

A Special Issue on STEM Teaching, Learning, and Research

Science
Technology
Engineering
Mathematics

Today's Students Are Tomorrow's Scientists



Provost Winston Langley

As provost and vice chancellor for academic affairs, it is with great enthusiasm and pride that I share with you the first Special Issue of *RISC Quarterly*, which offers a glimpse into our past, present, and planned future successes in teaching, learning, and research in science, technology, engineering, and mathematics.

Our faculty and students are actively engaged in STEM teaching, learning, and research in a manner as diverse as our UMass Boston student body, the most racially diverse of all public four-year institutions of higher education in New England. Our 2010 fall enrollment was 15,454 students from 139 countries, and 25% of these were graduate students. About 44% of our undergraduates are minority students, while 57% of our undergraduates and 70% of our graduate students are women. The majority of our students are the first generation of their families to attend university, most receive financial aid, and nearly all are commuters.



Our faculty are in many instances leading the dramatic and sweeping changes in STEM education in the Boston Public Schools, surrounding towns, and across the country. They are contributing to meeting regional IT workforce development needs. Internationally, they are encouraging sustainability through ocean science education in China's coastal cities of Beijing, Xiamen, and Qingdao.

You will read many success stories and discover numerous innovative ideas and exciting initiatives in the following pages. One notable example is the UMass-Boston led Boston Science Partnership, which was recently highlighted as a model regional program (*Science* 20 August 2010; Vol. 329, no. 5994, p. 906-907).

We are indeed on the move as a campus and community—with the best still to come!

Inside...

Boston Science Partnership p. 2

Science and Math Undergraduate Student Success Center p. 3

Freshman Success Communities p. 3

Faculty Profile: Arthur Eisenkraft p. 4

Professional Development for STEM Faculty p. 5

Faculty Profile: Robert Chen p. 6

UMass Boston Scientists Lead U.S. Team to Bring Ocean Science Education to China p. 7

Faculty Profile: Hannah Sevan p. 8

UMass Boston-Dana Farber/Harvard Cancer Center Partnership p. 9

A National Center for Advanced Technological Education Established at UMass Boston p. 10-11

Towards a B.S. Program in Engineering p. 12

Mathematics p. 13

Undergraduate STEM Programs for Underrepresented Minorities p. 14-15

Research Experiences for Undergraduates p. 16

Women in Science Club p. 16

Cognitive and Neurosciences p. 17

STEM Grants Awarded to UMass Boston p. 18-20

The Boston Science Partnership

As the United States strives to maintain and extend its global leadership in science and technology, science and math educators from across the country recently attended a national showcase at UMass Boston on progress made in teaching and learning in urban science education.

The showcase served as a forum for the Boston Science Partnership (BSP), composed of the Boston Public Schools, Northeastern University, and UMass Boston as the lead institution, to share with a national audience its results and findings. These impressive results began with the BSP's dramatic expansion in 2004 thanks to a \$12.5M National Science Foundation (NSF) Math and Science Partnership grant.

In 2004, the BSP partners envisioned that at the end of their project challenging core courses would be taught by highly qualified teachers; advanced science courses would be accessible to all Boston Public School students; university faculty would work alongside K-12 teachers in science education reform; and new academic and organizational structures would promote student achievement in science in grades 6 through 12.

The partners also envisioned the BSP as an exchange program, where science and engineering professors would learn as much about science education from K-12 teachers as the teachers and pre-service science teachers learn about science content from professors. Now, in 2011, success is no longer a distant, abstract horizon, but a fast approaching reality rich in achievement.

“Since the start of the project, we have seen impressive results in student achievement, teacher quality, and relationships between the Boston Public Schools and local higher education institutions,” says Hannah Sevian, the project’s lead investigator and an associate professor of chemistry at UMass Boston. Sevian is joined by her faculty colleagues Arthur Eisenkraft, distinguished professor of science education and director of the Center of Science and Mathe-

matics in Context, and Robert Chen, professor of environmental, earth and ocean sciences.

There have been numerous showcase outgrowths, including providing consulting to national partnerships who were invigorated by the excellent attendance. Also, showcase proceedings were published last summer for a wider audience of science education reformers.

Using the BSP as a springboard, UMass Boston has in a remarkably brief time built an enviable capacity in science and math teaching, learning, and research.

“The BSP has changed the culture of science education in Boston by creating a vibrant, highly qualified, high achieving community



In his March 8, 2011 speech at TechBoston Academy, President Barack Obama recognized the University of Massachusetts Boston for preparing many of the teachers who work at the school.

of instructors and students from kindergarten through higher education,” says BSP Project Director Jennifer Dorsen.

“In five years, the project has tripled the number of students succeeding in Advanced Placement science, added 260 licenses to teachers’ resumes, formed long-lasting partnerships between higher education and schools, and created an active network of teacher-leaders in science education.”

College of Science and Mathematics Undergraduate Student Success Center

In 2008, Dean Andrew Grosovsky established the College of Science and Mathematics Student Success Center (SSC) to support students from the time they are first admitted to UMass Boston to when they are well connected with a faculty adviser.

While increasing the number of places science and math students can receive guidance, the SSC also helps improve student retention, reduce time to graduation, and more widely provide academic enhancement opportunities to young scientists. Below are three concurrent approaches the SSC staff use to assist undergraduates.

Comprehensive New Student Advising: Working closely with the University Advising Center, a SSC staff member attends every new student advising and registration session, dramatically altering and increasing the precision of



Dean Andrew Grosovsky explains to new students about to embark on their academic careers in science and mathematics the many advantages of participating in a Freshman Success Community.

information disseminated to new students.

Emphasis on Math Preparation: As a key indicator for success in the sciences, SSC staff members spend much time and effort on addressing math readiness, math placement, and the math curriculum in collaboration with university partners.

Supplemental Instruction: The SSC leadership oversees the development of out-of-class, facilitated study groups for the introductory science gateway courses in which new students traditionally struggle.

Freshman Success Communities

When Michelle Foster, associate dean for student success at the College of Science and Mathematics (CSM), first invited Erica Elliott to enroll in the fledgling Freshman Success Communities (FSC) program, Erica was skeptical. All she knew about the program was that she would be taking classes with the same group of students all year.

“I thought it sounded too much like high school,” she says. “I didn’t like the idea at first.”

But Foster was adamant that it would be a good fit for Erica, and so she agreed to join the first group of students participating in FSCs in fall 2009. Looking back on her year, Erica, now a junior majoring in biochemistry, says, “It was amazing. I’m so glad I had this chance!”

Freshman Success Communities were developed by Andrew Grosovsky, CSM dean, in response to the challenges faced by undergraduate students, especially new freshmen. According to Grosovsky, CSM has the fastest-growing population of “traditional age” students at UMass Boston, 75 percent of the college’s incoming students are freshmen, and of those 80 percent are first-time freshmen. The first challenge for many such students is that attending a large university can be an alienating experience, especially if they are the first in their families to do so.

“When [students] come into a large place, it can be hard for them to figure out what’s what,” he says.

Foster agrees, adding, “Often, students don’t know about all the resources we have for them. They don’t want to ask for help because there’s a stigma that they’re not good enough.”

