

SAN DIEGO STATE UNIVERSITY
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SAN DIEGO STATE
UNIVERSITY

Leadership Starts Here



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Increasingly recognized for innovative research, San Diego State University continues to establish itself as a leading public research university. This journey is possible in great part because of our creative and entrepreneurial faculty. SDSU scholars are leading the way in the arts, biomedical research, public health, technology and education. They are Fulbright Scholars, prestigious Young Investigators, award-winning authors, and acclaimed scientists.

SDSU's first fundraising campaign far surpassed its goal last year - and was extended for another three years. This new phase includes two important components that are critical to our research mission: \$6.7 million has already been raised to support a research endowment, and construction has begun on the Engineering and Interdisciplinary Sciences Complex, where researchers and entrepreneurs will work collaboratively to develop real-world applications for research discoveries.

Another three areas of excellence in which SDSU has critical expertise were identified last year. Additional faculty will be recruited to help address these important research challenges:

- Blue Gold: Mitigating the Effects of Water Scarcity
- Digital Humanities and Global Diversity
- Smart Health Institute (SHI): Wearable Biomedical Sensors for Precision Medicine.

Congratulations to SDSU researchers for the nearly 700 awards and \$121 million they received for their research last year. This brochure highlights some of their innovative programs. A complete listing of 2014-15 awards can be found here:

http://www.foundation.sdsu.edu/news/news_2014_15_awards_listing.html.

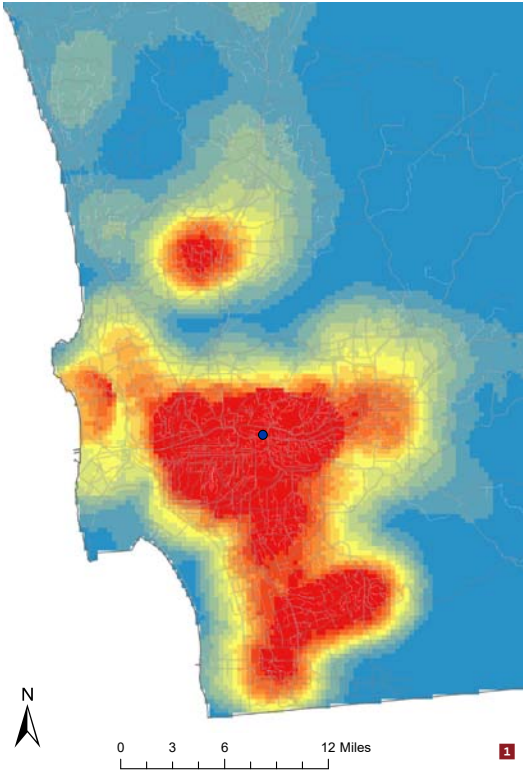
Stephen C. Welter

Vice President for Research and Dean of Graduate Affairs

San Diego State University

It's critical to understand why and how we make choices, and what these choices mean to us individually, to our society, and the environment.
-Bruce Appleyard

Student Residences Map



Six Principles of Livability

1. Provide more transportation choices
2. Promote equitable, affordable housing for people of all ages, incomes, races and ethnicities
3. Enhance economic competitiveness
4. Support existing communities
5. Coordinate/leverage federal policies and investments
6. Value communities and neighborhoods

(USDOT/HUD/EPA Sustainable Communities Partnership)

Innovative Civic Solutions

BRUCE APPELYARD Public Affairs

Transportation, land use and urban design expert Bruce Appleyard focuses on helping people and communities make informed choices about how we live, thrive, and sustain ourselves equitably now, and into the future.

A key focus of his work involves “livability.” The most livable communities offer diverse opportunities for people to improve the quality of their lives. Dr. Appleyard has designed a “Livability Calculator” to assess a community’s equitable access to quality of life opportunities. He utilizes GIS and visualization tools to engage decision-makers and the public in planning, urban design and integrated solutions.



This work has important implications for communities concerned about climate action planning, smart growth, air and water quality, and making streets safe, friendly and inviting for pedestrians, bicyclists and transit riders.

Dr. Appleyard’s research has been supported by the National Academy of Sciences, California’s Strategic Growth Council, HUD, EPA, Caltrans, among others.

- 1 Commute-shed of SDSU students illustrating travel and housing patterns and preferences. Image by Sam St. Lifer, Courtney Armusewicz, and Jeremy McKinstry
- 2 Dr. Bruce Appleyard. Photo by Belinda Smith

The Neuro-Cognition of Word Comprehension

PHILLIP HOLCOMB

Psychology

Language use is the quintessential human cognitive ability, and fundamental to this ability is the skilled use of its elemental units, words. Understanding how the brain identifies individual words (from approximately 50,000 possibilities) in less than half a second is a continuing challenge for scientists.

Phillip Holcomb is a cognitive neuroscientist and co-director of SDSU's NeuroCognition Laboratory where he and his colleagues study the role of visual word recognition during reading, reading acquisition, bilingualism and second language acquisition. In a related line of research his lab has teamed up with SDSU's Laboratory for Language and Cognitive Neuroscience to provide a better understanding of the neurocognitive factors that interfere with

the comprehension of written language by adults who are pre-lingually and profoundly deaf.

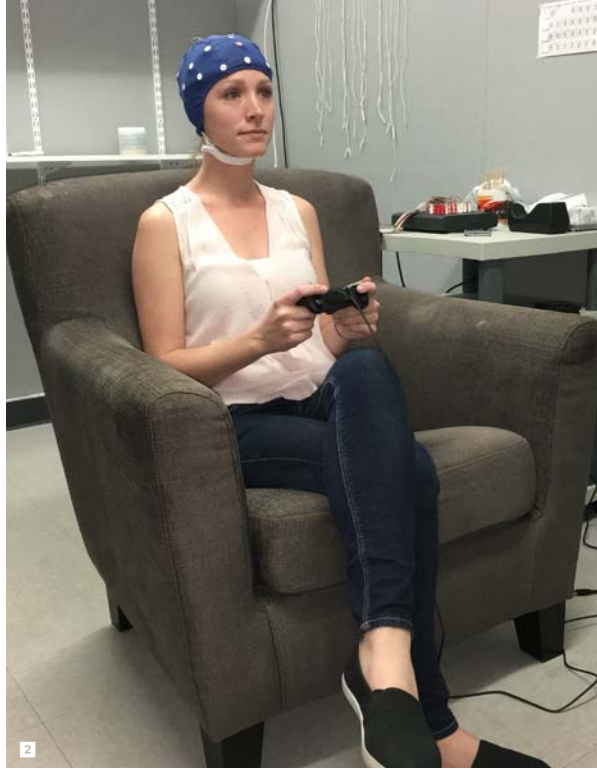
By examining the neurocognitive underpinnings of word processing, Holcomb's work is providing a better understanding of

this fundamental aspect of the reading process which has important implications for clinicians studying language disorders like developmental dyslexia, educators seeking to design the best methods for teaching second languages, as well as researchers attempting to create targeted remediation programs for deaf adults with poor reading ability.

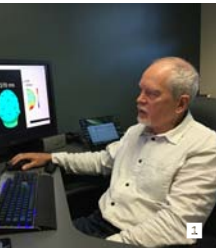
Dr. Holcomb's research is supported by the National Institutes of Health and the National Science Foundation.

- 1 Dr. Holcomb pours over new data.
- 2 A participant during electroencephalography (EEG) data collection
- 3 A voltage map depicting differences across the scalp after a meaningful stimulus has been presented.

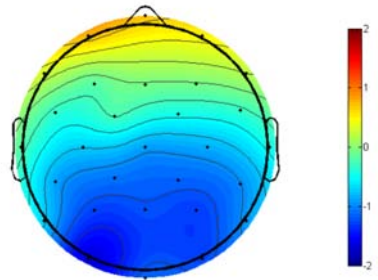
Photos by Katherine Midgley



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New Directions in Global Entrepreneurship

MARTINA MUSTEEN *Management*

The Centers for International Business Education and Research (CIBERs) were created by Congress in 1988 to increase and promote the nation's capacity for international understanding and competitiveness.

