

SAN DIEGO STATE UNIVERSITY
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R E S E A R C H
H I G H L I G H T S



**SAN DIEGO STATE
UNIVERSITY**

Leadership Starts Here



SAN DIEGO STATE UNIVERSITY

Leadership Starts Here

SDSU continues to gain recognition as a leader in higher education. Our students are distinguishing themselves in the classroom, laboratory, and community. Their success can be attributed in great part to the accomplished faculty who teach and support them.

We welcomed fifty-six new faculty members last fall, whose diverse research areas include computational archaeology, gender-based violence, Hindu pilgrimage and practice, muscle health, bioethics, and the formation of galaxies. Their inquiries are deepening the learning experience for our students and preparing them for collaborative and creative future endeavors.

Much of SDSU research is collaborative, cutting across disciplines and including partners in the community, industry and government. Last year, an interdisciplinary team of SDSU deans, research directors and faculty received a transformative award from the National Institute of Minority Health and Health Disparities.

This \$10 million grant recognizes SDSU's excellence and established the SDSU Population Health and Health Disparities Endowment. By creating a sustainable infrastructure for population health and health disparities research that integrates the health, engineering and computer science disciplines, research findings can be translated more quickly into improvements in clinical, public health and organization practices, and population health.

The award is enabling us to invest in technologically innovative data collection and intervention delivery for translational research and in the use of big data to help define how we understand, measure, and intervene in health influencers.

This is one example of the innovative and impactful work being conducted at SDSU. This brochure highlights some of the other exciting research that is inspiring students and improving society.

Congratulations to all the SDSU researchers who received more than 700 awards and \$130 million to support their programs last year. A complete listing of 2015-16 grants can be found here: https://www.foundation.sdsu.edu/news/news_2015_16_awards_listing.html.

Stephen C. Welter
Vice President for Research and Dean of Graduate Affairs
San Diego State University

Calling Foul on Biofouling

NICHOLAS SHIKUMA

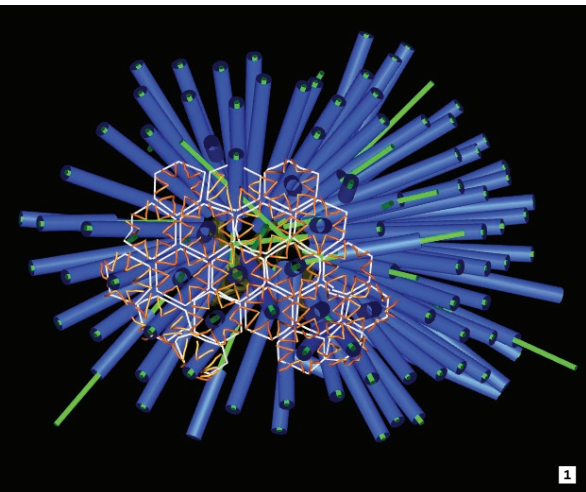
Biology

Biofouling, the accumulation of living organisms (e.g., plants, algae, bacteria and barnacles) on underwater equipment like ships' hulls can lead to the impairment or degradation of these submerged surfaces. Bacteria-triggered biofouling can, for example, significantly increase fuel consumption for ships underway and decrease their speed - with substantial economic consequences for the U.S. Navy and other shipbuilders/water-related businesses.

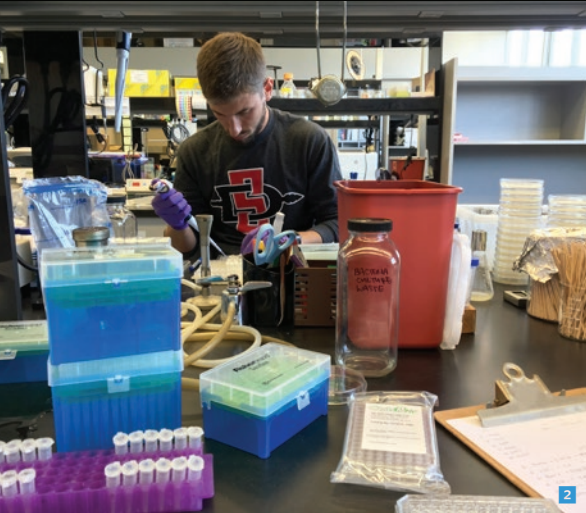
Dr. Nicholas Shikuma is studying the free-swimming larvae of biofouling organisms, hoping to better understand what triggers these organisms to develop from their larval to adult state and what role bacteria play in this metamorphosis. His research is showing that it is an important one: the tubeworm, (a biofouling culprit) relies on bacteria to successfully reach its adult life stage.

This work could ultimately inform future strategies to inhibit biofouling and has implications for understanding how bacteria help our development and well-being.

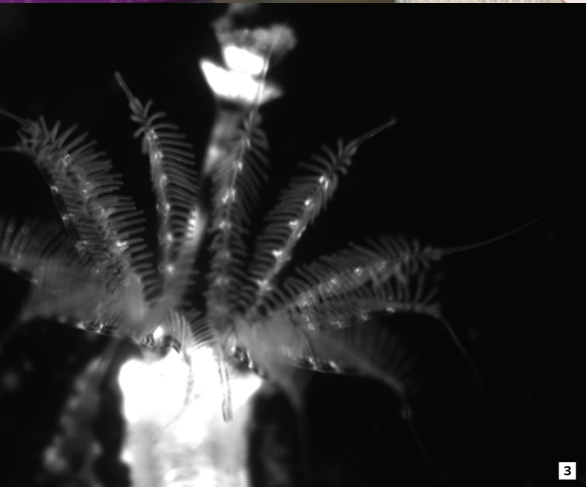
The Office of Naval Research supports Dr. Shikuma's research.



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- 1 Model of a bacterial stimulant for tubeworm metamorphosis. Photo by: Martin Pilhofer
- 2 MS student Chip Ericson mid-experiment in the Shikuma lab. Photo by: Nicholas Shikuma
- 3 Adult tubeworm, *Hydroïdes elegans*. Photo by: Nicholas Shikuma

Identifying Early Brain Signature of Autism

INNA FISHMAN
Psychology

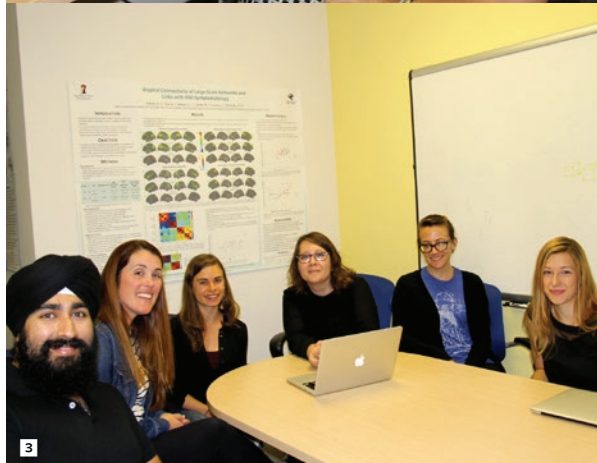
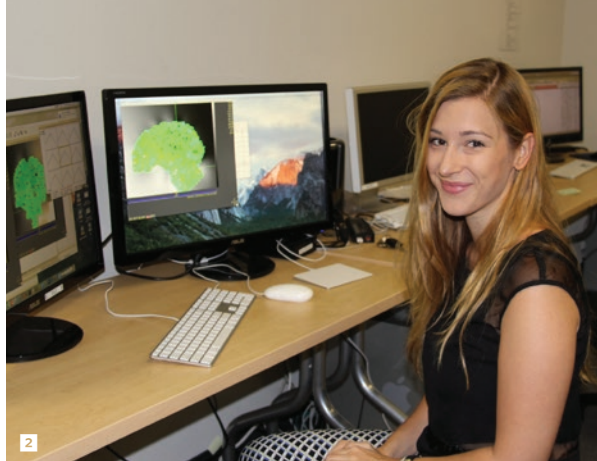
As a disorder of brain development, autism spectrum disorder (ASD) affects the brain's growth and function. Yet, the cause and timing of these effects are still unknown. Understanding these mechanisms is critical because it will lead to more accurate diagnosis and intervention, improving the long-term outcomes for people with ASD.

