The mission of the University of Massachusetts is to provide an affordable and accessible education of high quality and to conduct programs of research and public service that advance knowledge and improve the lives of the people of the Commonwealth, the nation, and the world.

The data in this report reflects activities from July 1, 2014 to June 30, 2015.

On the Cover: Whitney Battle-Baptiste, director of UMass Amherst’s W. E. B. Du Bois Center, holds a domestic artifact excavated at the Du Bois Homesite in Great Barrington, Mass.: a circa 1920 bottle for Old Spice aftershave—alas, most likely not the great man’s property, but that of his cousin Edward Wooster.
CONTENTS

02 Vice Chancellor’s Message

Features

03 Ready for Prime Time
A new director and state-of-the-art home are moving the Institute for Applied Life Sciences forward

06 Growing Data Sciences
New college and center are expanding the campus’s data science leadership

09 Green Design
The Design Building will give sustainable research, education, and construction high visibility

12 A Cleaner Drop to Drink
The campus and commonwealth make clean water technology a priority

14 Deeply Du Bois
The W. E. B. Du Bois Center celebrates and builds on its namesake’s legacy

16 Curious Minds
UMass Amherst undergrads have dazzling research opportunities

18 Reigning in Antibiotics
A campus researcher sees an answer in targeted bacteriocins

21 Nurturing Innovation
The Armstrong Fund seeds science with high market potential

Departments

23 Research Highlights
29 Sponsored Activity
30 Technology Transfer
32 University Press
33 Creative Accomplishments
34 Faculty Bookshelf
FROM THE VICE CHANCELLOR

Dear Friends and Supporters:

Ten years ago we published our first annual Report on Research. At the time, nanotechnology was the new buzzword and the campus had just topped the $100 million mark in both research awards and expenditures. Plans were being made to revitalize a faculty thinned by budget cuts, and blueprints for new buildings and research facilities were on the physical plant docket. Growing our faculty and modernizing our research facilities were priorities for meeting the campus’s goal of increasing external funding and rising to the top tier of nationally ranked public research universities.

Since then, the campus has emerged as a nanotechnology leader. Our strength in nanomanufacturing secured our selection by the Department of Defense as the New England node of a $75-million federal Flexible Hybrid Electronics Manufacturing Innovation Initiative (see page 24). Research awards have increased 66 percent and total research expenditures have climbed nearly 60 percent, reaching over $200 million this year. Full-time instructional faculty ranks have climbed nearly 20 percent over the past decade, and our research footprint has expanded dramatically. Over a half-million square feet of space in seven new facilities has been dedicated to sponsored research activity since 2005, and more facilities for research and innovation are coming online (see pages 3 and 9).

The net result of this activity is the campus’s rise to national prominence. For example, UMass Amherst ranks 18th in the top 200 programs of the 2014 Quacquarelli Symonds (QS) World University Subject Rankings, and U.S. News & World Report ranks the campus among the nation’s Top 29 public universities of 2015.

That climb has been accompanied by the campus’s continued commitment to student research. Our graduate students continue to excel, and this year the campus has again been designated a Top Producing Fulbright Institution. Undergraduate research is also on the rise (see page 16). This year, 76 Commonwealth Honors College students received Honors Research Grants, and 93 received Honors Research Fellowships. The Office of Undergraduate Research Services assisted approximately 1,000 students in finding research opportunities on and off campus, and of the 1,100 students statewide who participated in the 2015 annual Massachusetts Undergraduate Research Conference, 420 were from UMass Amherst.

As I reflect on this decade of success I want to acknowledge you, our alumni, friends, and supporters, who have helped to make this success possible. It is through your generosity and your commitment to the UMass Amherst mission that we claim our status as the flagship public research university of the Commonwealth of Massachusetts.

On behalf of the campus, thank you for your support. I look forward to partnering with you on new programs and initiatives that will define the next ten years at UMass Amherst.

Sincerely,

Michael F. Malone ’79PhD
Vice Chancellor for Research & Engagement,
Ronnie & Eugene Isenberg Distinguished Professor of Engineering
With its new director and a state-of-the-art home under construction, the Institute for Applied Life Sciences is aiming high.

Peter Reinhart’s professional life has been evenly split between academia and industry. He began as a tenured professor at Duke University Medical Center. He moved on to leadership positions in the pharmaceutical industry, at Wyeth and Pfizer, and in biotechnology, most recently at Proteostasis Therapeutics and Alzheon, two Massachusetts companies producing novel treatments for Alzheimer’s, Parkinson’s, cystic fibrosis, and other neurodegenerative and orphan diseases.
Reinhart’s background makes him an ideal choice to lead UMass Amherst’s new Institute for Applied Life Sciences (IALS), which helps transform campus research discoveries into such human healthcare products as medical devices, drug-delivery technologies, and therapeutic candidates. Established in 2014 with $95 million from the Massachusetts Life Science Center and a $55-million campus investment, IALS develops research-program pipelines that forge connections between university researchers and industry partners who can bring campus discoveries to market.

That collaborative approach has great appeal to Reinhart, who was hired as IALS’s founding director in the fall of 2014. At Duke, he became interested in applying research discoveries to real-world problems and translating some of them into solutions from which patients can benefit. In industry, he saw firsthand the power of team-based science and technology development. “I found that by having 15 people, each with different backgrounds and skillsets, collaborating on different aspects of the same problem, I could be much more effective,” Reinhart says. Encouraging focused adoption of that approach for the campus’s expanding life sciences research, he says, requires “the development of a new type of academic institute,” one modeled more along biotechnology-startup principles than traditional university-department lines.

IALS brings more than 120 UMass Amherst faculty together with UMass Medical School faculty members from more than 25 departments to conduct research in the Institute’s three centers. The Models to Medicine Center focuses on the study of cellular pathways and novel drug targets to identify therapeutic candidates with the potential to halt or slow the progression of specific diseases. The Center for Bioactive Delivery works on new drug-delivery technologies to more effectively deliver drugs to particular cell types in specific regions of the body. The Center for Personalized Health Monitoring focuses on the development of affordable wearable devices to track individual health data—everything, Reinhart says, from ‘smart bandages’ that provide feedback on how well a wound is healing to devices that track anything from stress levels to changes in cognitive abilities. The latter could help catch early signs of slowly progressing neurodegenerative diseases such as Alzheimer’s or Parkinson’s years before a standard clinical diagnosis could, allowing for earlier intervention.

IALS serves as a matchmaker of sorts for campus researchers and industry partners who can help turn university discoveries into healthcare products. The Institute identifies campus research projects with development potential and advises interested faculty on how to make their work catch industry’s eye. In some cases, IALS provides seed grants to help generate key data required to sufficiently de-risk projects to rouse industry interest. It also seeks to create startup companies based on campus inventions. To do so, it has partnered with the campus’s Berthiaume Center for Entrepreneurship to provide a range of new venture services for IALS programs. Institute faculty recently launched one such startup, Cyta Therapeutics, to commercialize a class of novel polymer-based nanogels as drug-delivery vehicles.

Reinhart also reaches out to companies, letting them know about any campus research that fits well with their goals. For instance, he presented a pharmaceutical company interested in treating Huntington’s disease with an overview of all the

The IALS wing will house research, administrative, and collaborative space. Peter Reinhart (left) and business manager Narayan Sampath (right) review blueprints with Brian Prindle, Consigli project engineer.
A key to realizing IALS’s mission is its new state-of-the-art facility, due to be completed in early 2016. In addition to research-laboratory space, offices, a hospitality center, and a conference center, it will include more than twenty core equipment facilities with instruments available to campus researchers and their industry partners. In the Models to Medicine Center and the Center for Bioactive Delivery, that will include equipment for biological imaging, mass spectrometry, nuclear magnetic resonance, biophysical protein characterization, nutraceutical formulation, genetic-sequencing, and (in collaboration with the medical school) high-throughput screening.

Core facilities in the Center for Personalized Health Monitoring (CPHM), include a human/technology interaction lab (with an apartment-like space where study subjects can be monitored in a natural setting), a mobile health lab, and a sleep-monitoring lab. The CPHM also has an entire floor dedicated to the study of manufacturing techniques that will allow the health-monitoring devices developed there to be produced inexpensively, making them widely accessible to patients. Labs include an advanced print and roll-to-roll manufacturing facility, sensor integration labs, and digital design and fabrication labs.

Reinhart sees students—undergrads, graduate students, and postdocs—playing an integral role in IALS’s success. After all, he notes, “the next generation of solutions are going to come from the next generation of thinkers.” That next generation of investigators, Reinhart adds, also will be key to bridging the divide that too often has kept academia and industry from working together. “We are trying to demonstrate new types of skills for solving problems,” he says. “I would love to see our faculty and students experience the power of science and manufacturing performed as a team sport, rather than by individual excellence.” If IALS can combine the power of the university’s “innovation engine” with the team-oriented, milestone-driven approach of a small company, it will fill an important gap in the traditional interactions between academia, industry, and government, and do much to develop the next generation of healthcare solutions.