Dr. Martina Musteen leads SDSU's CIBER, a national center of excellence that links workforce and information needs of U.S. business with the international education, language training, and research capacities of universities across the U.S. The center, supported by the U.S. Department of Education, serves as a regional and national resource to business people, students, and teachers at all levels.

An expert on international entrepreneurship and internationalization of small and medium-size firms in emerging economies, Musteen's research explores how smaller firms leverage their networks to find international business opportunities and offshore certain activities to partners abroad. She also leads the International Business Opportunity Development Program, which enables students to work with international companies to bring their products into U.S. markets.

Dr. Musteen is instilling a more global perspective in the next generation of American entrepreneurs, enhancing U.S. competitiveness overseas and helping small businesses abroad enter the U.S. market.



- 1** SDSU students worked with these managers of New Zealand's TourWriter company to develop an international strategic plan for their itinerary software.
- 2** Managers of New Zealand-based lighting company LDP Ltd., praised the IBOD program and SDSU students who helped them make "inroads and improvements" in both local and international markets. Photo by Dean Coleman
- 3** Dr. Martina Musteen. Photo courtesy of College of Business Administration

Visualizing Big Data and Social Media Messages

MING-HSIANG TSOU

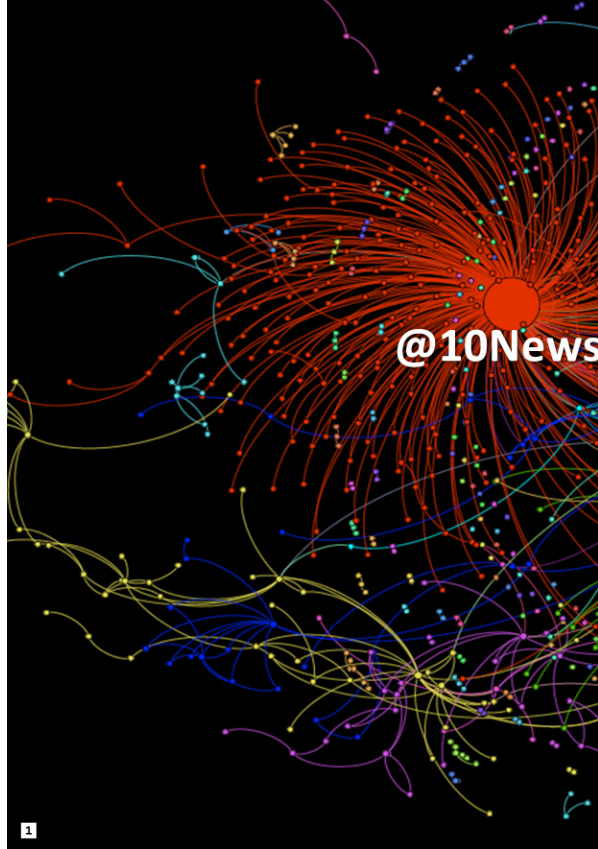
Geography

Geographer Ming-Hsiang Tsou has developed an innovative method of analyzing space-time dimensions of the spread of ideas using social media and Big Data on the Internet. Using both computational methods (e.g. geographic information systems and machine learning methods) and traditional social scientific approaches (e.g. qualitative and behavior analyses), Tsou is analyzing diffusion patterns of human messages, activities and communications, including disease outbreaks, vaccine exemption issues, disaster responses, and social movements.

For example, Tsou and his team built several prototypes (SMART dashboard and GeoViewer) for the San Diego Office of Emergency Services social media outreach platform to monitor disaster warning and evacuation messages in real time via social media channels.

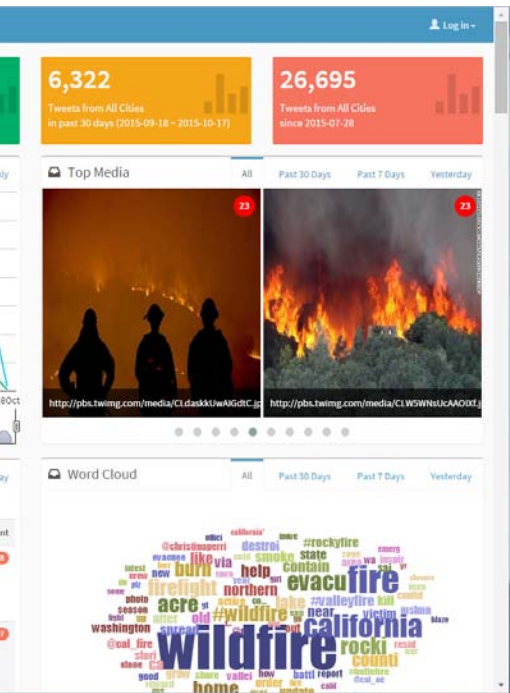
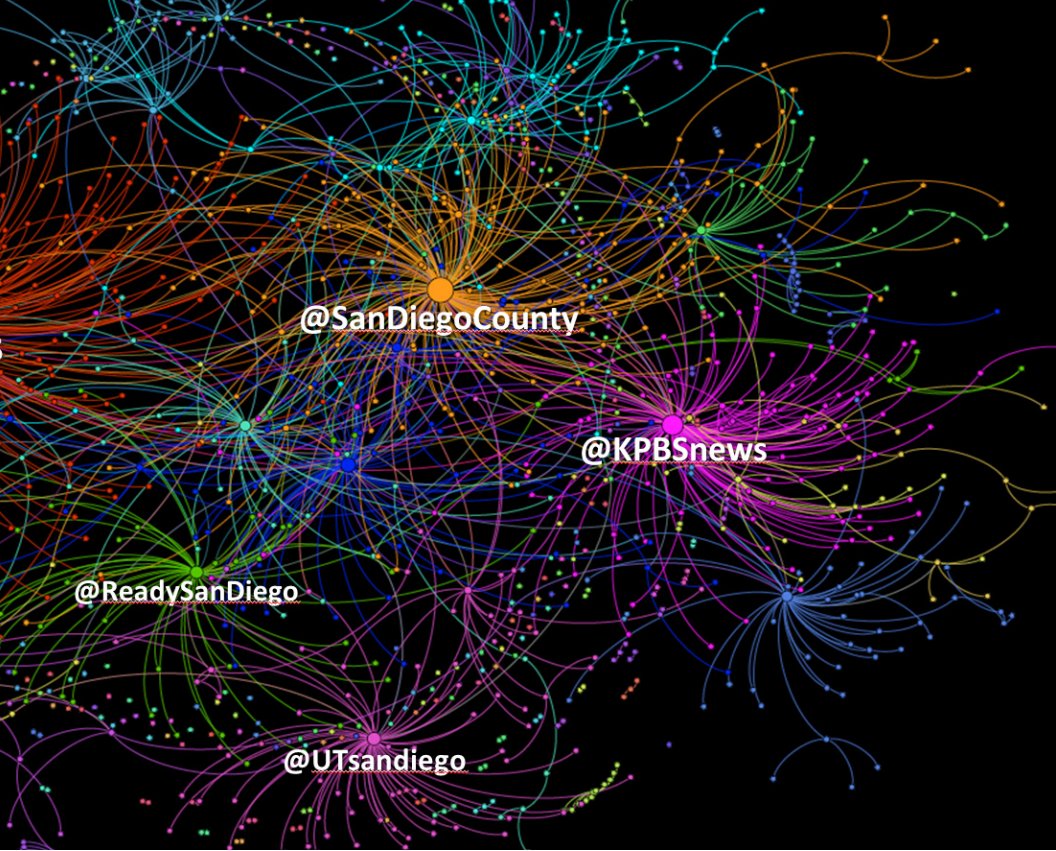
A mobile App is under development to facilitate rapid dissemination of official alerts during disaster events. This platform can identify and recruit the top 1,000 San Diego volunteers based on their social network influence factors and help government agencies communicate more effectively to the public and be better prepared for both natural disasters and human-made crises.

Dr. Tsou's work is funded by the National Science Foundation.



1 The Twitter (Retweets) Social Network Analysis for San Diego Wildfire 2014. Image created by Elias Issa

2 The SMART Dashboard for Monitoring California Wildfire Social Media Messages Daily (developed by Dr. Calvin Jung at the Center for Human Dynamics in the Mobile Age, San Diego State University).