Neuroscientist Inna Fishman conducts imaging studies to identify brain patterns associated with symptoms of autism. Using cutting-edge techniques from anatomical, functional and diffusion MRI, she examines changes in brain organization during the critical developmental window, between the age of first ASD symptoms (18-24 months) and 4-5 years of age when ASD symptoms are at their peak. Dr. Fishman and her team scan toddlers at night, when they are naturally asleep, without sedation or medications.

This research promises to identify early brain markers of risk that may help us develop effective treatments for this life-long disorder.

Dr. Fishman's work has been supported by the National Institute of Mental Health, Autism Science Foundation, UCSD's Clinical and Translational Research Institute, and SDSU's Center for Clinical and Cognitive Neuroscience.

- 1** Postdoctoral researcher Dr. Joanne Jao explains the MRI procedure to a child's family, with help of the friendly Coda Bear, the lab's mascot. Photo by: Jiwandeep Kohli
- 2** Natalia Witkowska, an undergraduate research assistant, inspects toddler brain image quality. Photo by: Debbie Brighton
- 3** Dr. Fishman (center) with graduate student Jiwandeep Kohli, postdoctoral fellow Dr. Mikaela Kinnear, joint doctoral program student Lindsay Olson, and undergraduate research assistants; Seraphina Solders and Natalia Witkowska. Photo by: Debbie Brighton





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Home-Based HIV Testing in Rural Uganda

SUSAN M. KIENE
Graduate School of Public Health

Throughout sub-Saharan Africa there is a pressing need for early and simpler entry into HIV care and treatment. As many as two-thirds of patients are lost between testing HIV positive and initiation of treatment. Timely linkage to care reduces mortality rates, improves treatment outcomes and decreases the likelihood of transmitting HIV to others.

In rural Uganda, global health researcher Susan Kiene is testing a home-based HIV testing and counseling model with enhanced linkage to care services to see if it reduces time to HIV care, treatment initiation, and population-level infectivity. Her enhanced intervention emphasizes counseling and seeking social support to overcome HIV-related stigma - and may be a cost-effective HIV testing and referral approach.

Dr. Kiene's work is supported by the National Institute of Mental Health.

- 1 Study field team member Asha conducts an interview
 - 2 Study field team members walk to a household with the Village Health Team representative.
 - 3 Field team with Dr. Kiene
- Photos by: Rashid Muyingo

Climate Variability and Change at the Roof of the World

FERNANDO DE SALES Geography

A specialist in regional climate modeling, physical geographer Fernando De Sales studies the effects of surface-atmosphere interactions on the climate and ecosystem of East Asia, in particular of the Tibetan Plateau. Also known as the “Roof of the World,” the land mass is the world’s highest and largest plateau, with an area about four times the

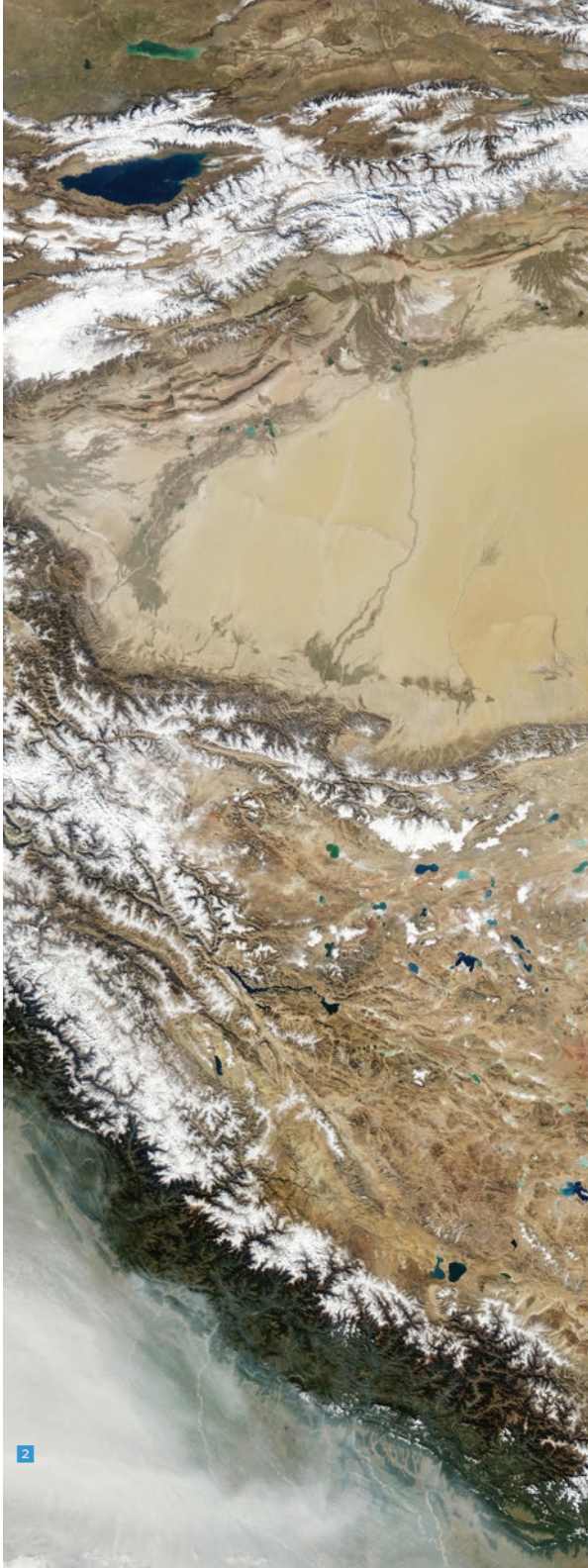
size of France. Its snow pack feeds ten rivers that provide water for irrigation and human consumption to more than 1.4 billion people.

Dr. De Sales and his colleagues are utilizing an atmosphere-ocean-land modeling system to investigate the causes of climate variability and change in the region. The study considers both natural processes like natural vegetation and snowfall variations, as well as human impacts like agricultural expansion and greenhouse gas emissions. This work will produce more reliable East Asian regional future climate prediction and help assess the impact of climate change on the region’s water and land resources.

Dr. De Sales’s research is supported by UCLA and the National Science Foundation.

