SAN DIEGO STATE UNIVERSITY

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OVERVIEW

The mission of San Diego State University is to provide research-oriented, high quality education for undergraduate and graduate students, and to contribute to the solution of problems through excellence and distinction in teaching, research, and service. The university strives to impart an appreciation and broad understanding of the human experience throughout the world and the ages. This education extends to diverse cultural legacies; the advancement of human thought including philosophy and science; the development of economic, political, and social institutions; and the physical and biological evolution of humans and their environment.

SDSU continues its ascent as a leading national university and a Carnegie R2: Doctoral Universities – Higher research activity university. US News and World Report's annual ranking of America's Best Colleges lists SDSU at No. 74 among public universities, and No. 146 overall among national universities. The overall ranking represents a jump of 37 spots since 2011. In addition, according to the US New Diversity Index, SDSU is among the top 7 in the country for ethnic diversity – a point of pride for SDSU, where students from all backgrounds are achieving academic excellence. The university is also recognized as one of the best colleges for LGBT students and received a 2016 INSIGHT Into Diversity Higher Education Excellence in Diversity (HEED) Award.

SDSU is the flagship school of the California State University System, with more than 35,000 enrolled students and 700 tenured and tenure-track faculty. Over the last two decades, SDSU has staged an institutional transformation from its historic identity as a regional comprehensive university to a top 100 public research university with more than 100 masters and 22 joint doctoral programs and $130 M in annual research funding in academic year 2015 – 2016 (including nearly $25M from the NIH) the most of any California State University campus. SDSU faculty members have received a total of more than $1.7 billion in external funding since 2000. The university's strategic plan "Building on Excellence," developed in 2012 and first implemented in 2013, prioritizes faculty research, a commitment materialized through its construction of a new $90 million Engineering and Interdisciplinary Sciences building, cluster hires in seven competitively selected interdisciplinary "areas of excellence" and increased seed, start-up, matching, and bridge funding for all faculty and grant-seeking training programs for junior faculty.

RESEARCH CAPABILITIES

Viromics Information Institute

Phages are the most diverse and numerous component of the human body. These bacteria-killing viruses form a novel immune system that is currently unexploited for improving human health. The SDSU Center for Personalized Phage Medicine was founded to explore and translate phages into therapeutics at both the individual and community level.

Imagine a scenario where inexpensive phage treatments are developed, tested, and implemented on small regional scales in less developed regions of the world to reduce malnutrition with all of the secondary health, economic, and social benefits associated with being better-fed. Conversely, imagine using personalized phage-based defense systems from our own bodies to capture the direct and indirect benefits of reduced obesity levels, including reduced coronary heart problems, type II diabetes, stroke, some cancers, osteoarthritis, or respiratory issues. These

accomplishments will be the launching points for a new way to approach human or animal health.

The SDSU Center for Personalized Phage Medicine is the first research center in the world to target obesity and childhood malnutrition with personalized phage therapies. Our research will deepen science's understanding of phages and apply new findings to improve the health of children and adults worldwide.

At the SDSU Center for Personalized Phage Medicine researchers from biology, computer science, mathematics, physics, and engineering are brought together to build new technologies to identify, purify, engineer and reintroduce phages to patients. By using a person's naturally occurring phages we will avoid problems with an immune response and also ensure that those phages are able to efficiently attack the undesired bacteria in the intestine.

Cell and Molecular Biology

The Molecular Biology Institute (MBI) is currently composed of members drawn predominantly from the Departments of Biology and Chemistry and is designed to serve these departments in the coordination, support and enhancement of research and training in the molecular life sciences. The interests of the MBI faculty span a wide range of biological problems, and their research activities are supported by research grants obtained from a variety of sources, including the National Institutes of Health, the National Science Foundation, NASA, the American Heart Association, the Muscular Dystrophy Association, Sea Grant, and the Air Force. Current grant support is in excess of $3 million per year. The MBI faculty are also participants in the Ph.D. programs in Chemistry and Biology (other programs). More than 100 M.S. and Ph.D. candidates, post-doctoral fellows, and technicians participate in the research programs of the MBI faculty.

