives clean, accurate materials; she says, “your data are only as good as your samples.”

The Mass CHILD team also includes consultant **Robert J. Goldberg, PhD**, UMMS professor of medicine, who is well known in the area for his role as principal investigator of the Worcester Heart Attack Study and the Worcester Heart Failure Study. Dr. Goldberg’s role in this project is to advise Mass CHILD leadership about the recruitment and retention of fathers in the study for crucial data collection.

**Ronald C. Kessler, PhD**, professor of health care policy at the Harvard Medical School and co-director of the World Health Organization’s World Mental Health Surveys being conducted in 28 countries, will advise the Mass CHILD leadership team about the challenges to long-term retention of study subjects.

of community partnership and that of UMass Memorial Medical Center—and in particular the UMass Memorial Children’s Medical Center. “We know Worcester County and Worcester County knows us,” Felice said simply. To assist Mass CHILD in community engagement, Felice invited 18 members of the communities within Worcester County to serve on the Community Advisory Board and to be study ambassadors in their respective communities.

UMass Memorial will be intimately involved in the study, in part because 40 percent of the babies born in Worcester County take their first breaths in the maternity wards at the Memorial campus. In addition, all women in the study will have two additional ultrasound examinations during pregnancy, adding 2,000 annual tests to the medical center’s already busy ultrasound service. Hospital leadership, keenly interested in the study and the advances it may bring to health care, was a key contributor and participant in the UMMS contract bid for the NCS.

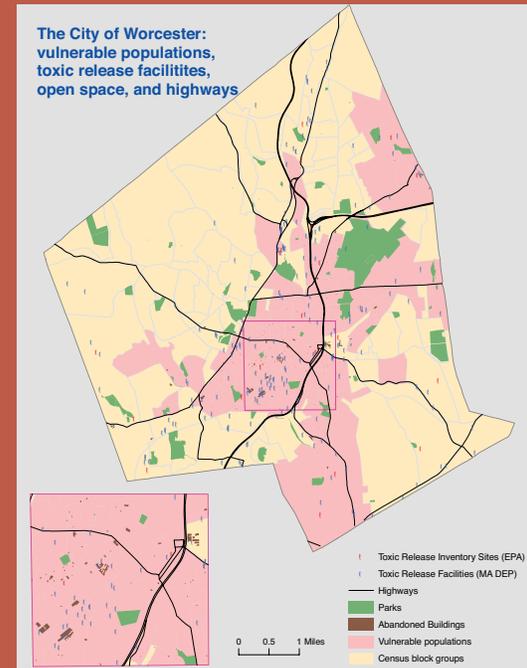
In addition to its implications for patient care, the NCS will be influential in public health research for decades beyond its data collection period. “I’m particularly excited about the study for the opportunities it may create for our young faculty who have yet to find their research niche,” said Felice. “Something like this can have a profound impact on a young person’s career.”

“There is tremendous value in this award not only for the nation but for UMass Medical School in particular. Through it we will be able to leverage other studies and attract additional research funding,” said Professor of Pediatrics and Psychiatry Thomas J. McLaughlin, ScD, Mass CHILD’s co-principal investigator. As a study center, UMMS will have easier access

to NCS data than other universities, and there will be opportunities as the study unfolds for clinical science and basic science researchers at UMMS to launch adjunct studies. “We might want to study the role of environmental exposures in modifying DNA expression or in the emergence of a new phenotype such as a disturbance in metabolism or an overt disorder,” suggested Dr. McLaughlin. “If we can identify what environmental triggers might trip a genetic predisposition to a disease, for example, we may have an opportunity to intervene very early in life.”

Mass CHILD has already begun considering additional research questions that may be answered with the NCS data. Felice, for one, hopes to finally have answers to questions surrounding the high infant mortality rate that has plagued Worcester for years. Chair of the city’s Infant Mortality Reduction Task Force, she said, “With so much data to be gathered from mothers and their babies, this is likely our best shot to answer this question.”

Felice, concluded, “I hope that when this study is complete and we’ve been able to put to rest some of the region’s and nation’s concerns about child health and the environment, our participants will look back on what they’ve contributed and will be proud to say, ‘I was a Mass CHILD baby.’” ●



As part of the Mass CHILD project, UMass Medical School will work with researchers at Clark University who will assist with environmental sampling and mapping using Geographic Information Systems (GIS). Clark principal investigator Timothy Downs, DEnv, is assistant professor of Environmental Science and Policy in Clark’s Department of International Development, Community and Environment (IDCE). Colleague Yelena Ogneva-Himmelberger, PhD, is assistant professor of Geographic Information Science, and Robert Goble, PhD, is a senior environmental health research professor, also in IDCE. The GIS creates and overlays maps of geographic, demographic and socio-economic data, as well as maps illustrating potential hazards like highways, waterways and pollution sources, and resources like open space and health care facilities. Maps can show where children are most exposed to hazards and have the most limited access to resources. This information will be paired with data from the Department of Public Health that tracks the county’s birth records from the past five years, enabling Mass CHILD to target certain neighborhoods for recruiting. “It will be fascinating to track changing environmental data and health data trends in parallel and seek spatial associations,” said Dr. Downs.





