



MONTCLAIR STATE UNIVERSITY COLLEGE OF SCIENCE AND MATHEMATICS



CSAM AT A GLANCE:

- Global research programs span six continents and 25 countries
- 60 percent of all CSAM faculty have been recruited in past 10 years and all from institutions known for research excellence
- 200 faculty research publications every two years
- Strong federal research support from NSF, NIH, DOE, DOI, NOAA, EPA, NASA, DOD, HUD, USDA
- Industry partnerships and R&D collaborations include Celgene, Novartis, PSEG, Bristol-Myers Squibb, Roche, Merck, DuPont, Eisai, TD Bank and Investors Bank
- 44 percent increase in undergraduates and 42 percent increase in graduate students in last decade
- 24 master's and doctoral programs, N.J.'s only PhD program in Environmental Management
- Leading resource for health, life sciences and environmental fields
- Strong science and business leadership, transdisciplinary mindset and fast, flexible, creative entrepreneurial spirit

WHERE DISCOVERY MEETS INNOVATION

Nestled along the southeastern ridge of the **Watchung Mountains** is New Jersey's second-largest higher education institution, Montclair State University. With an unparalleled view of New York City and New Jersey's ever-changing economic and societal landscape, Montclair State plays a uniquely important role in addressing the region's educational and workforce needs.

These changes are especially evident in Montclair State's College of Science and Mathematics (CSAM). Built on a legacy of excellence in science and mathematics teacher preparation, CSAM today plays a significant role in preparing the next generation of professionals and scientists.

"Over the last decade, our focus has been on advancing the University's scientific research capacity to generate new discoveries, processes and technologies that will support the long-term growth of New Jersey's economy," said CSAM Dean Robert Prezant.

All measures of activity in Montclair State's College of Science and Mathematics have increased significantly over the last decade with a 44 percent rise in undergraduate enrollment, a 42 percent increase in graduate enrollment and robust growth in research-active faculty who have, in turn, fueled a rapid expansion in research grant support from all major federal and state agencies.

The participation of New Jersey's business community has also grown remarkably in CSAM – from the establishment of an external Advisory Council comprised of senior executives from New Jersey's private and public sectors to numerous formal partnerships with some of the state's leading science-based companies. "These relationships

significantly contribute to developing curriculum relevant to New Jersey's economic needs, supporting education and research

opportunities for our students and enabling discoveries and innovations that address critical economic and sustainability issues," said Prezant.

Two principal drivers guide Montclair State's science research. The first stems from the campus' proximity to a large segment of the nation's pharmaceutical, bio-pharma and health-related industries.

Montclair State University established the Margaret and Herman Sokol Institute for Pharmaceutical Life Sciences in 2007 to advance transdisciplinary research in medicinal chemistry, pharmacology, biochemistry, natural products chemistry, molecular biology, computational sciences, environmental toxicology and emerging technologies such as biomaterials and nanotechnology.

The second natural driver is due to CSAM's location in the nation's largest urban ecosystem, which continues to face significant challenges in reversing a legacy of poor land-use decisions, compromised land and water quality, habitat degradation and loss and non-sustainable use of natural resources.

Montclair State research scientists are currently engaged in a variety of initiatives that focus on environmental management, contaminant fate and transport, environmental modeling, remote sensing, hydrology, contaminant remediation, seismology, sustainability science, urban and coastal ecology, restoration ecology, biodiversity, watershed management, invasive species, fisheries ecology, climate studies and epidemiological pharmaceutical-global health issues.

"The work of our scientists in the life sciences and environmental management is not only aimed at discovering new knowledge and preparing well educated professionals for New Jersey's workforce, but also on developing innovative solutions and technologies that hold both commercial potential and highly beneficial health and environmental outcomes," said Prezant.

