SEE HOW WE IMPACT THE WORLD

From studies that inform evidence-based medicine to investigations that help explain the dynamics of storms, research at the University at Albany has a wide-ranging impact.

This report highlights how UAlbany research enhances the welfare of both local communities and distant nations. You’ll learn about outstanding faculty members who are leading the way through innovation, creativity and discovery. UAlbany investigators are addressing the ever-growing threat of cybercrime and developing new methods for solving crimes. Across disciplines, researchers are studying how to manage and best use the massive amounts of digital data now available.

Faculty are putting their expertise to work around the globe assisting governments in controlling trade of goods and technologies related to weapons of mass destruction. And closer to home, UAlbany scientists are working with and seeking partners to put their discoveries and innovations to work for the greater good.

These are some of the ways in which the University at Albany is making a real difference for society today.

Robert J. Jones, Ph.D.  
President

James A. Dias, Ph.D.  
Vice President for Research
With funding from the New York Capital Region Research Alliance and inspiration from a White House initiative to advance brain research, UAlbany faculty researchers continue tackling Alzheimer’s disease. Research encompasses new treatments, an early detection sensor, and a diagnostic method to differentiate Alzheimer’s from other forms of dementia. Faculty utilize evidence-based practice modeling to support health and life-long learning among aged persons.
FOSTERING COLLABORATIONS FOR BETTER CAREGIVING

School of Social Welfare Professor Philip McCallion’s research has made significant scholarly contributions to caregiving and community-based aging efforts. By emphasizing the interaction of informal care with formal services and collaboration across service systems, his work has generated best practice strategies, supported widespread delivery of evidence-based interventions, informed workforce development, and created tools for aging-prepared communities.

Reflecting their collaborative, evidence-based and translational focus, McCallion and colleagues in the Center for Excellence in Aging & Community Wellness are pursuing a Health Research, Inc. and CDC-sponsored NYS Department of Health Arthritis Program that targets 50,000 New Yorkers with arthritis using evidence-based health promotion interventions. The program incorporates web-based education and workforce development to connect communities to best health practices and vital resources.

A New York State Office for the Aging effort to develop an Administration on Aging Systems Integration Initiative stems from McCallion’s research on information and assistance, care transitions, benefit access, options counseling, participant direction, and evidence-based health interventions. It seeks to better understand the system-level prerequisites for transforming long-term services and strives to support older adults to live in their communities as long as they wish.

THE CHANGING HEALTH PATTERNS OF OLDER ADULTS

Using data from nationwide surveys regarding the elderly in the U.S. and Japan, Benjamin Shaw of the School of Public Health is conducting a four-year National Institutes of Health-funded study on how older adults’ patterns of physical activity, substance use, and health care utilization change with increasing age.

Shaw’s study also looks at how racial, socioeconomic and cultural differences, as well as psychosocial factors of the elderly, impact health behaviors and quality of life.

Although individual health behaviors, including alcohol consumption, smoking, physical activity, and weight management, have been widely studied, Shaw believes we currently know little about how these behaviors change in later life. His study aims to:

- Describe how individual health behaviors change during old age;
- Assess the extent to which variations among individuals in late life health patterns of behavior are influenced by key social status indicators and psychosocial factors;
- Analyze the interrelationships between health outcomes and various health behavior changes during late life; and
- Compare and contrast the prevalence, determinants, and health impact of various patterns of late-life health behavior change in the U.S. and Japan.
Mining Big Data

Across disciplines at the University at Albany, researchers are studying how to manage and best utilize massive amounts of digital data. The Center for Technology in Government, for example, has developed critical tools for government to better comprehend data and make it available to the masses. Faculty are designing systems to process large data sets and algorithms for analyzing the structure of social networks.
MINING MEDICAL RECORDS TO IMPROVE HEALTH CARE

A patient’s medical record typically contains a vast amount of information, some standardized for use in computer information systems, but much written unstructured in free text. How best to mine the text and make it readily accessible is the challenge being addressed by Özlem Uzuner of the Department of Information Studies. In collaboration with Partners Healthcare in Boston, Uzuner is developing natural language processing technology to automatically extract information from narrative medical records. These records contain comprehensive information about patients’ symptoms, diseases and treatments. The technology that underlies her work is the same that underlies the IBM Watson computing system. Computing power is harnessed to rapidly process information to better understand the meaning and context of human language.