Brain Imaging of Alcohol Effects

KSENIJA MARINKOVIC

Psychology

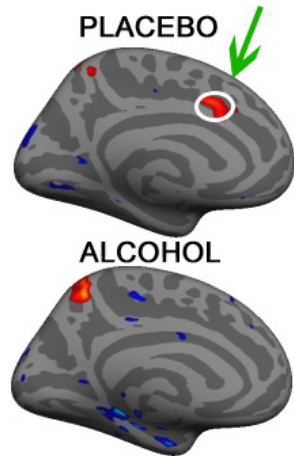
Dr. Ksenija Marinkovic leads SDSU's Spatio-Temporal Brain Imaging Laboratory which focuses on the "where and when" characteristics of neural circuits underlying cognitive functions such as decision making, inhibitory control, language, and emotion perception.

Of particular interest are alcohol-related impairments of self-regulatory functions which may contribute to drinking in the context of family history and genetic markers. Executive functions are vulnerable to alcohol intoxication as it interferes with goal-directed behavior and the ability to evaluate conflicting demands and inhibit impulsive responses. Alcohol impairments may result in a decreased capacity to exert self-restraint, contributing to increased drinking and dependence.

By using a variety of brain imaging techniques including magneto- and electroencephalography (MEG/EEG), functional and structural MRI, and psychophysiological measures of autonomic functions, Dr. Marinkovic is obtaining precise information that may help develop individualized prevention strategies.

She also collaborates with Dr. Ralph-Axel Mueller to study language in adolescents with autism spectrum disorder.

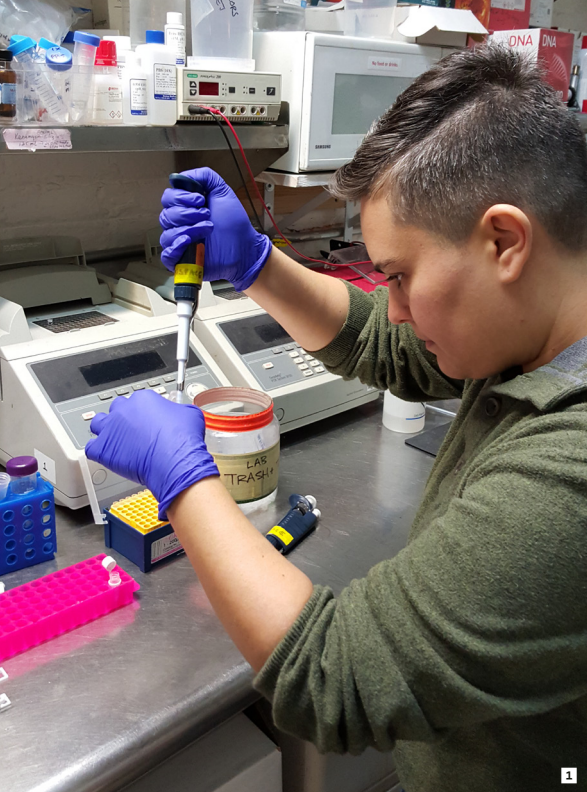
Her work is supported by the National Institute on Alcohol Abuse and Alcoholism and the National Institute of Mental Health.



1 Magnetoencephalography (MEG) scanner that records magnetic fields generated by the brain. Image by Elekta

2 Dr. Marinkovic (front row center) with lab members from left: Siyuan Huang, Nicole Fong, Lee Holcomb, Lauren Beaton, Edward Nguyen and back row: Stephen Cruz, Laura Wagner, Angeles Correas, Audrey Andrews, Burke Rosen, Tyler Brocklehurst. Photo by Megan Mott

3 Functional MRI map showing activation of the area that is essential for making decisions. It is selectively reduced by moderate intoxication, resulting in impaired self-control.



Synthetic Biology: Can We Engineer a More Democratic Science?

SARA GIORDANO
Women's Studies

Based on the sciences of genetics and recombinant DNA technologies, the still emerging field of synthetic biology uses engineering principles to redesign existing, natural, biological systems for useful purposes. The field is attracting a new generation of scientists to a more democratic biology that manifests outside of traditional scientific laboratories - sometimes in shared kitchens and garages.

Neuroscientist, ethics consultant and women's studies professor Sara Giordano examines these physical spaces and the larger ethos surrounding synthetic biology. Her work takes her to community labs in New York City and Los Angeles where she uses an analysis based in feminist science studies to explore resonances and discordances with previous activist and academic calls for more democratic sciences. Dr. Giordano asks what are the ethical and political possibilities and dangers of the construction of these new democratic sciences.

Her work is funded by the National Science Foundation.



- 1 Dr. Sara Giordano. Photo by Oliver Medvedik
- 2 A community biolab in NYC. Photo by S. Giordano

Whistle While You Work (Underwater)

MARIE ROCH
Computer Science

Sound travels farther underwater than light and is an important communication channel for many marine species. Dr. Marie Roch is one of the world's leading scientists in the field of marine mammal bioacoustics.

Dr. Roch gathers information about free-ranging whales and dolphins and designs computer algorithms to analyze the sounds they produce. This data is helping to understand how these animals use their habitat, how naval operations may affect their behavior, and is helping to inform science-based public policy decisions.

Beaked whales are elusive animals that are very hard to observe visually – some species have never been seen alive. Fortunately, their calls can be distinguished with computer-assisted techniques, and Roch and her collaborators at Scripps Institution of Oceanography have been able to assign acoustic “signatures” to the species, letting us learn about these animals that have been implicated in mass stranding events related to human activities. Ongoing work is assessing ways to measure human impact on these animals.

This research has been funded by U.S. agencies such as The Office of Naval Research, The Bureau of Ocean Energy Management, and The U.S. Navy Living Marine Resources Program.

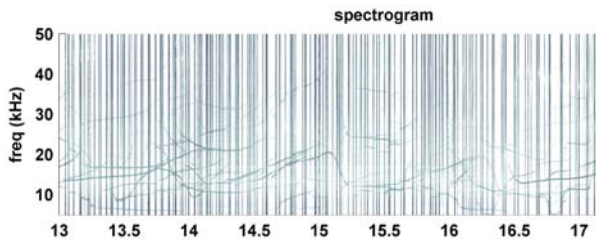


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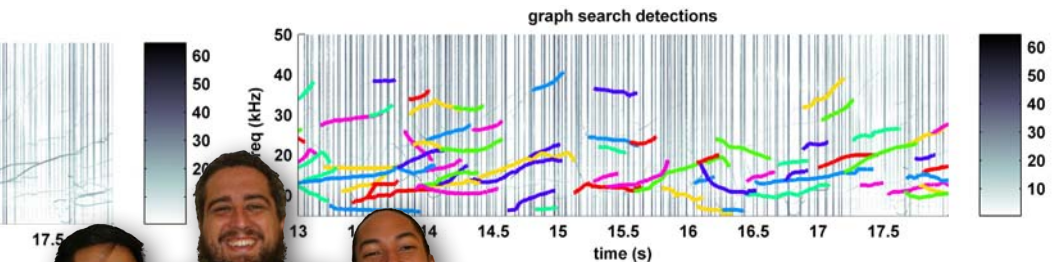
1 Blue whale fluking before a deep dive off the coast of San Diego.

2 The left figure shows five seconds of common dolphin whistles and echolocation clicks. Whistles, which are used in communication, are represented as dark curves that rise and fall in frequency over time. The dark vertical lines are echolocation clicks that are used by these animals for navigation. The right panel shows the same data with whistles automatically detected by the Roch Lab's *silbido* whistle detection system that can be used for communication and environmental research.