JOHN SIEKIERKA

PhD Biochemistry, NYU; Director, Sokol Institute for Pharmaceutical Life Sciences; former R&D leader at Johnson & Johnson, Merck and Roche. Dr. Siekierka is the recipient of the Johnson Medal and is a New Jersey Inventors Hall of Fame inductee for his role in the design and development of the first drug-eluting coronary stent.

DIANA THOMAS

PhD Mathematics, Georgia Institute of Technology; Associate Professor, Mathematics; Director, Center for Quantitative Obesity Research at Montclair State University. NIH-funded researcher in the area of Computational Modeling to Determine Energy Intake During Weight Loss. Collaborates with Pennington Biomedical Research Center (LSU).

DAVID ROTELLA

PhD Medicinal Chemistry, Ohio State University; Sokol Professor of Chemistry; former R&D leader with Wyeth, Pfizer and Bristol-Myers Squibb. Dr. Rotella has authored over 30 scientific publications, several books and book chapters, currently holds seven patents and has presented more than 30 invited lectures at U.S. universities on drug discovery topics.

NINA GOODEY

PhD Chemistry, University of Texas at Austin; Postdoc, Penn State University; Associate Professor of Chemistry and Biochemistry; NSF-funded researcher studying repurposing of existing drug molecules as inhibitors of the enzyme dihydrofolate reductase in pathogens that cause diseases including filariasis and malaria. Collaborates with Northeastern and Rutgers universities.

THE SOKOL INSTITUTE FOR PHARMACEUTICAL LIFE SCIENCES

BUILDING RESEARCH PROGRAMS OF EXCEPTIONAL POWER AND RELEVANCE

The Sokol Institute for Pharmaceutical Life Sciences is actively engaged

in combining strengths across disciplines and building research programs of exceptional power and relevance. "The answers to so many of today's pivotal global health issues are being found in the blending of science and math, at the juncture of disciplines where research questions are created and are being explored," said Dr. John Siekierka, director of the Sokol Institute and Sokol Professor of Medicinal Chemistry.

PRIVATE AND PUBLIC SECTOR COLLABORATIONS

The Sokol Institute has developed strong research ties with the pharmaceutical, biotechnology and technical services industry. One example is a rapidly expanding collaborative research effort between the Sokol Institute and Celgene Global Health where Sokol researchers are carrying out chemical and biological studies to identify a clinical candidate for treatment of parasitic infections.

Sokol and CSAM research scientists also are leading transdisciplinary initiatives with other university research centers in the areas of chemical biology, oncology, reproductive biology and computational technologies including:

- *Understanding the mechanisms involved in eliminating and/or misplacing a protein with tumor suppression activity in prostate and skin cancer cells.*



PharmFest keynote speaker, Celgene CEO Robert Hugin, points to the critical need for innovation and collaboration among academia, industry and government in the life sciences.

- *A collaborative effort with the St. Barnabas Medical Health Center to develop models and tools to detect and treat poor pregnancy outcomes early in gestation.*

WORKFORCE DEVELOPMENT

Preparing tomorrow's leaders in the life sciences and related health industries is not just a function of immersing students in a rigorous, research-based science curriculum. It is also a matter of grounding students in the context of a rapidly changing life sciences sector. One way this is accomplished is through *PharmFest*, where several hundred industry leaders, scientists and students participate in this interactive industry and academic forum on emerging issues and trends in pharmaceutical life sciences.

Held biennially and sponsored by Montclair State and the HealthCare Institute of New Jersey, *PharmFest* topics range from small molecule and biologic drug discovery and development, to business incubation, nuclear medicine, electronic health records, integrated project management, drug development and the role that life science start-ups represent in the biotech value chain.

"Our focus is on expanding our capacity to generate new discoveries, increase industry participation to support the life sciences R&D pipeline and ensure our graduates are workforce ready," said Siekierka.



Agnieszka Nawrocka Chojnowski is part of a Sokol Institute/Celgene research team developing selective inhibitors with the potential of becoming a drug to treat filariasis.