The ability to readily access the information in narrative records has a number of potential benefits. It can provide more complete information to all involved in a patient's care. Sometimes, for example, a reaction to a prescription might lead to a hospital emergency room visit, but all the records relating to this may not be linked and accessible. For researchers, the information access can provide evidence of clinical trends, adverse events, and disease incidences.

LARGE SCALE DATA ANALYSIS ADVANCES RESEARCH IN THE LIFE SCIENCES

New state-of-the-art equipment at UAlbany’s Cancer Research Center is a sign of both the growing importance of advanced data analytical capabilities in research and the steps UAlbany is taking to train the next generation of scientists. The equipment includes an advanced mass spectrometer for protein analysis and instrumentation for monitoring changes in DNA and RNA.

The instrumentation enables scientists to acquire and analyze massive amounts of information. Scientists at the Cancer Research Center use these high-tech tools as they study breast and prostate cancer genetic mechanisms.

The instrumentation in the Cancer Research Center will also be used in UAlbany’s planned bachelor's degree program in bioinstrumentation, offered by the School of Public Health. The program is designed to give students hands-on experience with the complex equipment used in research today and to develop their expertise in data analytics, providing them with the skills biotech companies seek.

Many other life sciences researchers are also harnessing big data in their work. College of Nanoscale Science and Engineering Associate Professor Thomas Begley analyzes large data sets in his work to develop nanoscale-based diagnostic tools and a knowledge base that promotes personalized medicine.
Forensics plays a vital role in the criminal justice system and in research underway at the University at Albany. One emerging area of research focus is the growing threat of cybercrime. Cyber security and warfare-related projects include the investigation of computer security threats such as botnets and malware, risk analysis, security policy development and evaluation, security modeling, and development of self-organized complex systems.
CHEMISTS APPLY A LASER FOCUS ON SOLVING CRIMES

University at Albany chemist Igor Lednev is applying his laser spectroscopy expertise to the development of new scientific methods for solving crimes.

These crime scene methods include the analysis of gunshot residue to help determine the caliber and type of weapon and an easy-to-use approach for identifying body fluids. Both methods make use of laser spectroscopy, which focuses a laser beam on a sample, yielding a characteristic light emission that can be analyzed by a spectrometer. Well-suited for forensic analysis, spectroscopy does not destroy evidence and requires limited sample preparation.

In the absence of a weapon or discernible gun ammunition remains at a crime scene, gunshot residue can become critical evidence. Such residue comprises particles from the parts of the ammunition and firearm that explode or reside near points of explosion including the primer, propellant, and tiny particles of the cartridge case and gun itself.

Lednev’s team uses a type of laser spectroscopy, near-infrared Raman microspectroscopy, and advanced statistics to analyze gunshot residue to determine the type of ammunition used, and then, through comparisons and elimination, what kind of a gun was used in the crime.

With his work on gunshot residue analysis and identification of body fluids at crime scenes, Lednev is aiming to optimize methods for use in real-life crime investigations.

DIGITAL IMAGE FORENSIC SPECIALIST UNCOVERS FAKE PHOTOS

A team led by University at Albany computer scientist Siwei Lyu has developed a new method for authenticating digital images by analyzing “noise,” the digital equivalent of film grain which is generally invisible to the human eye.

Using statistical and computational analysis, the method effectively measures noise strength across a photo to determine which parts of the photo originated from different sources.

Numerous factors, during and after a photo is taken, introduce noise, such as temperature and thermal conditions, sensor saturation, quantization, compression, and transmission. Since an unaltered image is expected to have uniform noise strength across all pixels, altered photos demonstrate inconsistencies in noise variances.