3 Roch team members Yun Trinh, Scott Lindenua and Sean Herbert.
Photos by Marie Roch



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Understanding An Increasingly Digital World

JESSICA PRESSMAN *English & Comparative Literature*

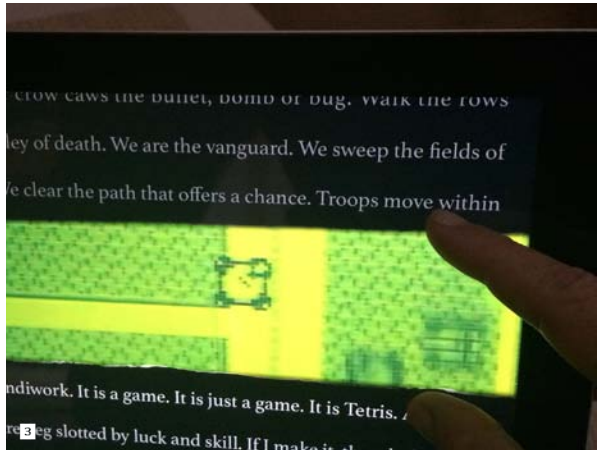
"Digital Humanities" describes efforts to study digital technologies and culture, employ computational practices in research and teaching, and reflect upon the impact of all things digital.

SDSU's Digital Humanities Initiative is a grassroots, faculty-led effort to promote digital humanities research and teaching by providing a hub for strategic innovation and collaboration.



With support from the National Endowment for the Humanities, director Jessica Pressman is gathering a team from seven universities to build a regional digital humanities network with SDSU as its central hub.

Pressman is a scholar of 20th and 21st-century experimental literature. Her first book situates born-digital literature in literary history by tracing a genealogy between digital and modernist literature. Her latest book is a co-written collaborative close reading that models digital humanities literary criticism. Pressman's research seeks to adapt traditional practices of literary criticism to emergent poetics and to push English departments to recognize how literary studies is also media studies.



1 Dr. Jessica Pressman. Photo by Jeneene Chatowsky

2 Students in Dr. Pressman's "Digital Literature" class read born-digital literature and write web-based analytical essays. Here they are in class having small group discussions about a digital novel. Photo by J. Pressman

3 Screenshot of reading the app-based novella *PRY* (2015) by Tender Claws, one of the required texts in Dr. Pressman's class. Photo: J. Pressman



Improving Workforce Skills

SUZANNA FUENTES *Imperial Valley Campus*

For over 30 years the Center for Professional Skills Development at SDSU's Imperial Valley Campus has served as a liaison between SDSU - Imperial Valley and Latin America.

Under the leadership of director Suzanna Fuentes, the Center coordinates international training programs to certify academic professionals as teachers of English as a Second Language (ESL).

In addition to these international programs, Fuentes focuses on the local community. With the support of the Imperial County Department of Social Services and the Imperial County Workforce Development Office, the Center provides innovative workforce training programs designed to enhance employability. These programs focus on ESL, computer skills, and job readiness. Participants are community members who are seeking to improve their workforce potential.



- 1 Ms. Fuentes receives an award at the Binational Conference on Leadership from Instituto Tecnológico de Baja California President Francisco Javier Ortiz Serrano.
- 2 Commencement ceremony for graduates of the Medical Office Assistant Program. Photo by Adriana Vadillo.

MicroRNAs: Mini Gene Regulators

ROBERT ZELLER

Biology

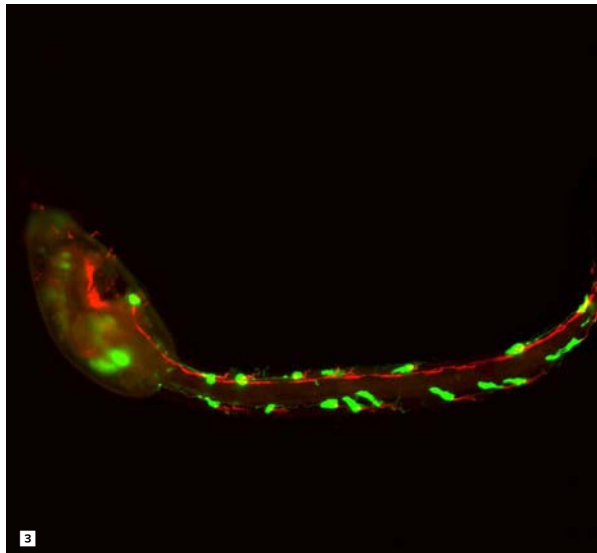
Gene regulation, the process of turning genes on and off, ensures that the appropriate genes are expressed at the proper time and place and can help an organism respond to its environment. Gene regulation is accomplished by a variety of mechanisms including chemically modifying genes and using regulatory proteins.

Biologist Robert Zeller is studying a class of small molecules called microRNAs which regulate hundreds of genes and play a role in the development of organisms - and are implicated in a number of human diseases. Zeller and his team use the embryos of an ascidian - a marine invertebrate closely related to humans - to study the regulation and function of a particular microRNA, miR-124.

An integrated experimental approach employing bioinformatics, molecular genetics, classical embryological methods, high resolution imaging and mathematical modeling to investigate miR-124 function has shown that this microRNA plays an important role in regulating the appearance and patterning of sensory neurons of the larval peripheral nervous system.

These neurons provide an experimentally manipulable model for understanding how microRNAs function during animal development, as well as in humans.

Dr. Zeller's work is funded by the National Institutes of Health and the National Science Foundation.



1 An in situ hybridization shows that miR-124 is expressed in the sensory neurons of the larval tail (purple dots).

2 Adult ascidians growing in the Zeller lab aquarium.

3 Green fluorescent protein is expressed in the sensory neurons of a transgenic ascidian larva (green cells).

Images by Zeller Lab



Visualizing the Future of Naval Communications

D.J. HOPKINS

Theatre, Television, and Film

Last year, D.J. Hopkins, Director of SDSU's School of Theatre, Television, and Film, organized a team of faculty and students in an innovative collaboration with the U.S. Navy's Space and Naval Warfare Systems Center Pacific (SPAWAR). SPAWAR is the military's leading research and development laboratory for command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR).

The team produced three short films that visualized future applications of technology currently in development at SPAWAR. These "visualizations" combined live action and animated special effects to depict innovative C4ISR technologies at work in the field.

Hypothetical scenarios were produced to illustrate how advanced communications technology could provide solutions to specific Naval challenges (e.g., defense crises and humanitarian missions). The completed films were designed in a "modular" structure so that discrete segments could be easily updated as technological advances are realized.

- 1 Cast and crew preparing for the interior S.E.A.L. team dolly shot. Photo by Casey Price
- 2 Director Casey Nicholas Price directing the background actors during the search and rescue scene in the command center. Photo by Carlo Fiorillo
- 3 Cast and crew at the command center. Photo by Rich Underwood

Weather Prediction Tools

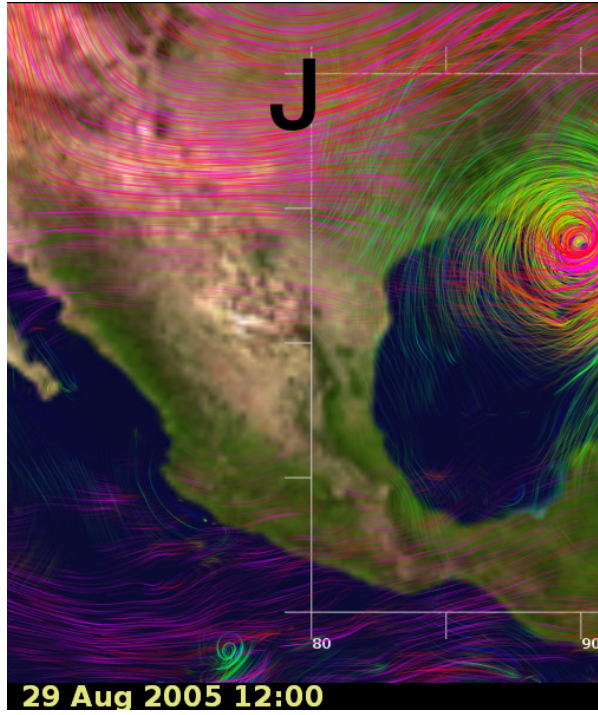
BO-WEN SHEN

Mathematics and Statistics

Atmospheric scientist Bo-Wen Shen specializes in global numerical weather and climate modeling. One part of this research includes investigating chaos (behavior that is highly unpredictable due to sensitivity to small changes - but not random) in high-order Lorenz models to understand the impact of the Butterfly Effect on predictability.