MONTCLAIR STATE UNIVERSITY COLLEGE OF SCIENCE AND MATHEMATICS



Opened in fall 2015, CSAM's Center for Environmental and Life Sciences is a state-of-the-art facility for established and developing interdisciplinary teams of researchers, accommodating strong industrial links, business incubators, and facilitating education, training and student opportunities for in-depth research experiences.

COLLABORATIVE RESEARCH RESOURCES FOR NEW JERSEY'S BUSINESS COMMUNITY

Montclair State's College of Science and Mathematics offers an array of research resources for New Jersey's business community, including faculty expertise, laboratory services and specialized equipment and host site services for business incubators.

interdisciplinary research, teaching and service facility equipped with scanning and transmission electron microscopes, an atomic force microscope and ancillary instruments. Analysis services span the biologic, chemical, materials and geologic sciences and include expert onsite technical support.

offers Continuing Education credit-bearing courses for LSRPs, professional engineers, environmental attorneys, certified environmental service providers, as well as the larger environmental community. CSAM has unique expertise in environmental management, sustainability studies, research and education and is a leading provider of highly qualified professionals and scientists to New Jersey's environmental-related agencies and private sector environmental engineering and management firms. For full course listing, go to montclair.edu/csam/ceep.

ON-SITE BUSINESS INCUBATORS

ENDOMEDIX, Inc., located in CELS' 4th floor incubator lab/office suite, is pursuing ongoing R&D work around a proprietary medical device technology involving the specification and processing of two biopolymers for use as a surgical hemostat and tissue sealant. Contact: Dr. Richard Russo Presidentrusso@endomedix.com

IMMUNOMEDICS, Inc., is a mid-stage incubator located in one of CELS' Vivarium procedure areas adjacent to an animal holding room. This biopharmaceutical company is primarily focused on the development of monoclonal antibody-based products for the targeted treatment of cancer, autoimmune and other serious diseases. Contact: Dr. Thomas M. Cardillo Executive Director, Pre-Clinical and Hybridoma Development tcardillo@immunomedics.com

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SPONSORED RESEARCH AND BUSINESS COLLABORATIONS CSAM proactively supports the formation of academic/industry collaborations and partnerships designed to create new science-based enterprises and speed the development of new technologies. Contact: Ann Frechette Director, External Relations frechettea@mail.montclair.edu 973-655-4225

CONSULTING SERVICES

- Environmental Management:**
- Water/sediment sampling and analysis
 - Geochemical contamination investigation
 - Hydrologic/hydrogeologic monitoring and modeling
 - Benthic biodiversity studies
 - Wetlands assessment
 - Vegetation and wildlife studies
 - Landscape characterization
 - Environmental data management
 - Computerized mapping
 - Air quality and climate modeling
 - Site investigations
- Contact: Dr. Matthew Gorrington gorringm@mail.montclair.edu 973-655-5409

Life Sciences:

- High throughput screening
 - Proteomics
 - Biomaterial platforms
 - Drug analysis technologies
- Contact: Dr. David Rotella rotellad@mail.montclair.edu 973-655-7204

LABORATORY SERVICES

CSAM's Microscopy and Microanalysis Research Laboratory (MMRL) is an

Contact: Dr. Laying Wu wul@mail.montclair.edu 973-655-2028 montclair.edu/csam/mmrl

INSTITUTES AND CENTERS

PSEG INSTITUTE FOR SUSTAINABILITY STUDIES

Promotes research and education focused on key sustainability issues. Contact: Dr. Amy Tuininga tuiningaa@mail.montclair.edu 973-655-3667

CENTER FOR QUANTITATIVE OBESITY RESEARCH

Promotes collaborative interdisciplinary research related to obesity health issues. Contact: Dr. Diana Thomas thomasdia@mail.montclair.edu 973-655-7262

CONTINUING ENVIRONMENTAL EDUCATION FOR PROFESSIONALS

Designed to meet the demand for environmental continuing education courses in Northern New Jersey, CSAM