1 Dr. Fernando De Sales. Photo by: Ira Zukanovic

2 The Tibetan Plateau is a region of stunning beauty, as shown by this true-color image. It is graced with hundreds of lakes that sparkle against the tan and peach colors of the land. The plateau’s elevation averages 16,010 feet above sea level and it is bounded by mountain ranges, making it a challenging target for climate modeling studies. Photo by: NASA





Protective Health Benefits of Nuts, Watermelon and Chocolate

MEE YOUNG HONG

Exercise and Nutritional Sciences

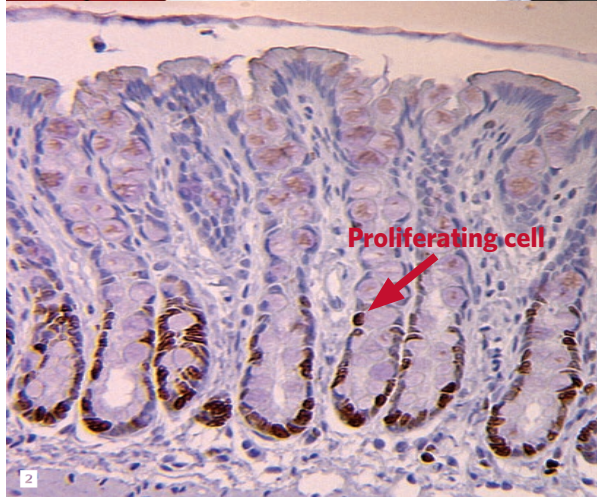
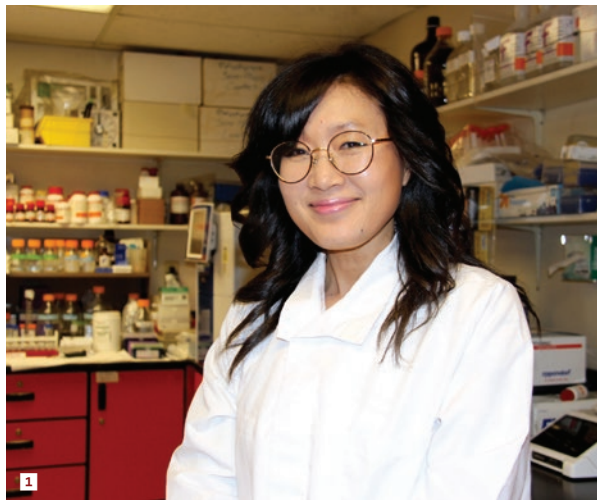
Phytochemicals, which occur naturally and provide plants with flavor and color, are thought to be responsible for the protective health benefits many plant-based foods provide. Dr. Mee Young Hong examines the role diet and these phytochemicals play in disease.

While studies have explored the protective effects of specific nut types on heart disease, there is limited research on whether the beneficial effects can be extended to consumption of a nut mixture. Dr. Hong is filling this knowledge gap by exploring the acute and long-term effects of mixed nuts (almonds, hazelnuts, pecans, pistachios, walnuts and peanuts) on metabolic parameters and weight management, and whether mixed nut consumption modulates food intake by controlling appetite-regulating hormones.

Her other studies include the impact of daily consumption of flavonol-rich dark chocolate on risk factors for cardiovascular diseases including inflammation, lipid profiles and liver function, and the effect of watermelon supplementation on colon cancer prevention due to its antioxidant, anti-inflammatory and vasodilation properties.

Dr. Hong's work is supported by the American Heart Association's Western States Affiliate, the Center for Health and Human Nutrition at UC Davis and the National Watermelon Promotion Board.

- 1 Dr. Mee Young Hong. Photo by: Debbie Brighton
- 2 Photomicrograph of colonic crypts stained for cell proliferation. Photo by: Hong Lab
- 3 SDSU graduate student Jaclyn B. Gaylis conducts research to examine effects of watermelon powder on gene expression involved in colon carcinogenesis. Photo by: Debbie Brighton



Forecasting Future Seismicity

THOMAS ROCKWELL Geology

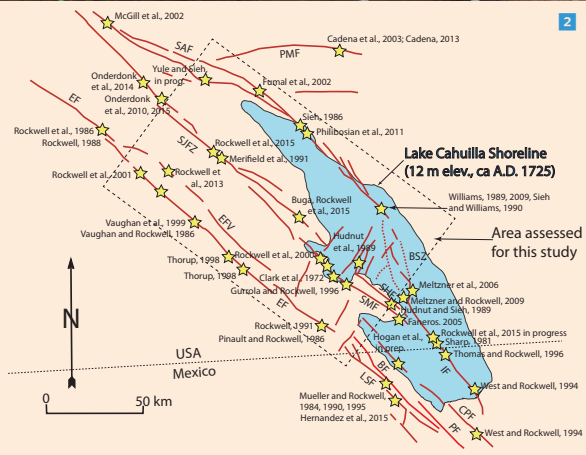
It is said that the best predictor of future human behavior is past behavior. The same might be said for earthquakes. By understanding the past rupture history of an earthquake fault, we can better estimate the likelihood of a future large earthquake.

An expert on the tectonics and earthquake hazards of southern and Baja California, Dr. Thomas Rockwell has also conducted extensive trenching programs to examine faults in the western U.S., South and Central America, Europe, the Middle East and Asia. He uses structural geology, soil and sedimentary stratigraphy and geomorphology combined with various radiometric dating techniques to assess rates of fault activity, determine recency of faulting, and date past earthquakes.

The Southern San Andreas fault (SAF) is recognized as one of California's most significant seismic hazards for the breadth of the area likely to be severely affected by a large earthquake, and for the lifelines that would be severed by such an event. Dr. Rockwell is examining the wide and complex step-over region between the San Andreas and Imperial faults to determine the likelihood of faulting in this area. Using dynamic rupture modeling, his group is assessing whether a large earthquake on the southern San Andreas fault could potentially jump to the Imperial fault and sever Interstate 8, along with most major arteries to the north (I-10, I-5, etc.).

Dr. Rockwell prepared an 1100 year record of large earthquakes in the southern San Andreas fault system which demonstrates that at least one large earthquake is likely on the fault system in the near geologic future.

The U.S. Geological Survey and University of Southern California support this research.



1 Dr. Rockwell and field assistant digging new trenches on the Agua Blanca fault in Baja, California. Photo by: Peter Gold

2 Paleoseismic sites researched during the past 35 years in the southern San Andreas fault system. Most stars represent SDSU studies. The dashed box is the area assessed for moment release in the past 1100 years. Image by: Rockwell Lab