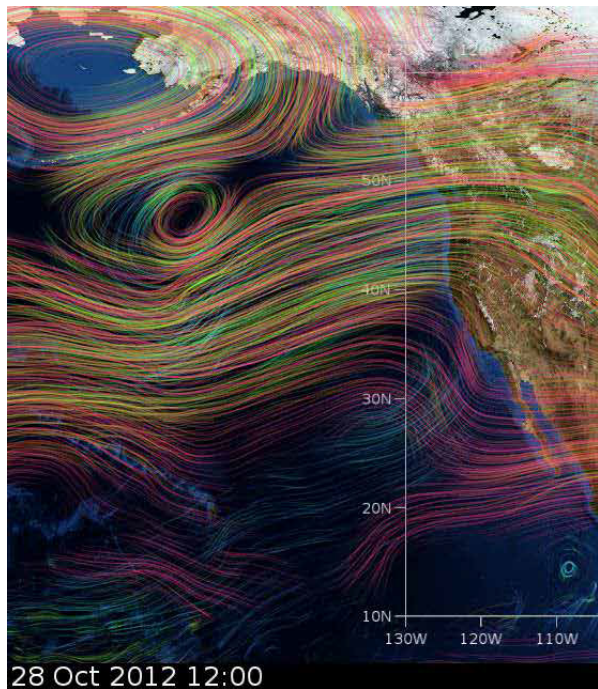
Shen's work provides more accurate climate models for the earth's surface, taking into account change over time and specific regional variables. With better climate models, researchers and policymakers can better predict sweeping weather changes and better prepare for the potential harms of climate change.

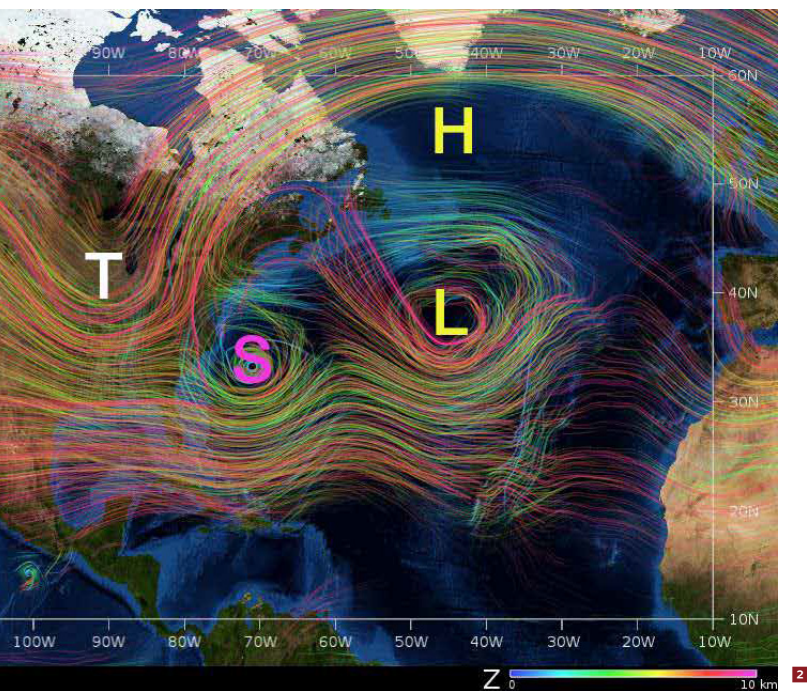
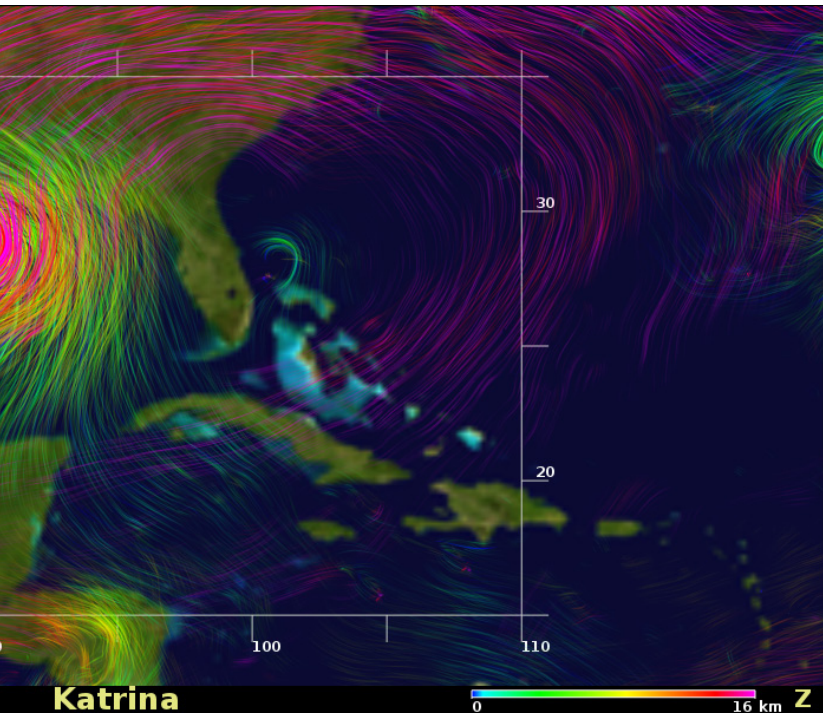
This work is supported by the National Aeronautics and Space Administration.



1 Snapshot from a multiscale simulation showing the interactions of Hurricane Katrina and an upper-level trough during landfall. Analyses of the 4D (X-Y-Z-time) visualization suggest that the horizontal phasing of an approaching jet stream and Katrina's southwesterly outflow (to the southeast of the jet) further strengthened the upper-level anticyclonic flow over the hurricane (dense, upper-level streamlines in expanding pink). The phasing thus enhanced Katrina's development and created strong, deep convections. Bron Nelson, NASA/Ames

2 Scale interactions of Hurricane Sandy and environmental flows. The Coupled Advanced Modeling and Visualization (CAMVis) framework produced a remarkable 7-day track and intensity forecast of Hurricane Sandy, made possible by improved simulation of the interactions among Sandy, the upper-level trough (labeled T) and the high-low blocking system (labeled H and L). David Ellsworth, NASA/Ames





Molecular Mechanisms of Heart Disease

CHRIS GLEMBOTSKI

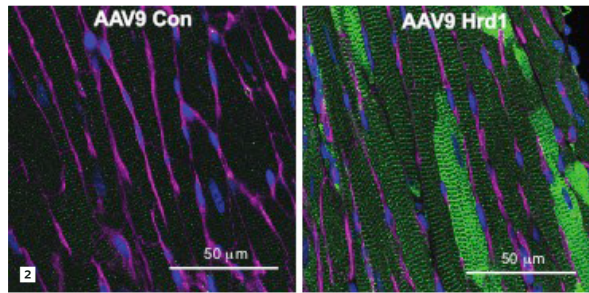
Biology

According to the Centers for Disease Control, someone in the United States has a heart attack every 43 seconds. Approximately half of those who survive a heart attack develop heart failure and die within five years of diagnosis. Heart failure causes 600,000 deaths each year in the United States. While current therapies treat the symptoms, they do not cure the disease.

At the SDSU Heart Institute, Dr. Chris Glembotski and his research group are searching for novel cures for heart failure using innovative gene and stem cell-based approaches.

They have harnessed key aspects of the cellular mechanisms that make cancer cells so resistant to death and enhanced them in the heart, which decreases the severity of heart attacks in experimental animal models of heart disease.

Dr. Glembotski's work is funded by the National Heart, Lung and Blood Institute, the American Heart Association, the Rees-Stealy Research Foundation, and the SDSU Heart Institute.