Another obstacle, according to Grosovsky, is the rigorous schedule of required courses that must be completed by first-year science students. A student who does not successfully fulfill freshman science and math requirements during his or her first year is less likely to return for sophomore year, less likely to graduate in four years, and less likely to graduate overall.

Foster adds that many students aren’t aware of how critical these required classes are. “I can’t tell you how many students walk into my office and tell me they want [\(cont’d on page 17\)](#)

Faculty Profile: Arthur Eisenkraft

Although I did not originally set out to pursue social change, fighting inequity in science education has become my third passion. —Arthur Eisenkraft, Distinguished Professor of Science Education and Director of the Center of Science and Mathematics in Context

Against the chaotic and tragic backdrop of the Vietnam War, Arthur Eisenkraft knew he was born to teach. A newly-minted graduate of SUNY Stony Brook, his odyssey began in Nepal as member of the Peace Corps in 1971.

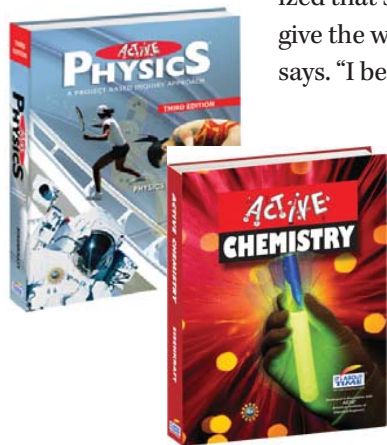
When he returned home he spent the next 25 years teaching high school physics and was a 6-12 science coordinator.

When asked by a student reporter several years ago why he loves teaching, Eisenkraft replied, “Perhaps it is hard to explain. It’s just so many things; it’s my whole being.”

Early in his career, he thought telling students about physics and observational learning was enough for his students to achieve. As he reflected more on his teaching, read the research literature, and discussed teaching with others, he realized his students could become better learners if he could listen intently to their reasoning and help them reflect on their thinking.

“One pivotal moment in my teaching occurred when I realized that students do not want to give the wrong answer,” Eisenkraft says. “I began to understand that

their wrong answer was plausible to them and it was my responsibility to listen to how they arrived at this way of looking at the science content and the world.”



Arthur Eisenkraft

So he began exploring his students’ thought and logic to help him in guiding their learning. It also radically changed the quality of questions he asked students. No longer did he ask questions to which he knew the answers. No longer did he ask questions the answers to which would lead him to respond, “That’s wrong.” Instead, he asked questions about how they view the phenomenon, what evidence did they have for their conclusion, and whether there are alternative views that would be acceptable to them.

From 1991 to 1999, Eisenkraft served as both editor and project manager of the National Science Foundation- (NSF) supported Active Physics curriculum project initiated by the American Association of Physics Teachers, the American Institute of Physics, and the American Physical Society to increase the percentage of students studying physics. He led all aspects of the Active Physics project.

Eisenkraft is a nationally recognized leader in developing innovative science education programs, such as *Active Physics* and *Active Chemistry*. In March 2010, he received the Robert H. Carleton Award from the National Science Teachers Association (NSTA). The award recognizes one individual who has made outstanding contributions to and provided leadership in science education and to the NSTA in particular.

“The creation of Active Physics required organizing hundreds of teachers and thousands of students as we wrote, pilot tested, rewrote, field tested, and rewrote the curriculum again,” he recalls.

Following the success of *Active Physics* (now in its 3rd edition), Eisenkraft created *Active Chemistry* with the support of the American Institute of Chemical Engineers as well as the NSF. Together, *Active Physics* and *Active Chemistry* have contributed to a rise in science enrollments nationwide and, for the first time, provided high-quality, laboratory-based science programs to high schools in large urban areas, such as Louisville, Los Angeles, San Diego, to name some, and now Boston.

Since his 2004 appointment as COSMIC director, Eisenkraft has developed and led a series of workshops to assist UMass Boston science and math professors in aligning their teaching with the existing knowledge on how people learn (described in greater detail on the next page).

COSMIC Professional Development for UMass Boston STEM Professors

Nurturing Cultural Change

Over the past five years, the UMass Boston Center of Science and Mathematics in Context (COSMIC) has run a series of workshops to assist professors in aligning their teaching with what is known from research about how people learn.

For two years, a monthly seminar (approximately three



hours) brought together ten to fifteen science and mathematics faculty. They explored issues related to learning, student misconceptions, formative assessment, pedagogical content knowledge, and the purpose and effectiveness of lectures and laboratory investigations. Annual university colloquia focus on learning issues. Recent speakers include Rodger Bybee, Richard Duschl, and Carl Wieman, associate director for science in the White House Office of Science and Technology Policy.

Throughout 2008, a talk focusing on how people learn was delivered to the College of Science and Mathematics faculty during their weekly departmental seminar series to ensure that all had some exposure to the research literature. In 2009, a series of monthly lunch meetings was held to provide discussions of classroom practice.

Investing New Resources in Faculty Development

In 2009, the Office of the Dean of the College of Science and Mathematics (CSM) received a \$300,000 grant from the Davis Educational Foundation to develop and implement new and innovative pedagogical methods. The program's overall goal is to

enhance instructors' abilities to engage students in STEM courses. As part of the Davis Foundation grant, professors have been applying for and receiving mini-grants of \$5,000 for projects on instructional innovation and excellence, science content, excellence in mentoring, and scholarship in teaching seminars.

Sustaining Cultural Change

Over 45 professors (50% of the CSM faculty) have been involved in aspects of the NSF-funded, UMass-Boston led Boston Science Partnership. Some of these professors have co-taught content classes with Boston teachers for Boston K-12 teachers. Teaching these courses required the professors to attend multiple workshops on instructional models, assessment, and other proven research-based practices.

Collaborating on the Vertical Alignment of STEM Teaching and Content

Other professors have been involved in helping to vertically align the K-13 curriculum in the different disciplines. As an example of one facet of this initiative, a UMass Boston professor, a Roxbury Community College professor, and a Boston Public School teacher met monthly to investigate the alignment of their introductory undergraduate class. Since the successful students in any of these courses are deemed ready to take the second year course, the three teachers were brought together to explore if the content and teaching across the different institutions were aligned.

Examples of Faculty Development STEM Projects Funded by the Davis Educational Foundation

1. Charting a new MAP: A tool for student engagement, learning outcomes, assessment, and retention
2. Virtual Field Trips in Earth Science
3. A survey of laboratory practice at UMass Boston
4. Women in Science Mentoring Program
5. Travel support to attend the American Association of Physics Teachers New Faculty Workshop
6. Putting 'Discussions' Back into the Chemistry Discussion Sessions Using POGIL, or Process Oriented Guided Learning Inquiry

Faculty Profile: Robert Chen

What actually makes people happy is full engagement. You are most alive when working at the limit of your abilities.

—Bill McKibben, author, educator, environmentalist

Robert Chen's world revolves around collaborations in research and outreach. Whether designing a new environmental data-gathering sensor with engineers, working with district science coordinators on a new curriculum, providing support for K-12 or community college science teachers, Chen's *raison d'être* is collaboration.

