

NEW NJIT FACULTY  
WILL ENERGIZE  
THE UNIVERSITY'S  
INTERDISCIPLINARY  
VISION FOR EDUCATION,  
RESEARCH AND  
ECONOMIC ENGAGEMENT

# DISCIPLINES AND DEPARTMENTS DOVETAIL

The talents of more than 20 new faculty members will soon add momentum to NJIT's strategic plan for making a major impact on the quality of life in the 21st century. This interdisciplinary initiative is focused on three vital areas – convergent life science and engineering, “digital everywhere” – ubiquitous computing – and sustainable systems.

The women and men joining NJIT to serve a growing student body bring expertise that spans diverse supporting clusters. These include advanced manufacturing, architecture, design and construction, “big data,” biochemistry, business systems, material science and engineering, and sensing and control.

NJIT's academic status and interdisciplinary strategy have attracted people at various stages of their careers, and who offer NJIT both distinctive abilities and new resources, says Provost Ian Gatley. For example, hydrologist Michel Boufadel, who will join the Department of Civil and Environmental Engineering, was head of the civil engineering program at Temple. He has grants from organizations such as the U.S. Environmental Protection Agency and the Federal Emergency Management Agency.

“Michel has funding to continue investigating effects of the *Exxon Valdez* oil spill in Alaska, and he has worked on the *Deepwater Horizon* spill in the Gulf,” Gatley says. “I've heard him speak on several occasions, and his talks were tremendously exciting.”

Gatley says that enthusiasm for NJIT's interdisciplinary commitment was very apparent during the search process. “Everyone interviewed spoke about how the problems they work on are inherently interdisciplinary, how they like to work on teams, how they look forward to collaborating with colleagues across disciplines.”

## 21st-CENTURY EXPECTATIONS

Donald Sebastian, NJIT's senior vice president for research and development, emphasizes that connecting with real-world issues is at the heart of expectations for a technological research university. “Academic disciplines are the core of the university and the framework for learning. However, their alignment with industries of the future is not as obvious as with those sectors that have prevailed over the last century. Our strategic research thrusts are designed to make those 21st-century connections explicit.”

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## “TECHNOLOGY MUST FOCUS ON DEFINING APPROACHES THAT ARE BOTH ECONOMICALLY REALISTIC AND ENVIRONMENTALLY RESPONSIBLE, AND THAT TAKES SYSTEMS THINKING.”

— Donald Sebastian, NJIT senior vice president for research and development

Sebastian says that convergent life science and engineering, digital everywhere and sustainable systems – themes that transcend departments or colleges – shaped NJIT’s hiring plan.

Sustainable systems build on NJIT’s long history of environmental engineering research but go well beyond traditional boundaries of that field. We must use technology to mitigate our footprint and coexist with the natural environment, yet without regressing from the quality of life we have come to expect. This covers everything from abundant energy to the basics of food, potable water and adequate housing – all of which require efficient industrial production and transportation systems scaled to an ever-growing population. “Technology must focus on defining approaches that are both economically realistic and environmentally responsible, and that takes systems thinking,” Sebastian says.

There is also a transformative synergy between the life sciences and a host of other disciplines. Experts in biology and clinical medicine are collaborating with colleagues in fields ranging from mathematics to every branch of engineering. Over the last decade, NJIT created biomedical engineering and biological sciences departments to anchor collaborations across the campus. These efforts are yielding insights into basic physiological processes, new therapies and pharmaceuticals, and innovative medical devices.

The combination of broadband wireless networking and highly functional portable electronics linked to high-powered cloud computing systems will mainstream digital technology into applications that have yet to be imagined. NJIT’s strategic focus on this area promises further advances in high-speed wireless signal processing, network security, nanoscale electronics, user interface design, “big data” systems, e-commerce and social interaction.

The economic implications of NJIT’s interdisciplinary vision are substantial. Too often, scientific discovery produces useful knowledge that cannot be translated into practical applications until other problems are resolved – and these often lie outside of the professional

boundaries of the individual researcher. More than ever, they lie outside the boundaries of a single discipline as well, and that is why teaming is critical if academic research is to make an impact on commercial innovation.

This environment also mirrors the world in which the majority of NJIT students will build their careers. Some will enter academia but most will not, and students will benefit greatly from studying at a school that fosters positive connections between the cultures of the academic and commercial communities.

### AMONG THOSE ENERGIZING THE VISION

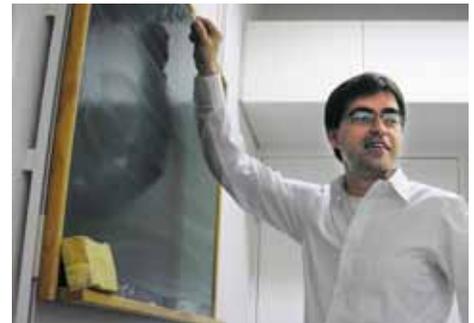
#### Convergent Life Science and Engineering

**Bharat Biswal**, professor and new chair of the Biomedical Engineering Department, comes to NJIT from the University of Medicine and Dentistry of New Jersey. Expert in neuroimaging, he is developing new methods for studying brain functions and pathology.