## Baby's Breath of Life

*At UMass Medical School, clinicians, basic scientists, engineers and a mathematician team up to help premature babies breathe easy.*

By Kelly A. Bishop

## A sleeping baby, snug in bed,

is emblematic of contentment and security. But for some of the approximately 12 percent of babies born prematurely each year in the United States, sleep can be a precarious state during which the essential act of breathing can pose a life-threatening challenge. Now, a multidisciplinary team of researchers at UMass Medical School is employing strategies gained from non-traditional approaches to identify the causes of infant apnea for the development of life-saving treatments.

At forty weeks *in utero*, most babies are prepared for the transition from gaining oxygen from the placenta to gaining it from the air; in premature babies, however, the area of the central nervous system that controls breathing hasn't matured enough to allow for nonstop breathing outside of the womb. As a consequence, premature infants experience—often during sleep—periods of shallow or stopped breathing, a serious medical condition known as apnea of prematurity (AOP).

AOP is found in more than 50 percent of premature infants, according to 2006 statistics from the National Institutes

of Health, and is almost universal in the smallest of those preemies. Defined as pauses in breathing that last for more than 20 seconds, apnea is often also associated with bradycardia, a decrease in the number of heart beats, as well as lower oxygen levels in the blood. Although clinicians in Neonatal Intensive Care Units (NICU) across the country are able to successfully treat apnea with pharmaceutical interventions, investigators have yet to understand the effects of AOP or those treatments on an infant's long-term health.

David Paydarfar, MD, UMMS professor of neurology and physiology, is intrigued by the mysteries of AOP. As a physician-scientist, he is particularly interested in the brain's control of respiration and the consequences when that system goes awry or is immature, as in the case of apnea. During the past three years, Dr. Paydarfar has established a multidisciplinary effort—comprising clinicians, basic scientists, engineers and a mathematician—aimed at better understanding and treating infant apnea through a number of unique approaches.

One such approach pairs neurobiology and physiology to determine the role of sensory stimulation on the breathing

mechanism. When an infant stops breathing, a nurse or other caregiver may touch or rub the infant to encourage inhalation. This type of manipulation often wakes the infant, however, disturbing essential rest. In order to develop interventions that may restart breathing without waking the baby, investigators must understand the relationship between sensory signals and the breathing mechanism.

“Everyone has been focused on the moment when the infant stops breathing, but I believe the question is, ‘How can we prevent this to begin with?’” Paydarfar said. “Our group is conducting basic science and clinical studies to figure out not only how sensory processing normally functions in respiratory control, but also how the system experiences problems in an immature infant. Then we can begin to explore what sensory stimuli might make it work better.”

To explore how sensory neurons function and sensory signals enter the brain to affect the breathing mechanism, Paydarfar recruited Peter Grigg, PhD, professor and interim chair of physiology and an expert in the field of sensory physiology, to develop an animal model of infant apnea. “Engineers are often inclined to

“Everyone has been focused on the moment when the infant stops breathing, but I believe the question is, ‘How can we prevent this to begin with?’ Our group is conducting basic science and clinical studies to figure out not only how sensory processing normally functions in respiratory control, but also how the system experiences problems in an immature infant.”

– David Paydarfar, MD



A cart containing all the necessary equipment for an infant study allows Elisabeth Salisbury, PhD, (above) and her colleagues in the NICU to wheel the system to the bedside of infants, who are studied with all of their usual monitoring apparatus. The cart contains two computers, one for recording signals and one that triggers a special mattress (placed in the isolette and pictured here) to provide gentle vibrations to the infant. Sensors attached to the infant record breathing and apnea, heart rate, skin temperature, oxygen levels, sleep and movement over the six to eight hours of the study. Other sensors record light and sound levels and air temperature. Here, Salisbury reviews signals that were previously recorded in a premature infant.

On page 16, the entire team is assembled: at front, David Paydarfar, MD; Elisabeth Salisbury, PhD; Premananda Indic, PhD; Xuanxuan Gan; Frank Bednarek, MD; Peter Grigg, PhD; and Daniel Robichaud.

solve a sensory problem with a hammer, where a feather might be better,” Dr. Grigg said. “For example, to stimulate a child with apnea, we expect that a puff of air is actually more effective than a gentle thump. Due to the obvious limitations of

studying infants, we can understand these significant differences by working with animal models.”

To test the clinical implications of discoveries in animal models, Paydarfar recruited Elisabeth Salisbury, PhD, assistant

professor of neurology and pediatrics, to investigate how sensory stimulation affects breathing in premature infants.

In addition to physiology, technology offers a variety of tools that can provide insights into what may trigger an apnea episode. Investigators record dozens of biological signals from affected infants in response to temperature, light or stage in the sleep cycle. These signals produce an extraordinary amount of data that must be collected, stored and analyzed for clues to the causes of apnea.

“We are doing experiments with many variables; they may be connected to an outcome of apnea, but the question becomes, ‘How do you make conclusions when you have such a large number of variables?’” Grigg said.

To address this problem, research engineers Daniel Robichaud II and Xuanxuan Gan, and mathematician and electrical engineer Premananda P. Indic, PhD, instructor in neurology, joined the team. According to Robichaud, who is responsible for streamlining and simplifying the software that analyzes the data from animals and humans, the work has fortified his commitment to biomedical informatics. “I enjoy the project because what I do has the real result of helping little ones down the road. It also makes a great answer to the inevitable question of, ‘What good is your research?’ There is a very real and significant answer.”

