The USC Wrigley Institute’s Mission:

To encourage responsible and creative decisions in society by providing an objective source of marine and environmental science and fostering an understanding of the natural world among people of all ages.
NEW LEADERSHIP AND A BOLD NEW VISION

As we celebrate the achievements of Academic Year 2016-2017, we are proud to welcome Dr. Ken Nealson as the new Director of the USC Wrigley Institute for Environmental Studies (WIES). Since 2001 Ken has been the Wrigley Chair in Environmental Studies and Professor of Earth Sciences and Biological Sciences at USC. He is joined by Dr. John Heidelberg as Associate Director. John is an Associate Professor of Biological Sciences at USC.

Since taking the helm, they have begun to apply their considerable leadership talents to crafting an ambitious new vision for the institute. This vision reflects the outstanding potential for the Wrigley Institute to play a leading role in USC Dornsife’s approach to addressing global environmental and sustainability issues.

Sustainability has become one of the most complex and multifaceted problems of the 21st century. The USC Wrigley Institute is poised to meet this challenge both inside and outside of the classroom.

The remote Catalina Island setting of our marine laboratory exemplifies the need for creative conservation of resources. Issues of water, energy, food, and waste are never far from our minds, as they are for island communities worldwide. The Wrigley Institute is increasingly ‘walking the walk’ by adopting new sustainable strategies at the Wrigley Marine Science Center (WMSC). These improvements offer the USC community unique opportunities to observe and test some of today’s most cutting-edge solutions.

But sustainability challenges are not restricted to islands; they are global in scale and touch every corner of our interconnected world. We are proud to be a hub for sustainable programs on USC’s main campus. This year, we inaugurated a new Wrigley Institute Sustainability Prize, which encourages entrepreneurial innovation and environmental ideas with market potential from the USC community. Undergraduate internships continue to engage students in research and outreach programs, while our graduate fellowships support ongoing excellence in sustainability and conservation themes.

In the coming years, the USC Wrigley Institute will continue to grow our sustainability emphasis. With your help, we are excited to be a catalyst for science-led solutions as we train the next generation of environmental champions.
At the Wrigley Marine Science Center on Catalina Island, USC groups are conducting transformative research in the field of environmental sustainability. Scientists pursuing this work aim to support humanity and industry while sustaining the planet’s natural resources for future generations.

**Kelp as Biofuel**

Giant Kelp, *Macrocystis pyrifera*, is incredibly fast growing and a potential source for biofuels. The kelp naturally grow in a narrow band of habitat, such as that found along southern California’s shallow coastal zone. Working with Marine BioEnergy Inc., Institute researchers are testing methods to grow the kelp in deeper open ocean environments. Using unique ‘kelp elevators’, our researchers transport kelp up and down on a daily basis: near the surface during the day to gather sunlight for photosynthesis, and lowered to colder deeper depths at night to absorb nutrients unavailable in open ocean surface waters. If it works, kelp could potentially become a vital and sustainable farmed commodity for the biofuel sector.

**Breeding a Better Bivalve**

Using selective breeding and advanced genetic techniques, graduate student Nathan Churches and Professor of Biological Sciences Sergey Nuzhdin are looking to transform the aquaculture industry. The team has been funded by NOAA’s Small Business Improvement Research grant to study the genetics behind improved bivalve phenotypes, and ultimately commercialize these improved cultivars for sale. Their work takes advantage of the Wrigley Institute’s greenhouse and a new state-of-the-art aquaculture longline array in Catalina Harbor, just a mile from the Wrigley Marine Science Center. These facilities enable cultivation bivalves across generations, empowering the team to conduct innovative new studies in sustainable seafood.
Wrigley Sustainability Prize

In 2017, the Institute launched an exciting new initiative: the USC Wrigley Sustainability Prize! This annual competition supports environmental research and entrepreneurial ideas with market potential from the USC community. Through the Prize, WIES aims to highlight innovative start-up ideas from all disciplines and reward concepts that could result in meaningful environmental change. Judges include USC experts and investors, and winning teams receive funding to help translate their ideas into action.

2017 Winners:
1st Place: Jenny Liu and Noah Snyder
USC Marshall School of Business
Heat retentive, non-toxic coating for industrial piping

2nd Place: Camille Connor, Kyle Borch and Willie Du
USC Marshall School of Business
Real time shower water use tracking monitor with gamification

3rd Place: Holly Tassi, USC Marshall School of Business
Creating an American market for food products made by women in Ghana

Sustainability Prize Spotlight – Team Interphase

2017 Sustainability Prize Winning Pitch!

The U.S. Department of Energy projects world energy consumption will increase 56% by 2040. This causes two major problems: rising utility cost and carbon emission from energy generation. At Interphase Materials, we invented a nano-coating that improves heat transfer of cooling systems. Our materials improve the interaction between cooling water and tubing, resulting in an immediate 5-10% increase in efficiency of heat transfer.

This means we ultimately reduce the amount of utility cooling systems use, which not only saves money but also greatly reduces CO₂ emissions from energy generation.