Huntington’s-related work being done by IALS researchers, and showed the company how to partner with those researchers. Such partnerships, Reinhart says, can range from small—funding a graduate student for a year, for instance—to larger deals, such as the one announced last summer with Anika Therapeutics, a Massachusetts-based maker of therapeutic products for tissue protection, healing, and repair. Under its agreement with IALS, Anika will work with Professor of Chemistry S. “Thai” Thayumanavan and Associate Professor Lisa Minter of the Department of Veterinary and Animal Sciences to develop a novel treatment for rheumatoid arthritis. Reinhart expects IALS to have in its pipeline at any given time anywhere from six to 20 projects at various stages of development, much like the portfolio of a biotech or medical-device company. Advanced projects will eventually need the kind of regulatory, human-safety, marketing, and commercialization expertise that is best obtained from alliances with experienced industry partners.
This spring UMass Amherst demonstrated its deep faith in the potential of one of today’s highest-profile emerging technologies by holding a symposium celebrating the creation of the campus’s Center for Data Science. The event drew executives and other representatives from such major corporations as Google, Amazon, Yahoo, Thomson Reuters, MassMutual, Pratt and Whitney, and the New England Venture Capital Association. It also revealed just how boundless are the field’s opportunities.

Consider this: We live in an Information Age in which, individually and collectively, we are creating a digital footprint of staggering proportions. By one recent estimate, companies and consumers are creating between six and seven exabytes of data annually—enough to fill 60,000 Libraries of Congress. Another estimate claims that 90 percent of the data in the world has been created over the past two years. Be it drawn from traditional column-and-row databases such as medical and transactional records or less structured forms such as text, photos, satellite imagery, and audio and video files, this torrent—often called Big Data—just keeps growing.
Therein lies a golden opportunity, or rather a host of golden opportunities. Advances in data science, many driven by university research, are enabling organizations of all kinds to harness the power of Big Data in ways unimaginable even a few years back. Companies, government agencies, universities, and nonprofits are tapping this power to gain previously hidden insights into how to develop new products, make informed decisions, and improve the quality of our lives in countless ways.

At the symposium James Kurose, distinguished professor of computer science and assistant director of the NSF’s Computer & Information Science & Engineering directorate, asked, “What do you think the cities that your children are going to live in will look like in ten or twenty years? Transportation, energy, safety, security, how resources within cities are used, how cities are planned—all are going to depend on data.”

UMass Amherst has long been poised to shine in this new realm. The Department of Computer Science was formed in 1964, with three faculty members. It has grown ever since, becoming a college and building on strengths in machine learning, computer vision, information retrieval, software engineering, theoretical computer science, networking, and multi-agent systems, and expanding into new fields like Homophily, the tendency of similar nodes to be connected, is a characteristic of many real-world networks. So is the existence of nodes with uncommonly large numbers of connections. The networks in this graphic show increasing homophily (from left to right) and a decreasing density of high-degree nodes (from top to bottom). Image courtesy David Jensen.

Computer scientists Deepak Ganesan (left) and Benjamin Marlin use wearable sensors such as these computational eyeglasses to collect patient data that can accelerate biomedical discovery and optimize care delivery in the health sciences.
“What do you think the cities that your children are going to live in will look like in ten or twenty years? Transportation, energy, safety, security, how resources within cities are used, how cities are planned—all are going to depend on data.”

– James Kurose

graphics, multimedia learning technologies, distributed systems, security and privacy, digital forensics, and databases.

Recently reconfigured and renamed the College of Information and Computer Sciences, it now includes some 800 undergraduate majors and 150 doctoral students and is among the largest such programs in the commonwealth. It is distinguished by a strongly collaborative culture that enhances both research and teaching. Faculty members consistently work together across traditional boundaries between specialties within computer science, and graduate students in completing their qualifying exam are required to explore a research problem bridging two distinct areas of computer science. The college is also deeply committed to multidisciplinary research, with faculty members and students engaged in an unusually large number of projects involving other disciplines.

Faculty growth is a major priority. “We are projecting an investment leveraging 80 new faculty in data science related areas: 40 in just the past five years, plus hiring 40 more in the coming decade,” says Professor Andrew McCallum, director of the Center for Data Science. “We are pursuing industrial partners and government sources to invest $100 million to help us meet these goals.”

Academics are another priority. The Center for Data Science is leading the development of new data-science courses, concentrations, certificates, and a master’s degree program to address the workforce demand in the field. That demand is great: the Massachusetts Technology Leadership Council estimates that by 2018 there will be 120,000 data-science jobs in the commonwealth alone.

The campus has reason for confidence in the college’s vision. “Our computer science faculty have long been recognized as national and international leaders in research and education,” notes Chancellor Kumble Subbaswamy. “They already generate $18 million a year in federal and other research support. Establishing this new college will enable them to pursue new programs and collaborations within the campus and the university system, increase the scope of the college’s industry relations, and enhance its already strong national reputation.”

Industry and government are taking note. “Several companies, like Amazon, Google, and Thomson Reuters, have already made major contributions of hardware, data, and funding to deepen our collaborations, while others are joining our new Industry Affiliates Program to have greater access to our research and students,” says McCallum. “They’ve also expressed interest in our forthcoming topical workshops this fall and spring.”

On the potential of data science, McCallum says, “Our interests and those of the key players in data science are very well aligned. We all want to make better decisions, whether they’re about how to improve efficiency or maintain our health or expand a business or accelerate the progress of science. In coming up with these solutions, we’re addressing some of the biggest, most complex problems faced by today’s society. And that’s very exciting for UMass Amherst’s researchers and students.”
The campus's new Design Building gives sustainable research, education, and construction high visibility.

In the first-floor lobby of Holdsworth Hall sits an unusual bench. Seen from the side, its unfinished edges show three layers of wood topped by a layer of pink insulation topped by a thin concrete slab. Slender pieces of vertically embedded metal bind the wood to the polished concrete top.

Produced as a student project in the Building and Construction Technology (BCT) program, the bench is a scaled-down example of applying a modern technical twist to a centuries-old construction material. Timber—which, thanks to its sustainable qualities, is enjoying new popularity—is used here in a structural composite beam system.

The bench also serves as an example of the kind of hands-on learning opportunities that the campus's 87,500-square-foot Design Building will offer. Now
under construction next to the Studio Arts Building and due to open in January 2017, it will serve as home to BCT and two departments, Architecture and Landscape Architecture & Regional Planning. In essence, it will be a large-scale learning laboratory offering students hands-on experience with sustainable architectural and landscape design, materials research, and the latest building technology.

“That was something we wanted for the building,” says Alexander Schreyer, director of the BCT Program. “Every component and the landscape surrounding will enable us learn from it.”

The Holdsworth Hall bench shows that this learning has already begun. The students who built it employed the same construction technique to be featured in the building’s floors, which will be built up of several layers of cross-laminated timber (CLT, a new solid-wood product), a layer of insulation for sound absorption, and a polished concrete surface on top, all held together by thin but strong steel connectors.

“This structural system,” notes Peggi Clouston, an associate professor of wood engineering in the BCT program, “has been extensively studied by our research group on campus and has already demonstrated many improvements over conventional construction methods.”

Given its environmental benefits, timber-frame construction is gaining new favor these days. Because wood is a carbon-neutral material that absorbs and stores carbon during growth, timber-framed buildings have smaller carbon footprints than their steel-framed cousins. Wood is also renewable, non-toxic, and biodegradable, and can be sourced from sustainably managed forests. Clouston was recently awarded a $390,000 grant from the National Science Foundation to develop cross-laminated timber from low-value Northeastern species. Her co-investigators are Schreyer and Sanjay Arwade of Civil and Environmental Engineering. Creating that high-value market for low-value wood helps to create green jobs and spur economic development for the local forest industry.

“Timber-framed buildings,” says Clouston, “can be designed to be remarkably durable and long-lasting. In fact, we’re talking about building high-rises out of wood now.” It was therefore fortunate when in the summer of 2014 UMass Amherst’s leadership joined with local politicians in seizing the chance to make the new Design Building a showpiece of modern wood construction.

While the methods being used in the building have been thoroughly tested in Europe and Canada, they’re still fairly novel in the U.S. Schreyer says that the Design Building will be the “most technologically advanced wood structure” on the East Coast and offer a unique learning opportunity, not just for people on campus but also for designers and builders in the region. Schreyer, Clouston, and their colleagues have worked closely with the building’s designer, Boston’s Leers Weinzapfel Associates, to ensure that students will learn not only in the newly constructed classrooms and labs but from the building itself—an open, sunny space with plenty of windows and skylights.

Throughout the building, students will observe sustainable features, from low-flow water fixtures to lights that automatically turn off when sensors indicate that a room is empty. The heating and ventilation systems will be highly energy-efficient, and space will be left on the roof for possible installation of solar panels.