Novel Antennas at Microwave and Millimeter Wave Frequencies

SATISH K. SHARMA
Electrical and Computer Engineering

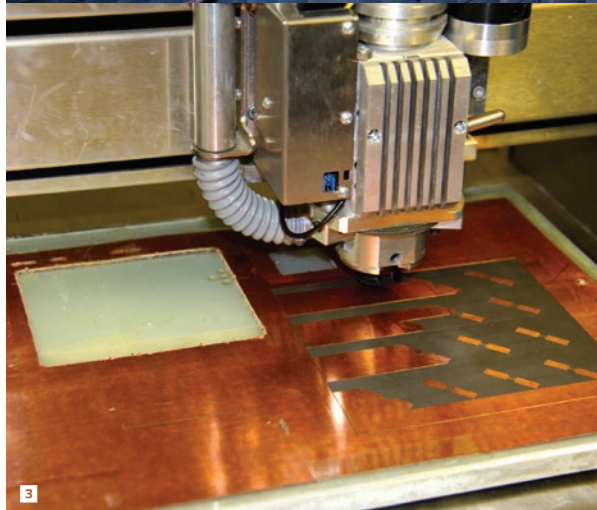
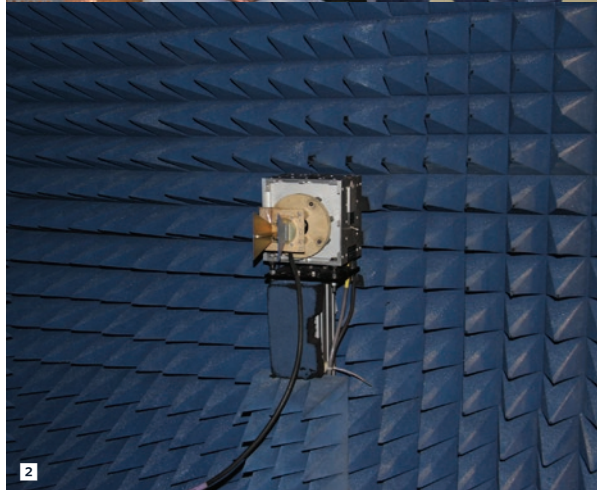
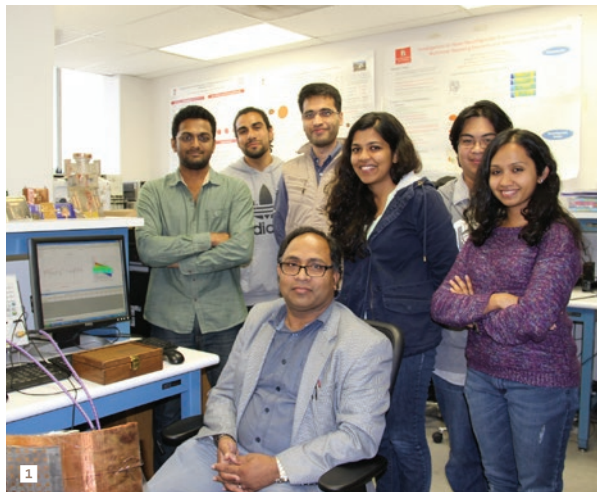
Antennas are an important component of any communications system because they are responsible for transmitting and receiving electromagnetic (EM) waves. Satish Sharma, director of SDSU's Antenna and Microwave Laboratory, designs antennas for modern wireless and satellite communications and radar applications.

He builds a variety of antenna types including phased array and null steering antennas, hybrid analog digital beam-forming antennas, feeds for reflectors, massive multiple input multiple output (MIMO) antennas, reconfigurable antennas, micro-strip antennas and arrays, electrically small antennas, dielectric resonator antennas - and uses novel electromagnetic metamaterial structures to enhance antenna performance.

These compact structures and antennas are improving the performance of portable and handheld devices, direction finding systems, nano-cube satellites, and anti-jamming communication systems. His lab facility includes several full wave analysis tools, vector network analyzers, and radiation pattern measurements in an anechoic chamber from 800 MHz to 50 GHz, and a mini-compact range from 50 GHz to 110 GHz.

Dr. Sharma received the National Science Foundation's prestigious CAREER award in 2009 and is a Senior Member of the Institute of Electrical and Electronics Engineers. The Office of Naval Research, Space Micro Inc., and Broadcom Corporation support his current work.

- 1 Professor Sharma (seated) and his Antenna and Microwave Lab research students (from left: Mohana Komandala, Azzam Tabbal, Ghanshyam Mishra, Roshin George, Alejandro Castro, and Sandhya Krishna)
 - 2 Inside view of the anechoic chamber, Antenna and Microwave Lab at SDSU.
 - 3 An antenna structure being milled using a computer-aided milling machine (LPKF S-42) after its simulation design
- Photos by: Debbie Brighton



“As long as poverty and injustice, and gross inequality persist in our world, none of us can truly rest”

—Nelson Mandela

RISE

SAN DIEGO

Fostering Urban Leadership and Engagement



Fostering Community Engagement to Increase Equity and Inclusion in Public Policy

MOUNAH ABDEL-SAMAD
School of Public Affairs

RISE San Diego is a community organization created to help develop urban leaders and promote resident-led civic engagement.

Dr. Mounah Abdel-Samad is partnering with RISE to monitor and evaluate the impact of Race and Equity panels, city staff and community leader training, and to provide institutional best practices for equity and inclusion that facilitate equitable and inclusive public policy.

The diverse nature of Southern California in general and San Diego more specifically accent the need to analyze why disparities persist between different societal groups and the impact of such disparities on citizens' quality of life.

San Diego's growth has been challenging for some of its citizens, particularly the 15.8% living in poverty. Local governments can play an important role in reducing inequality. Dr. Abdel-Samad's work can open the door for more discussions and tools to redress the continuously growing income inequality in San Diego.

Dr. Abdel-Samad's work is supported by RISE San Diego.

1 Dr. Mounah Abdel-Samad. Photo by: Debbie Brighton

Mapping the Offshore Paleolandscape and Cultural Resources of North America's Pacific Coast