A chemical oceanographer with a research interest in inorganic chemistry, Chen is a full professor in the Department

Chen is co-principal investigator of the \$12,500,000 NSF Boston Science Partnership Grant; founder of the UMass Boston Center for Coastal Environmental Sensing Networks; and in 2010 led a U.S. delegation to Beijing where they conducted a seminal two-day workshop in ocean science education for Chinese scientists, educators, and government officials.

of Environmental, Earth and Ocean Sciences. Noted for his efforts in K-12 science education and outreach, he received the University of Massachusetts President's Public Service Award in December 2005.

"Whether it's for researchers and educators, or physicists and biologists and earth scientists, or administrators and faculty members, being able to bridge two different cultures and facilitate interaction effectively has increased my capacity," Chen says. "I've gained respect and trust from teachers because now I can say the right thing. I can speak their vocabulary."

His work on the Boston Science Partnership entered phase 2 when he received a \$2,100,000 National Science Foundation (NSF) grant for "Boston Energy in Science Teaching. The project's faculty and teacher participants are exploring the use of an organizing principal of energy in science as a vehicle to extend and research how teachers' in-depth conceptual understanding translates into deeper student engagement, exposition, and learning of science.

Chen's other signature outreach and education efforts are the Watershed Integrated Science Partnership (WISP) and the Centers for Ocean Sciences Education Excellence (COSEE).

The Neponset River Watershed is home to Boston's largest intact estuary, two-state designated areas of critical environmental concern, at least two state champion trees, a storehouse of aquatic biodiversity, and a wealth of protected natural areas along its shores.

Since 2002, the National Science Foundation has awarded Chen \$3,700,000 to support the WISP collaboration between UMass Boston and the local school districts of Boston, Milton, and Dedham. Chen uses the Watershed to train teachers and educate UMass Boston students about the state-mandated science curriculum. By using experiential examples from the playground, students' backyards, and their neighborhoods, WISP facilitates teachers and students gaining a deeper understanding of a wide variety of science concepts using the environment as an integrating context.



Robert Chen

Since 2002, the COSEE network has grown to 12 thematic and regional Centers located around the U.S. Their overall mission is "to spark and nurture collaborations among research scientists and educators to advance ocean discovery and make known the vital role of the ocean in our lives."

Recently, the NSF awarded \$855,000 to Chen and colleague Arthur Eisenkraft to establish a new center on Ocean Communities in Education And social Networks. In collaboration with the American Society of Limnology and Oceanography, New York Hall of Science, and Boston Public Schools, Chen is using existing social and professional relationships to strategically engage ocean scientists in education and outreach activities by offering them professional development workshops at annual meetings and connecting them to COSEE network outreach activities using social media.

UMass Boston Scientists Lead U.S. Team to Bring Ocean Science Education to China

China's breathtaking rise as a global economic power has brought economic prosperity to many of its people, but as we know from hard experience in the U.S.—at the cost of great damage to their natural environment.

So in March 2010, UMass Boston, represented by scientists Robert Chen and Xu-Chen Wang, led a U.S. delegation of fourteen scientists, educators, and graduate students to the historic city of Beijing. They conducted a seminal, two-day workshop to share their expertise in ocean science education with Chinese scientists, educators, and government officials.

Prior to their departure, Chen and his colleagues believed that their workshops in Beijing and universities in the port



Xu-Cheng Wang and Robert Chen (5th and 6th respectively from the left) and their U.S. colleagues in Beijing, China.

cities of Xiamen and Qingdao could serve as the prelude for establishing a COSEE-China, or Centers for Ocean Sciences Education Excellence. Funded by the National Science Foundation, there are 12 of these thematic and regional centers located around the U.S.

It was during a 2006 fact-finding trip to China that Chen and Wang were inspired to develop the proposal for a COSEE-China planning workshop. “Members of the scientific community in China feel like the public is not getting enough information about the oceans and the importance of the marine environment,” said Chen. “They want to do more to get the word out. We presented some of our ideas about science and outreach, and showed our Chinese colleagues how these centers work in the United States.”

The COSEE program engages scientists with formal and informal educators, and it does that with cutting-edge research as it is being conducted, not years later after it is published. The COSEE model is a catalyst that brings science into the classroom along with the excitement of ongoing research.

Lundie Spence, COSEE Council former chair, observed during the trip that the similarities are greater than the differences regarding ocean education and outreach in the U.S. and China.



Chen notes that one of the seven Essential Principles of Ocean Literacy is, “The Earth has one big ocean with many features.” The U.S. and China share this same ocean, a point not lost on the high school and undergraduate students the delegation visited with in Xiamen. Chen believes these students are motivated to study oceanography to help conserve ocean resources. Much of the populations in the U.S. and China are not, unfortunately, aware of how the ocean affects their daily lives.

Chen and his fellow delegates believe one COSEE accomplishment that might work in China involves translating existing educational resources developed by the COSEE network. An example is offering the successful Communication Ocean Sciences course for education in China, which is currently offered at twelve U.S. universities.

In fact, two days after the highly successful workshop in Beijing, the State Oceanic Administration (China's equivalent of the U.S. National Oceanic and Atmospheric Administration) committed to initiating COSEE-China. Given its vast coastline, such an investment in ocean science education by China is urgently needed.

Faculty Profile: Hannah Sevia

I never see what has been done; I only see what remains to be done. —Marie Curie quoting Buddha

Hannah Sevia believes that progress in social justice can in part be achieved through access to high-quality science education. So while many talk the talk, Sevia politely and firmly walks the walk.

In 2006, she received the University of Massachusetts President's Public Service Award for her work with the Boston



Hannah Sevia

Public Schools. Jack Wilson, UMass president at the time, wrote: "Professor Hannah Sevia's work addresses a critical need of the Commonwealth: K-12 science education. She has demonstrated a commitment to providing science education of the highest quality to all students, especially underrepresented, overlooked or underprivileged K-12 students in urban communities."

From 1995-2001, she worked as a science teacher at Chelsea High School and later as the science curriculum coordinator for the Chelsea Public School District. In 2001, she arrived at UMass Boston as an assistant professor with a dual appointment in curriculum and instruction in the College of Education and Human Development and chemistry in the College of Science and Mathematics.

Sevia plainly states her research pursuits: "Studying how students progress in developing understanding of chemistry ideas and practices across wide ranges of education, and adapting materials science, chemistry, and physics research to develop high school and undergraduate laboratory and teaching curricula that adhere to research on

learning and cognition. I am particularly interested in learning and teaching in urban contexts, and in increasing access and equity for students who are underrepresented in science fields."

In 2004, the NSF awarded Sevia a \$12,500,000 Math and Science Partnership grant to improve science teaching in the Boston Public Schools. She, in partnership with her colleagues Robert Chen and Arthur Eisenkraft, and with the Boston Public Schools Science Department, and colleagues at Northeastern University, set about the business of dramatically expanding the work and impact of the Boston Science Partnership (BSP).

In 2006, the NSF awarded Sevia a \$712,000 supplemental grant to add Bunker Hill and Roxbury Community Colleges to the BSP. She led a research study on factors that affect

2007 Boston Higher Education Partnership Service Award, for service to the Boston Public Schools

2006 University of Massachusetts President's Public Service Award, UMass Boston recipient

2006 Faculty Appreciation Award, nominated by students

2004 Faculty Appreciation Award, nominated by students

2000 NSF's Presidential Award for Excellence in Secondary Science Teaching, Massachusetts finalist

students' interests, aspirations, and performance in STEM subjects in an urban public system through high school, community college, and four-year university.