A portion of the building will have a “green roof” outdoor courtyard where students will be able to enjoy a rooftop garden. They will also use it to study the benefits of green roofs, which prevent storm water runoff and maintain moisture, keeping the building cooler and reducing the need for air-conditioning. In addition, they will study the building’s rainwater retention system, which will collect water from the roof and channel it to bioswales, landscape elements that filter out pesticides and other harmful chemicals.

The Design Building is the latest example of UMass Amherst’s commitment to sustainable building. Sixteen campus buildings meet the university’s stringent Green Building Guidelines, which call for water and energy efficiency, the use of “green” building materials, and other environmentally sound practices. Seven campus buildings have received LEED certification, meeting the comprehensive standards set by the U.S. Green Building Council, and several more are
The new Design Building offers students hands-on experience with sustainable architectural and landscape design, materials research, and building technology. Above: BCT students Mohamed El Shamy (right) and Rommel Cordova-Fiori at the construction site. Below: An architect’s rendering of the building’s central interior courtyard.

The Design Building is on target for LEED Gold or possibly Platinum certification. The new building will also create opportunities for interdisciplinary learning by bringing the Architecture, Landscape Architecture & Regional Planning, and Building & Construction Technology departments and programs together under one roof. That will allow students and faculty to work collaboratively; for example, Schreyer says, architecture students will be able to see how students in building and construction technology test the materials that they will eventually use in their designs. That integrated approach, he says, reflects an industry trend of planners, designers, materials developers, and builders working closely throughout the construction process—an approach, he adds, more efficient and less wasteful of resources.

The layout of the Design Building lends itself to easy sharing and observation. At the center will be a large enclosed common area, flooded with natural light. Studios, testing labs, and workshops looking on to the atrium will showcase the work happening inside. A glass-enclosed exhibit space on the first floor, visible from North Pleasant Street, will allow students and faculty to display their projects.

While the new building won’t be ready for occupancy for more than a year, students have already begun reaping its educational benefits. This summer, as groundwork began at the site, student interns working with the project and construction managers reported on its progress and what they’d learned via a blog. As construction moves forward, students can follow the process up close, thanks to two time-lapse cameras at the site.

Students in the BCT, architecture, and landscape architecture programs are not the only ones who will benefit from the Design Building. Features like a café and attractive interior and exterior courtyards will draw a wide range of students and visitors to the building. Because it is in a high-traffic part of campus—near the Haigis Mall, Fine Arts Center, and Campus Pond, and en route to a busy bus stop—large numbers of students will pass by its glass-walled studios and exterior spaces, where students will work on larger demonstration projects. “Visibility will be huge in comparison to what we have now,” Clouston says. “You won’t be able to help noticing what’s happening.”

To which Schreyer adds, “Everyone will then see and learn about the state of the art of sustainable built environments up close.”
David Reckhow and his colleagues in the Department of Civil and Environmental Engineering have long set the stage for research and development aimed at finding healthier, more effective alternatives for U.S. water treatment facilities. With $4.1 million in new funding from the U.S. Environmental Protection Agency (EPA) in hand, and having established a national center for innovative small drinking-water systems, UMass Amherst is forging professional alliances that are set to move water research and the water treatment industry forward while boosting the economy.

Reckhow’s team is working with the New England Water Innovation Network (NEWIN) to develop a translational cycle that will see early water-systems innovations move onto pilot tests and be put more quickly into use in the public and private sectors. Having traveled with Deval Patrick, the former governor of Massachusetts, to Israel and Singapore to see model water innovation networks firsthand, Reckhow is helping the campus create similar infrastructure for the commonwealth. According to Reckhow, the industry faces constant changes: the regulatory environment, increasing competition for water supplies, build-out and contamination, and climate change all keep it on its toes. With this in mind, NEWIN is designing the network to foster a constant back-and-forth between the innovators, the researchers, and the end-users, so that the R&D will fill specific industry needs.

EPA funding and an innovative treatment center are putting the campus’s water research on the map.

Above: Reckhow’s ferrate solution is a water treatment disinfectant comparable to chlorine, but without chlorine’s deleterious side effects.
With 300 institutions in Massachusetts involved in water technology—a sea of innovators everywhere from western Massachusetts to Cambridge—organizations here are ready to tap into that market and solve the water industry’s pressing problems.

“Researchers must always be aware of the industry’s volatile nature in order to address issues in real time,” says Reckhow.

Reckhow and compatriots from around the country are conducting bench, pilot, and full-scale experiments with alternative technologies to enable water treatment plants to more safely and effectively achieve high levels of disinfection while minimizing undesirable chemical contaminants. The use of chlorine has saved many lives over the past century, but epidemiological studies show that it may cause increased bladder cancer mortality by forming chlorinated organic compounds. Ferrate—a compound produced by mixing iron salt with chlorine before it is used to treat water—has proven comparable to chlorine as a disinfectant, without its side effects. The tricky part, however, is getting the recipe just right, so that all the chlorine is eliminated in the process of producing ferrate. The team is working with industry partners to perfect the process and define its benefits. They must also prove it to be safe before it can be tested and broadly approved.

“This is something, of course, that we don’t do lightly,” says Reckhow. “It could potentially affect people’s health. Everyone needs to agree that it’s perfectly safe.”

In much of this work Reckhow focuses on small treatment systems. Larger systems have the resources to solve many of their own problems; smaller ones often can’t afford such luxuries. Moreover, small systems are greatly more numerous—97 percent of U.S. drinking water systems are classified as small. Reckhow’s new EPA grant is being used to expand this work with small systems, funding the creation of a center on the UMass Amherst campus called the Water Innovation Network for Small Sustainable Systems, or WINSSS.

Reckhow says that in providing funding for this national center and another of its kind at the University of Colorado Boulder, the EPA is seeking places where emerging water technologies can be tested and refined for the betterment of the water utilities across the country. Reckhow’s partners on the project are UMass Amherst colleagues John Tobiason, Caitlyn Butler, Chul Park, and Prashant Shenoy, along with researchers at the University of Texas Austin and the universities of Florida, South Florida, Illinois, and Nebraska.

WINSSS develops proof of concept and brings early innovations to the point where they can be tested on a pilot scale. By plugging into NEWIN, Reckhow’s research and WINSSS will help create jobs and spur the economy. The global water industry is expected to generate as much as $600 billion this year, and some three hundred institutions in Massachusetts are involved in water technology. This sea of innovators from Western Massachusetts to the Cambridge area is ready to tap into that market and solve the industry’s pressing problems. NEWIN was formed to connect these institutions and turn their innovative energy into useful products.

“Suddenly, there’s a synergy there,” says Reckhow. “We can offer our expertise, they can offer their expertise, and that’s a real victory for making products that sell and that create jobs.”

Going forward, Reckhow is proposing to help small systems with regulatory challenges, including improving coordination between various water regulatory agencies. He explains that the EPA delegated much of its authority to the states and, because each state tends to do things differently, it can be difficult to pass changes on a national scale. He hopes New England will set an example by coming together as a region to agree on a uniform set of standards.

“If you can do that in hardheaded New England, we can probably do it across the country too,” Reckhow says. “I think it’s going to bring new life into the field. If we can be more innovative and more open, there’s going to be a greater interest on the part of the public and students who want to move into the field.”
In the world of African American scholarship, one figure easily casts the longest and broadest shadow. “The work of W. E. B. Du Bois is the backdrop of everything we do,” says John H. Bracey Jr., professor and chair of the W. E. B. Du Bois Department of Afro-American Studies. “His recognition of the community and life behind what he called ‘the veil’ is the operative concept in virtually all studies of the African American experience.”

Nor was Du Bois’s influence limited to the academy; he was known and admired throughout the world by anti-colonial activists and radicals in Africa, Asia, Latin America, the Caribbean, and Europe. He died, aged 95, on August 28, 1963, on the eve of the historic Civil Rights March on Washington. The next day NAACP leader Roy Wilkins, addressing the quarter-million people gathered before the Lincoln Memorial, paid tribute. “At the dawn of the 20th century,” Wilkins said, “his was the voice that was calling to you to gather here today in this cause.”

Throughout his long life Du Bois confronted racism, poverty, the subordination of women, environmental degradation, and the horrors of war and nuclear weaponry. He promoted education as a fundamental right, and was a central figure in movements for world peace, civil rights, and self-determination for people of African descent.

At UMass Amherst, Du Bois’s face—high-domed, almond-eyed, hawk-nosed, trimly goateed—seems to be everywhere. The towering main library is named for him and houses a vast archive of his papers and memorabilia. The Afro-Am department is likewise named for Du Bois and counts among its onetime faculty his widow, Shirley Graham Du Bois, and their son, David Graham Du Bois. Out in the Berkshires, on the outskirts of Great Barrington, the university has assumed
stewardship of the W. E. B. Du Bois Homesite, where he spent the formative years of his childhood living with his maternal grandparents.