TODD BRAJE
Anthropology

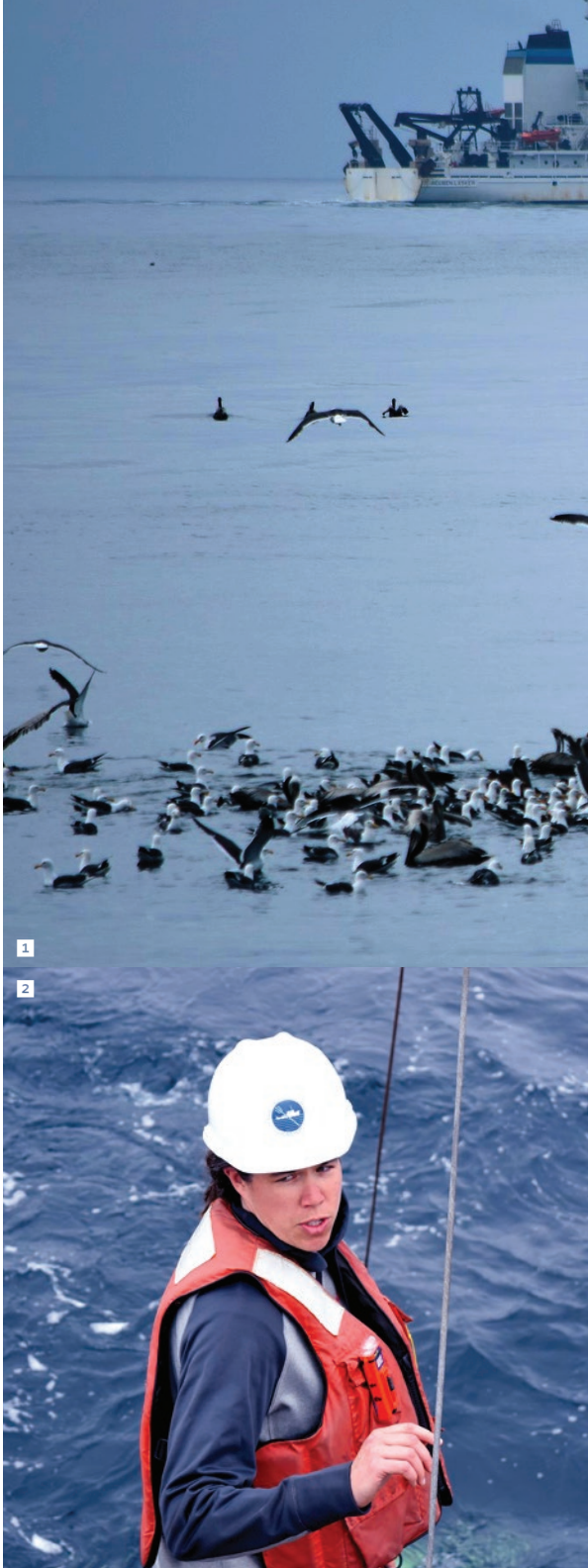
JILLIAN MALONEY
Geological Sciences

Off the Pacific Coast of North America, rising postglacial sea levels have submerged a vast paleolandscape that almost certainly contains inundated archaeological sites and, perhaps, evidence for the initial human colonization of the New World. Very little research has been conducted to identify submerged archaeological sites, however, and to track the history and adaptations of terminal Pleistocene and Early Holocene coastal hunter-gatherer-fishers in North America.

Anthropologist Todd Braje and geologist Jillian Maloney are using archaeological surveys, sonar tools, and sediment sampling to identify and assess the submerged landforms off southern California and central Oregon. Their work to map and sample the seafloor conducted as part of this effort should enhance regional landscape models of submerged archaeological resources and act as a critical step in better understanding the earliest human adaptations to New World marine ecosystems along the Pacific Coast.

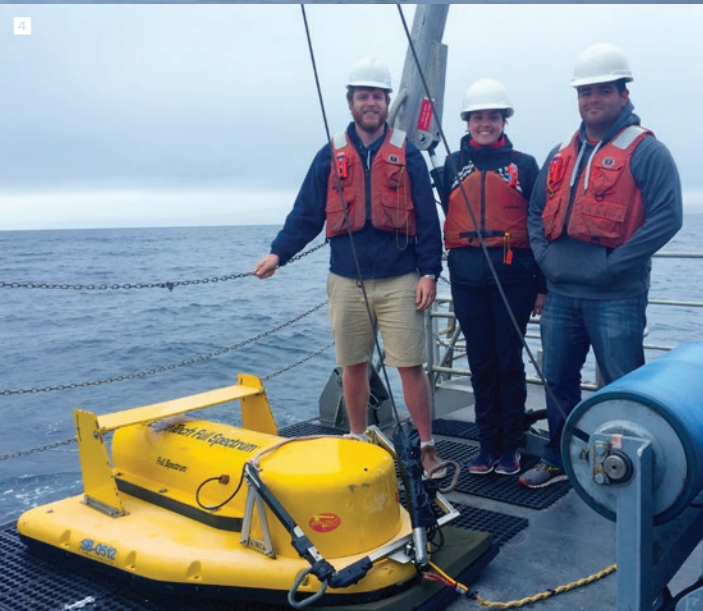
The U.S. Department of the Interior's Bureau of Ocean Energy Management supports this research.

- 1** A flock of seabirds gather near the vessel while another NOAA research vessel collects data offshore Santa Cruz Island. Photo by: Greg Sanders, BOEM
- 2** Jillian Maloney (SDSU) instructs crew during deployment of Chirp profiler. Photo by: Greg Sanders, BOEM
- 3** Graduate student Joseph McCain, holding a chipped stone eccentric crescent, indicative of sites dating more than 8000 years old on the Channel Islands. Photo by: Todd Braje
- 4** Preparing to deploy the Chirp profiler used to map features buried beneath the seafloor. Photo by: Greg Sanders, BOEM



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Understanding Shopping Behavior in Food Retail Environments

IANA CASTRO
Marketing

Dr. Iana A. Castro examines in-store decision-making and how cues in the retail environment influence consumer preferences and choices.

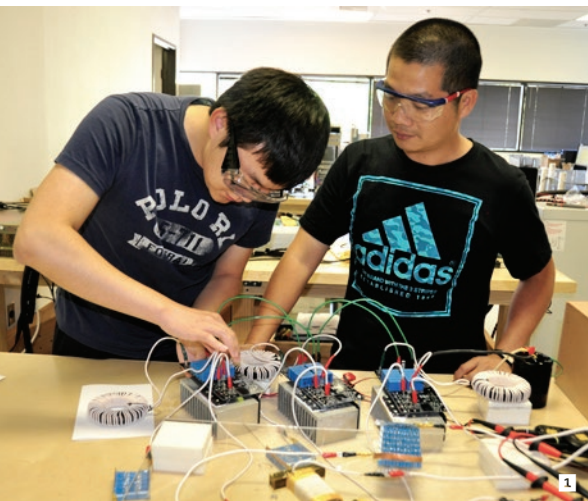
Her Shop 2gether Project is a collaboration with Dr. Guadalupe X. Ayala and focuses on understanding the food shopping behavior of Latino consumers, who are disproportionately affected by obesity and grocery shop more frequently and more often with children than the general population.

Using mobile eye-tracking technology that captures visual and audio data from both the parent's and the child's perspective, the researchers are exploring the in-store factors that influence parents' and children's food and beverage requests and purchases. They are also examining how general shopping behaviors, parenting behaviors and relevant cultural and economic factors influence requests and purchases. This research will help identify ways of encouraging healthier food and beverage choices and provide important considerations for future in-store interventions.

Dr. Castro's work is funded by the National Institute of Child Health and Human Development and the Robert Wood Johnson Foundation Healthy Eating Research Program.



- 1 Child participant going through the calibration process for the eye-tracking glasses
 - 2 Parent and child participants completing a grocery shopping trip while wearing the eye-tracking glasses
- Photos by: Project Team



Improving Hybrid and Electrical Vehicle Performance

CHRIS MI
Electrical and Computer Engineering

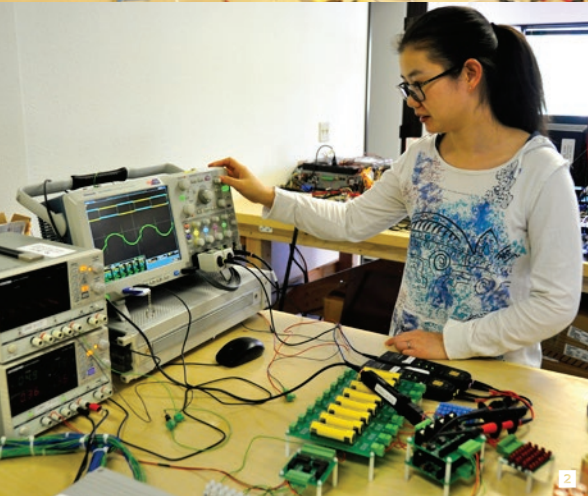
Even at a time when gas prices are relatively low, interest in fuel efficient, alternate energy vehicles is growing. Consumers appreciate the environmental and economic benefits of conserving fuel and producing less CO₂ emissions. California leads the country in electric and hybrid car sales and the U.S. is second only to Japan in sales of these vehicles.