Chemistry and Biochemistry

The Department of Chemistry and Biochemistry at SDSU has always been a leader in the California State University system. This department was the first within CSU to confer an ACS-accredited bachelor's degree in chemistry (1949), the first to confer a master's degree in chemistry (1951), and the first (and only) to confer a doctoral degree (1967) in chemistry. The Ph.D. program, a collaborative effort with the University of California, San Diego, was the first of what are now several Joint Doctoral Programs within CSU.

The department has attracted faculty who are uncommonly devoted to excellence in teaching and research, provided students with a substantial amount of hands-on laboratory experience with modern equipment, and fostered an environment that promotes independent and critical thinking. The on-campus facilities provide a substantial inventory of modern chemical instrumentation and computer equipment in a new laboratory building. Additional resources are available through collaborations with faculty at nearby institutions and with the extensive local chemical industry.

Exercise and Nutrition Sciences

The school has evolved from its beginnings in 1914 as a physical education department to one that now offers undergraduate degrees in kinesiology, athletic training, and foods and nutrition. It also offers masters degrees in exercise physiology, nutrition, and kinesiology, as well as a doctor of physical therapy degree.
Besides offering strong academic programs, the school's faculty are active researchers who are publishing on a range of topics that include:

- exercise and diet behavior in the control of chronic diseases,
- environment and religiosity on physical activity
- role of diet in performance and protection against cancer, heart disease, and osteoporosis
- postural control in children with prenatal exposure to alcohol
- effects of injury and aging on proprioceptive functioning and brain activation
- effects of aging, spinal cord injury, stroke and Parkinson's disease on muscle recruitment
- assessment of mitochondrial functioning and relation to fitness and disease
- thermoregulation during exercise

Climate and Sustainability Studies

Members of SDSU's Center for Climate and Sustainability Studies were among the first to detect global warming, associate it with human activity and determine the effects of climate change on Earth's ecosystems. They investigate how global climate change can affect ecosystems to feedback and amplify global warming, and how temperature variations—even as slight as 1 degree—can accelerate the spread of infectious diseases. They will bring the impacts of climate change close to home by studying its effects on San Diego's ecosystems, agriculture, water availability and general economic health.

Autonomy and Unmanned Systems

The Mechatronics Club is a student organization at San Diego State University (SDSU). The goal is to create an environment that not only promotes STEM education, but does so in a way that provides students with hands-on experience building autonomous robots within a team. The SDSU Mechatronics Club is broken down into three divisions: Apprentice Program, RoboSub, and RoboAir. All three divisions provide students with a diverse educational habitat in which to build skills in engineering, time management, and team-based cooperation: Apprentice Program is a robotics development program that is intended for beginning to intermediate engineering students. Students with an apprentice role are given tasks to complete, such as creating a project proposal to prove their potential to innovate. RoboSub is a robotics competition team that designs and builds an autonomous underwater vehicle (AUV) for participating in the ONR and AUVSI Foundation's International RoboSub Competition. The RoboSub project is intended for intermediate to advanced engineering students. RoboAir is a robotics competition team that designs and builds an unmanned aerial vehicle (UAV) for participating in the AUVSI Seafarer Chapter's International Student Unmanned Aerial Systems (SUAS) Competition. The RoboAir project is intended for intermediate to advanced engineering students.

Human Dynamics in the Mobile Age

There is the growing recognition of the importance of spatial and temporal dynamic relationships in explaining processes relevant to human behaviors, public health, and social activities, which has become known as the "spatial turn." A maturing of mobile technology and smart phone devices enables social scientists to collect data on human activities and behavior digitally and to transform their research from qualitative analysis to computational modeling, simulation, and predictions with the focus on dynamic spatial and temporal relationships.