Gan, who was recruited to build bioinstrumentation to better and less invasively gather the data while also developing software to create predictions of clinical outcomes based on the information, has also gained an appreciation for the collaborative process. “When I see our predictions link together with the actual activity of infants in the NICU, I am truly gratified,” she said.

“Working in the NICU is a unique opportunity because it is not just the medical personnel who are seeing clinical data for the first time. Viewing the output, parents can see—physiologically—what happens when there is a pause in breathing. That...reinforces why this research is so important.”

— Francis J. Bednarek, MD

Dr. Indic jokes that, when he was recruited to the group, he felt like the outsider. “I used to feel like an alien because I had a background in math and theoretical analysis. But I could immediately appreciate the enormity of the problem and knew that I could apply concept and theory to the effort to solve it.”

Specifically, Indic uses mathematical approaches to understand the neural activity of the breathing mechanism—how neurons communicate with one another. Because the neurons are in motion, or oscillating, and firing rhythmically, it is particularly challenging to explore the signals that encourage or disrupt neuronal communication and affect the ability to breathe.

“Math helps because it makes predictions that are not intuitive,” said Paydarfar. “If we can model in advance some of our theories of how certain signals impact function, it can ultimately affect how we conduct our clinical studies.”

Clinical trials are at the heart of this multidisciplinary research effort. Using the UMass Memorial Medical Center NICU as a living laboratory, Paydarfar and colleagues are able to systematically evaluate the technologies and strategies

derived from their bench research. UMass Memorial Medical Center Chief of Neonatology Francis J. Bednarek, MD, professor of pediatrics and obstetrics & gynecology, has been at the forefront of the treatment of premature infants for more than three decades and was eager to join Paydarfar’s team. “In the three decades since I began my neonatology career, most investigations have been focused on the moment the apnea occurs. I think one of the reasons more progress hasn’t been made is this focus on the terminal event and not the factors that lead to it. That is why our studies are so exciting,” Dr. Bednarek said. As medical safety officer for investigations in the NICU, Bednarek provides crucial insight into those approaches that will work for clinical trials.

“Working in the NICU is a unique opportunity because it is not just the medical personnel who are seeing clinical data for the first time. Viewing the output, parents can see—physiologically—what happens when there is a pause in breathing. That is a powerful thing that reinforces why this research is so important,” Bednarek said.

Dr. Salisbury directs the clinical studies and guides not only parents through the

process, but also her fellow scientists as she helps them acclimate to the sensitivities of working within such an environment. “To do a bedside study, you have to be at the bedside. I bring the engineers to the NICU so that they understand the impact of their interventions on the environment and the infant,” said Salisbury.

In addition to the supportive parents and her colleagues, Salisbury credits the success of the trials to the extraordinary cooperation of the nurses and physicians on Bednarek’s staff. “The parents who participate in this vital research are coming from a very traumatic place, and the nurses are rightfully very protective. We didn’t just walk in the door and say, ‘This is what we’re doing.’ Instead, we said, ‘These babies are under your care and we would like to work with you.’”

According to Paydarfar, the successful launch of this research initiative owes much to the collaborative spirit at UMMS and UMass Memorial. “We have been able to get everyone involved as stakeholders because they realize that the research is related to treatment and that we are trying to advance knowledge while we take care of these infants,” he explained. “Everyone participates with enthusiasm and commitment.”

While a complete understanding of the causes of infant apnea could be years away, Paydarfar is confident that with the team he has assembled from so many disciplines, progress will bring the possible causes into view. “Ideally, with advanced technologies that incorporate insights from neurology, physiology and mathematical modeling, we can prevent apnea before it starts,” he said. “We want to develop technology that stimulates the infant *before* the apnea occurs. Whatever we come up with may help thousands of other infants—or maybe it won’t—but the key is that we’re not giving up.” 🍷



# Educational Experts

*Students at UMass Medical School take advantage of many ways to craft curricula and create legacies for future learners.*

By Ellie Castano

**Student participation in shaping** the UMass Medical School curriculum has been a part of the institutional culture since the school was founded. Here, it's not just about involving students when someone is looking, such as the accrediting bodies that all higher education institutions are accountable to; it's about genuine openness to the unique ideas and perspectives that students bring and valuing those contributions. Students are involved in defining their academic experience at a high level and through wide-ranging opportunities that illuminate their future as physicians.

“Our students bring their own histories and experiences, which range from scholarly and academic to positions of leadership in industry and advocacy in nonprofits,” said Senior Associate Dean for Educational Affairs Michele P. Pugnaire, MD. “We have an institutional commitment to respect in the student–teacher relationship, which translates to respect in the doctor–patient relationship.”

Students are members of the committees responsible for overseeing the current Medical School curriculum, they contribute to faculty research, initiate their own outreach projects locally and internationally, and serve as representatives on national medical education organizations. And they're central to the ongoing Competency Implementation Project (CIP), the long-term curriculum renewal project that will transform the Medical School curriculum by 2012.

CIP will reshape the curriculum to align with the six competencies for medical education that embody the school's educational philosophy and attributes of its faculty and students: physician as scientist, communicator, clinical problem solver, patient and community advocate, and person. The new competency-based curriculum will define success by understanding how students apply knowledge and skills in situations that mirror how physicians perform in the real world.

CIP is characterized by inclusiveness, transparency, frequent and widespread communication, a diversity of leadership, shared decision making and student participation every step of the way.