And then there is the W. E. B. Du Bois Center. Established in 2009 and housed in the library, it keeps alive his legacy of melding high scholarship and passionate activism to engage the nation and the world in interdisciplinary discussion around global issues of race, labor, and social justice. The Du Bois Center makes its resources readily available and accessible to the public, runs an annual fellows program, maintains and expands the archive, and conducts energetic educational outreach to connect students, educators, scholars, and the public through lectures, symposia, scholarships, and collaborations.

Since last January the dynamo driving all of this activity has been the center’s new director, historical archaeologist Whitney Battle-Baptiste, associate professor of anthropology. Her area of research focuses on the intersections of race, class, and gender in the shaping of cultural landscapes across the African Diaspora through the archaeology of such African American domestic spaces as the Du Bois Homesite. Her theoretical interests include Black Feminist theory, African American material and expressive culture, and critical heritage studies. Battle-Baptiste earned a bachelor’s degree in history and secondary education from Virginia State, a Historically Black University. She went on to receive a master’s degree in history from the College of William & Mary and a Ph.D. in anthropology from the University of Texas at Austin. The author of Black Feminist Archaeology (Left Coast Press, 2011), she is currently working on a collection of narrative essays about women of color in the field of archaeology, also to be published by Left Coast.

Battle-Baptiste has worked on such historic sites as the Hermitage, the home of Andrew Jackson in Nashville, Tenn.; Rich Neck Plantation in Williamsburg, Va.; the Abiel Smith School in Boston; the Millars Plantation on the Bahamian island of Eleuthera; and the Du Bois Homesite. The latter helped draw her to UMass Amherst.

“We live in complicated times,” says Whitney Battle-Baptiste. “I want my work at the Du Bois Center to enable a new generation of scholars, students, and citizens to uphold the tradition of Dr. Du Bois, and to help UMass Amherst students see that W. E. B. Du Bois is far more than the name on the library.”

“We live in complicated times,” Battle-Baptiste continues. “I want my work at the Du Bois Center to enable a new generation of scholars, students, and citizens to uphold the tradition of Dr. Du Bois, and to help UMass Amherst students see that W. E. B. Du Bois is far more than a name on the library. He influenced everything from modern sociology, Pan Africanism, the civil rights movement, and nuclear disarmament to social, economic, and racial justice on a global scale. We as a nation need to engage in much and sometimes painful introspection, and at the Du Bois Center we want to reach beyond research, beyond the boundaries of the academy, to build relationships with community partners and produce work valuable to all members of our society, shedding light on critical issues confronting people throughout the world today.”
Emma Lutz ’17 spent the past summer cloning. Ten years ago, as a member of the Class of 2007, she likely would have been working as a lifeguard or a cashier over the break. Instead, she took on something that used to be the exclusive province of graduate students: an intensive nine-week research stint in biological sciences at Harvard’s T. H. Chan School of Public Health.

For many UMass Amherst students, such challenging research has become an integral part of the undergraduate experience. Lutz, a double major in microbiology and public health, worked on a project titled “Construction of a Late-Stage Gametocyte-Specific Fluorescent P. falciparum Line.” The parasite Plasmodium falciparum, she explains, causes the most dangerous form of malaria. At Harvard, Lutz worked on a team attempting to construct a fluorescent parasite line to study these lethal parasites at a critical point in their life cycle.

She learned conventional cloning and basic parasitology techniques, including how to culture parasites, centrifuge and purify a culture, perform an invasion assay, and freeze and thaw parasites. Most importantly, she says, “I learned about a routine day in the life of a researcher. My goal is to work in a lab.”

Lutz probably wouldn’t have landed this competitive opportunity without the help of the UMass Amherst Office of Undergraduate Research and Studies (OURS), a division of the Learning Resource Center. “They helped me find the program and prepare my application,” she reports.

Lin Tang, director of the Learning Resource Center, explains that OURS actively searches for research and scholarly opportunities for undergraduate students in all disciplines. It has been in operation for nine years and serves ever-growing numbers of undergraduates seeking research opportunities. Nearly a thousand students visit the office each year. Tang enumerates the benefits of undergraduate research: Students learn directly from top faculty in their field. They establish connections and network within their discipline. They develop and enhance their skills and expertise. And they connect classroom and real-world learning.

Biochemistry major Kyle Swainamer ’18 has worked in Jeanne Hardy’s chemistry lab since the second semester of his freshman year. His current work, on the protein crystallization of caspases, could lead to new treatments for cancer and neurodegenerative diseases.
Many students discover or redouble their commitment to career paths through undergraduate research; others find that it’s time to change course. “Discovering what you don’t like is just as important as finding what you do like,” says Debra Phillis of the OURS staff. She cites one student headed for medical school who discovered that he preferred lab work to working with humans.

The OURS staff meets with undergraduates individually to find research opportunities—on campus, locally, nationally, and even internationally. Through their giant, ever-expanding database (“You could call us the Match.com of research opportunities,” Lin jokes), they’ve found students positions working with NYU Project Healthcare, as museum interns, or in public health in Ghana, studying sea turtles in the Everglades, doing research at the Brookhaven National Laboratory or such leading corporations as AstraZeneca, Genzyme, and Bose, and serving in any number of other roles at hundreds of other sites.

As more students attend college, more of them look for research opportunities, intensifying the competition for some slots. For example, undergraduates applying for National Science Foundation research internships have only a 5 to 8 percent chance of getting one. OURS has helped UMass Amherst students land some of those, but the office is eager to help all undergraduates, not just those with the highest GPAs, find opportunities that meet their interests. Students are pleased with the results: the office has a 95 percent satisfaction rate.

One such satisfied student is civil and environmental engineering major Tracy Donoghue ’17, who had a summer research position at the University of Houston’s Cullen College of Engineering. She worked in structural engineering rehabilitation, fabricating a new kind of composite patch for steel structures that are prone to fatigue, and learned to use all sorts of engineering equipment. “The best part for me was seeing how my ideas and calculations relate to something physical,” Donoghue says. “It affirmed that civil engineering is the perfect major for me.”

Advocate for Undergraduate Research

Gretchen Holbrook Gerzina, the new dean of Commonwealth Honors College, assumed her post in July and soon became aware of the long history of support for undergraduate research at UMass Amherst. “Commonwealth Honors College has shown its commitment not only through the curriculum, but also through its research conference and individual research experiences,” she says.

Most CHC students complete substantive research that culminates in a thesis—an experience many alumni recall as an undergraduate high point. Many students present their research at the annual CHC-sponsored Massachusetts Statewide Undergraduate Research Conference. Open to all students in the commonwealth’s public higher education system, it has grown exponentially along with undergraduate research opportunities on the campus. The 22nd conference will be held in April 2016.

Gerzina herself is a keen researcher, internationally renowned scholar, and prolific author. She is an expert in Victorian literature, biography, African American literature, and the story of black people in England. Throughout her academic career, at Vassar College, Columbia University, and most recently Dartmouth College, she has mentored many undergraduate research assistants.

Gerzina wants students in all disciplines to have such opportunities, because undergraduate research benefits both faculty and students. “Students learn the nuts and bolts of research and see how to become fully engaged in the research process,” she says. “Faculty benefit from the students’ commitment and fresh perspectives.”

Golden Chances to Present Academic Work

The growth of the annual Undergraduate Research Conference, held on campus each April, reflects the growth of statewide undergraduate research opportunities:

2005: 411 students from the Massachusetts higher-education system; 124 UMass Amherst students.
2015: 1,100 students from the Massachusetts higher-education system; 420 UMass Amherst students.
Picture a fragile wilderness happily maintaining its delicate ecological balance until an invasive species begins edging out the native wildlife. If you were managing that ecosystem, would you carpet-bomb it with an invader-killing toxin that would also harm the native species and might eventually become resistant?

Scale that dilemma down to the microbial level and you can see the challenges facing researchers fighting infectious disease. Broad-spectrum antibiotics have become less effective as resistant bacteria evolve. The World Health Organization has identified antibiotic resistance as a major threat to public health. In the U.S. alone it annually causes at least 2 million illnesses and 23,000 deaths, and racks up as much as $20 billion in healthcare costs.

Current antibiotics also have serious potential side effects: they kill beneficial bacteria as well as harmful ones.

“We’ve paid a significant price for our reliance on broad-spectrum antibiotics,” says Professor of Biology Margaret Riley. “We didn’t understand the impact they were having. Because nine out of 10 cells in our body are microbial, when we take an antibiotic we’re attacking our own microbiome, and it’s going to have an impact. We’ve been devastating our own health.”

Riley, an internationally recognized researcher in biology, applies her expertise in evolutionary biology and microbial ecology to develop new technologies—basically an entirely new drug platform—to fight antibiotic resistance. She does so using a unique combination of novel research, keen collaborators, ecology, and battlefield strategy.