IEEE Fellow Chris Mi is an expert on electric and hybrid vehicles, which use electricity as their primary fuel or to improve the efficiency of conventional vehicle designs. Dr. Mi's work is helping to better predict the life and performance of batteries, which are essential for these vehicles. By increasing battery pack performance, reducing pack design and cost, and extending the pack service life, Dr. Mi and his team are helping to make these cars run more efficiently - without sacrificing performance or safety.

The Mi lab group is also working on wireless power transfer technology which can charge electric vehicles wirelessly, eliminating the need for an electric plug and increasing safety.

Dr. Mi leads the Graduate Automotive Technology Education (GATE) Center of Excellence, which is training the future automotive engineering workforce in the development and production of cost-effective, high-efficiency vehicles.

His work is supported by the Department of Energy, National Science Foundation and Nanjing Golden Dragon Bus Manufacturing Company, Ltd.



- 1 Ph.D. candidate Tianze Kan (left) and visiting scholar Ruikai Mai (right) working on a wireless charging system for an underwater robot
 - 2 Ph.D. candidate Chenwen You works on a battery diagnosis system.
 - 3 A wireless power transfer system prototype
- Photos by: Mi Lab



Super Stars

ROBERT QUIMBY Astronomy

According to NASA, a supernova is the explosion of a star – the largest explosion that takes place in space. They occur when the core of a star collapses under its own weight or when the cooling embers of long-deceased stars are suddenly reignited. These explosions release elements throughout the universe which go on to form new stars, planets, and material fundamental to life such as the calcium in our bones.

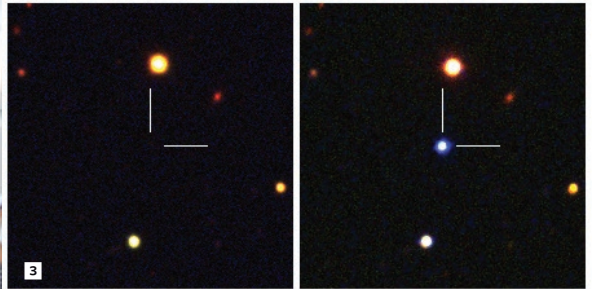
Astronomer and recipient of the 2014 Breakthrough Prize in Fundamental Physics, Robert Quimby leads SDSU's Mount Laguna Observatory. He has discovered several of the brightest supernovae ever observed and is studying a new class of supernovae that shines 100 times brighter than the average.

Using optical, ultraviolet, and X-ray observations, Dr. Quimby's research will determine if these superluminous supernovae draw their immense power from compact objects, such as neutron stars that form during stellar core-collapse, or if this energy is released as fast-moving supernova ejecta plow through slow moving gas around the star.

Dr. Quimby's work is funded by the National Aeronautics and Space Agency and the National Science Foundation.

1 SDSU students, Melanie Olaes and Isaac Spitzer, prepare the 1.1m Telescope at Mount Laguna Observatory for the night.
Photo by: Robert Quimby





- 2** Dr. Quimby will use the 1.3m Phillips Claud Telescope to classify and study rare supernovae. Photo by: Robert Quimby
- 3** Images taken before a star explodes as a superluminous supernova (right) and during the supernova (left). The galaxy hosting the supernova is difficult to see because it is so far away, but the superluminous supernova is clearly visible because as it explodes it shines much brighter than all of the stars in the host galaxy combined. The crosshairs mark the location of the supernova. Photo by: Robert Quimby

Understanding Molecular Mechanisms of Disease

CHRISTAL SOHL

Chemistry and Biochemistry

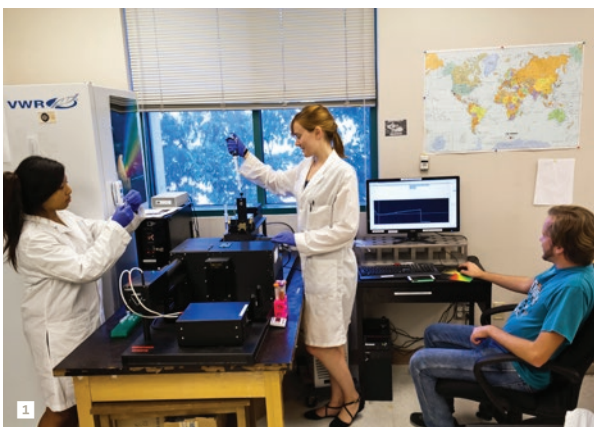
Mutations in enzymes, a class of proteins that act as biological catalysts to perform complex chemical reactions, can alter their function, often leading to disease.

Dr. Christal Sohl and her team are exploring how mutations in the enzyme isocitrate dehydrogenase 1 (IDH1) is mutated in the majority of lower grade brain cancers. These mutations can equip IDH1 with a brand new catalytic activity: the production of a small metabolite called 2HG. Biosynthesis of this metabolite can contribute to cancer development.

By measuring the rate of 2HG production using enzyme kinetics, Dr. Sohl has shown that different mutations in IDH1 vary widely in their ability to produce 2HG. Some IDH1 mutants can generate 2HG 50,000-fold more efficiently than non-mutated IDH1.

The Sohl lab also uses cell-based models, and, in collaborative work, lipidomics and metabolomics to identify new downstream consequences of IDH1 mutations to better understand how cancer develops. This work can identify novel pathways that may be therapeutically targeted in brain cancer patients.

Dr. Sohl's research is supported by the National Institutes of Health.



1 Undergraduates Stacy Anselmo (left) and Madison Kennedy (middle) prepare samples for the stopped-flow spectrophotometer. Graduate student Diego Avellaneda Matteo (right) monitors the enzymatic reaction. Photo by: Christal Sohl

2 Dr. Sohl (left) guides graduate student Anna Uvarova in the use of the rapid chemical quench, an instrument that allows millisecond-length measurements to determine pre-steady-state kinetic rates. Photo by: Stacy Anselmo

3 The Sohl Lab

Urbanization of Wildlands and Ecosystem Impacts

ALICIA KINOSHITA
Civil, Construction and Environmental Engineering

Dr. Alicia Kinoshita and her research group utilize field studies, remote sensing, and modeling to predict hydrologic recovery in watersheds that have been disturbed by natural and anthropogenic activities such as mitigation, restoration and urbanization.

Many wildlands and forests in the United States are under substantial pressure from increasing human development and recreational demand. Recreational trails and users can significantly impact surrounding ecosystems and watersheds where developed systems have not been planned and maintained. Negative impacts include noise pollution, erosion, weed invasion, increased travel into remote areas, water and soil pollution, decreased biodiversity near trails, and habitat fragmentation.

Using San Bernardino National Forest as a case study, Dr. Kinoshita and Ian Crano (M.S. Civil Engineering) are assessing the impacts of recreational trails, which is critical for planning sustainable trail systems, accommodating climate change, and managing increasing recreational demands.

This research is funded by the Big Bear Valley Trails Foundation.



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- 1 Dr. Alicia Kinoshita
- 2 Walking a system trail in Big Bear Valley, California. Downed trees and rocks are used to retain sediment. Photo credit Crano, January 2015
- 3 User-created trail ("short cut") to a parking lot. Photo by: Alicia Kinoshita
- 4 Graduate student Ian Crano prepares for research trek. Photo by: Jennifer O'Brien

Boca Sana, Cuerpo Sano (Healthy Mouth, Healthy Body)

TRACY FINLAYSON
*Graduate School of Public
Health*

While oral health has improved for most in the U.S. in recent decades, improvements have not been experienced equitably. Untreated dental diseases remain “a silent epidemic,” disproportionately afflicting racial/ethnic minority groups and the socially disadvantaged. Untreated dental disease can cause pain and lead to difficulty with eating, speaking, learning and working.