1. Dr. Glembotski discusses research results with post-doctoral fellow, Dr. Jungkang Jin (left) and senior research specialist, Ms. Marie Marcinko. Photo by Lauren Radack
2. Gene therapy-mediated overexpression of the ubiquitin ligase, Hrd1, in cardiac myocytes of the mouse heart mitigates the damaging effects of heart failure. Doroudgar et al (2015) *Circ. Res.* 117(6):536-546.
3. Glembotski Molecular Cardiology Research Lab: Zoe Sand, Khalid Azizi, Amber Pentoney, Haley Stephens, Dr. Shirin Doroudgar, Adrian Arrieta, Monty Hogan (front), Dr. Chris Glembotski, Donna Thuerauf, Dr. Jungkang Jin, Winston Stauffer. Photo by Jaqueline Emathingier



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Better Health Care for Vulnerable Populations

MARÍA LUISA ZÚÑIGA

Social Work

Epidemiologist María Luisa Zúñiga conducts community-based participatory research to study the intersection of alcohol and drug use, mental health, sexual risk behaviors and self-care practices that contribute to poor health among diverse, vulnerable populations. Dr. Zúñiga specializes in the health of populations living in the U.S.-Mexico border region and individuals and communities impacted by migration.

She has identified individual, environmental, and policy-related factors that increase risk of substance use and poor mental health. Dr. Zúñiga also works with a rural community in Yucatán impacted by extensive out-migration and substance use risk among youth.

Her research has led to improved understanding of cross-cultural communication between clinicians and their Latino patients. This work includes approaches to helping clinicians in the U.S. and Mexico dialogue more effectively with their Latino patients about binational health care utilization and use of complementary and alternative therapies.

Dr. Zúñiga's research has been supported by NIH, the Health Resources and Services Administration, Administration for Children and Families, the Pacific Institute for Research and Evaluation, and the Mayo Clinic.

- 1 Family walking home from school in a rural community in Yucatán, México. Photo by María Luisa Zúñiga
- 2 SDSU and UCSD students working in the Mexican Migration Field Training Program with community medical provider, anthropologist Dr. Pedro Lewin (back) and Dr. Zuniga (right).
- 3 High-school teacher and community research collaborator with Dr. Zúñiga. Photo by Isela Martínez

Improving Higher Education Outcomes for Black Men

**FRANK HARRIS III AND
J. LUKE WOOD**

*Administration, Rehabilitation
and Postsecondary Education*

Current research indicates that two thirds of Black men who enroll in college will drop out without earning a degree. Just five percent of minority male students enrolled in community colleges will earn a degree (vs. 32% for white male students). Frank Harris and Luke Wood are addressing this alarming trend.

Through the Minority Male Community College Collaborative (M2C3), they are helping this population achieve better education readiness, graduation, transfer and labor outcomes. This national research and practice center partners with community colleges from California to New York to support their capacity to advance outcomes for men of color.

Their work is supported by various community colleges and districts including San Diego City and Mesa Colleges, Chaffey College and Santa Monica Community College District.



1 Roundtable discussion on “Narratives of Success.”

To guide their discussion, all participants watched a short video from men of color in community colleges and heard from a panel of former community college male of color students about their community college experience (e.g., highlights, challenges, factors that contributed to their success). Photo by Soua Xiong

2 Equity root cause analysis group activity. Photo by Soua Xiong

3 Dr. J. Luke Wood and Dr. Frank Harris III. Photo by Ricardo Rojoa

Characteristics of Cannabis-only and other Drug Users who visit the Emergency Department

Reed, M., Woodruff, Ph.D. & Daniels, Ph.D. / SDSU School of Social Work, Center for Alcohol Studies



Addressing Alcohol Misuse in the Military

MARK REED
School of Social Work

Alcohol misuse is a unique concern to the U.S. Department of Defense (DoD) because it is higher among military personnel compared to civilians.

At the Center for Alcohol and Drug Studies and Services affiliated with SDSU's School of Social Work, Psychologist and Social Work Professor Mark Reed is evaluating a public health strategy for risky alcohol use that involves opportunistic screening and brief motivational intervention in acute care settings. Although the approach has shown promise with civilians, it has not yet been tested with military personnel.

This DoD-funded study, entitled the *Force Health Promotion Program*, is using formative research and a randomized trial to adapt and test the approach in a large military emergency department.



- 1 L-R Mark Reed, Ph.D., Megan Holt, Dr.PH, Susan Woodruff, Ph.D.; Daniela Flores. Photo by Sarah Clingon
- 2 Screening conducted in the Emergency Room. Photo by Center for Alcohol & Drug Studies and Services



Innovations in Global Water Quality

NATALIE MLADENOV *Environmental Engineering*

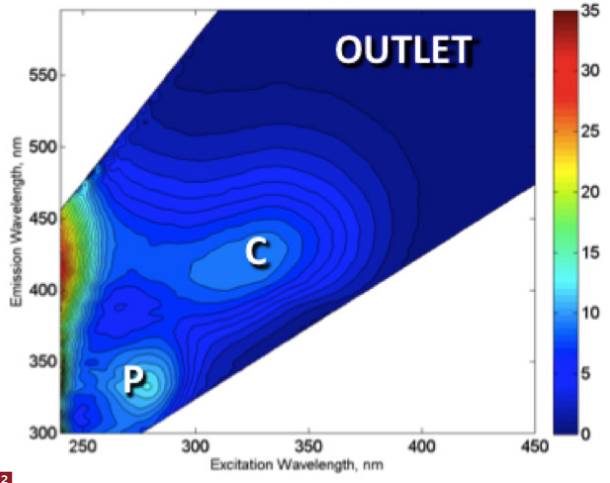
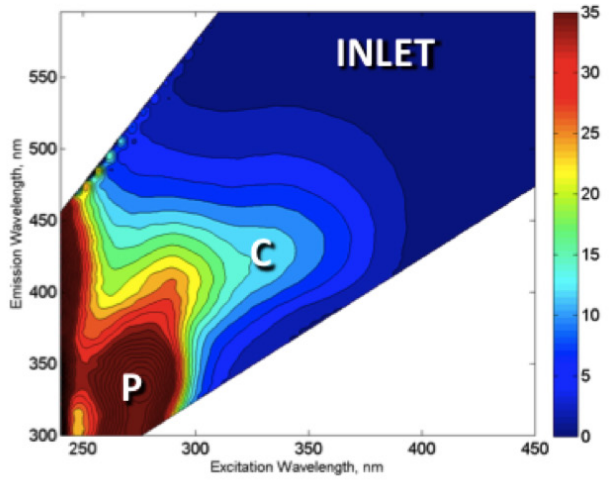
Escalating global demands on fresh water are resulting in water stress in many parts of the world, especially those undergoing rapid urbanization and industrial development. Protecting and preserving water quality and building water resiliency in communities through water reuse is essential for maintaining sustainable fresh water resources.

Environmental engineer Natalie Mladenov investigates fundamental biogeochemical processes that alter water quality in pristine and polluted settings. Her focus is on the specific interactions between organic matter, microbes, toxic trace elements and other contaminants in surface water, groundwater, and wastewater treatment systems.

Mladenov's recent research uses rapid fluorescence analysis of organic waste degradation in a community-level, sustainable water reuse operation in Durban, South Africa. A grant from the National Science Foundation allows Mladenov to bring undergraduate and graduate engineering students from Southern California to the University of KwaZulu-Natal field site for hands-on experiences tracking the performance of low cost, low energy, wastewater treatment and constructed wetland systems.

- 1 Dr. Mladenov (right) and colleague Dr. Monica Palomo (Cal Poly Pomona) collect a treated wastewater sample from a chamber in the anaerobic baffled reactor treating wastewater for agricultural water reuse in Durban, South Africa. Photo by Natalie Melgoza
- 2 Three-dimensional fluorescence spectra for inlet and effluent (outlet) water samples show decrease in protein-like fluorescence (region P) associated with labile organic carbon and microbes and persistence of humified fluorophores (region C) after wastewater treatment using a coupled anaerobic reactor and constructed wetland system.
- 3 The research team at the University of KwaZulu-Natal (left to right: Natalie Melgoza, Monica Palomo, Federick Pinongcos, Amy Bigelow, Mesai Loffe, Heather Tegley and Dr. Mladenov). Photo by Bjoern Pietruschka





2



Fugitive Methane: Capture and Conversion

MARINA KALYUZHNYAYA

Biology

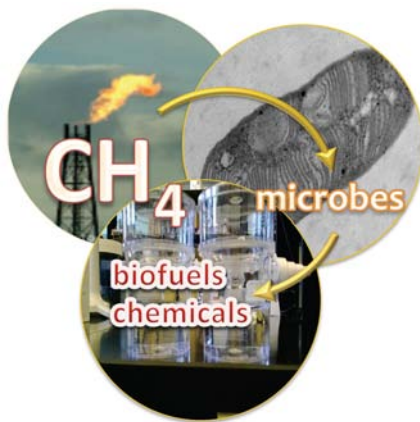
Methane is a critical component of Earth's carbon cycle that is causing up to 20% of the Earth's warming.