The project's principal investigator until 2009, Sevia began a leave of absence from UMass Boston to serve as a program officer in the NSF's Divisions of Undergraduate Education and Research on Learning in Formal and Informal Settings. Sevia contributed to leading the Math and Science Partnership program, the Robert Noyce Scholarship program, and the Research Experiences for Undergraduates Sites program in STEM education; served as a program officer in the programs on Discovery Research K-12 and Climate Change Education Partnerships. She collaborated with three other program officers on a study of the footprint of NSF's investment in learning progressions research in science and mathematics education. While at NSF, she was part of the Climate Change Education Working Group team who received the NSF Director's Award for Collaborative Integration. Sevia returned to UMass Boston in September 2011 as an associate professor of chemistry.

UMass Boston-Dana Farber/Harvard Cancer Center Comprehensive Cancer Partnership Program



For achieving the highest score of all proposals submitted from across the country, UMass Boston has been awarded a prestigious \$13.7 million U54 grant by the National Institutes of Health, providing the UMass Boston-Dana Farber/Harvard Cancer Center (DF/HCC) Partnership with additional funds to further contribute to developing and strengthening the country's national cancer research program.

UMass Boston's Dr. Adán Colón-Carmona and the DF/HCC's Dr. Karen Emmons are co-directors of the partnership's leadership team. And thanks to their outstanding efforts UMass Boston joins the ranks of Boston University, Harvard University, and Tufts University as a member of those elite institutions waging war on cancer for the benefit of all people.



The U54 program's co-principal investigators are Adán Colón-Carmona, associate professor of biology at UMass Boston, and Karen Emmons, professor and associate dean of research at Harvard School of Public Health, and deputy director of the Center for Community-Based Research at Dana-Farber Cancer Institute.

The partnership's overall goal is to address health disparities in minority populations, and at the same time improve research, training, and outreach opportunities for minority students, nurses, and scientists. Featuring two pilot studies and five full projects, the U54 research priorities are in the areas of cancer cell biology (projects in cell cycle control, drug design, and cell signaling), cancer disparities during end-of-life care among Latinos, and cancer interventions and prevention utilizing faith-based organizations, also with a Latino community focus.

Colón-Carmona is a scientist with expertise in cell and molecular biology, along with a strong record of educating and training UMass Boston students from under-represented backgrounds. Emmons is a population scientist with expertise in cancer prevention and community-based research, along with a strong record of mentoring faculty.

In August 2003, UMass Boston and the Dana-Farber/Harvard Cancer Center (DF/HCC) initiated their ground-breaking public-private partnership to fight cancer. Over the next three years, through diligent planning and strong institutional commitments, the partnership successfully competed for a \$4.3 million NIH Minority Institution/Cancer Center Partnership grant, or U56 grant in 2005.

Those funds launched a strong collaborative program in cancer research, training, and outreach. To date, the partnership has been directly responsible for or directly leveraged \$26 million in research funds, and over \$13.6 million in training grants. Due to the success of this exciting and dynamic partnership, it was one of a handful of partnerships the NIH invited to submit proposals to the U54 Limited Grant Competition. Through the U56 program (funded 2005-2010), the partnership developed the Accelerated Nursing Doctoral Program in Cancer Disparities. The next essential step of the U54 program will be the establishment of a Nursing Post-doctoral Program in Cancer and Health Disparities.



A National Center for Advanced Technological Education Established at UMass Boston



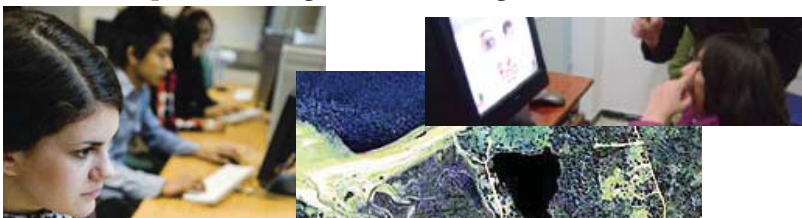
Deborah Boisvert

Over the past eight years, the Boston Area for Advanced Technological Education Connections, or BATEC, has developed a regionally coordinated system for attracting talented students from diverse demographics and backgrounds to IT careers, promoting lifelong learning of technical skills, and meeting our region's IT workforce needs.

This success is the result of a dynamic working partnership among industry leaders, IT educators, and community organizers who have a deep understanding of how to achieve the core structural reforms necessary to ensure that education programs keep pace with the rapidly evolving IT field. Now, thanks to its success and a new \$5 million grant from the National Science Foundation, BATEC, started as one of 36 regional Advanced Technological Education (ATE) centers across the nation, has now become a National Center for Broadening Advanced Technological Education Connections.

“As a national center, BATEC will extend its role as a connector, nexus, and catalyst by focusing on computing technologies and their intersections with other technology domains,” says Deborah Boisvert, BATEC's founding director. To achieve these results, BATEC has set the following goals: extend and strengthen computing discipline pathways and industry connections to produce 21st century IT professionals; adapt and advance BATEC strategies to transform IT education in urban areas; and conduct research to inform IT education and workforce development models.

Throughout these three over-arching goals, the National Center will extend BATEC's innovations by creating urban IT laboratories for connecting educators, industry advisors, government officials, and thought leaders. By using this integrated approach, they will in concert advocate, facilitate, and coordinate IT educational reform to address the spectrum of significant challenges to our nation's future.



Achieving National Prominence

- 2011** National Science Foundation awards BATEC a \$5 million grant to establish a National Center for Broadening Advanced Technological Education Connections.
- 2010** The Association for Computing Machinery's Special Interest Group for IT Education appoints Deborah Boisvert as co-leader of a 27-member Special Committee to develop an IT model curriculum for two-year colleges.
- 2008** The BATEC-led Synergy National Conference (a followup to the 2006 conference) collaborates with other ATE Centers and brings together educators to share, learn, and experience new tools and approaches for implementing 21st Century teaching and learning practices.
- 2007** BATEC produces the *IT Workforce Skills Study* that includes input from workers, hiring managers, and strategic planners across the country. Conclusion: Employability skills and contextual skills “are every bit as important as any technical skill element an employee may possess.”
- 2004** BATEC pioneers a model process for the integration of 21st Century skills throughout local IT education programs.
- 2003** National Science Foundation funds the BATEC Partnership.

E is for Engineering

A Brief History of the Engineering Program

For some internal and mostly external reasons, Boston is the only major metropolitan area in the United States without an independently accredited four-year engineering program in a public university. Nevertheless, for more than two decades our faculty and administration have worked dilligently and creatively on developing opportunities for our underrepresented and economically disadvantaged students to pursue engineering education and careers.

The Engineering Program at UMass Boston started as two-year transfer (2+2) program in conjunction with local private universities in the mid 1980s when the Commonwealth of Massachusetts subsidized the tuition of our students for their 3rd and 4th years at private institutions. When the subsidy ended in the early 1990s, an alternative 3+1 transfer program in electrical engineering was developed in collaboration with UMass Lowell to provide an affordable option to our students and to shorten the duration of the required relocation to another univervity.