An inaugural Isman-Fine Leadership Fellowship with the Center for Oral Health in California, Dr. Tracy Finlayson addresses oral health disparities and issues around access to dental care, particularly for vulnerable population groups. Her community-based participatory research with Mexican migrant families in north San Diego County led to the development and evaluation of a low-literacy oral health educational curriculum in English and Spanish; her community health worker-led educational intervention improved self-reported oral health quality of life and oral hygiene practices among those not regularly performing them. Her work has significant implications for oral disease prevention.

Dr. Finlayson’s recent research was funded by the Dentaquest Foundation, and her research with UC San Francisco is supported by the National Institutes of Health.



1 Dr. Finlayson and her research team at a 2015 oral health conference. Photo by: Center for Oral Health

2 Dr. Tracy Finlayson

Global Education for California's Teachers and Students

EMILY SCHELL Teacher Education

How can we prepare today's youth for informed, productive, and peaceful participation in an increasingly interconnected world? The California International Studies Project (CISP) starts with their teachers to develop global competence and leadership skills that translate into equitable learning opportunities for Pre-kindergarten-12th grade students. This results in global education programs focused on inquiry, collaboration, communication, and creativity skills necessary to understand and address local and global issues.

Dr. Emily Schell coordinates the statewide office of the California International Studies Project, a six-site network that connects universities and K-12 schools to improve interdisciplinary and standards-based teaching of world history, geography, and global studies. CISP is one of nine California Subject Matter Projects (CSMP) authorized by California statute in 1988 to enhance student learning by providing comprehensive, content-focused, and high quality professional development for teachers while promoting teacher leadership.

Dr. Schell's work is supported by the University of California.



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- 1 Third grade students practice their French language skills with SDSU Intercultural Ambassador Jeremy Normand
 - 2 CISP collaborates with the California Geographic Alliance in the SDSU Geography Department to equip teachers with geospatial learning skills
 - 3 Castle Park High School students investigate water quality issues with SDSU Intercultural Ambassador Joseph Wasswa from Uganda
- Photos by: Emily Schell

New Chemistry and New Medicines

MANAL SWAIRJO Chemistry and Biochemistry

RNA molecules are produced in our cells, and like DNA, are critical to all life forms. Messenger RNA (mRNA) carries our coded genetic information to other parts of our cells for protein production, while transfer-RNA (tRNA) decodes the message to enable its translation to amino acid sequence during the creation of new proteins. A molecule of many tribulations, tRNA encounters many cellular processes that prepare it for its important role in life.

Professor Manal Swairjo uses structural bioinformatics and X-ray crystallography to discover and understand the molecules that process tRNA in disease-causing bacteria like *Neisseria gonorrhoeae* and *Staphylococcus aureus*. In her investigations, she uncovers new molecular mechanisms in these pathogens to target with antibiotics, and new ways to catalyze chemical reactions to replace current, environmentally unfriendly chemical industrial methods.

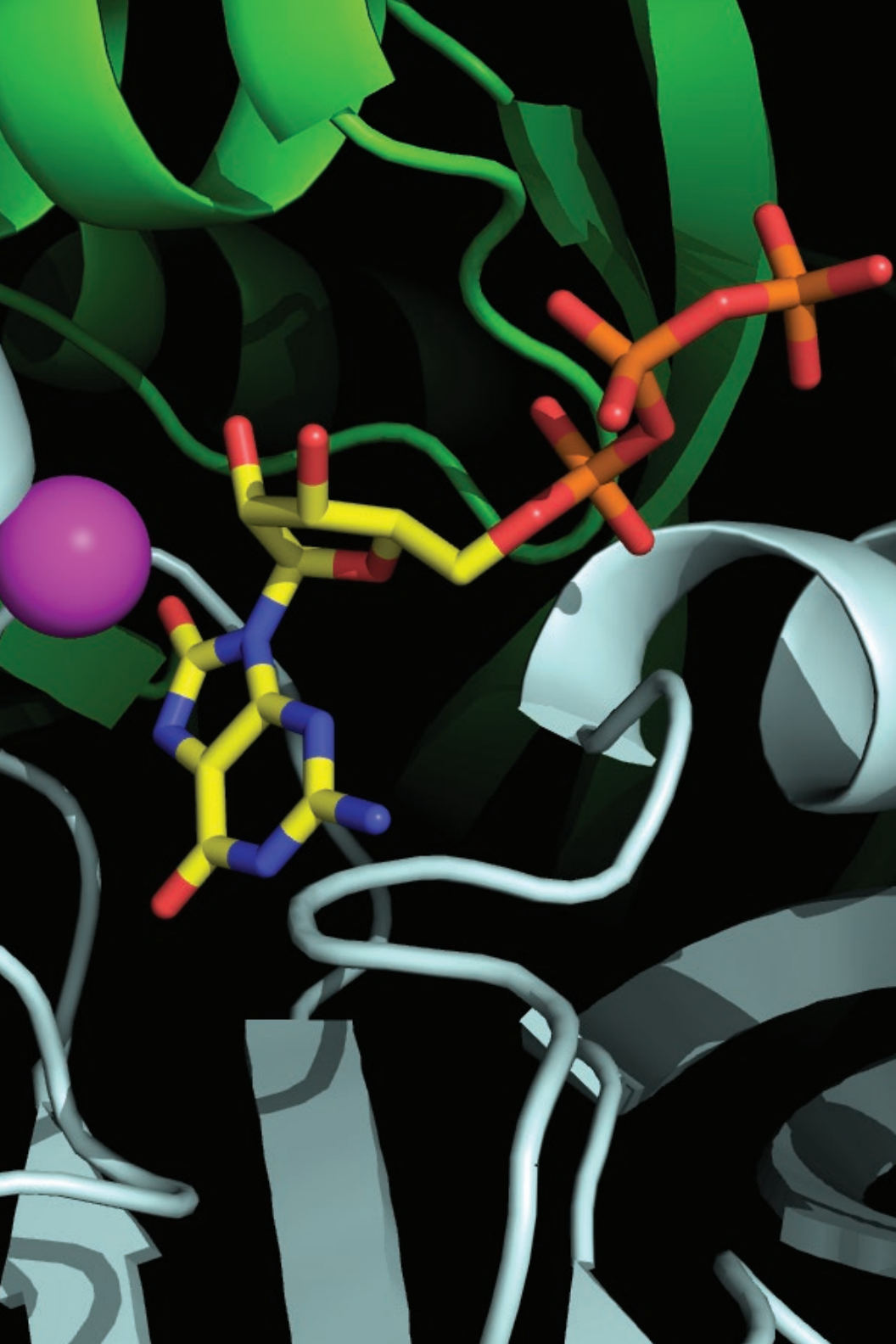
Her work not only helps us better understand how genes evolved to make life forms what they are today, but also allows us to discover new ways to fight infectious diseases and improve the environment.

Dr. Swairjo's research is supported by the National Institute of General Medical Sciences and the National Science Foundation.