Whenever a photo is manipulated digitally, the underlying characteristics of the image pixels are disturbed in a way that they become unnatural. Though human eyes may not be able to detect such subtle changes, they can be readily picked up by computer algorithms. The techniques developed by Lyu aim to ensure that significant manipulations can be detected. The new method does not explicitly rely on the knowledge of image format, camera model, or tampering procedure, and has a high level of detection accuracy.

Lyu, the recipient of a highly competitive Faculty Early Career Development Award from the National Science Foundation, developed the new method through his work with the New York State Center for Information Forensics and Assurance.
Global Reach

In 2012, UAlbany served global populations as atmospheric scientists journeyed to the Andes and Antarctica to study the effects of glacier melt and to enhance global models of climate change. Educators explored how universities impact national economies, while public policy experts created learning tools to recognize terrorist groups, promote conflict resolution and aid peaceful development through more open government.
CONTROLLING THE SPREAD OF WEAPONS OF MASS DESTRUCTION

Bryan Early’s expertise on economic sanctions, the proliferation of nuclear and aerospace technology, and the use of strategic trade controls as tools of economic statecraft, have taken him around the globe.

The Rockefeller College professor directs the Project on International Security, Commerce, and Economic Statecraft (PISCES) at the Center for Policy Research. Partnering with his PISCES team, Early has obtained more than a dozen grants, including approximately $1.75 million in funding from the U.S. State Department to provide strategic trade control assistance to countries in South America, Europe, Africa, the Middle East, and Asia.

Since the Soviet Union’s fall, the U.S. Government has actively aided countries seeking to impose more stringent controls on their international commerce involving goods and technologies related to weapons of mass destruction (WMD).

Early and PISCES colleagues are meeting this challenge, conducting programs in Armenia, Lebanon, Kazakhstan, Kosovo, the Kyrgyz Republic, and Oman, with future assignments scheduled in Brazil, Saudi Arabia, and Taiwan.

Early emphasizes there is no “one-size-fits-all” solution to the challenge of WMD proliferation. His team draws on their academic and legal knowledge, their skills as policy analysts, and their practical understanding of the political systems of the countries they work with to help them enhance their systems of control over potentially dangerous goods and technologies.

BUILDING CITIZEN PARTICIPATION IN KENYA

UAlbany’s Center for International Development (SUNY/CID) is working with Kenya to strengthen and expand its representative institutions, more than a decade after it began helping the Kenya National Assembly (KNA) become one of the most robust legislatures on the African continent.

Since 2000, supported by grants from the U.S. Agency for International Development (USAID) and the United Kingdom’s Department for International Development (DFID), SUNY/CID has conducted more than 250 workshops and seminars related to parliamentary processes, budgeting and institutional reform. It has funded and guided 150 interns to support a new committee system and technical staff in Kenya, and produced more than 400 research reports.

New USAID and DFID funding support SUNY/CID’s latest efforts, which bring Center staff together with Kenyan researchers and fact-finders to consolidate Kenya’s parliament as a leading societal force.

New developments have included a bicameral legislature through institution of a Kenyan Senate, effective funding and oversight committees, and legislative budget-making that funds both the federal government and 47 county legislatures. Professional staff services now include research, budget and legal counsel offices. After recent elections, all legislative members and staff received training, as did 150 newly elected county assembly speakers and staff.

The devolution of power to the counties is a key aspect in Kenya’s goal of increasing citizen participation and service delivery throughout the nation.
LANCE BOSART:
A LIFETIME OF CONTRIBUTIONS TO METEOROLOGY

Department of Atmospheric and Environmental Sciences Distinguished Professor Lance Bosart is among the world’s most influential synoptic-dynamic meteorologists. He is the recipient of a National Weather Association’s (NWA’s) Lifetime Achievement Award and a Jule Charney Award, one of the American Meteorological Society’s (AMS’s) highest prizes. Over the past four decades, Bosart’s diverse areas of interest have included planetary-scale and mesoscale meteorology, particularly involving winter storms, hurricanes, organized convective systems and the predictability of individual flow regimes, as well as weather analysis and the forecasting process.