To create an alternative antibiotic, a microbial smart bomb to target and destroy single strains of bacteria, Riley enlists the power of the bacteria themselves. Bacteria interact with members of their own species by
creating bacteriocins—protein compounds through which they communicate with one another and target and attack competitors.

Riley uses *E. coli* as an example: “You have *E. coli* in your gut right now, and you want it there, chewing the mucin layer; it’s very happy and it’s helping you. But some lineages have gotten nasty. If you get an invasion from eating a raw hamburger, that new strain is going after the same environment as your commensal *E. coli*. They start to compete, and then get crowded.”

At that point, Riley explains, the resident strain is likely to produce a bacteriocin to kill off this invader but nothing else. “Which makes perfect ecological sense,” she adds, “as the native *E. coli* needs the rest of the microbiome in there to survive.”

Such bacteriocins are the basis for narrow-spectrum antibiotics targeted to particular strains or species, and only those strains. Bacteriocins “don’t care about those other species” of microbes, Riley explains, because they aren’t competing for the same resources.

That specificity is the key to an antibiotic treatment that kills off the invader but leaves the rest of the microbial ecosystem intact. Fewer molecules are needed, making for far less risk of toxicity: bacteriocins work instantaneously, taking only one molecule to kill an invading cell.

Since the members of your microbiome continuously produce bacteriocins, your immune system does not perceive them as foreign. And unlike broad-spectrum antibiotics, a targeted-bacteriocin approach is much less likely to encourage the evolution of resistant strains.

For such an innovation to get from the laboratory to the marketplace, it must be translated. Two implementations of Riley’s research illustrate the process.

Bacteriotix is an LLC that would investigate the use of bacteriocins to treat and prevent CAUTIs, catheter-acquired urinary tract infections that account for nearly 40 percent of hospital-acquired infections in the United States. CAUTIs can lead to secondary infections, sepsis, and even death, and are particularly pernicious because pathogens invade the tender tissue where a catheter inserted and form colonies on and in the catheter. No measures now on the market effectively prevent these bacterial invasions or foil their ability to become resistant to broad-spectrum antibiotics.

The pivot point between discovery and implementation is known as “translational science.” In the case of Bacteriotix, Riley’s chief translator is Sandra Roy ’09, a Ph.D. candidate in animal biotechnology and biomedical sciences, and Riley’s research fellow and lab manager since 2009. Outside the lab, Roy takes Isenberg School of Management courses bridging the scientific and business worlds.

After earning her undergraduate degree, Roy drew upon Riley’s research to create Bacteriotix. It won her the $30,000 grand prize in the UMass Amherst Innovation Challenge.

Counting on the power of bacteriocins, Roy created a drug cocktail that covers the range of potential bacterial
fungal uropathogens in a CAUTI and is nontoxic and non-inflammatory to delicate mucous membranes. It can be used first as a lubricant during catheter insertion and thereafter as a wash to be put up the catheter if it is inserted for long.

Roy is now working with the UMass Technology Transfer Office to find a company to market Bacteriotix. Supported by funding from a Manning Fellowship she won this spring, Roy is selecting a local manufacturer and will perform toxicity tests and then enlist hospitals to test the product.

Riley’s research caught the attention of another like-minded collaborator: Chinese scientist Xiao-Qing Qiu of Sichuan University. The inventor of pheromonicins, a combination of pheromones and bacteriocin technology, Qiu approached Riley with a new process for using colicin Ia protein, a bacteriocin produced by *E. coli*, to destroy other bacteria by disguising it with a pheromone recognized by that bacteria.

In its native function, colicin Ia coming close to a surface receptor in the lipid bilayer of an enemy *E. coli* microbe creates a pore in the bilayer. The bacteria tries to close the pore but within minutes runs out of energy—“Its guts run out,” Riley primly notes.

Qiu postulated that he could use colicin Ia’s function but trick it into recognizing bacteria other than *E. coli*. He attached a pheromone produced by another human pathogen to the bacteriocin to bring the colicin Ia to the cell surface of the new bacterial species. Once within the van der Waals zone of attraction, the bacteriocins, as Riley says, have “no choice but to do their job.”

Qiu’s idea impressed Riley, and the two began collaborating. “His technology theoretically works with any microbial attacker with a lipid bilayer,” explains Riley. Pheromonicins might therefore have applications for the Epstein-Barr virus, which causes Burkitt’s lymphoma. In addition to bacteria and viruses it also has applications for fungi, and so might be a cure for white-nose syndrome in bats.

The Chinese government has committed 200 million USD to support a newly created pheromonicin institute in Beijing and wants to start a sister institute in the Amherst area, led by Riley. UMass Amherst is currently reviewing the intellectual-property procedures and other policies needed to support the collaboration.

Bacteriocin-powered antibiotics represent a new frontier in the treatment of infectious disease and a new, more strategic way of working with our bodies’ ecosystems. “We need to think differently about microbes,” asserts Riley. “Few of them are interested in harming us, and so many are key to our survival.”

Professor Riley gratefully acknowledges the National Institutes of Health, the Department of Defense, ImmuCell, Pheromonicin Biotech Limited, UMass Amherst, and the UMass Innovation Challenge for their support.
It’s an intriguing question, first posed in the 1970s: might economic or engineering benefits be gained by replacing the typical one-rotor design of offshore wind turbines with one using numerous smaller rotors?

Researchers thought they might, says Matthew Lackner, associate professor of mechanical and industrial engineering and a member of UMass Amherst’s Wind Energy Center. Large rotors, he explains, generate a good deal of energy but are costly due to their large mass. Using many smaller rotors might generate just as much power but be more affordable. In addition, if one rotor in a multi-rotor model breaks, the others could still operate—and the turbine keep generating—while the repair is made.

Some back-of-the-envelope math suggested that the idea had promise, and Lackner and his colleagues—James Manwell, professor of mechanical and industrial engineering, and Sergio Breña, associate professor of civil and environmental engineering—were eager to delve more deeply...
into such matters as the design and installation costs of a structure that could support multiple rotors. They were able to do so starting in 2012 thanks to a two-year grant from the Armstrong Fund for Science. Established nearly ten years ago with a gift from stalwart campus supporters John and Elizabeth Armstrong, the Armstrong Fund awards UMass Amherst faculty grants of $20,000 a year for up to two years to support work that “challenges conventions in their field.”

This year’s Armstrong Award recipients are Sarah Perry, assistant professor of chemical engineering, and Jun Yan, assistant professor of chemistry. Perry will use her grant to develop a synthetic formulation method to allow the tetanus vaccine to maintain its safety and effectiveness without the need for refrigeration. That would be especially useful in developing countries where a lack of refrigeration leads many desperately needed doses to spoil and be discarded unused. Yan’s grant will allow his lab to test the use of the inorganic compound tungsten diselenide rather than the standard silicon in making transistors for electronic devices, making for lighter, faster portable devices.

Since its establishment, the Armstrong Fund has supported 14 research projects by faculty from departments ranging from food science to polymer science and engineering, computer science to veterinary and animal science. The fund was established to support projects that have promise but are not yet far enough along to apply for traditional funding sources. At the end of the grant term, recipients report their findings and give a public lecture on their work.

Lackner, Manwell, and Brena’s grant allowed them to fund graduate student Gaurav Mate, whose thesis entailed creating detailed models of various multi-rotor concepts engineered to withstand the forces of wind and gravity. He also did an economic analysis of whether multi-rotor models could compete economically with conventional turbines.

In the end, Lackner says, the research yielded promising results. While a multi-rotor turbine system has approximately the same total mass as a single-rotor model, less of that mass is concentrated in the blades, which are made of expensive composite materials; the mass lies more in the underlying support structures, made of less-expensive steel. That suggests that a multi-rotor turbine can more cheaply generate the same amount of power as a single-rotor one.

While questions remain about the construction and installation of such models, Lackner says that “it shows potential.” He and his colleagues are now building on their findings to further develop the multi-rotor concept.

Jeanne Hardy, associate professor of chemistry, won an Armstrong Award in 2013 in support of her work researching caspase-6, a human protein involved in the development and progression of Alzheimer’s disease and the development of Huntington’s disease. The grant helped her lab explore the relationship between caspase-6’s two conformations, helical
and non-helical, and how the protein shifts between the two in a way specific to this protein.

The data they found allowed them to identify a compound that binds to and interacts with caspase-6 in a very specific manner, inhibiting it and preventing it from leading to the development of Alzheimer’s. “This is the kind of thing you’re looking for in developing a drug,” Hardy says. Her lab will now continue working on caspase-6-specific inhibitors, with an eye on developing drugs for treating Alzheimer’s.

Jennifer Ross, associate professor of physics, is a bio-physicist whose work centers on microtubules—strong, hollow microscopic tubes that provide structure to many human and plant cells. She received an Armstrong grant in 2009 to support her research on how cells organize themselves and how that process can be recreated in a lab setting using highly advanced microscope techniques.