- 1 The active center of the new antibiotic target and folate biosynthesis enzyme GTP cyclohydrolase IB from the pathogenic bacteria *Neisseria gonorrhoeae*, the causative agent of the common sexually transmitted infection gonorrhea. A potent inhibitor and substrate analog 8-oxo-GTP is lodged in the active site, giving clues for strategies to target this enzyme with a new class of antibiotics. The crystal structure of this complex was determined in the Swairjo lab using X-ray crystallographic methods. Image by: Swairjo Lab



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Coping With Chronic Disease

VANESSA MALCARNE

Psychology

According to the Centers for Disease Control, chronic diseases are responsible for seven of ten deaths each year. Treating people with chronic diseases accounts for 86% of our nation's health care costs.



Internationally recognized for her work in this area, Dr. Vanessa Malcarne and her colleagues at SDSU's Chronic Illness Research Lab focus on prevention and quality

of life after diagnosis, with attention to underserved populations.

Dr. Malcarne has designed a program for the Deaf community in American Sign Language that provides Deaf patients and their families with information and strategies to cope effectively with a cancer diagnosis. She and her team are also examining the social impacts of disease, working, for example, with a large international consortium, the Scleroderma Patient-centered Intervention Network (SPIN), to reduce body image-related distress in patients with a rare disease, systemic sclerosis. Dr. Malcarne has also created or evaluated many instruments used nationally and internationally to measure health-related quality of life in diverse community and clinical populations.

Her work is ensuring that communication, measurement, and treatments are appropriate for the populations being assessed. The following sponsors support her research: National Cancer Institute, the Canadian Institutes of Health Research, the Rheumatology Research Foundation, and the California Breast Cancer Research Program.

1 Dr. Vanessa Malcarne

2 Deaf-friendly videos on coping with cancer use American Sign Language. Photo by: Vanessa Malcarne



“Self-belief does not necessarily ensure success, but self-disbelief assuredly spawns failure.”

—Albert Bandura



Positive Psychology: Maximizing the Potential of People with Disabilities

NAN ZHANG HAMPTON Administration, Rehabilitation and Postsecondary Education

According to psychologist and social learning theorist Albert Bandura, people's beliefs about their abilities have a profound effect on those abilities.

Rehabilitation counseling professor Nan Hampton's work has provided support to the self-efficacy theory and expanded it to include people with disabilities. She found that self-efficacy mediated the influences of disability and health status on academic achievement, career development, and quality of life in people with disabilities. The low self-efficacy levels of people with disabilities were due to the lack of access to sources of self-efficacy.

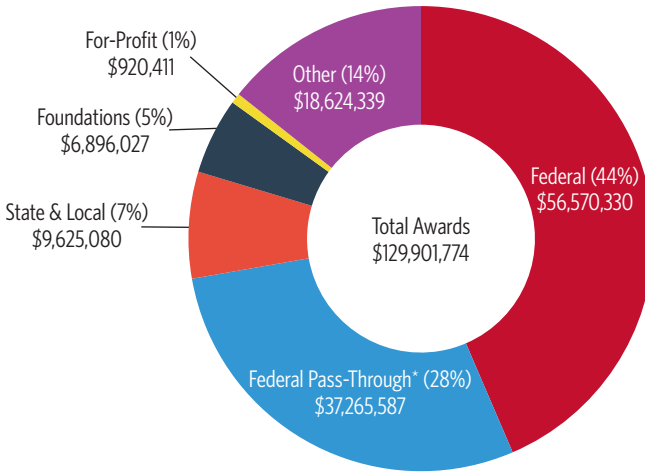
Dr. Hampton has also investigated the impact of culture on perceptions of disabilities and has found that traditional cultural values of ethnic minorities were positively correlated with rehabilitation outcomes, verifying the importance of focusing on cultural assets of clients from underserved and underrepresented populations.

Guided by these theories, Dr. Hampton teaches in SDSU's Rehabilitation Counseling Program, which prepares qualified rehabilitation personnel to provide employment and development services for people with disabilities. The U.S. Department of Education's Office of Special Education and Rehabilitation Services supports these graduate training programs.

1 Dr. Nan Hampton. Photo by: Ricardo Rojo

2 Dr. Hampton with graduate students in her Group Dynamics in Rehabilitation Counseling class. Photo by: Debbie Brighton

Awards by Sponsor Type Fiscal Year 2015-2016



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 \$130 million in support of their research programs.
- More than 70% of awards came from federal sponsors.
- The National Institutes of Health awarded \$25.6 million to SDSU researchers.
- SDSU is classified as an R2 Doctoral University with Higher Research Activity by The Carnegie Foundation.
- The international business undergraduate program is ranked ninth in the nation by *U.S. News and World Report*.
- *U.S. News and World Report* ranked these SDSU graduate programs highly: rehabilitation counseling (#10), speech language pathology (#25), clinical psychology (#26), audiology (#27) and public health (#39).
- *FORBES* magazine ranked SDSU #23 on its list of American's Most Entrepreneurial Universities.
- A record 551 students presented their original research at SDSU's Student Research Symposium.
- The Campaign for SDSU, the university's first comprehensive fundraising campaign, surpassed its \$750 million goal and has already received \$10.6 million to support a research endowment.
- SDSU is included among Princeton Review's Most Sustainable Universities.
- For the fourth consecutive year, SDSU has been awarded the INSIGHT Into Diversity Higher Education Excellence in Diversity (HEED) Award.
- San Diego State University was ranked as the 25th best college in the United States for veterans, and second-best in California by the *Military Times*.
- Since 2011, SDSU has climbed 37 spots to #74 among public universities on *U.S. News & World Report's* annual ranking of America's Best Colleges.
- The Campus Pride Index recognized SDSU for being a top LGBT-friendly campus.
- SDSU alumna Wendy Halloran and a Phoenix news team won the Alfred I. duPont-Columbia University Award for investigative journalism, one of the most prestigious awards in broadcast journalism.
- SDSU alumnus Matt de la Pena won the prestigious Newbery Award for children's literature.
- Alex DeNoble received the Presidential Award from the International Council for Small Business.
- Mark Sussman received the Distinguished Achievement Award from the American Heart Association.
- The SDSU-UCSD Comprehensive Cancer Center received \$13 million to fight cancer in underserved communities.
- John Eger was named the first Zahn Professor of Creativity.
- The Department of Housing and Urban Development awarded \$700,000 to Georg Matt, who leads a research team exploring the properties and dangers of third-hand smoke.
- Marilyn Chin received the 2015 Anisfield-Wolf Book Award, joining the ranks of previous recipients Toni Morrison, Martin Luther King Jr., and Maxine Hong Kingston.
- A team of SDSU psychologists and educators led by David Marx received a \$1.5 million NSF grant for an empowerment program for women in STEM fields.
- Annalisa Berta was elected a fellow of AAAS for her work studying whale anatomy and evolution.
- SDSU researchers led by Ming Tsou are working with San Diego county emergency services and the Red Cross to develop GIS-based tools to improve wildfire evacuation planning.
- J. Luke Wood was the recipient of the 2016 Dr. Carlos Vallejo Memorial Award for Exemplary Scholarship, recognizing his commitment to multi-cultural education and underserved communities.
- William Zahner received a prestigious NSF Career Award.



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