At a curriculum retreat in spring

2006, six work groups (one for each competency) concluded that to implement a competency-based curriculum, restructuring was required. Eighteen pilot projects were launched to address the priorities identified in the current curriculum, and a new structure—CIP II—was created to focus on the curriculum in four key areas: foundational studies, core clinical experiences, senior studies and longitudinal programs. The new work groups, made up of more than 100 faculty and students, were charged with developing “blueprints” for the structure of the curriculum by asking, “What would [the curriculum] look like if . . . ?” Using these blueprints, the work groups and the Educational Policy Committee created 10 models for the four-year curriculum.

At the most recent redesign session, participants endorsed a structure for the new curriculum. Led by Dean of the School of Medicine and Executive Deputy Chancellor and Provost Terence R. Flotte, MD, the new framework departs from the current structure in several significant ways: students will begin their clinical experiences earlier; basic sciences coursework will be spread-out across

the four years; there will be increased flexibility for students to shape their own experiences; a capstone scholarly project will be introduced; and learning communities of students and faculty from all four years will be established.

Going forward, the endorsed curriculum will undergo formal approval by the Educational Policy Committee and the next phase of the CIP will begin, during which the details for implementing the curriculum will be worked out. The year 2012 will arrive with the new curriculum fully in place.

“The experience of contributing to the process of curriculum reform has made me a more proactive student,” said Candice McElroy, Class of '08. “While I know that the changes we are working on will not be in place before I graduate, it does make me realize how seriously the administration takes student input. It also forces me to be reflective about my ongoing experiences.”

Margaret Tuttle, Class of '10, was a piano teacher before becoming a medical student, so her decision to become involved in CIP was inspired by her



MD/PhD student Bharath Nath (left) talks with Senior Associate Dean for Educational Affairs Michele Pugnaire, MD, at the Competency Implementation Retreat last fall. Nath is an active CIP student representative. As an Association of American Medical Colleges (AAMC) Organization of Student Representatives Primary Delegate, Nath presented a poster overview of CIP at the AAMC 2006 annual meeting.

perspective as an educator. “I hoped to learn what is considered essential in medical education. I also wanted to learn the process that an institution goes through in order to make such major changes,” said Tuttle, adding, “The changes might not be quite right the first time around, but change can be made on a continuing basis to keep the school’s curriculum alive and thriving.”

Students involved in the CIP process have already gotten their feet wet. At UMMS, students begin formally contributing to the curriculum in their first and second years. They are initially invited to serve on the curriculum committees made up of medical educators and first- and second-year course directors and students. “Lots of different issues come up in these meetings,” said second-year student Jorge Tello, who has participated on the first- and second-year curriculum committees and is a member of the Educational Policy Committee. Student input ranges from reporting on the structure and content of courses they’re currently taking to offering ideas about using new technologies that could complement classroom and clinical experiences, such as web-streaming video recording of lectures.

Tello was impressed by how formally and consistently students are asked for

their input at the curriculum committee meetings. “I feared early on that the student presence was requested mainly as a ‘silent partner.’” He said he quickly found this wasn’t the case.

“Our student representatives are really a part of the committee, they are not just advisors. They take their roles very seriously,” said Susan Gagliardi, PhD, professor of cell biology and neurology, who leads the first-year curriculum committee. Student representatives also provide input through informal surveys of their fellow students and engage in

committee-sponsored faculty–student discussions that can result in immediate adjustments to courses. The work that students begin in their first and second years continues in their third and fourth years as they serve on the Clinical Years Committee.

## Courses to Enrich

In addition to the opportunities for shaping the curriculum that CIP and the various educational committees present, students have another avenue for making their mark on the curriculum:

“The experience of contributing to the process of curriculum reform has made me a more proactive student. While I know that the changes we are working on will not be in place before I graduate, it does make me realize how seriously the administration takes student input. It also forces me to be reflective about my ongoing experiences.”

– Margaret Tuttle, School of Medicine Class of 2008



At left, students in the Optional Enrichment Elective *Wilderness Medicine and Recreational Emergencies* (page 24) receive instruction on how to build a wilderness stretcher at Wachusett Mountain Ski Area near Princeton, Mass. The students, from left to right, are Christopher Tully and Andrew Jones. This photo is courtesy of Andrew Monte. On page 21, in a photo taken by Matthew Logalbo, Monte and fellow students Heather Young and Vanessa Jacobsohn (obscured) attend to “patient” Jennifer Cyrkler, who is feigning altitude illness in the Uinta Mountains of Utah.

the Optional Enrichment Elective (OEE) program. OEE courses are non-credit electives that students take in addition to their normal course load. The courses are part of the accredited curriculum, are linked to the competencies and appear on student transcripts. OEE provides a means for students to develop courses that reflect their professional and personal interests, deepen their understanding of topics covered in other courses and advance skills prior to their clinical years' training. They also expose students to coordinating and managing curriculum in a real setting.

The process for establishing these electives mirrors that of developing a course for the regular curriculum—working closely with Susan Pasquale, PhD, director of Curriculum and Faculty Development and an assistant professor of family medicine & community health, and with a dedicated faculty advisor who is accountable for the integrity of the course, students prepare a proposal that includes objectives, a detailed syllabus and an overview of how the course furthers knowledge or enhances skills acquired through the curriculum or is auxiliary to a topic already covered. Students then present their proposal to the Educational Policy Committee. The students enlist faculty and other expert presenters from inside and outside

UMMS to teach course sessions.