However, the high cost of transferring to a private institution and the required geographic relocation remain as major barriers for the vast majority of our students. Thus, aggressive efforts to gain full access to engineering education and careers for our students continue, and have recently begun showing some encouraging results.

The Engineering Program

The Engineering Program at UMass Boston currently offers several options for students wishing to major in this field, and enrolls close to 100 students, or intended majors. In civil, electrical, industrial and mechanical engineering, students complete the first two years of their degree at UMass Boston. After successful completion of the sophomore year, they apply to one of the cooperating institutions for admission to the junior year of its engineering program. Admission is guaranteed at the UMass Amherst, Dartmouth, and Lowell campuses.

Our faculty hold doctoral degrees from such schools as Johns Hopkins University and Cornell University and are distinguished scholars and scientists. They publish articles in leading journals, receive significant support from major funding agencies and provide expert consulting to private companies and public agencies. Students obtain research

experience by working with our faculty on research projects leading to presentations at local and International conferences. The Program has two teaching labs, one of which has been recently renovated with individual workstations in team seating arrangements, and state-of-the-art audio-visual equipment.

As internship opportunities from local companies arise, they are made available to our students. There has always been a great demand for engineers. As the economy continues to grow at a rapid pace, so does the need for the latest technology as well as the people who invent and apply it. For the past few years, there has been a shortage of engineers nationwide including Massachusetts. Thousands of engineering positions in Massachusetts alone are left unfilled, even with high salaries. The average salary of engineers is nearly twice of that across all industries. It certainly pays to be an engineer.

Progress on Establishing a Four-Year B.S. in Engineering at UMass Boston

To further enhance our reputation as an outstanding center of urban undergraduate STEM, we have submitted a proposal to offer a Bachelor of Science degree in Electrical and Computer Engineering (ECE). The proposal, which was approved by the UMass Board of Trustees in June 2011, is currently pending for review and final approval of the Massachusetts Board of Higher Education.

By building on the existing two-year transfer program offered, the degree would provide the only public option for a complete four-year engineering education in the city of Boston. Thus an important hurdle would be removed for those students who wish to major in ECE but who are unable to either afford the tuition of local private institutions or to relocate outside the Boston metropolitan area to one of the other UMass campuses.

A new undergraduate program at UMass Boston would provide ECE majors with the required level of scientific knowledge, engineering training, and practical experience through the development of a rigorous and stimulating curriculum. Our goal is to meet a long overdue obligation to offer an affordable engineering education of high-quality as part of UMass Boston's mission, and to provide our constituents with the opportunity to pursue advanced study and develop rewarding careers in engineering and technology.

M is for Mathematics

Designing a Student-Centered Teaching and Learning Approach to College Algebra

In 1993, the introductory college algebra course was often the first and only mathematics course taken by many undergraduates, including prospective teachers, and its large national enrollment included a disproportionately large number of women and underrepresented minorities.

All too often, rather than encouraging, the accepted teaching pedagogy discouraged students from pursuing paths that emphasized quantitative thinking skills. In response, the National Research Council identified the course as the linchpin of the about to be undertaken national mathematics reform efforts.

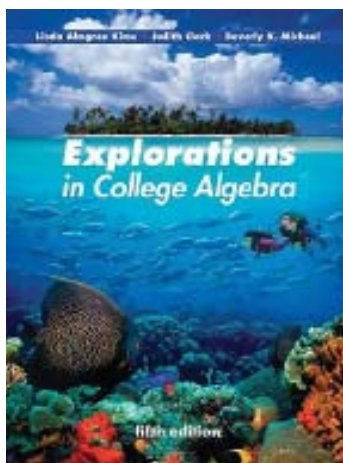
So in 1993, then UMass Boston Professor of Mathematics Linda Kime (now retired) proposed to the National Science Foundation (NSF) that she could develop, implement, evaluate, and start dissemination of a new approach to introductory college algebra. This new approach, Kime claimed, would increase enthusiasm for and competence in quantitative reasoning.

The NSF did fund Kime's proposal leading to the establishment of the College Algebra Consortium at

UMass Boston and comprised of the following institutions: Roxbury Community College, an historically black college; Bridgewater State College, a suburban college with a large teacher preparation program; and Wentworth Institute of Technology, a private college that focused on educating students for technical careers.

Designed in the spirit of the calculus reform movement this innovative textbook changes college algebra from an instructor-centered lecture format to a student-centered learning experience. The first half explores algebra applied to social sciences and the latter half to physical and life sciences. Throughout, students collect data, organize data sets, and share their observations in both written and verbal forms. An anthology of readings in the back of the book deepens the understanding of special topics and demonstrates how mathematics relates to everyday life.

Ultimately, the project aided in the revitalization of undergraduate mathematics teaching by providing a successful national model for introductory algebra. Eighteen years later the discipline altering textbook *Explorations in College Algebra* is now in its fifth edition.



A Quantitative Reasoning Perspective on Climate Change

In March 2011, Professors of Mathematics Ethan Bolker and Maura Mast, together with Mark Pawlak of Academic Support Programs, organized and hosted the 15th Annual Meeting of the Northeast Consortium for Quantitative Literacy.

Faculty from schools and colleges across New England heard the internationally known mathematics educator and author Dr. Deborah Hughes-Hallett's keynote address on "Addressing Climate Change from a Quantitative Reasoning Perspective." Her address fueled lively discussions on topics including community service and the physics of action movie special effects. Support for the meeting was provided by UMass Boston as well as Bolker and Mast's National Science Foundation grant for "Course, Curriculum, and Laboratory Improvement."

Korean Students Sample American Mathematics Culture

As part of a collaborative relationship between KyungHee University in Seoul, South Korea and UMass Boston, 25 Korean mathematics students visited campus in summer 2011. The visit's goals were manifold and included a glimpse into American mathematical culture.

Assistant Professor Eduardo Gonzalez and Professor Eric Grinberg provided presentations that considered the following questions: How is mathematics instruction in the U.S. different from that in Korea? What aspects of mathematics are emphasized, and which are de-emphasized? to name a few. The presentations included combinatorics, coding theory, integral geometry, and geometric probability.

Undergraduate STEM Programs for Underrepresented Minorities

Bridges to the Baccalaureate Program

The Bridges to the Baccalaureate Program, funded by the National Institutes of Health, is a partnership among UMass Boston, Bunker Hill Community College, and Roxbury Community College. Bridges advances the careers of community college students interested in pursuing a biomedical



**Professor of Biology
Michael Shiaris**

research career. The specific goal of our Bridges program is to increase the numbers of community college students who are underrepresented minorities (URMs) in the science, technology, engineering, and mathematics (STEM) fields to transfer to four-year research universities and graduate with a B.S. degree.



**Associate Professor
of Biology
Alexia Pollack**

Under the leadership of principal investigator and Professor of Biology Michael Shiaris, Bridges has since its 2006 inception brought approximately 70 URM students to the UMass Boston campus in a summer program anchored by their placement into research laboratories to conduct research under the direction of UMass Boston and Dana Farber STEM research faculty mentors. Bridges par-

ticipants are typically paired with junior- and senior-year undergraduate students, minority graduate students, or supportive staff research associates. Associate Professor of Biology Alexia Pollack is the program's academic coordinator.

The summer program also provides weekly math workshops, research and career workshops, inspirational guest speakers, and a two-week intensive workshop on biomedical research principles, instrumentation, and techniques.