In addition, the coating prevents bio-fouling and provides long term protection against corrosion and scale buildup using all natural FDA-approved components.
2016-17 was another stellar year in fundamental and interdisciplinary USC research with the Wrigley Institute. Faculty research continues to give us new insights into California’s coastal biodiversity and complex human impacts upon our coastal environments.

New Understanding of Microbes
Nitrification is an essential process in aquaponics systems, taking potentially toxic ammonium and turning it into benign nitrate. This process is typically carried out in two steps by different microbes, but new research shows that some organisms can carry out the whole process by themselves. USC Biological Sciences Associate Professor Eric Webb, Environmental Studies faculty Dr. Jill Sohm and students are using molecular biology techniques to look for microbes with this newly identified physiology in the Wrigley Institute’s aquaponics system, a closed ecosystem where nitrification is very important.

Diversity at the DISCO
The Diversity Initiative for the Southern California Ocean (DISCO) is a research initiative of the Natural History Museum of Los Angeles County. Led by Associate Curator Regina Wetzer, its aim is to discover and document invertebrate biodiversity in California’s coastal environment using modern genetic techniques. As part of the study, researchers have collected select fouling organisms from the floating dock at the Wrigley Marine Science Center for identification and genetic barcoding. The research will help managers better know what species are where, and how their distributions change along the California coastline with time.

Squid and Symbiosis
Using the mutually beneficial association between the Hawaiian Bobtail squid and the bioluminescent bacteria Vibrio fischeri, USC researchers in Dr. Scott Fraser lab work to understand how animals and bacteria establish and maintain such positive relationships. At the Wrigley Marine Science Center, they are establishing a breeding colony of squid for use in their research. They hope to learn what animal genes are important for selecting and maintaining beneficial bacteria, and how the relationship may alter features of the squid anatomy such as the nervous system.
Climate Impacts in the Ocean
Over the next century, surface water temperatures in the ocean are expected to rise considerably because of climate change. USC faculty member Dr. David Hutchins and student Joshua Kling are studying what will happen to phytoplankton, microscopic organisms that remove carbon dioxide and create oxygen, as global temperatures rise. By culturing phytoplankton at different temperature regimes, they hope to understand the consequences of human fossil fuel emissions for ocean biology and chemistry and predict the potential feedbacks from these changing ocean processes to atmospheric CO₂ and global climate.

Catalina’s Water Bears
Tardigrades, also known as ‘water bears’, are microscopic animals considered to be extremophiles because of their ability to survive extreme conditions such as desiccation, UV and X-ray exposures, and very high or low temperatures. They are found in numerous locations around the world and serve as interesting model organisms for medical and aerospace research. Until recently, there were no records of tardigrades inhabiting Catalina Island. Targeting known tardigrade habitat types on the island such as moss and barnacle beds, USC professor Dr. Karla Heidelberg and students have confirmed that they do indeed exist on Catalina. The group is now conducting additional work to further characterize the different populations they have found.

Monitoring the Night Light
Many marine species are sensitive to light sources at night. USC Architecture and Spatial Sciences professor Dr. Travis Longcore studies the intensity of human light pollution on coastal areas to help minimize this impact. His student Benjamin Banet monitored Catalina’s beaches during Summer 2016 using sensitive camera equipment. He compared light pollution on beaches facing toward and away from Los Angeles as well as developed beaches versus more isolated ones. Dr. Longcore is also performing focused light pollution analyses at the Wrigley Marine Science Center, enabling us to modify light sources and improve our facility’s visual footprint on the environment.
2016-17 Faculty Science Highlights

Below are some of the faculty and senior scientist research projects we hosted at the Wrigley Marine Science Center on Catalina Island in academic year 2016-17.

**Faculty and Senior Researcher Projects**

Roman Barco, USC  
Microbial colonization of steel and iron-bearing minerals in a near-shore marine

Matthew Becker, CSULB  
Mapping of springs, seeps, and baseflow in Cottonwood Canyon, Catalina Island

Jean Davis, California Dept. of Fish and Wildlife  
Developing trophic indicators for ecosystem based management of kelp bass

Corey Garza, CSUMB  
Intertidal surveys of Big Fisherman Cove, Catalina

Karla Heidelberg, USC  
Evaluations of bioluminescence resulting from microbial/zooplankton symbiosis

Karla Heidelberg, USC  
Marine tardigrades of North America: Echinscoides sp. found in dry moss on Catalina Island, CA, USA.

Jenny Hofmeister, UC Davis  
Site assessment for abalone restoration

Donal Manahan, USC  
Biochemical and physiological adaptations of developing marine animals in efforts to sustain natural populations and advance aquaculture
Monica Martinez, UC Riverside
Hydrodynamics of collective motion: flow-swimmer interactions in unsteady flows

Rita Mehta, UCSC
Feeding ecology of the California moray eel

John Orrock, U. Wisconsin
Determining prevalence of Sin Nombre virus in Channel Islands mice

Victoria Petryshyn, USC
Empty cyanobacterial and algal sheaths stabilize top 2 centimeters of Catalina Harbor tidal mud flats

Chris Plante, Aquarium of the Pacific
Staff diver training in advanced fish collection techniques