The *Wilderness Medicine and Recreational Emergencies* elective, developed in 2004, is a model of how these courses evolve over time to reflect the experiences of the participants and advisors. This elective was conceived and created by Andrew Monte, Class of '05, and Matthew Logalbo, Class of '06, and sprang from a shared love of the outdoors and a desire to broaden their knowledge about wilderness and recreational emergencies. “Matt and I, being outdoorsy people, felt that it would be an interesting area to teach as well as an opportunity for us to learn more ourselves, to become the experts, as teaching anything necessitates,” said Dr. Monte, now an emergency medicine resident at UMMS and resident advisor to third- and fourth-year students enlisted to teach the course.

Envisioned as an opportunity for students to learn basic responses to recreational emergencies, the course has evolved into a comprehensive, hands-on introduction to injury assessment and emergency life-saving treatment. “We’ve tried to build on the pre-clinical concepts that first- and second-year students are learning in the classroom,” said Monte.

The course incorporates didactic sessions that include time in the classroom and in the school’s simulation lab, with

trips to recreation areas for emergency drills. At a recent session at Wachusett Mountain Ski Area, students broke into small groups and set off to find injured “patients” in multiple-person scenarios in the wilderness—in this case, the patients were emergency medicine residents and patient simulator mannequins. Upon discovering the accident victims, students assessed the scene for safety and performed primary and secondary physical surveys of the patients. Students also discussed their performance with course leaders and received feedback on how to improve.

According to Fran Renzi, MD, professor of emergency medicine and the elective’s course advisor, first- and second-year students gain practical experience in clinical decision making. “The course instills confidence in basic life-saving and clinical decision-making skills. Students progress from feeling uneasy when initially presented with emergency scenarios to becoming comfortable stabilizing the ‘patient.’”

The most recent addition to the OEE program is *Exercise Medicine*, offered for the first time in 2008. Second-year medical students Teri Kleinberg and Laura Hagopian wanted to incorporate physical activity into a discussion of exercise and sports medicine; Dr. Pasquale advised them on curricular



Adam Ellis is a guest speaker for students enrolled in the Optional Enrichment Elective *Exercise Medicine*. He was invited to describe the role athletics plays in the physical and emotional well-being of people with disabilities. In a wheelchair since a car accident in the early 1990s, Ellis plays quadriplegic rugby and said the sport has helped him adjust to life in a wheelchair. Touring with his team has taught him how to travel, ride an escalator and adapt to non-wheelchair accessible places—tips he did not learn in rehab. Ellis, who is married, has a child and runs an insurance company, told the students that, through sport, he has learned to live exactly how he wants to.

design, teaching methodology and evaluation aspects of the course in keeping with the established curriculum standards. “I encouraged Laura and Teri to make linkages to the years one and two curriculum in areas such as physiology and anatomy.”

Kleinberg and Hagopian worked with course advisors Anne Gilroy, MA, assistant professor of cell biology, and Lee Mancini, MD, assistant professor of family medicine & community health and a member of the UMass Memorial Sports Medicine Center, to develop an OEE that explores the physiological and psychological aspects of sports and exercise integrated with the basic science curriculum. The initial offering of the elective features eight units, including one on weightlifting that highlights techniques for minimizing injuries; a session on common sports injuries and treatments; a unit that examines the role athletics plays in the physical and emotional well-being of people with disabilities; and one on sports nutrition. Each session is supplemented by 30 minutes of exercise to reinforce the importance of fitness in a physician’s life.

Dr. Pugnaire noted that, through these electives and participation in shaping the primary curriculum, students and faculty engage more fully with one another, enhancing respect and shared learning. Students in particular develop skills in leadership and professional inquiry, self-directed advocacy and a sense of creating a legacy larger than themselves. “We’re creating processes in medical school that will be sustaining to them in their multifaceted careers as physicians.” ©

## Students Shape their Research and Nursing Educations

The Graduate School of Biomedical Sciences also relies heavily on its students to shape the curriculum. In fact, the student evaluation process is so valued by the faculty and administration that students are required to complete an evaluation after each of the three exams in Blocks 1, 2 and 3 of the first-year core course and don’t receive grades until their evaluations are complete. In addition to providing an overall sense of the accessibility of the materials and the teaching, the evaluations shed light on any problems that students may have with a particular course or method of instruction and allow for real-time changes that can mean the difference between student success and failure.

Another important way that GSBS students contribute is through participation in the process the school is currently undertaking to transform the core curriculum. The internal evaluation portion of the process includes two vital elements: interviews with faculty and with students. Students who recently completed the core curriculum are being polled extensively on the appropriateness of course content and formats and are asked what should be added or subtracted. The feedback from these interviews, which will be completed this spring, will be compiled and used in the next phase of the core curriculum redesign, which includes outside reviewers at peer institutions.

In the Graduate School of Nursing, students are a valuable resource for refining and shaping the curriculum, and the school engages them in traditional ways. Like the GSBS and the School of Medicine, GSN students are represented on committees and have been responsible for introducing new classes and new areas of specialty. In particular, the Graduate Entry Pathway program family nurse practitioner track is the result of student interest in the field. Originally a post-master’s certificate, the program grew out of demand from the first class of GEP students and graduated its first cohort of students in 2007.