“I’ve always been interested in how the inside of the cell rearranges itself depending on its functions,” Ross says. “We have no idea how that occurs. There’s no foreman inside the cell telling things where they’re supposed to go, yet thousands and thousands of things all work together.”

Ross’s lab breaks these processes down into simpler forms by isolating and removing from cells individual proteins that she compares to tiny machines serving particular functions. The proteins can then be combined in known quantities in systematic ways, enabling the researchers to see how they organize themselves. Building cells from their component parts like this helps researchers understand their internal organization; that, in turn, can be helpful, for instance, in understanding why certain cells end up organizing in ways associated with adult-onset diseases. The research can also be applied to human tissue creation to approach such challenges as building cells to develop prosthetic skin.

In the years since receiving her Armstrong Award, Ross has continued to expand her work with the support of other grants. Lackner and his colleagues have also received subsequent funding, including grants from the National Science Foundation, the U.S. Department of Energy, and the Commonwealth of Massachusetts, for their work on wind turbines. But the team’s Armstrong funding, Lackner says, was crucial in helping them develop an initial idea that he describes as “a little out there, a little unconventional. I really appreciated it, because it gave us enough money to delve into an idea that really wasn’t ready for a large-scale proposal.”
2015 HIGHLIGHTS

Campus to Lead Federal Advanced Manufacturing Node

The U.S. Department of Defense has named UMass Amherst as New England’s lead institution for the department’s national Flexible Hybrid Electronics (FHE) Manufacturing Innovation Institute, a $191-million initiative including $75 million to create a competitive, effective, and sustainable research-to-manufacturing collaboration between industry and academia to solve problems in advanced manufacturing.

The Commonwealth of Massachusetts played a major role in the successful proposal, which includes academic collaborators MIT, UMass Lowell, Harvard, and Northeastern University, as well as partners in private industry who have pledged matching funds to support specific projects as they earn federal monies. “Leveraging the commonwealth’s incredible research universities to produce revolutionary flexible-manufacturing breakthroughs will help provide cutting-edge technology for our troops and a foundation for advanced-manufacturing growth in Massachusetts,” said Gov. Charlie Baker.

Comprehensive Survey Assesses Gaming Impacts

A research team led by Rachel Volberg, public health and health sciences, has released a comprehensive report of findings from a large-baseline population survey assessing Massachusetts residents’ attitudes about gambling, gambling participation, and gambling-related problems. Nearly 10,000 residents completed the survey, making it the largest, most representative survey of its kind ever conducted in the U.S.

Part of a legislatively mandated research agenda overseen by the Massachusetts Gaming Commission (MGC), the survey is part of the broader Social and Economic Impacts of Gambling in Massachusetts Study, which is unique in having obtained information about gambling involvement and problem-gambling prevalence prior to the introduction of casino gambling. “The most important point is that we are establishing baseline conditions for every social and economic variable that might be affected by the introduction of casinos,” said MGC Chairman Steve Crosby. He added that tracking changes in variables over the life of casinos will inform data-driven mitigation strategies for responding to any negative consequences.

Underwater ‘Lemur Graveyards’ Discovered in Madagascar Caves

Researchers led by Laurie Godfrey, professor emerita of anthropology, and Alfred Rosenberger, Brooklyn College professor of anthropology and archaeology, have discovered what is likely the most extensive collection of extinct lemur fossils ever found in an underwater cave.

Thousands of specimens were found in the first exploration of three deep underwater inland caves on the island of Madagascar, off the southeastern coast of Africa. Godfrey and Rosenberger examined bones removed from the caves by a global team of divers and found skeletal remains of numerous recently extinct species, including giant lemurs, elephant birds, horned crocodiles, and extinct hippos. Because the remote caves were previously unexplored, many of the remains were complete, well-preserved, and together—a rarity in paleontological finds.

The two-week expedition, which was funded in part by both the National Science Foundation and the National Geographic Society, marks the start of what the researchers hope will be a multi-year project to further investigate the caves and their contents.
Schween First Woman to Join Juilliard Quartet

Cellist Astrid Schween, visiting assistant professor of music and dance, has been chosen to join the Juilliard String Quartet in September 2016.

The first woman to join the quartet, Schween will also become a member of the faculty of the Juilliard School. She is replacing Joel Krosnick, who has been with the quartet for 42 years. Schween will perform Schubert’s “C Major Quintet, D. 956” with the quartet at Krosnick’s final performance with the group, in Alice Tully Hall on February 22, 2016.

Schween has performed extensively throughout the U.S., Canada, Europe, Mexico, Australia, New Zealand, and Japan. A frequent guest artist with the Boston and Memphis chamber music societies, she is a member of the celebrated Boston Trio, an ensemble-in-residence at the New England Conservatory.

Petersen Recognized by White House as Outstanding STEM Mentor

President Barack Obama honored veterinary and animal scientist Sandra Petersen with the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring in a White House ceremony this past summer. Petersen is executive director of the Northeast Alliance for Graduate Education and the Professoriate (NEAGEP), a 15-institution alliance led by UMass Amherst and focused on increasing the number of students earning Ph.D. degrees in the STEM disciplines. Under Petersen’s leadership, the research-active faculty involved in recruiting, mentoring, and community building for underrepresented minority students increased tenfold at UMass Amherst, from 19 in 2003 to more than 200 today.

Innovative Method Holds Promise for Rapid Drug Screening

UMass Amherst researchers led by chemist Vince Rotello and doctoral student Ngoc Le have invented a fast, accurate nanoparticle-based sensor system. The multi-channel, signature-based approach to screening drugs uses gold nanoparticles with red, green, and blue outputs provided by fluorescent proteins. “Drugs with different mechanisms cause changes in the surface of cells that can be read out using the new sensor system,” says Ngoc. “We found that each drug mechanism generated a unique pattern, and we used these cell surface differences to quickly profile different drug mechanisms.”

Traditional genomic, proteomic, and other screening methods now used to characterize drug mechanisms are time-consuming and require special equipment. To discover a new drug for any disease, researchers must screen billions of compounds, which can take months. “Rapid determination of drug mechanism would greatly streamline the drug discovery process, opening the way for new therapeutics,” Ngoc adds.
Campus Neutrino: Finding a '2014 Top Breakthrough'

Physicists Andrea Pocar and Laura Cadonati and doctoral student Keith Otis joined with other researchers in the Borexino experiment, which first detected neutrinos created by the “keystone” proton-proton (pp) fusion process at the sun’s core. Their work has been named one of the “Top Ten Breakthroughs of 2014” by editors and reporters at Physics World magazine.

Pocar, one of the team’s principal investigators, said that the Borexino team’s physicists “looked into the heart of the sun” with these discoveries. Physics World lauded the research for its “fundamental importance, significant advance in knowledge, strong connection between theory and experiment, and general interest to all physicists.”

CIE Expands Educational Access for Millions

Researchers with the Center of International Education (CIE) are working under a five-year, $1.6-million subcontract with Waltham-based Education Development Center Inc. to help boost equitable access to education in places racked with crisis and conflict. The U.S. Agency for International Development is funding the project, which is aimed at building evidence and working with up to 60 field projects in 18 countries to increase educational access for 15 million learners in the world’s crisis and conflict zones. This target is part of the United Nation’s Millennium Development Goal of providing universal access to primary education.

Ash Hartwell, adjunct professor in the Department of Educational Policy, Research, and Administration in the College of Education (COE), leads the project with Joseph Berger, COE associate dean for research and engagement. CIE’s role, says Hartwell, is to partner with these organizations to shape research, evidence, and evaluations guiding this work.

Partnership Established with Jawaharlal Nehru University

The campus hosted an historic international workshop in June with visiting scientists from India’s Jawaharlal Nehru University (JNU) in New Delhi. The event launched a new collaboration between the two institutions to explore and cultivate mutual research interests and strengths on topics related to climate change. Chancellor Kumble Subbaswamy and JNU Vice Chancellor Sudhir K. Sopory introduced goals and strategies to guide future collaborative work between the universities. JNU is considered one of India’s premier universities in worldwide rankings, and its School of Environment Sciences is a national leader.

Seen as a pilot event for future long-term commitments to research partnerships in other areas, the workshop culminated with a signing ceremony for an action plan between the two campuses outlining specific activities and goals. The UMass Amherst-JNU partnership was initiated by Subbaswamy, who visited his native India in January 2014 to explore closer ties and strategic collaboration with top research institutions in a nation that is a growing and emerging global presence.
Nine Receive NSF CAREER Awards

Two cohorts of nine faculty members received competitive National Science Foundation (NSF) Faculty Early Career Development (CAREER) Awards during 2014–15. The awards support research and teaching on subjects as diverse as the development of chemotherapy drugs to the study of how metal nanoparticles behave in waterways and water supplies. Recipients are Shelly Peyton, assistant professor and Barry and Afsaneh Siadat Career Development Faculty Fellow of chemical engineering; Kevin Kittlestved, assistant professor of chemistry; Caitlyn S. Butler and Boris Lau, assistant professors of civil and environmental engineering; Alexandra Meliou, Yuriy Brun, and Benjamin Marlin, assistant professors of computer science; Alexei Oblomkov, assistant professor of mathematics and statistics; and Jeffrey Starns, assistant professor of physics.