Dr. Marina Kalyuzhnaya's research looks at microbes (or "bugs") that consume methane for energy. She works with these methanotrophs, or methane-eating "bugs" to explore how to convert methane to lipids - the precursor for drop-in liquid biofuels, and muconic acid - a chemical intermediate in the production of fibers and plastic.

Dr. Kalyuzhnaya has taken two main approaches to working with methanotrophs. The first is to understand the fundamental metabolic pathways of converting methane to energy, and the chemical steps in that process. The second is to explore genetic modifications that might be introduced to these bacteria to favor the production of one or more valuable chemicals (like lipids or muconic acid).

Breakthroughs in this research might improve processes that reduce methane concentration in the atmosphere by using methane to make valuable chemicals, at the same time it reduces the consumption of fossil fuels by providing new ways to make biofuels and plastics.

This work is funded by the ARPA-e, and the Alliance for Sustainable Energy, LLC.



1



1 Methanotrophic bacteria, such as *Methylobacterium alcaliphilum* 20Z, are prominent systems for conversion of methane into value-added products, chemicals and fuels.

2 *Methylobacterium alcaliphilum* 20Z cells possess extensive intracytoplasmic membranes when grown on methane. Image by David Collins and Dr. Steve Barlow

Can CO₂ Sequestration Slow Down Global Warming?

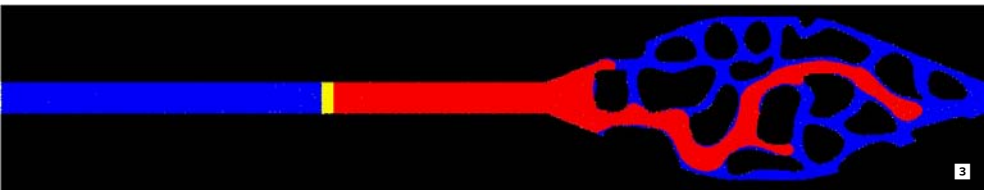
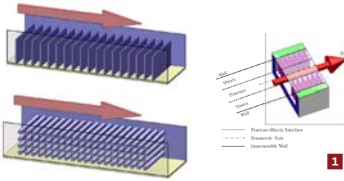
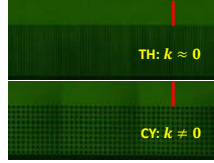
ILENIA BATTIATO
Mechanical Engineering

Carbon Dioxide (CO₂) sequestration is the process involved in carbon capture and the long-term storage of carbon dioxide. This technology can potentially control and stabilize atmospheric carbon emissions by trapping CO₂ in geologic formations - reducing greenhouse gas emissions.

With a prestigious early career research award from the U.S. Department of Energy, engineering physicist Ilenia Battiato is helping us understand how highly reactive fluids like CO₂ interact with host rocks in the subsurface. This work can help control the risks of possible leakage of CO₂ trapped in geologic formations such as carbonate rocks.

By examining how fluids move in the earth's subsurface, Battiato is hoping to understand fundamental processes that occur below ground - e.g., predicting if leaks of sequestered CO₂ will develop in the far future or if water is safe from a contaminant in the subsurface.

Her research is funded by Battelle Memorial Institute, the U.S. Department of Energy and National Science Foundation.



- 1 Flow experiments in a microfluidic channel fabricated at the Environmental Molecular Sciences Laboratory (EMSL) with different micropatterns (riblets and pillars). These are used to understand the impact of surface complexity on transport in the subsurface.
- 2 Dr. Battiato and Ph.D. students Bowen Ling, Farzaneh Rajabi and Mehrdad Yousefzadeh.
- 3 (in collaboration with Dr. A. M. Tartakovsky at the Pacific Northwest National Laboratory): Pore-scale numerical simulations of immiscible displacement (imbibition and drainage) in porous media where a non-wetting fluid (e.g. supercritical CO₂, in red) displaces a wetting fluid (e.g. water, in blue).

College Readiness: Addressing Summer Melt

LAURA OWEN
Counseling and School Psychology

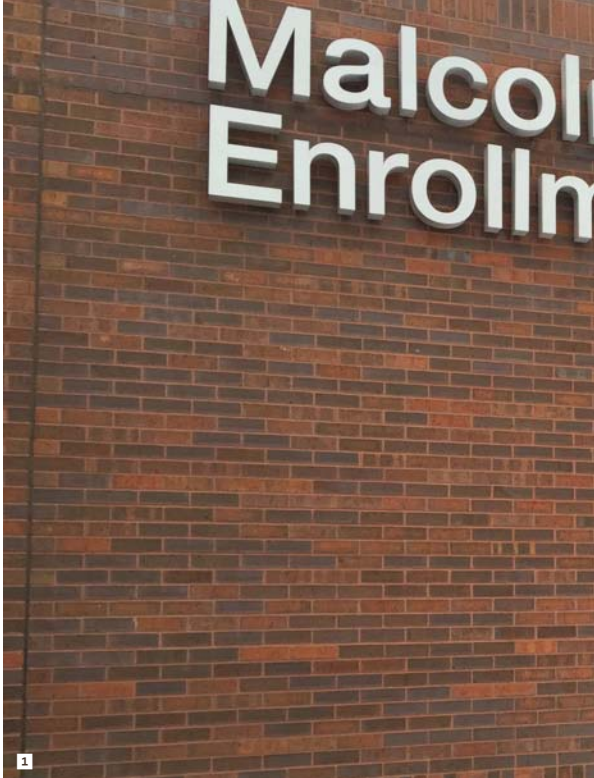
Summer is a critical transition period for high school students who have graduated and plan to attend college the next fall. As many as 50% of these academically qualified students, especially first generation and low-income students, intend and take steps to enroll, but do not show up - a phenomenon known as summer melt.

Laura Owen, in collaboration with researchers from across the country, is studying this trend by working with large urban school districts to understand how to better support students and their families as they transition from high school to higher education. She is also evaluating text messaging and tools like Bridgit, an online program that helps students prioritize complex college admissions tasks, and how summer melt programs help students navigate the financial aid and college admissions process.

Understanding and addressing the barriers students face at this stage will help to increase postsecondary opportunities for all students.

Dr. Owen's work has been supported by the Abell Foundation, the Austin Chamber of Commerce, the Bill and Melinda Gates Foundation, CollegeBound (Baltimore, St. Louis and Kansas City), the Michael and Susan Dell Foundation, the Foundation for California Community Colleges, Harvard University, the Texas Higher Education Coordinating Board and the U.S. Department of Education Federal Student Aid Department.