The popular GSN elective *Women’s Health* was also a requested course by master’s students, and both GSN and School of Medicine students asked for an Optional Enrichment Elective in complementary and alternative medicine, which was offered for the first time in fall 2007. And, the GSN’s growing slate of blended classroom and online courses has sprung from suggestions by students and applicants.

## Timeline 2007—News Briefs from UMMS and UMass Memorial Health Care



### January

The \$1 million challenge grant from The Kresge Foundation to the UMass Memorial Health Care Emergency Care Campaign is secured. In less than nine months, contributions from members of the community, local and regional businesses and foundations brought the grant to fruition, after it spurred more than \$6 million in donations to reach the \$40 million campaign goal for expansion of the emergency department and other urgent care areas at UMass Memorial Medical Center—University Campus. Through its Capital Challenge Grants program, The Kresge Foundation focuses on opportunities to strengthen leadership and giving through challenge grants for capital projects such as the Duddie Massad Emergency and Trauma Center at UMass Memorial.

### February

Central Massachusetts' first Brain Bee brings more than 40 area teens in grades nine through 12 to UMass Medical School to compete for the regional title and a chance to win the International Brain Bee in Baltimore in March. A program of the Dana Foundation, the UMMS Brudnick Neuropsychiatric Research Institute (BNRI) and Shriver Center and the Millipore Foundation, the Brain Bee educates teens about neuroscience and scientific careers. Participants take a written exam, answer questions about brain structure and function and identify neurological disorders. In addition to the competition, the Brain Bee includes interactive exhibits, information about mental health and substance abuse, and tips on sleep, nutrition, and helmet and seat belt safety.



### March

Nine residents of the Worcester East Side community celebrate their graduation from the Phlebotomy Training/Employment Program, an innovative course through which they have gained marketable skills. Created from a partnership of the East Side Community Development Center and UMass Memorial Medical Center, the program is part of the CDC's Neighborhood Revitalization Strategy Area Initiative and is aimed at providing low-income residents the opportunity, free of cost, to further their education and gain fulfilling employment in the region's growing medical field. In addition to classroom instruction, the students completed 120 hours of training at UMass Memorial to meet the rigorous standards of the American Society of Clinical Pathology.

### April

UMass President Jack M. Wilson joins the UMMS community in honoring the institution's educators—faculty, students and patients—during the annual Educational Recognition Awards. The ceremony brings the campus together to celebrate medical educators' achievements in teaching and mentoring students, while exemplifying the institution's supportive and collaborative learning environment. President Wilson remarks on the institution's recent achievements in both clinical education and research. "The reputation the Medical School has built, and its position in the *U.S. News & World Report* rankings, is a reflection of the passion our faculty have for providing students with a remarkable education and instilling in them a sense of service to the people of the commonwealth and the nation."





## May

Members of UMass Medical School and local communities gather for an intimate reading of poems from *Body Language: Poems of the Medical Training Experience*, an anthology of works by 45 physicians and medical students from across the country. The collection chronicles their unique experiences during their first and second years of medical school, the clinical years, internships, residencies and as attending physicians. Some of the poems are recited by Richard M. Berlin, MD, associate professor of psychiatry at UMMS. In 2005, Dr. Berlin established the Gerald F. Berlin Creative Writing Award, which encourages creative writing among UMMS students and residents and honors Berlin's father, who struggled with a severe chronic illness.

## June

UMass Medical School Commencement exercises feature the first graduates of the Graduate School of Nursing's GEP program. Established in 2004, the Graduate Entry Pathway enrolls students who are seeking a nursing career, but possess a bachelor's degree in a field other than nursing. Students are set on the path of the Graduate School of Nursing's existing master of science degree, which strives to meet and exceed the challenges of nursing shortages by training individuals to enter the profession. The Commencement program also recognizes Professor of Cell Biology Merrill K. "Ken" Wolf, MD, (right) who, for the past 30 years, has demonstrated his love for and commitment to UMMS students by performing all arrangements for the annual Commencement in Worcester on Mechanics Hall's historic pipe organ.



## July

UMass Memorial Medical Center is named one of the nation's top leaders in performance improvement by Thomson Healthcare, a leading provider of decision support solutions that help organizations across the health care industry. Thomson Healthcare evaluated the performance of more than 2,800 U.S. hospitals in a variety of clinical, financial and operational areas and identified those that have improved the most from 2001 to 2005. According to the study, UMass Memorial, along with the other hospitals named on the list, decreased the number of patient complications and adverse safety events more than the expected number, and discharged patients nearly a day earlier, despite increasing patient acuity.

## August

UMass Medical School is awarded a three-year grant to continue its Area Health Education Center (AHEC) program, which seeks to remedy the current shortage of health care professionals across the state. The \$500,000-per-year grant is funded by the Health Resources and Services Administration and will support the statewide system of six regional AHEC training centers. AHEC activities include continuing education programs for more than 8,000 health care professionals; community-based training for medical students and residents; and advocacy for health service delivery systems within communities. Middle and high school students participate in academic support programs and internships so they can learn about health care careers.





## September

More than 45,000 calls and 26,600 completed patient missions mark the 25th anniversary of the UMass Memorial Medical Center Life Flight program. Members of the helicopter flight crew recount the remarkable changes in medical care and technology they've witnessed, allowing them to today provide advanced life support care on the scene, with highly sophisticated monitoring devices to assess the patient's condition en route to the hospital. Original member Rory Duquette is still the communications director for Life Flight; chief pilot Jack Loadholt joined in 1983; chief flight nurse Cheryl Coyle, RN, came a few years afterward; and many others date back 10 years or more. The crew celebrates with members of the UMass Memorial Emergency Medical Services, which logs 30 years in existence.