PASSAIC RIVER INSTITUTE

Environmental research, education and outreach focused on the Passaic River, its tributaries and watershed lands. Contact: Dr. Meiyin Wu wum@mail.montclair.edu 973-655-7117

THE MARGARET AND HERMAN SOKOL INSTITUTE FOR PHARMACEUTICAL LIFE SCIENCES

Supports transdisciplinary research with academic and industry collaborators in the areas of medicinal chemistry, pharmacology, biochemistry, natural products chemistry, molecular biology, computational sciences, environmental toxicology and pharmacology and new technologies such as biomaterials and nanotechnology. Contact: Dr. John Siekierka siekierkaj@mail.montclair.edu 973-655-3411

THE COLLEGE OF SCIENCE AND MATHEMATICS IS HOME TO:

PSEG Institute for Sustainability Studies

Passaic River Institute

New Jersey School of Conservation

Remote Sensing Laboratory

Center for Environmental Management and Analysis

Microscopy and Microanalysis Laboratory

Statistical Consulting Laboratory

Bristol-Myers Squibb Center for Science Teaching and Learning

Science Honors Innovation Program (Merck, Roche and Celgene)

Weston Science Scholars Program

ENVIRONMENTAL MANAGEMENT AND SUSTAINABILITY

INNOVATING SOLUTIONS AND NEW TECHNOLOGIES

CSAM has unique expertise in environmental management, sustainability studies, research and education. The College is a leading provider of highly qualified professionals and scientists to New Jersey's environmental-related agencies and private sector environmental engineering and management firms.

The College's broad array of educational offerings include New Jersey's only PhD in Environmental Management, plus master's degrees in Environmental Management, Environmental Science, Geoscience, Marine Biology and Coastal Sciences; certificate programs in Water Resource Management, Geographic Information Science and Environmental Forensics; and customized training programs for New Jersey's environmental sector.

CSAM research faculty and their students in Earth and Environmental Sciences and Biology are also playing a pivotal role in conducting sustainability science research aimed at mitigating historic damage to surrounding ecosystems in New Jersey, as well as examining and addressing future economic and ecological impacts associated with economic revitalization, land-use decisions, sustainable exploitation of natural resources and global climate change.

With a focus on promoting innovative research in the discovery of new environmental solutions, CSAM researchers have developed several technologies including:

BALLASTSOLUTION — Developed with funding support from the U.S. Department of the Interior, Dr. Meiyin Wu has invented a ballast water treatment system using ultrasound technology. The

system is designed to eliminate the introduction of non-indigenous species into home ports via discharge of ship ballast water. Because it can eliminate microscopic planktonic aquatic organisms as well as eggs and larvae of macro-organisms, BallastSolution technology may also provide a green, chemical-free means of treating swimming pools and even be used in waste water management.

ADVANCES IN WATER TREATMENT

Applications of ferrate(VI) for the treatment of waste water as well as drinking water are being advanced by Dr. Yang Deng. Ferrate(VI) is a promising green agent for potable water treatment, addressing both traditional and emerging contaminants through multiple mechanisms, in particular, oxidation and coagulation. Ferrate(VI) is increasingly employed in potable water treatment plants to remove color and odor, phosphorus, regulated toxic organic and inorganic species such as benzene and arsenic, algae, pathogenic bacteria and viruses, as well as emerging pollutants including pharmaceutically active compounds and microcystins. Ferrate(VI) produces few toxic byproducts and the end product (iron precipitates) is also nontoxic; therefore ferrate(VI) is an "environmentally friendly" water treatment chemical.

URBAN ROOFTOP HYDROPONICS

In the sustainability management area, Dr. Robert Taylor is exploring urban roof agriculture in various global cities as a method to increase food security, enhance environmental awareness and as a key strategy for urban sustainability. This research project addresses the capacity of cities to reduce both their ecological and carbon footprints through utilizing under-used roof space in larger global cities in the Tropics.



Dr. Meiyin Wu working with a BallastSolution prototype unit.