Information Management and Cyber security

Visualization of real-time data is rapidly becoming both a profound solution and problem in the world of rapid decision-making. Massive potential data feeds are available from inputs such as Social Media and seismic sensors, but how these data can be appropriately gathered, organized, processed, visualized, and used for decision making is an ever-increasing challenge for universities, government agencies, and organizations like DoD. How to then teach and train both faculty and students in the use of such Big Data for real-time decisions also becomes a major challenge as there are approaches to the solutions, but there will never be final solutions. Adding the complexity of multiple languages, cultures, structured versus unstructured, and image-versus-numerical (database) information makes the challenge of both accomplishing and teaching solutions almost impossible. Interacting with the data and visualizations is also extremely difficult because you are asking for real-time processing in 3D or higher (4D, 5D) dimensional understanding and cognition of the data streams. This center focuses on providing DoD with research-based solutions for both visualization, interaction, and distributed collaboration with massive data sets like Social Media, global sensor networks, and other real-time crowdsourcing of critical data.

Water Energy Food Nexus

Future water security in many areas of the world, including southern California, will require both increased supply through wastewater reuse and desalination, and demand management through integrated resource management strategies. Nonpoint-source pollution will continue to harm downstream ecosystems and shallow subsurface aquifers. Alternative water supply strategies, including wastewater reuse, can also have ecological benefits by reducing discharges into the environment. Thus, Blue Gold – the availability of fresh water and the health of watersheds are inextricably linked and increasingly tied to issues of energy and technology as human population, societal demand, and climate change intensify.

Smart Health

The Smart Health Institute develops research programs with potential applications to a wide range of fields including

health, medical innovation and devices, disease diagnostics, and wireless communication by developing next generation health sensor technologies ranging from portable, wearable and minimally intrusive sensors that can provide real-time health monitoring and integration into rehabilitation assessment, intervention and long-term follow-up of patients and sailors to compact, label-free biomedical sensors with sensitivities down to single molecules, or even nanoparticles that have been a dream of scientists for years.

Clinical and Cognitive Neuroscience
Faculty specializing in clinical and cognitive neuroscience collaborate to increase understanding of brain-based disorders. Working with a range of ages and afflictions, they also look for genetic factors that may influence an individual's susceptibility to injury or damage and response to treatment.

FACILITIES
General, common research facilities include NMR, X-ray diffraction, MassSpec and other facilities hosted by the Department of Chemistry and Biochemistry, the SDSU Visualization Center specializing in organizing and delivering geospatial data over small networks (terabytes to the handheld) for emergency response and disasters, the SDSU 50-inch Phillips Claud Telescope facility on Mt. Laguna, and the SDSU Coastal and Marine Institute - built in 2006 on a prime coastal site at the old Naval Training Center near the airport and San Diego Bay.

SDSU Biosciences Center
The Donald P. Shiley BioScience Center is a free-standing research unit at SDSU with a mission to understand the relationship between infection, inflammation, and heart disease. The 7 faculty members of the BSC are engaged in research addressing ischemic heart disease, age-related immune dysfunction, autophagy in aging and infection, Coxsackievirus myocarditis, periodontal disease and atherosclerosis, influenza, multidrug resistant Staph aureus and the roles of autophagy and mitochondrial quality control in cardioprotection. The 4th floor of the Center dedicated to cardiovascular research comprises 3,500 sq ft of research space and 3,000 sq ft of office space. The 4th floor also houses a dedicated room for Langendorff perfusions (4 setups for perfusion and hemodynamics, 1 setup for collagenase perfusion) and terminal rodent surgeries, including a small-animal ventilator and surgical microscope. In addition, the 4th floor houses the deconvolution fluorescence microscope, which although 12 years old has appropriate filter sets, upgraded computer, and connection to the lab server for archival storage of image data. The 3rd floor houses immunologists and a fly geneticist/entrepreneur with a Phase II SBIR. The 3rd floor includes two tissue culture suites and a flow cytometer that is in addition to the FACS facility in the Biology Department in the adjacent Life Science Building.

The second floor is being built out to provide incubator space for SDSU technologies and will provide 4000 sq ft of wetlab space and 3000 sq ft of office space. The lab space has been specifically designed to meet the needs of small startups. Common-use equipment, including fume hoods, autoclave, biosafety cabinets, water purification system, walk-in cold room, freezers, and centrifuges will be available.
The 3rd floor, 2nd floor, and 1st floor contain well-appointed conference rooms which are available to occupants for formal or informal meetings. Each conference room accommodates up to 20 people while the Gold Auditorium holds 100. The 1st floor also houses the "Bio-Pod" which is an administrative unit that includes 2 grant administrators. The basement houses a vivarium hosting the extensive mouse colonies of BSC investigators, a surgical suite (for survival surgeries and interim hemodynamic studies), and the IVIS. The Caliper Spectrum IVIS was acquired two years ago through an S10 grant and is in use by multiple investigators.