## October

As a principal investigator of a National Institutes of Health/Institute of General Medical Sciences Program Project Grant first awarded in 2001, UMass Medical School Professor of Biochemistry & Molecular Pharmacology Celia A. Schiffer, PhD, (right) is at the forefront of investigations to reveal how HIV develops resistance to current drugs. In recognition of her success, Schiffer is awarded a full, five-year renewal of the project. The renewal, totaling more than \$8.5 million, will speed studies to contribute to the development of drugs that promise greater effectiveness against HIV. These new strategies may also reduce drug resistance in other quickly evolving diseases, including lung cancer and hepatitis C. Professor of Biochemistry & Molecular Pharmacology and Director of Chemical Biology Tariq Rana, PhD, is also an investigator on this project.

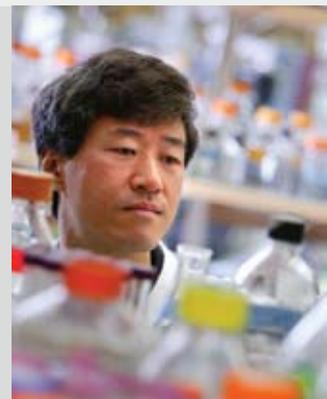


## November

UMass Memorial Medical Center joins other prestigious institutions—including the Mayo Clinic and Brigham and Women's Hospital—when it is named to the University HealthSystem Consortium (UHC) 2007 list of "Top 10" academic health centers for quality and accountability performance. UHC, an alliance of the 97 U.S. academic medical centers that provides its members with services to improve clinical, operational and patient safety performance, rates hospitals on measures of quality, safety, mortality, effectiveness, efficiency, equity and patient-centeredness. UHC notes that high-performing academic medical centers, such as UMass Memorial, share five key attributes of top performers: a shared sense of purpose, leadership style, an accountability system, a focus on results and a culture of collaboration.

## December

The Association of University Technology Managers reports that the University of Massachusetts took in more than \$27 million in licensing revenues in 2006 and spun off two companies based on technology and intellectual property discovered partly through UMass research funding. That figure places UMass 12th in the nation in licensing revenues among major colleges and universities, ahead of Harvard, Cal Tech and Johns Hopkins University. This year, the University is expected to generate more than \$41 million in licensing money, due in part to more than \$9 million in royalties associated with RNAi technology licenses to Sirna Therapeutics, recently purchased by Merck, and Nobel Prize-winner Craig Mello's company, RXi, which recently announced it is going public.



## 2007 Facts & Figures for UMMS

### FY '07 Funding and Revenue

State appropriation	\$48.9 million
State contracts*	\$32.9 million
Public Service	\$381.2 million
Research (sponsored activity)	\$168.6 million
Sales and services**	\$133.8 million
Other revenue	\$73.3 million
<b>Total</b>	<b>\$838.7 million</b>

\*Provide mental health and pediatric services for those who cannot afford private care.

\*\*Examples include Continuing Education, Massachusetts Biologic Laboratories and New England Newborn Screening Program.

### Total Research Funding – Fiscal Year Ending:

June 30, 2003	\$151,288,571
June 30, 2004	\$167,200,007
June 30, 2005	\$174,181,453
June 30, 2006	\$175,085,967
<b>June 30, 2007</b>	<b>\$174,505,488</b>

### Technology Management

For Fiscal Year:	2003	2004	2005	2006	2007
Invention Disclosures	139	112	66	74	79
U.S. Patent Applications	92	151	93	66	58
Licensing Agreements	32	9	28	32	67
Sponsored Research Agreements	\$3,760	\$3,019	\$993	\$1,238	\$3,097
Licensing Revenue (\$ in thousands)	\$19,161	\$26,212	\$27,694	\$25,545	\$40,684

### Where Our Students and Residents Learn

#### UMass Memorial Health Care

UMass Memorial Medical Center  
(Hahnemann, Memorial and University campuses)

UMass Memorial—Clinton Hospital  
UMass Memorial—HealthAlliance  
Hospitals (Fitchburg and Leominster campuses)

UMass Memorial—Marlborough Hospital  
UMass Memorial—Wing Memorial Hospital and Medical Centers

Barre Family Health Center  
Community Healthlink  
Hahnemann Family Health Center  
South County Pediatrics  
Tri-River Family Health Center

Berkshire Medical Center  
Caritas St. Elizabeth's Medical Center  
Milford Regional Medical Center  
Saint Vincent Hospital

Day Kimball Hospital  
Harrington Memorial Hospital  
Heywood Hospital  
Holyoke Hospital  
Hubbard Regional Hospital  
Noble Hospital  
Westborough State Hospital  
Worcester State Hospital

Community Health Connections, Inc.  
ACTION Health Services  
Fitchburg Family Health Center  
Greater Gardner Community Health Center  
Leominster Community Health Center  
Fallon Clinic  
Family Health Center of Worcester  
Great Brook Valley Health Center  
Greater Lawrence Family Health Center  
Holyoke Health Center  
Lahey Clinic  
Metrowest Medical Center

**200 Volunteer Practices and Clinics across the Commonwealth**

### Education

<i>Number of Faculty (including voluntary)</i>	2,688
Basic science full- and part-time faculty	317
Clinical full- and part-time faculty	2,371