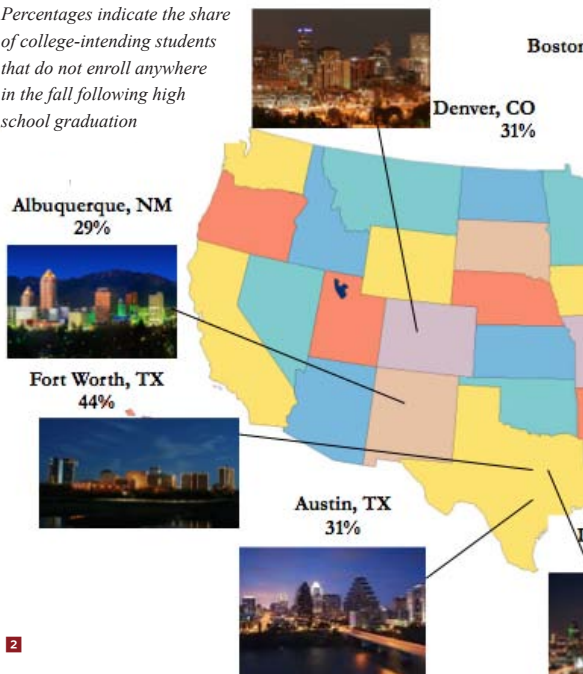
- 1 Consulting at the Kansas City Summer Melt Center: Victor Bradford (Missouri College Advising Corps), Laura Owen and graduate students Kristy Eagle, Elva Pena, and Scott Birkestrand.
- 2 Map of Summer Melt percentages in districts included in Owen's study.
- 3 Graduate students working in the Summer Melt Center at Hoover High School, San Diego.
Photos by Laura Owen



1

High School to College

Percentages indicate the share of college-intending students that do not enroll anywhere in the fall following high school graduation



2

m T. Wilson ment Center



College Transition



3

Increasing the Competency of Community Service Workers

JENNIFER TUCKER-TATLOW Social Work

Jennifer Tucker-Tatlow is the director of SDSU's Academy of Professional Excellence. Established in 1996, the Academy serves health and human service agencies in California and across the nation by providing services that are competency-based, culturally appropriate, and delivered via a variety of training modalities including webinars, coaching, simulation trainings, and mobile applications.

A recent contract with the California Department of Social Services is providing training for Adult Protective Services staff, preparing them to conduct investigations, report elder/dependent adult abuse and provide interventions to ensure the safety and security of vulnerable elders.

Our programs aim to improve the quality of life in our communities by developing competent, nurturing, supportive professionals.
-Jennifer Tucker-Tatlow

Other projects include increasing the skills and knowledge of Southern California County child welfare workers, building collaborative partnerships to improve outcomes for Tribal youth and creating a simulation training site in the Inland Empire.

Funding for Academy programs comes from the State of California, the National Adult Protective Services Association, Casey Family Programs, the Health Resources and Services Administration, and multiple California counties.

1 Adult Protective Services Training. Photo by Lori Delagrammatikas

2 Graduates of Leaders in Action (Executive Development program). Photo by Tina Kerrigan





1

Attacking Asthma

JOHN ELDER Public Health

In California's Imperial Valley, children are twice as likely as the national average to suffer from asthma. The population is largely Hispanic, and previous research has shown that children from these populations are less likely to be prescribed asthma treatment; they are also less likely to follow prescribed treatment regimens.

Behavioral scientist and Distinguished Professor John Elder is studying this trend. Poor ventilation, mold and dust mites in homes, pollen, air pollution from dust blowing in from the drying Salton Sea as well as from agricultural sources and air pollution from the truck crossing at the U.S./Mexico border in Mexicali - all present challenges.

"Our team is providing parents with the knowledge and resources needed to protect their children from pollutants and to respond quickly and effectively to an asthma attack."

-John Elder



2

Dr. Elder is working with community partners in primary care settings, state and local health departments, community-based organizations, and industry representatives to develop more effective treatment approaches to control asthma.

This work is supported by the Affordable Care Act-funded Patient Centered Outcomes Research Institute (PCORI).

1 Respiratory therapist demonstrates how to use an inhaler with a mask and spacer. Photo by Leticia Ibarra

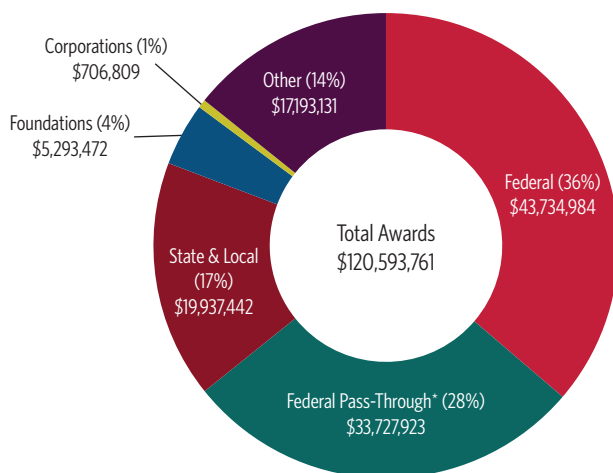
2 The 'Flag Program' warns children and parents about days with high levels of pollution when outdoor activities should be curtailed

3 School personnel raise a corresponding flag to indicate air pollution levels. Photo by Esther Bejarano



3

Awards by Sponsor Type Fiscal Year 2014-2015



*These federal funds "pass-through" other agencies before being awarded to SDSU Research Foundation.

SDSU Doctoral Programs

SDSU is proud to offer these joint and independent doctoral programs:

MAJOR/CONCENTRATION	PARTNER UNIVERSITY
Audiology (Au.D.)	UC San Diego
Biology	UC San Diego
Chemistry	UC San Diego
Clinical Psychology	UC San Diego
Computational Science	Claremont Graduate University
Computational Science: Statistics	Claremont Graduate University
Ecology	UC Davis
Education	Claremont Graduate University
Education Leadership: Pre K-12 School Leadership	Independent
Education Leadership: Community College/Post-Secondary Leadership	Independent
Engineering Sciences: Bioengineering	UC San Diego
Engineering Sciences: Electrical & Computer Engineering	UC San Diego
Engineering Sciences: Mechanical & Aerospace Engineering	UC San Diego
Engineering Sciences: Structural Engineering	UC San Diego
Evolutionary Biology	UC Riverside
Geography	UC Santa Barbara
Geophysics	Scripps Institution of Oceanography/UCSD
Interdisciplinary Research on Substance Use	UC San Diego
Language & Communicative Disorders	UC San Diego
Math & Science Education	UC San Diego
Physical Therapy (DPT)	Independent
Public Health: Epidemiology	UC San Diego
Public Health: Global Health	UC San Diego
Public Health: Health Behavioral Sciences	UC San Diego

Other Distinctions

- SDSU faculty and staff received \$120.6 million to support their research programs.
- The National Institutes of Health awarded \$22.4 million to SDSU researchers.
- SDSU faculty and staff garnered \$8.4 million in National Science Foundation funding.
- SDSU is classified as a research university with “high” research activity by The Carnegie Foundation.
- Forbes ranks SDSU as a top 25 (#18) most entrepreneurial university.
- U.S. News and World Report ranked four of SDSU's graduate programs among the nation's best: rehabilitation counseling, psychology, education, and business.
- SDSU was recognized by the Carnegie Foundation as a top university for community engagement.
- U.S. News and World Report includes SDSU in its list of “up and coming universities” (#14).
- SDSU received a \$30 million grant to establish STEM degree programs in the nation of Georgia.
- SDSU's Center for Sensorimotor Neural Engineering received \$15-\$20 million renewed funding from the National Science Foundation.
- Phillip Greiner received a \$2.5 million grant from the U.S. Department of Health and Human Services to establish the San Diego/Imperial Geriatric Education Center to improve care for older Americans.
- SDSU astronomers Jerome Orosz and William Welsh discovered the 10th known “transitioning circumbinary” planet, which orbits two stars and has two suns after discovering the first instance of a two-planet circumbinary system in 2012.
- SDSU alumnus Gemechu Abraham, Professor Michael Sloan and their student team created a human-powered grain thresher that produces three times as much food as traditional threshers. The team won a \$100,000 prize for their efforts but, more importantly, this development holds promise of reducing malnutrition in the developing world.
- Graduate student David Curran received the top research award from the American Solar Energy Society.
- Ricardo Zayas received a prestigious NSF Career Award.
- Robert Quimby received the Breakthrough Prize in Fundamental Physics.
- Marilyn Chin won the Anisfield-Wolf Book Award.
- Kim Stringfellow was awarded a Guggenheim fellowship.
- Ron King was named Fulbright Senior Specialist.
- Greg Talavera was honored with the 2014 Helen Rodriguez-Trias Social Justice Award.
- Roland Wolkowicz identified a drug to fight dengue fever.
- Ralph Axel-Mueller and Inna Fishman identified brain anomalies in autism.
- Rob Edwards and colleagues discovered a virus that affects digestion in over half the human population.
- Willa Fields received the Nursing Informatics Leadership Award from the Healthcare Information and Management Systems Society.
- Kelly Doran and graduate student Brandon Kim discovered an approach that may prevent bacterial meningitis.



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