Bosart’s influence on synoptic-dynamic meteorology, the study of weather processes occurring over a horizontal range of 1,000 kilometers or more, has been vast. A strong observationally based discipline in 1950, the field expanded to include numerical investigations based on modern synoptic-dynamic principles by a small cadre of scientists, introducing Bosart and his well-funded studies into such areas as explosive cyclogenesis, hurricanes, fronts, and tornadoes.

In the 1990s and 2000s, Bosart and other synoptic-dynamic meteorologists used newly produced global gridded datasets to investigate weather phenomena around the world and to link tropical, midlatitude and polar weather systems.

Bosart’s funded research is extensive, including 39 grant awards in the last decade, most originating from the National Science Foundation and National Oceanic and Atmospheric Administration. He has researched systems spanning five continents working on a variety of multiscale (time and space) research problems that relate to the weather and climate of higher latitude, middle latitude and tropic regions.

His career extends beyond research to teaching and service. Arriving at UAlbany in 1969 after receiving his Ph.D. from MIT, Bosart remains an active instructor. He was credited by the NWA with “educating a generation of researchers, professors, forecasters, and NOAA employees.” In 2002, he received the first AMS Teaching Excellence Award, now named after Edward N. Lorenz (the father of chaos theory).

Bosart has served the research and operational community in many ways. The international Cyclone Workshop, which he helped found in the early 1980s, has grown significantly and continues today. Bosart has also been instrumental in organizing international symposia and summer schools at The National Center for Atmospheric Research, where he holds an Affiliate Scientist position, in Boulder, CO.
EDWARD HANNAN:
NEW YORK STATE CARDIAC BYPASS REPORTS IMPROVE SURVIVAL RATES

Distinguished Professor and Associate Dean Emeritus of the School of Public Health Edward L. Hannan is a nationally and internationally acclaimed leader on health care quality and outcomes. Hannan brings evidence-based medicine to practicing clinicians.

He was one of the first investigators to demonstrate that lower mortality and fewer complications are associated with high-risk cardiovascular procedures when hospitals and surgeons perform higher volumes of these complex procedures.

Since the 1980s, Hannan has been involved in the development and use of clinical and claims databases for cardiac surgery, angioplasty, trauma care, carotid endarterectomy, cancer, and hip fractures. These databases identify significant risk factors for mortality and complications, predict the occurrence of these adverse events, and assess hospital and physician performance.

In the cardiac surgery/angioplasty arena, he has been working with the New York State Department of Health for nearly 25 years to improve quality and access to cardiac procedures. This includes the development of the first clinical database for public reporting of health outcomes in the country and the issuance of annual public reports for cardiac surgery and coronary angioplasty. These reports have been credited with reducing the coronary artery bypass graft (CABG) surgery and angioplasty mortality rates to among the lowest in the country.

Hannan has also been active in conducting numerous comparative effectiveness studies for different cardiac procedures (e.g., CABG surgery and angioplasty, different types of coronary stents, CABG surgery with and without a heart-lung machine) which resulted in the establishment of evidence-based medicine that has led to the development of national cardiac guidelines.

Hannan earned a Ph.D. in industrial engineering and operations research from the University of Massachusetts, Amherst. He is a fellow of the American College of Cardiology, a rare honor for a non-physician, and was named the First Distinguished Visiting Clinical Research Scientist by Duke University.

Hannan has published more than 200 peer-reviewed studies in the *New England Journal of Medicine*, the *Journal of the American Medical Association*, *Circulation*, and numerous other prestigious journals. He currently holds more than $2 million in annual grant funding from New York State, the National Institutes of Health, and the federal Agency for Healthcare Research and Quality.
STUDENTS TAKE RNA DISCOVERIES FROM LAB TO MARKET

In 2012, The RNA Institute at UAlbany launched its inaugural Thermo Fisher Student Venture Fund program, further underscoring the significant role universities play in combining research with entrepreneurship and economic growth. The program awarded two teams of science and business students $50,000 each to develop commercially viable RNA-technology projects.