Engineering and Interdisciplinary Sciences Complex
SDSU is making major investments in scientific infrastructure. Scientists and engineers in SDSU's new, state-of-the-art Engineering and Interdisciplinary Sciences Complex (projected to open January 2018) will focus on the future of collaborative work and Team Science.

The new complex is dedicated to the needs of future scientists and engineers. The complex's interior space will introduce much more instructional, laboratory and collaborative space than was available in the previous building. The design will foster the kinds of novel innovations that emerge when scientists, mathematicians and engineers can see one another working and easily bounce around ideas in common spaces and coffee shops. In terms of technological capacity, the EIS Complex will house state-of-the-art scientific and industrial machines. Because many of these machines require extremely precise calibration and can be affected by vibration and ground movement, the structure is designed to be stiff, solid, and immobile. The lowest level will house an MRI machine, which won't sit on foundation, but instead on a concrete slab isolated from the structure, offering maximum protection to this ultrasensitive equipment.

The EIS Complex is a key piece in SDSU's drive to become a top-50 public research university. Not only will it enhance the university's current teaching and research capacities, it will boost SDSU's ability to attract the best and brightest researchers and graduate students. To help bring products to market, the EIS Complex with house the William E. Leonhard Entrepreneurship Center, creating a crossroads for the STEM disciplines and a focal point for SDSU's entrepreneurship efforts.

The complex will reflect the university's legacy style — California Mission Revival — with a modern twist. The 85,000-square-foot building will fit seamlessly with campus architecture but will have durable, cost-effective painted cement in place of large adobe blocks, white exteriors, regularly spaced small windows, tile roofs and modest decorative elements. There will be 11,500 square feet of instructional space with 17 cutting edge labs that include state-of-the-art scientific and industrial machines and a modular setup, allowing scientists and engineers to easily relocate their resources to be closer to potential collaborators.

REPRESENTATIVE PAST PERFORMANCE

1. Energy Systems Technology Evaluation Program (ESTEP): Since inception, ESTEP placed 35 veteran students in paid internships, from 3 months to two years, at military facilities. Compensation includes a monthly stipend of up to $16000 plus travel and training. The key outcome of the program is that 100% of the participants have been employed within 2-months of completing their degree. Two grants were received since 2013 totaling $1.5M.
2. Theoretical Analysis, Exploratory Studies, and Technical Services (TAEST): Since July 2011, the Research Foundation received and completed 18 Delivery Orders at a combined value of $598,560. That contract ended in

April 2014 and was replaced with a new competitive award in February 2015 for which we have received several new delivery orders still in progress.
3. SSC PAC C4ISR IDIQ: SDSU was engaged to provide SSC-PAC S&T professionals access to the University's facilities and expertise in the fabrication of Micro-Electro-Mechanical Systems (MEMS) and provide interaction between SSC-PAC researchers and university researchers in order to promote further cooperative agreements when the SSC-PAC S&T professionals MEMS projects transition from this course to other funded projects. Two task orders were awarded to execute the MEMS training program at a combined cost of about $55,000.
4. Students Services: Since award, there have been 210 students engaged on research at SSC Pacific valued at approximately $3,059,000. Currently there are about 25 students actively participating in the program.
5. A team led by astronomers from NASA's Goddard Space Flight Center and San Diego State University used the Kepler Space Telescope to identify the new planet, Kepler-1647 b.
6. Decentralized Feedback Control Design for Cooperative Robotic Walking with Application to Powered Prothetic Legs, This project will investigate the systematic design of decentralized feedback controllers that coordinate low-dimensional subsystems to achieve robust legged locomotion, overcoming the curse of dimensionality in legged robots and enabling cooperative human-machine walking with powered prosthetic legs. $612,213.00.