#### School of Medicine

MD students	408
MD/PhD students	27
Alumni	2,831

#### Graduate School of Biomedical Sciences

PhD students	334
MD/PhD students	19
Biomedical Engineering & Medical Physics students (joint program with WPI)	4
Clinical & Population Health Research students	13
Alumni	336

#### Graduate School of Nursing

MS students	50
Graduate Entry Pathway students	109
Post-master's students	3
PhD students	23
Alumni	698

Continuing Medical Education Certificates	22,500
Allied Health Program Students	1,651

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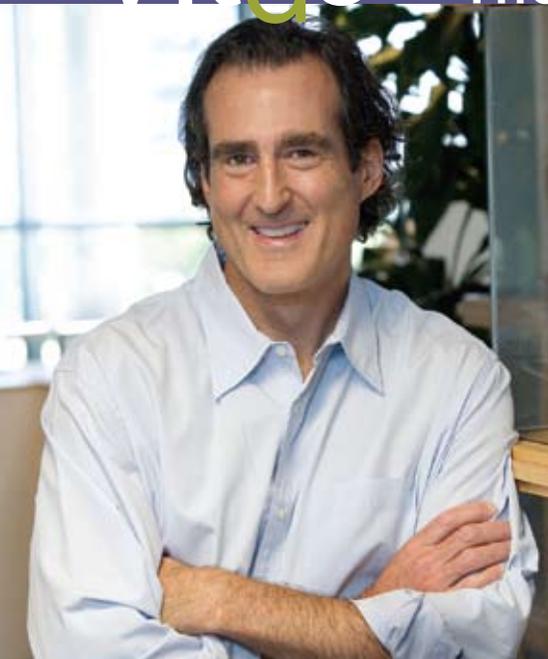
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# Vitae: The Last Word



By Craig C. Mello, PhD

Howard Hughes Medical Institute Investigator at UMass Medical School, the *Blais University Chair in Molecular Medicine* and Nobel Laureate

*The fall of 2007 marked the passing of a year since I stood on a stage in Stockholm, next to a King and a line of co-recipients esteemed in their fields of science, literature, economics and medicine, honored and amazed to be in their company. I frequently think about my fellow Nobel Prize winners of 2006, and those thoughts then naturally go to the ones who came before and the ones who will come after. We don't know the names of the future Laureates, but we can certainly make a mental short list of the men and women who could easily wear a medal around their necks signifying their contributions to mankind's progress.*

Judah Folkman was on my short list. I know he must have been on the Nobel Assembly's as well. Unfortunately, the prize cannot be awarded posthumously. When Judah died recently, I was deeply saddened—he was a great man who inspired a whole generation of researchers, including me, with his innovative ideas about cancer therapy. I was profoundly honored when he spoke at my investiture as the Blais University Chair in 2004. Judah was pleased to speak at UMass Medical School—he was a member of the Worcester Foundation for Biomedical Research Board of Trustees and a recipient of its Gregory Pincus Medal in 1998. But I know he also reveled in describing his sometimes tortuous path from discovery to acceptance, and his audience was captivated by his story—especially me. It was a kind of pep talk to all scientists to never give up.

Judah contrasted his experience in discovery with that of mine and Andy Fire's—Judah postulated that cancer tumors' growth can be thwarted by stopping their blood supply. He was repeatedly rebuffed before the theory was

accepted by the scientific community decades afterward and generated 10 new cancer medications and many more in various phases of testing. Andy and I revealed the nature of RNA interference's role in turning off genes and shared the Nobel eight years later. Any sheepishness I may have felt regarding our “early acceptance,” however, was graciously dispelled by Judah because his words, in sum, were about persistence. This is a persistence that doesn't necessarily have to last decades. This is a persistence that defines all who undertake research and understand its potential.

“Who can say whether the young scientist with the new idea will become an expert of the future?” Judah spoke at the investiture. “He or she may not be able to prove the new idea for many years (if at all)...and therefore, to succeed, must persevere with experiment after experiment until compelling proof can be obtained. This requires a strong belief in the idea almost to the point of obsession, in order to survive years of relentless criticism until the proof is in.”

As a researcher, Judah was the definition of determination. He began laboratory experiments in 1960 while a practicing pediatric surgeon. In 1981, he committed himself to bench work. One of his peers

suggested that Judah's theory about inhibiting cancer's growth stimulus as the key to making the disease controllable was “only in the mind of the principal investigator.” But this comment only urged Judah on. One observation he made during an interview with the Washington, D.C.-based Academy of Achievement upon his induction in 1999, I believe, is telling: “Medicine seems very advanced now, but not if you have a brain tumor or leukemia.” It's really that simple—as long as people suffer and die from disease, researchers will take as long as necessary to advance thought to reach breakthroughs. Recognition may take 30 years, or it may take eight, but as Judah has shown us, the mission to end human suffering will take lifetimes.

All researchers share Judah's experience—the ups and downs that occur during our dogged pursuit of knowledge in our chosen fields. I am honored to share these highs and lows with all of my colleagues and with Judah. I had hoped to celebrate with him on the occasion of his own trip to Stockholm to receive the Nobel Prize, as inevitable as it seemed to me. But it is not to be. And, I believe, he would find that OK. For Judah, it was enough to save one life. In my estimation then, he has already won. ©

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