Made possible through funding from biotech manufacturer Thermo Fisher Scientific, Inc., the interdisciplinary program unites graduate students and postdoctoral fellows from The RNA Institute, College of Arts and Sciences, and UAlbany’s School of Business. Participants develop inventions and submit proposals to advance the commercialization of RNA technology. The winning teams are required to demonstrate proof of principle and conduct a detailed market analysis for their inventions, with additional in-kind support from School of Business partners.

Thermo Fisher Venture Fund winners, from left, Papa Nii Asare Okai, Vitali Sikirzhytski, Ryan Henderson, Rabi Musah, Brady Bieniek, William Ellithorpe

The inventions and proposals were formulated through an entrepreneurship course designed by School of Business lecturer and investment banker Fred Buse, and judged by a committee of Thermo Fisher and The RNA Institute representatives.

In addition to developing novel technologies aimed at furthering the discovery of therapeutics, diagnostics, and forensics with application to RNA, the project also created a unique collaboration among life scientists and MBA students that catalyzed RNA science commercialization.

BIOTECH SPIN-OFF RECEIVES PRIVATE INVESTMENT

Five-year-old HocusLocus, LLC, a University at Albany biotechnology spin-off, received an investment that will advance its scientific reputation and increase National Institutes of Health (NIH) funding opportunities.

HocusLocus uses ribonucleic acid (RNA)-binding proteins to identify RNA involved in specific diseases and tissues. The company, which works with UAlbany inventor Scott Tenenbaum, received the funding in 2013 from private investment firm Eastern New York Angels (ENYA).

According to HocusLocus chairman Edward Eveleth, ENYA’s support bolsters the company’s credentials as it conducts research at both HocusLocus and Tenenbaum’s labs. It also adds weight to the company’s upcoming submission to NIH for a Phase II award, which would confirm the technical merit and commercial potential of the research, and bring an increase in funding of up to $1 million. HocusLocus earned an NIH Phase I award of $293,000 in September 2011.

Tenenbaum developed pioneering work on post-transcriptional regulation called RNA switching technology, which HocusLocus licensed in 2009. Since then, the company has been developing a diagnostic kit that allows researchers to detect the real-time production of specific miRNAs in living cells without destroying them in the process, an important advance for basic biological research and a potential huge benefit to stem cell technology.
PLANTING “SEEDS” OF SMALL BUSINESS GROWTH

Since 1984, the Small Business Development Center (SBDC) in the University at Albany’s School of Business has mentored more than 20,000 entrepreneurs, helping them access more than $320.8 million in local economic investment, and creating nearly 11,000 jobs in Albany’s Capital Region.

In 2011, the SBDC collaborated with faculty and students from the schools of Business and Social Welfare, as well as with area business organizations, SEFCU, and Empire State Development (ESD), to create the Small Enterprise Economic Development (SEED) program, the Capital Region’s first character-based microloan initiative.

With a $2.5 million revolving loan fund established by SEFCU and nearly $200,000 in support from ESD, SEED has awarded 28 loans totaling $995,000, and helped create and/or save 112 regional jobs. New firms have taken root at a more rapid rate than with conventional entrepreneurial assistance programs because the project targets passionate entrepreneurs who cannot secure loans based on standard financial criteria.

The program provides these individuals with technical assistance, training, mentoring, and peer support to start and/or expand their companies. Since SEED’s inception, 37 entrepreneurs have completed the program and increased their knowledge of small business ownership, development of business models, and the benefits of social support.

SEED participant Patricia Greenwood
Professor Li Niu in the Department of Chemistry is making strides in the fight against Lou Gehrig’s disease or Amyotrophic Lateral Sclerosis (ALS). Niu holds four patents and has two pending patent applications for RNA aptamers, which is a novel class of drug candidates for the potential treatment of ALS.

ALS is a progressive neurodegenerative disease characterized by selective degeneration of lower motor neurons in the spinal cord and brainstem and upper motor neurons in the motor cortex. The disease is characterized, as well, by the loss of motor neurons which eliminates the brain’s ability to initiate and control muscle movement. The life expectancy of an ALS patient averages two to five years; currently there is no cure and few effective treatments.