At the end of the summer experience, students give oral presentations of their summer research to an audience of participating faculty, graduate and undergraduate students, and their peers. Several students have been awarded travel grants to present their summer research at national scientific meetings.

Bridges directly enriches the academic experience and success of many more students, both URMs and non-URMs, during the academic year at the community college campuses through support of facilitated study groups, mathematics workshops, seminar speakers, career advising services, and tutoring programs. At least 50 community college students per year, or 200 students total to date, have participated in some of these activities on their home campuses. The program's success is measured by the numbers of Bridges fellows who eventually transfer to four-year research institutions (over 80% of participants) and ultimately graduate with a B.S. degree.

Initiative for Maximizing Student Diversity in the Biomedical Sciences



Funded by the NIH, the IMSD at UMass Boston enhances the academic and research experiences of underrepresented undergraduates to increase the number pursuing

doctoral study in biomedical fields and attaining doctoral degrees. A key component of this project is the university's partnership with the Dana Farber/Harvard Cancer Center, which addresses health disparities in minority populations and improves research, training, and outreach opportunities for minority students.

The program has successfully developed a community of science learners with a drive to excel academically. Sophomore students taking science courses are recruited to apply to become IMSD affiliates. Affiliates who successfully complete at least the first level of IMSD gateway courses are encouraged to apply to become IMSD fellows.

Each IMSD affiliate is coached by an upper-class IMSD fellow and mentored by an individual faculty member who is a researcher in the fellow's area of concentration, as well as by the program's co-principal investigators and co-directors, Associate Professors of Biology Rachel Skvirsky and Adán Colón-Carmona.

Ronald E. McNair Post-Baccalaureate Achievement Program



Funded by the U.S. Department of Education, the McNair program is built on the assumption that many exceptional individuals from low-income, first-generation backgrounds who would make superb college teachers may not be easily identified. Inadequate academic preparation at the secondary level and the

resulting mediocre performance in lower division courses, combined with cultural barriers, often result in their potential being overlooked.

Students are provided opportunities to excel at the undergraduate level in science and math related fields, work toward doctoral degrees, and undertake careers in college teaching. Students pursue at least one year of independent research under the close supervision of a faculty mentor, culminating in giving an oral or poster presentations at scientific conferences and UMass Boston.

The program is named for Dr. Ronald E. McNair, who with six colleagues perished when the Space Shuttle Challenger exploded shortly after liftoff in 1986. McNair was the second African American in space.

Robert Noyce Teacher Scholarship Program for Math and Science Teachers

The College of Science and Mathematics and the College of Education and Human Development, in partnership with Boston Public Schools and Randolph Public Schools, are collaborating on a Noyce Phase II Scholarship and Stipend project for the following purposes: supporting additional cohorts of STEM professional Noyce scholars in the Teach Next Year (TNY) program; expanding the research begun on issues that arose as a result of the Phase I project; and extending the longitudinal evaluation of the progress and retention of the scholars.

The funding supports 50 STEM professionals (in 5 cohorts), to complete the year-long TNY residential teaching program that culminates in a master's degree, licensure in secondary science or math, and additional certification in either teaching students with moderate disabilities or teaching English language learners.

As a result of the Phase I project, four innovations have been added to the project: (1) measurements of academic progress made by the students taught by the Noyce graduates; (2) the addition of Randolph Public Schools; (3) the additional certification to teach students with moderate disabilities or English language learners; and (4) expansion of the school-based professional learning communities to district-wide and cross-district professional learning communities.

The program's principal investigator is Associate Professor of Curriculum and Instruction Lisa Gonsalves who is joined by her co-principal investigator and Associate Professor of Biology Brian White.

In 2000, White was one of the first science faculty in the U.S. to receive an NSF CAREER award, \$498,000, in science education for his project, "Exploring Authentic Imagery: Factors that Influence Students."

The program is named for Dr. Robert N. Noyce who is credited as being the co-inventor of the integrated circuit, or microchip. A computer industry pioneer, He was the co-founder of both the Fairchild Semiconductor Corporation (1957) and Intel (1968).

Urban Massachusetts Louis Stokes Alliance for Minority Participation Program

UMass Boston serves as the lead institution in the NSF LSAMP program that includes UMass Dartmouth, UMass Lowell, and the Bristol, Bunker Hill, Middlesex, and Roxbury community colleges. The program's student support services have directly impacted more than 1,500 undergraduates, garnering positive attention from the governor's Massachusetts Life Sciences Center as well as the Massachusetts STEM Summit organizers.

The program recently began sponsoring undergraduate biotechnology, pre-engineering, and physical science workshops that bring together community college and university students, with more than 70 working on faculty-mentored research assignments at partner institutions. Students have been placed in prestigious research internships at Genzyme, Amgen, Novartis, the Broad Institute, and the Dana-Farber Cancer Institute.

A UMass Dartmouth student was awarded one of the NSF's prestigious 20 annual international research summer internships, which he spent at the University of Nairobi in Kenya.

Research Experiences for Undergraduates

Since 2004, Associate Professor of Biology Rachel Skvirsky has served as the principal investigator and director of the Research Experiences for Undergraduates in Integrative and Evolutionary Biology at UMass Boston. The program stresses the integration of diverse fields of biology, demonstrating common themes across the biological sciences and especially the connections between cell and molecular biology on the one hand, and ecology and conservation biology on the other.

Accordingly, student research projects span a diverse array of problems in biology. The projects are designed to help students develop independence in making research decisions, skills in experimental design, and insight into their broad field of research.

In addition to research, students participate in enrichment activities designed to promote a sense of community among students and faculty, teach communication skills, enhance understanding of issues surrounding modern biology, and prepare students for advanced work in science. These experiences occur during weekly discussions and workshops that focus on practical, personal, and ethical aspects of research. The program also features field trips in and around the Boston Harbor and final research presentations.

The program serves a culturally and ethnically diverse student population, thus broadening the participation in science of underrepresented groups. Close mentoring relationships, as well as collegial interactions among student participants, are key components of the experience. The program is designed to stimulate and support interest in biological research and to equip students to pursue research careers.

Present and past REU grants awarded to UMass Boston faculty appear on pages 18-20.

Women in Science Club

While a growing number of women in the U.S. are being trained for scientific careers, some fields still have startlingly few women scientists. Nationally, only 16 percent of employed scientists and engineers are women. This is particularly true of the physical sciences, mathematics, and computer science.

Women faculty are poorly represented in the higher ranks of academia. They account for less than 1% of women engineers and only 7% of women scientists reach the status of full professor. On the average, the annual salary of female scientists is 25% less than their male colleagues.



So when young women enroll in undergraduate programs in the hard sciences, they encounter structural barriers to their advancement.

In response, Wei Ding, assistant professor of computer science, founded the Women in Science Club at UMass Boston. Ding also serves as a UMass Boston faculty representative at the National Center for Women and Information Technology.

The Club has invited outstanding female professors from prestigious universities, who would be good role models for our students, to give research seminars and host panel discussions on various women-in-science issues. The Club has organized career mentoring events with invited local employers, mock interviews, practice and critique of oral presentations, and sharing and discussion of internship experiences. Outreach activities include Tech-Savvy Computing Camps for middle-school girls in the Boston area, attending the symposium of Leaders in Science and Engineering: the Women of MIT, and recruiting female undergraduate students to work on Ding's research projects.