**Cristiano L. Dias**, assistant professor, Physics, pursues multidisciplinary research that uses physical models and high-performance computing to describe phenomena in molecular biology. He comments, “Rational design of drugs for medical purposes requires a molecular understanding of nature’s robots, i.e. proteins. My research contributes to this effort from a computational perspective in which physics meets chemistry, biology and computer science.”

**Eric Fortune**, associate professor, Biology, is fascinated by animal behavior. His studies include measurements of animal behavior that, when coupled with sophisticated quantitative approaches, can be applied in brain experiments to discover the cellular mechanisms that control behavior. Engineers can, in turn, translate these insights into improved control systems for use in robots and prosthetic devices.

**Simon Garnier**, assistant professor, Biology, is engaged in research related to fields that include ethology, experimental psychology, cognitive and social sciences and swarm



Cristiano L. Dias (top), Eric Fortune and Ji Meng Loh

intelligence. He is mainly interested in the emergence of intelligent collective behaviors in groups of social animals.

**Mei Liu**, assistant professor, Computer Science, works at the intersection of medicine and computation. Recent research has focused on using electronic health records to increase awareness of adverse drug reactions.

**Ji Meng Loh**, associate professor, Mathematical Sciences, investigates spatial data analysis and visualization, and related statistical methodology. Applications range from functional magnetic resonance imaging and epidemiology to astronomy.

#### Digital Everywhere

**Cesar Bandera**, assistant professor, School of Management, is working on mobile or “m-health.” Through his company, Cell



Cesar Bandera

Podium, Bandera has support from the National Institutes of Health to develop applications for environmental public health outreach and training via smart phones.

## STUDENTS WILL BENEFIT GREATLY FROM STUDYING AT A SCHOOL THAT FOSTERS POSITIVE CONNECTIONS BETWEEN THE CULTURES OF THE ACADEMIC AND COMMERCIAL COMMUNITIES.

**James Cicon**, assistant professor, School of Management, uses advanced computer methodologies to analyze the views expressed by investors, managers, analysts, and others. Once quantified, the results are used as explanatory variables in models of corporate and market behavior.

**Xiaoning Ding**, assistant professor, Computer Science, is working in various areas of experimental computation, including operating systems, cloud computing and distributed systems, computer architecture, and database systems. He has been awarded the prestigious Computing Innovation Fellowship funded by the Computing Research Association and the National Science Foundation.

**Lian Duan**, assistant professor, Information Systems, focuses on large-scale data mining. His work can be applied in marketing, social networking, bioinformatics and other areas.

**Abdallah Khreishah**, assistant professor, Electrical and Computer Engineering, has a scope of research spanning network coding, wireless networks, congestion control, cloud computing, network security, and database systems for large projects. His research has been funded by the National Science Foundation and the UAE Research Foundation.

**Bernadette Longo**, associate professor, Humanities, is motivated by questions about our relationships with technological devices. She says, “My work looks at how we feel about making electronic communication and computing devices that are almost human. How are our human relations affected when we include machines in those human-to-human relations?”

**Catalin Turc**, associate professor, Mathematical Sciences, is interested in scientific computing, computational electromagnetics, and numerical analysis. His work has wide-ranging utility in fields such as electronics and energy.

**Songhua Xu**, assistant professor, Information Systems, has research interests that span information retrieval and management,

intelligent systems for biomedical applications, visual computing, human-computer interaction, and digital arts and design. He comments that he is “particularly passionate about building human-centered applications that benefit people and society through advanced computing techniques.”

### Sustainable Systems

**Michel Boufadel**, professor, Civil and Environmental Engineering, is a Professional Engineer and Professional Hydrologist. His work has encompassed floodplain delineation for the Federal Emergency Management Agency, contamination in urban streams, and oil spill research.

**Wenbo Selina Cai**, assistant professor, Mechanical and Industrial Engineering, is expert in operations management and dynamic pricing decisions. She is interested in researching questions related to economically sustainable energy systems and health care.

**Martina Decker**, assistant professor, College of Architecture and Design, explores how new materials might generate solutions to challenges such as water quality, energy generation and conservation, emissions and waste reduction, and health and safety. She says, “Materials engineered on a molecular level can be infused with very specific properties. These high-performance materials have great potential for giving us the tools to respond to important issues, especially in architecture and sustainable design.”

**Keith Krumwiede**, associate professor, College of Architecture and Design, is bringing expertise in urban design to NJIT from Yale. His particular emphasis is on high density, affordable housing intended for a sustainable urban environment.

**Jesse LeCavalier**, assistant professor, College of Architecture and Design, has research interests that include “big box” retail structures and their effect on urban form and organization. His studies have a special emphasis on how these entities interact with local retail areas and residential neighborhoods.



Michel Boufadel (top),  
Martina Decker,  
Jesse LeCavalier and  
Wen Zhang

**Alison Lefkowitz**, assistant professor, History, specializes in the legal and gender history of the 20th-century United States and the evolving relational structures that sustain society today. Her recently completed book manuscript *The Politics of Marriage in the Era of Women’s Liberation* examines legal, political, and cultural challenges to marriage from the establishment of President Kennedy’s Commission on the Status of Women until the defeat of the Equal Rights Amendment.

**Wen Zhang**, assistant professor, Civil and Environmental Engineering, has investigated the implications of introducing nanomaterials in environmental systems, and he is broadly interested in sustainable design and manufacturing. One of his goals is to integrate cutting-edge research from diverse disciplines into environmental science and engineering curricula. ■