Niu’s research involves a family of proteins called glutamate ion channel receptors, which are indispensable to brain functions such as memory and learning. When the receptors are excessively activated, extra calcium ions get into the cell, inducing cell death and making these channels potential targets for drugs against ALS.

The challenge remains that most inhibitors of glutamate ion channel receptors synthesized as potential ALS drugs are poorly water soluble and are generally non-specific organic compounds. Niu believes RNA molecules can be identified and used to inhibit glutamate ion channel receptors with good water solubility, higher potency and better selectivity. His research involves chemical modifications to improve stability or resistance to RNA-degrading enzymes so the aptamers have reasonable lifetime in vivo. His research group plans to test the effectiveness of these RNA aptamers in ALS animal models. The aptamers could also be used for potential treatment of epilepsy, stroke and other neurological diseases.

Niu’s research is supported by grants from the National Institutes of Health, the Department of Defense, and the Muscular Dystrophy Association.
TARGETING PROTEINS TO BLOCK PAIN

UAlbany Biologist Sho-Ya Wang has been awarded four patents based on her research on sodium channels, a class of proteins which play an important role in the effect of bioactive components ranging from local anesthetics to animal toxins.

Sodium channels conduct sodium ions (Na+) through a cell’s plasma membrane. Wang’s research is focused on the topology and functioning of the receptors in sodium channels that are targeted with local anesthetics. The targeting action normally results in the blocking of the sodium channels, thereby eliminating pain, but in cases of chronic or intractable cancer pain, the duration of the blocking action is often not sufficient. Wang is seeking to develop compounds that would more effectively block sodium channels and serve as longer-acting local anesthetics.

Wang’s patents cover mutant cell lines and a method for assessing the potential of compounds to modulate voltage-gated sodium channels. For example, the method could be used to screen drug candidates for their ability to treat a pathological condition, such as cardiac arrhythmia, that is manifested by increased persistent late sodium currents in the heart.

Furthermore, the invention provides the basis for a high throughput screen, which could accelerate the search for therapeutic agents.
Beyond its vast portfolio of research across an array of disciplines, the University at Albany deeply values the creative and scholarly achievements of its faculty in the arts and humanities. The New York State Writers Institute’s yearly hosting of great writers and filmmakers, the variety of outstanding productions at the Performing Arts Center, and the thought-provoking exhibits of the University Art Museum truly enrich the region.

HER SMALL STORIES REAP AN ABUNDANT LITERARY HARVEST

Department of English Professor Lydia Davis creates works of fiction that, by her standards, run long at two, three, or as many as nine pages. Others, however, can be as brief as a paragraph, or even a sentence. No matter the length, what is on the page acutely penetrates human feelings and transfixes readers through its originality, as underscored by Davis being awarded the fifth-ever Man Booker International Prize for fiction.

Davis, also a fellow at the New York State Writers Institute, has produced six short story collections, including *Collected Stories of Lydia Davis* (2009), *Varieties of Disturbance* (2007), and *Break It Down* (1986). A new collection, *Can’t and Won’t*, is due to be published in 2014.

She is also an accomplished translator, whose English versions of Marcel Proust’s *Du Cote de Chez Swann (Swann’s Way)* and Gustave Flaubert’s *Madame Bovary* helped earn her a Chevalier of the Order of Arts and Letters in France. She received a MacArthur Fellowship in 2003.

### UNIVERSITY AT ALBANY 2012 TOTAL EXPENDITURES BY SPONSOR TYPE
EXCLUDES COLLEGE OF NANOSCALE SCIENCE & ENGINEERING

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2012 TOTAL EXPENDITURES BY SPONSOR TYPE

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### FACILITIES AND ADMINISTRATIVE COSTS BY SPONSOR TYPE -
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FACILITIES AND ADMINISTRATIVE COSTS BY SPONSOR TYPE

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For more information about research at the University at Albany, visit www.albany.edu or contact:
James A. Dias, Ph.D., Vice President for Research, 518.956.8170 or jdias@albany.edu