The CAREER award is the NSF’s most prestigious in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education, and the integration of education and research within the context of the mission of their organizations.

Campus Nets $1.7 M in USDA Food-Safety and Local-Food Grants

Food scientists Julie Goddard and Lili He, along with Frank Mangan, director of the ethnic crops program at the Stockbridge School of Agriculture, were awarded grants totaling $1.7 million by the U.S. Department of Agriculture. The grants will support food safety research and work with farmers to grow and sell more local, fresh ethnic crops popular with immigrant communities.

Congressman Jim McGovern traveled to campus to announce the awards. “UMass Amherst has come a long way since being founded as the Massachusetts Agricultural College,” said McGovern. “While it has stayed true to its agricultural roots, UMass Amherst today boasts some of the best and brightest scientific minds in the commonwealth. These federal funds will help these researchers increase food safety and expand access to fresh, local, healthy food to those who need it most.”

Campus Joins Worldwide Universities Network

UMass Amherst has joined the Worldwide Universities Network (WUN). A higher education and research network made up of 18 universities spanning 11 countries on five continents, WUN works to drive international research collaboration and address issues of global significance. It focuses on four global challenges: responding to climate change; public health (non-communicable disease); global higher education and research; and understanding cultures. WUN is engaged in more than 100 active research initiatives, involving over 2,000 researchers and students. Projects and initiatives are supported by prolific partners such as the United Nations Foundation and World Bank.

Max Price, vice chancellor of the University of Cape Town and chair of the WUN Partnership Board, expressed his delight that UMass Amherst has joined “our mission to produce innovative, high-quality, sustainable research. Not only is the university a leader in life sciences, but its climate scientists are among the best in the world.” Provost Katherine Newman serves on the WUN Partnership Board. Associate Vice Chancellor Elizabeth Chilton is an Academic Advisory Group Member and the WUN campus coordinator.
Research Nets Graphene Discoveries
Two studies by UMass Amherst engineers are expanding our knowledge of how to use graphene, a thin but strong material with great promise in hundreds of nanotech applications. Electrical and computer engineer Zlatan Aksamija and graduate student Arnab K. Majee solved the longstanding question of how the boundary between grains of graphene affects heat conductivity in the substance's thin films. Their findings bring developers a step closer to being able to engineer films at a scale useful for cooling microelectronic devices and a plethora other nano-applications.

In a separate study, Jae-Hwang Lee, mechanical and industrial engineering, is the lead author of a study that demonstrates experimentally that graphene is 10 times more effective than steel when used in bulletproof vests. Graphene, made up of a single layer of carbon atoms, is strong and has excellent thermal conductivity.

Star Telescope Illuminates the Universe
The Large Millimeter Telescope (LMT) is now in operation on the summit of Volcan Sierra Negra in the state of Puebla, Mexico. Situated at an altitude of 4,600 meters, it is the world’s largest single-dish millimeter-wavelength telescope, enabling scientists to explore the physical processes that led to the formation and evolution of stars, galaxies, black holes, and planetary systems. The LMT is a binational collaboration between UMass Amherst and the Instituto Nacional de Astrofísica, Óptica y Electrónica. It is also the nerve center for the Event Horizon Telescope, a network of antennas that make up the largest telescope ever.

Using Safe Salmonella Bacteria to Attack Cancer Cells
Chemical Engineer Neil Forbes has received a five-year, $1.56-million grant from the National Institutes of Health to create nontoxic Salmonella bacteria that deliver cancer-killing agents inside tumors.

For more than 12 years, Forbes has been developing non-pathogenic Salmonella bacteria that propel themselves to find and enter tumors to deliver the cancer-fighting agents and to do it without causing the serious side effects of many chemotherapy treatments.

Forbes says his special Salmonella bacteria are attracted to tumors and accumulate inside them. Once they swim through the tumor tissues they deliver genes and proteins that disrupt cancer stem cells, reduce the volume of the tumors, and help prevent the cancer from moving to other areas of the body. The bacteria can also follow where the cancer cells have already moved inside the body, disrupting the spread of the cancer.

This dual targeting, finding and attacking tumors as well as any new tumors that may be spreading throughout the body, make this a potentially powerful treatment mechanism that has the potential to treat cancer at very early stages, Forbes says.
Fiscal Year 2015 Research Activity

Proposals Submitted: ....................... 1,333
Proposal Dollars: .......................... $592.7 million
Awards: .......................... .......................... 1,076
Award Dollars: .......................... $186.6 million
Total Research and Development Expenditures: .......................... $200.2 million*


Distribution of Award Dollars from Federal Agencies
$100,408,093

Distribution of Award Dollars from the Private Sector
$37,607,989

Three-Year Rolling Average of Awards FY 2006-2015

Access the campus's full sponsored activities report at: www.umass.edu/research
UMASS START-UP COMPANIES

Cyta Therapeutics Inc. (Drug Delivery Technologies)
Cyta Therapeutics was recently founded to commercialize drug delivery technologies developed by Professor Sankaran “Thai” Thayumanavan and his colleagues in the chemistry department. By creating chemically unique “nanogel” spheres in the presence of drugs and then coating the outside of the spheres with tissue-specific antibodies, drugs can be delivered exclusively to the tissues where they are needed, thus limiting side effects such drugs can cause when administered to the whole body. For example, this technology may be able to limit or eliminate such terrible side effects of chemotherapy as hair loss and weakness by delivering the drug only to tumor cells and reducing the total amount of the drug given to a patient. Cyta is exploring a wide variety of therapeutic uses for this technology.

MicrobeElectric, LLC (SMART Soil and Groundwater Monitoring Services)
Professor Derek Lovley and his colleagues in the microbiology department have shown that the microorganism Geobacter can produce a tiny electric current. They have also developed a ground sensor system that can amplify and detect this electric current, which can provide critical information about groundwater and soil contamination. This system, called Subsurface Microbial Activity in Real Time (SMART), will be further developed by the startup company MicrobeElectric LLC to provide real-time soil and groundwater-monitoring services to industrial sites, landfills, refineries, and owners of buried fuel tanks, such as gas stations. By providing continuous monitoring of contaminants, MicrobeElectric will enhance management and progress monitoring of environmental clean-up efforts at remediation sites and provide nearly instant notice should an underground tank begin to leak.

PearlPod LLC (Hormonal Moderating Technology)
Horses are among our most important animals, providing great sport and pleasure through saddle rides, horse-and-buggy rides, and pony rides, and providing entertainment from horse racing, jumping, and dressage. Unfortunately, female horses can act erratically during their mating season, disturbing or even endangering riders. Carlos Gradil, veterinary and animal sciences, has developed a unique intrauterine device that can moderate hormonal activity during the mating season and avoid such concerns. Initial testing shows the devices to be easy to use and very reliable. PearlPod LLC will further develop the horse IUD and explore possible contraceptive uses for this unique device in pets, and ultimately in humans.

UMASS AMHERST LICENSING ACTIVITY

Metabolix Inc.
Metabolix Inc. entered into an exclusive license agreement with UMass Amherst for a plant enhancement technology. The license covers a novel crop-improvement technology developed by Danny Schnell, Bibin Paulose, Mine Canakci and Michelle DaCosta of UMass Amherst’s College of Natural Sciences. Headquartered in Cambridge, Mass., Metabolix is an advanced biomaterials company with core capabilities in a number of areas, including plant genetics and botanical science.