Freshman Success Communities... continued from page 17

to be doctors when they have no idea of what that means, or what kind of classes they'll have to take," she says.

To help students overcome these challenges, Grosovsky drew on his experience at the University of California Riverside, where as a professor and vice provost for undergraduate education he was involved with various models of student success communities, to create UMass Boston's FSC program. He envisioned the communities as a way of establishing a bond among students, while bringing them closer to the resources they would need during their first year.

"These communities are about students being involved in their own success," Grosovsky says. "We wanted to let them know that they belong here. This is their university. And we will reach out to them, and do everything in our power to support them."

Elliott says that the support she received from the students in her group as well as from Grosovsky, her cohort's advisor, was exactly what she needed during her first year at UMass Boston.

"Just in the first week [of the program], we had this sense of family," she says. "[I] realized these people were going to be there for me for the rest of the year. It made me feel like I had someone to go to when I didn't know what to do."

Grosovsky adds that even he benefitted from the program. "I've taught for decades," he says, "but I don't think I've ever had a more satisfying teaching experience than this. In the communities, everyone is empowered. They help each other grow."

In fact, the FSCs have been so effective that in 2011 the program tripled in size from 2010: Six cohorts will serve 135 students in biochemistry; biology; chemistry; computer science; environmental, earth, and ocean sciences; and premedical studies. And nearly half of the first group of FSC graduates have volunteered to stay in the program as Dean's Ambassadors. Grosovsky says, "I've had students from the first cohorts ask me, 'Is there a Sophomore Success Community?' This is an important method for keeping them involved."

Undergraduate Success in Cognitive Science and Neuroscience

At UMass Boston, the Department of Psychology annually awards BS degrees that in number often rival and at times surpass many departments within the College of Science and Mathematics.

The department's minor in cognitive science is offered jointly with the Department of Computer Science, along with many other disciplines such as linguistics, philosophy, psychology, anthropology, sociology, biological sciences,

mathematics, statistics, and engineering.

In addition, the department has thriving apprenticeship and honors programs that rely on its research

programs in neuroscience. Those experiences allow the psychology faculty to place many of their undergraduate students in top graduate programs in neuroscience and related STEM programs.

While the department does not yet have a free-standing STEM grant in psychology, it does have an undergraduate Scholars Program that is designed to attract and support underrepresented minorities in preparation for biomedical careers.

The program is funded through a \$7,400,000 grant awarded to UMass Boston by the NIH's National Center on Minority Health and Health Disparities. Professor of Psychology Celia Moore is the program's principal investigator and project director. In collaboration with the Cherishing our Hearts and Souls Coalition in Roxbury, Massachusetts, UMass Boston has established the HORIZON Center, named for its goal of providing healthy options, research, interventions, and community organizing.

Roxbury has the youngest, poorest, least educated, and least employed people among Boston's neighborhoods. To date, this form of community-based participatory research, or outreach, has been very successful for all community members, faculty, and students alike.



STEM Grants Awarded to UMass Boston

2011-2001

Robyn Hannigan, Environmental, Earth and Ocean Sciences: \$326,321 from the NSF for “REU Site: Coastal Research in Environmental Science and Technology,” 2011-2013.

Adan Colon Carmona, Biology, and Karen Emmons, Dana-Farber Cancer Institute: \$13,700,000 from the NIH for the project “UMass Boston-Dana Farner/Harvard Cancer Center U54 Partnership,” 2010.

Robyn Hannigan, Environmental, Earth and Ocean Sciences: \$99,999 from the NSF for “Research Experiences Biology Undergraduates Travel Scholarship Program,” 2010-2012.

Robert Chen, Environmental, Earth and Ocean Sciences, Arthur Eisenkraft, Science Education: \$2,100,000 from the NSF for the project “Boston Energy in Science Teaching (BEST),” 2010-2013.

Robert Chen and Xuchen Wang, Environmental, Earth and Ocean Sciences: \$49,400 from the NSF for planning the “Centers for Ocean Sciences Education Excellence Workshop in China,” 2010-2011.

Maura Mast and Ethan Bolker, Mathematics: \$200,000 from the NSF for the project “Common Sense: Quantitative Reasoning in the Undergraduate Curriculum,” 2010-2012.

Robert Chen, Environmental, Earth and Ocean Sciences, Arthur Eisenkraft, Science Education: \$855,000 from the NSF for the “Centers for Ocean Sciences Education Excellence: Ocean Communities in Education and Social Networks,” 2010-2013.

Robyn Hannigan, Environmental, Earth and Ocean Sciences, Alan Christian, Biology: \$46,500 NSF Research Experiences for Undergraduates in Biology to participate in the “Workshop on Enhancing Communication and best Practices Through Networking” in Arlington, VA, March 18 - 20, 2010.

Lisa Gonsalves, Curriculum and Instruction, and Brian White, Biology: \$750,000 from the NSF for “Phase 2 of the UMass Boston Robert Noyce Scholars Program: Teach Next Year in Randolph and Boston,” 2010-2015.

Kamaljit Bawa, Biology: \$31,460 from the NSF for “U.S.-India Workshop: Articulate and Disseminate Research Priorities on Forest Canopies, Bangalore, India,” 2009.

Deborah Boisvert, University College: \$2,000,000 from the NSF for “The Synergy Collaboratory for Research, Practice, and Transformation,” 2009-2011.

Deborah Boisvert, University College: \$800,000 from the NSF for “Advancing the Successful IT Student Through Enhanced Computational Thinking,” 2009-2011.

Rachel Skvirsky and Adan Colon Carmona, Biology: \$1,4000 from the NIH for the “Initiative for Maximizing Student Diversity in the Biomedical Sciences,” 2008-2011.

Rachel Skvirsky, Biology: \$307,729 NSF Research Experiences for Undergraduates in “Integrative and Evolutionary Biology,” 2007-2011.

Arthur Eisenkraft, Science Education: \$1,389,000 from the NSF for the project “Active Physics Teacher Community,” 2007-2011.

Deborah Boisvert, University College: \$400,000 from the NSF for “A Community Addressing Seamless Information Technology Education for Students,” 2007-2010.

Peter Taylor, Science Technology and Values: \$17,755 from the NSF for “The Implications of Heterogeneity, for the Philosophy, History, Sociology, and Science of Biological Determinism,” 2006-2009.

Winston Langley, Provost’s Office, and Joan Becker, Academic Support Programs: \$2,370,026 from the NSF for the “Urban Massachusetts Louis Stokes Alliance for Minority Participation Project,” 2006-2011.

Robert Chen, Environmental, Earth and Ocean Sciences, Arthur Eisenkraft, Science Education, and Adan Colon-Carmona, Biology: \$2,000,000 from the NSF for the project “Watershed-Integrated Sciences Partnership 2 (WISP 2) between UMass Boston and Local School Districts,” 2006-2012.

Michael Shiaris, Biology: \$1,400,00 from the NIH for the project “Bridges to the Baccalaureate Partnership with Roxbury Community College and Bunker Hill Community College” 2006-2012.