ReclaimRx, LLC
ReclaimRx, LLC, a small business engaged in the development and commercialization of products and services that facilitate structural analyses of therapeutic proteins, has entered into an exclusive license agreement with UMass Amherst. The agreement covers UMass’s patent rights to a protein-labeling and structural-comparison technology developed by Richard Vachet, chemistry, and Eric Graban of ReclaimRx.
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<td>Igor A. Kaltashov</td>
<td>USP 8,766,179</td>
<td>Temperature-Controlled Electrospray Ionization Source and Methods of use thereof</td>
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<td>Sankaran Thayumanavan, Richard W. Vachet</td>
<td>USP 8,969,026</td>
<td>Polymeric Inverse Micelles as Selective Peptide Extraction Agents and Related Methods of MALDI-MS Analysis</td>
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<td>Sankaran Thayumanavan</td>
<td>USP 9,012,584</td>
<td>Organoboronate Nanoparticles and Methods of Using the Same</td>
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<tr>
<td>Craig T. Martin</td>
<td>USP 9,045,740</td>
<td>Modified T7-Related RNA Polymerases and Methods of Use Thereof</td>
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<td><strong>Food Science</strong></td>
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<td>David Julian McClements, Eric A. Decker</td>
<td>USP 9,040,109</td>
<td>Cross-Linked Biopolymers, Related Compositions and Methods of Use</td>
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<td><strong>Mechanical &amp; Industrial Engineering</strong></td>
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<td>Kourosh Danai</td>
<td>USP 8,712,927</td>
<td>Systems and Methods for Parameter Adaptation</td>
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<td><strong>Microbiology</strong></td>
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<td>Derek Lovley</td>
<td>Japan 5613364</td>
<td>Microbial Fuel Cells (joint w/ Toyota)</td>
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<td><strong>Polymer Science &amp; Engineering</strong></td>
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<td>Todd S. Emrick</td>
<td>USP 8,802,738</td>
<td>Polysters with Grafted Zwitterions</td>
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<td>USP 8,895,688</td>
<td>Halogen-free Flame Retarding Materials Based on Bisphenol Triazole Resins and Polymers</td>
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<td>Alfred J. Crosby</td>
<td>USP 8,906,283</td>
<td>Stimuli Responsive Surfaces and Related Methods of Use</td>
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<td>USP 8,852,694</td>
<td>Articles Including Surface Microfeatures and Methods for Forming Same</td>
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<td>Alfred J. Crosby, Ryan Hayward</td>
<td>USP 8,906,284</td>
<td>Crosby/Wrinkled Adhesive Surfaces and Methods for the Preparation Thereof</td>
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<td>Thomas P. Russell</td>
<td>USP 9,018,649</td>
<td>Method of Producing Nanopatterned Articles, and Articles Produced Thereby</td>
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<tr>
<td>Alan J. Lesser, Thomas McCarthy</td>
<td>USP 8,883,919</td>
<td>Reinforced Polymetric Materials, Methods of Manufacture Thereof and Articles Comprising the Same</td>
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*No longer at UMass Amherst
**Deceased
The University of Massachusetts Press publishes books of outstanding scholarly and artistic merit and distributes them as widely as possible, contributing to the stature of the university as a center of innovative research and sustaining the university’s contribution to a national and international conversation centered on new ideas and insightful scholarship. The press’s peer-reviewed books, many of them award-winning, are offered at affordable prices in a variety of print and electronic formats.

Editorial is overseen by a faculty board whose members represent a broad spectrum of academic departments. In FY15 the press published 39 new titles and sold a total of 42,537 books, of which 6.88 percent were e-books. Revenues amounted to $865,588.

NOTABLE AWARDS, FY 2015

Three books from the series Public History in Historical Perspective, edited by UMass Amherst Professor of History Marla Miller, won honors:

**NCPH Book Award, 2015:** From Storefront to Monument: Tracing the Public History of the Black Museum Movement, by Andrea Burns

**NCPH Book Award, Honorable Mention, 2015:** Alice Morse Earle and the Domestic History of Early America, by Susan Williams

**Henry Ford Heritage Association Book Award, 2015:** History Is Bunk: Assembling the Past at Henry Ford’s Greenfield Village, by Jessie Swigger

The press’s other prize-winning books include:

**John Lyman Book Award for Naval and Maritime Reference Works and Published Primary Sources, 2015:** Living with Whales: Documents and Oral Histories of Native New England Whaling History, by Nancy Shoemaker

**Ruth Emery Award, Victorian Society In America, 2014:** Community by Design: The Olmsted Firm and the Development of Brookline, Massachusetts, by Keith Morgan, Elizabeth Hope Cushing, and Roger Reed

**Ewell L. Newman Award, American Historical Print Collectors Society, 2014:** Creating a World on Paper: Harry Fenn’s Career in Art, by Sue Rainey

**Western Association of Women Historians Penny Kanner Prize, Honorable Mention, 2014:** One Colonial Woman’s World: The Life and Writings of Mehetabel Chandler Coit, by Michelle Marchetta Coughlin

**John Lyman Book Award in Maritime History, Honorable Mention, 2014:** A Bold and Hardy Race of Men, by Jennifer Schell

SPECIAL RECOGNITIONS

*Boston’s Cycling Craze, 1880–1900: A Story of Race, Sport, and Society,* by Larry Finison, was listed among the “Best New England Books of 2014” by *The Boston Globe.*

The Juniper Prize for Poetry winner *The Theme of Tonight’s Party Has Been Changed: Poems,* by Dana Roeser, was listed among the “Top Ten Poetry Books of 2014” by the *Baltimore City Paper.*

*SOS—Calling All Black People: A Black Arts Movement Reader,* edited by John Bracey, Sonia Sanchez, and Jim Smethurst, was listed among the “Best Books of 2014” in *Essence Magazine.*
Creative Accomplishments

Amy Altadonna: *The Other Place*, by Chris Hanna, produced by the Virginia Stage Company at Wells Theater, Norfolk, Va. (January 2015).

Eric Berlin: *Fantastique—Premieres for Trumpet and Wind Ensemble*, an MSR Classics CD with Richard Kelley, Charles Schlueter, Greg Spiridoupolis, the UMass Wind Ensemble, and James Patrick Miller. Includes two pieces by faculty member Jeffrey W. Holmes: *Continuum for Trumpet, Trombone, and Wind Ensemble* and *Herald Emeritus Fanfare*.


Paul Dennis: *Bespoke(n)*, choreographed by Deborah Goffe in collaboration with performer Paul Dennis. Produced by Ariel Rifka Dance Company at New York Live Arts (May 2015).


Olga Gershenson: Curated film series *World War I—Jewish Experiences in the Trenches and at the Homefront*, at the Center for Jewish History, New York (Fall 2014).

Copper Giloth: *Labyrinth of Fables/Le Labyrinthe Des Fables*, app release on iTunes and Google Play (July 2014).


Robin Mandel: *Hold #1*, selected by juror George Fifield for exhibition in the show “Intelligent Objects” at Creative Arts Workshop, New Haven, Conn. (June 2015), and selected as one of two of the show’s prizewinners, resulting in a solo show to come January 2016.

Joshua Michal: Performed as assistant principal horn with the Cincinnati Symphony Orchestra and May Festival Chorus for their production of Hector Berlioz’ *Requiem* (May 2015).

Felipe Salles: *Ugandan Suite* featured in Downbeat Magazine’s “Best Jazz CDs of 2014” (January 2015).

Felipe Salles: Soloist and featured composer with The Felipe Salles Quintet at Jazz na Fabrica, Sao Paulo, Brazil, hosted by SESC Pompeia (August 2014).


Gilles Vonsattel: performed with the Amphion Quartet in the Chamber Music Society of Lincoln Center’s summer series (July 2015).


Birthmark, Stephen Clingman (Jacana, 2015).

Mau Tempo no Canal de Vitorino Nemesio: Traducao, Simbolisimo, Escrita, Oralidade, Diaspora, Francisco Cota Fagundes (Ponta Delgada, Portugal, 2014).

Undergraduate Education for Public Health in the United States, Cheryl Lynn Addy, Daniel Shea Gerber, David Thomas Dijack, and Connie J. Eavashwick, eds. (Frontiers, 2015).


Epistemic Communities, Constructivism, and International Environmental Politics, Peter M. Haas (Routledge, 2015).

Improving Global Environmental Governance, Norichika Kanie, Steinar Andresen, and Peter M. Haas (Routledge, 2014).


Bede and Aethelthryth: An Introduction to Christian Latin Poetics, Stephen Harris (West Virginia University, 2015).


The Defocusing Nonlinear Schrodinger Equation: From Dark Solitons to Vortices and Vortex Rings, P. G. Kevrekidis, D. J. Frantzeskakis, and R. Carretero-Gonz´alez (SIAM, 2015).


We the Students and Teachers, Robert Maloy and Irene S. LaRoche (SUNY Press, 2015).


The Architecture of Paul Rudolph, Timothy M. Rohan (Yale University Press, 2014).


How to Prevent Special Education Litigation, David Schimmel (Teachers College Press, 2015).


Street Corner Secrets: Sex, Work, and Migration in the City of Dubai, Svati Shah (Duke, 2014).

Jewish Pasts, German Fictions, Jonathan Skolnik (Stanford University Press, 2014).


La Pantalla Sexuada, Barbara Zecchi (Cátedra, 2014).

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This image, created as part of the x-ray crystallography process executed in biological chemist Jeanne Hardy’s laboratory, depicts a high-resolution crystal structure of the dengue virus protease, an enzyme required for function of the deadly ‘bone-break fever’, which has now been detected in mosquitos in North America. The procedure beams x-rays through lab-grown crystals made up of trillions of copies of a protein, enabling an atom-by-atom view of the protein. Graduate student Muslum Yildiz used this image to show how using certain inhibitors to alter the structure of dengue virus protease may prevent the infection.

Photo: Jeanne Hardy Laboratory