STEM Grants Awarded to UMass Boston

Peter Taylor, *Science Technology and Values*: \$14,400 from the NSF for “Ecological Research and the Complexities of Participation in Social and Environmental Change,” 2006-2009.

Jeffrey Dukes, *Biology*: \$810,249 CAREER grant from the NSF for “The Boston-Area Climate Experiment,” 2006-2012.

Stephen Mrozowski and Heather Trigg, *Anthropology*: \$45,000 NSF Research Experiences for Undergraduates grant for “Archaeobiology at Sylvester Manor,” 2006-2007.

Anna Madison, *Science Technology and Values*: \$199,073 from the NSF for “SGER Undergraduate Evaluation Training,” 2005-2007.

Lisa Gonsalves and Jorgelina Abbate-Vaughn, *Curriculum and Instruction*, Marietta Schwartz, *Chemistry*, and Brian White, *Biology*: \$500,000 from the NSF for the “UMass Boston Robert Noyce Scholars Program,” 2005-2011.

Adan Colon Carmona, *Biology*, and Karen Emmons, *Dana-Farber Cancer Institute*: \$4,300,000 from the NIH for the project “UMass Boston-Dana Farber/Harvard Cancer Center U56 Partnership,” 2005.

Rachel Skvirsky, *Biology*: \$218,150 NSF Research Experiences for Undergraduates in “Integrative and Evolutionary Biology,” 2004-2007.

Robert Chen, *Environmental, Earth and Ocean Sciences*, Arthur Eisenkraft, *Science Education*, and Hannah Sevia, *Chemistry and Curriculum and Instruction*: \$12,500,000 from the NSF for the “Boston Science Partnership,” 2004-2012.

Peter Taylor, *Science Technology and Values*: \$6,000 from the NSF for “New England Workshop on Science and Social Change,” 2004.

Juanita Urban-Rich, *Environmental, Earth and Ocean Sciences*: \$25,000 from the NSF for “Development of Accessible Arctic Education for Elementary Students and the Public in the Arctic River-Delta Experiment,” 2004-2005.

Peter Taylor, *Science Technology and Values*: \$71,670 from the NSF for “Genes, Gestation, and Life Experiences: A

Critical Comparison of Concepts and Methods Used in Analyses of Biosocial Development,” 2003-2005.

David Landon and Stephen Mrozowski, *Anthropology*: \$194,000 NSF Research Experiences for Undergraduates grant for “Archaeobiology at Sylvester Manor,” 2003-2006.

Kamaljit Bawa, *Biology*: \$30,000 from the NSF for “Workshop: Articulate and Disseminate Research Priorities in Tropical Biology, Aberdeen, Scotland,” 2003.

Deborah Boisvert, *University College*: \$5,500,000 from the NSF for the “Boston Area Advanced Technological Education Connections,” 2003-2009.

Robert Chen, William Robinson, *Environmental, Earth and Ocean Sciences*, Michael Shiaris, *Biology*, and Hannah Sevia, *Chemistry*, and Curriculum and Instruction: \$1,727,458 from the NSF for the project “Watershed-Integrated Sciences Partnership (WISP 1) between UMass Boston and Local School Districts,” 2003-2006.

Kamaljit Bawa, *Biology*: \$24,090 from the NSF for “Workshops to Articulate and Disseminate Research Priorities in Tropical Biology,” 2002-2004.

Deborah Boisvert, *University College*: \$49,301 from the NSF for “Roadmap of Opportunities Institute,” 2002-2003.

Jason Evans and Michelle Foster, *Chemistry*: \$77,000 from the NSF for “Integration of Liquid Chromatography-Mass Spectrometry in the Undergraduate Curriculum,” 2002-2003.

Paul Fonteyn, *Biology*: \$3,243,782 from the NSF for “Community Science Workshops: Beginning a National Movement,” 2002-2009.

Kamaljit Bawa, *Biology*: \$50,000 from the NSF for “U.S.-India Workshop: Tropical Ecosystems: Structure, Diversity, and Human Welfare, Bangalore, India,” 2001.

Maura Mast and Dennis Wortman, *Mathematics*, and Dan Simovici, *Computer Science*: \$270,000 from the NSF for the “Computer Science, Engineering, and Mathematics Scholarship Program,” 2001-2006.

STEM Grants Awarded to UMass Boston

...cont'd from page 19

Brian White, **Biology**: \$498,000 CAREER grant from the NSF for "Exploring Authentic Inquiry: Factors that Influence Students," 2000-2005.

Rachel Skvirsky, Kamaljit Bawa, Robert Stevenson, and Rick Kesseli, **Biology**: \$277,000 from the NSF for "Undergraduate Mentoring in Environmental Biology: Anthropogenic Stresses on Natural Ecosystems," 2000-2006.

1999-1990

Dina Goldin, **Mathematics**: \$223,872 CAREER grant from the NSF for "Towards Practical Constraint Query Algebras," 1998-2002.

Judith Clark, **Curriculum and Instruction**, and Joan Lukas, **Mathematics**: \$172,545 from the NSF for "Teacher Preparation in Mathematics and Science at the University of Massachusetts Boston," 1997-2000.

Zong-Guo Xia, **Environmental, Earth and Ocean Sciences**: \$40,000 from the NSF for "Undergraduate Laboratory for Interdisciplinary and Cooperative Education in Geographic Information Technologies," 1996-1998.

Diane Paul, **Science Technology and Values**: \$79,802 from the NSF for "Phenylketonuria: Social History, Ethics, Policy," 1996-1997.

Jeremy Hatch, **Biology**: \$162,000 from the NSF for "Research Experiences for Undergraduates in Ecology & Conservation Biology," 1994-1998.

Linda Kime, **Mathematics**, and Judith Clark, **Curriculum and Instruction**: \$221,097 from the NSF for "A Redesign of the College Algebra Course," 1993-1996.

Jeremy Hatch, **Biology**: \$95,514 from the NSF for "Research Experiences for Undergraduates in Ecology and Conservation Biology," 1992-1994.

1989-1976

Kamaljit Bawa, **Biology**: \$5,500 from the NSF for "Workshop on the Ecology of Tropical Forest Plants, Bangi, Malaysia," 1987.

Kamaljit Bawa, **Biology**: \$40,000 from the NSF for "Research Experience for Undergraduates in Conservation Biology," 1987-1988.

Francis McCarthy, **Computer Science**: \$43,541 from the NSF for "Pre-College Teacher Development in Science," 1985-1987.

Joel Blair, **Computer Science**, and John Lutts, **Mathematics**: \$31,890 from the NSF for "Pascal and Computer Science: a Training Course For Pre-College Honors Teachers," 1985-1987.

Diane Paul, **Science Technology and Values**: \$24,000 from the NSF for "Scientific Issues and Value Conflicts in the Nature-Nurture Controversy," 1985-1986.

Lawrence Kaplan, **Computer Science**: \$16,239 from the NSF for "Undergraduate Research Participation," 1981.

Diane Paul, **Science Technology and Values**: \$18,282 from the NSF for "Lysenkoism in the West," 1980-1981.

Kamaljit Bawa, **Biology**: \$30,450 from the NSF for "Undergraduate Research Participation," 1977-1978.

Kamaljit Bawa, **Biology**: \$8,600 from the NSF for "Undergraduate Research Participation," 1976-1977.



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