Jesus Reyes, CSULB
California halibut environmental assessment for health

Ariadne Reynolds, Bay Foundation
Green abalone restoration project: deck spawning pilot study

Ann Russell, UC Davis
Trace metal incorporation into non-spinose planktonic foraminifera

Jayson Smith, California Polytechnic
Effects of phlorotannin concentrations of brown seaweeds on feeding rates of the black sea hare

Brandon Southall, UCSC
SOCAL-Behavioral Response Study is a multi-year effort designed to better understand marine mammal behavior and reactions to sound

Regina Wetzer, Natural History Museum of Los Angeles County
Removing select fouling organisms from the floating dock at Wrigley Marine Science Center for identification and barcoding

Crow White, Cal Poly SLO
Kellet’s whelk surveying and sampling for assessing population connectivity
Graduate Programs

Graduate students from USC and worldwide come to us to participate in unique field experiences. These programs take students to Catalina Island and across the region for immersive environmental training.

International GeoBiology Course

The interdisciplinary field of geobiology provides new perspectives on the history of life on Earth and informs the search for life on other planets. For the 14th year, students from across the world came together in Summer 2016 to travel the Eastern Sierras, explore hot springs and ancient sediments, and collaborate on field projects. Students culminated the program with field and lab work at the Wrigley Marine Science Center including exploration of Catalina’s unique geological resources.

- Kohen Bauer, University of British Columbia
- Scott Beeler, Washington University in St. Louis
- Cansu Demirel, Istanbul Technical University
- Jayme Feyl-Buska, USC
- James Floyd, University of Oklahoma
- Ian Foster, European Institute for Marine Studies
- Andrew Hyde, University of North Carolina Chapel Hill
- Emily Kraus, Colorado School of Mines
- Fernando Medina, University of Minnesota, Twin Cities
- Agustin Mors, Centro de Investigaciones en Ciencias de la Tierra
- Sheri Motomedi, University of Utah
- Virginia Russell, San Francisco State University
- Fredrik Sonderholm, University of Copenhagen
- Kate Thompson, University of British Columbia
- Elise Tookmanian, Caltech
- Anna Waldeck, Harvard

“This course impacted my science interests, yes, but it also impacted my expectations for what a life as a researcher can be.”

- GeoBiology Course Student 2016
Wrigley Institute Summer Fellows
Graduate students are awarded fellowships to do intensive field work at Catalina Island

- Casey Barr, USC – Metabolic sulfur compounds in Catalina Harbor sediment
- Kenneth Bolster, USC – Ferrous iron in marine surface waters
- Bingran Cheng, USC – Carbon metabolism in marine sediments
- Nathan Churches, USC – Bivalve genetic improvement for aquaculture improvement
- Russell Dauksis, CSUN – Trophic dynamics of fishes in seagrass communities
- Alexis Estrada, CSUN – Population structure and recovery of green abalone
- Tevfik Hamdi Kitapci, USC – Fertilization strategies of Catalina gooseneck barnacles
- Cherie Ho, Harvey Mudd – Characterizing fish population movements
- Joshua Kling, USC – Temperature impacts on phytoplankton community dynamics
- Aishwarya Korde, Harvey Mudd – Development of AUV tracking algorithms
- Caitlin McGarigal, CSULB – Angling and handling stress effects in fish
- Emily Meese, CSULB – Horn shark predator-prey interactions
- Emily A. Orzechowski, UC Berkeley – Snail ecology under environmental change
- Yubin Raut (Victoria J. Bertics Summer Fellow), USC – Nitrogen fixation in marine algae
- Griffin Srednick, CSUN – Influence of invasive alga on kelp fishes
- Genoa Sullaway, SDSU – Invasive alga and marine reserve ecosystem function
- Jason Wang, USC – gene markers for growth rates in Pacific oyster
- Xiaoshen Yin, USC – Early mortality in wild populations of Pacific oyster

2016 Wrigley Fellow, Griffin Srednick, California State University Northridge, Graduate Student
Kelp forests are incredibly important along the western coast of the United States. They provide valuable habitat for a diverse community of organisms including areas to feed and hide from predators, and nursery space for juvenile fishes and invertebrates.

Formed by giant kelp *Macrocystis pyrifera*, the density and size of forests can change based on environmental conditions or seasons. Kelp thrives in cold, nutrient rich waters. This is certainly why you may see less kelp off the mainland and Catalina during warm years. In addition to this, researchers have been documenting the spread of an alien algal species known as *Sargassum horneri*. Since 2006, this invader (known as “devil weed”) has begun to occupy areas formerly dominated by giant kelp. *Sargassum* provides different habitat structure than giant kelp and other native algae, which may alter the distribution and behavior of associated fishes.

So…do changes in this forest structure influence fishes, and if so how? These are questions I aim to answer. In order to do so, I have been performing surveys of fishes, invertebrates, and algae at a number of sites along the west end of Santa Catalina Island. I also collect algae from the field and see what type of invertebrates may be attached to them. So far, we have learned that algae affects fish differently. While certain species are unaffected by changes in algae, others respond a great deal. I am honored and excited to be in my second summer at the USC Wrigley Institute. The facility provides the ideal location to perform the work for this project, and offers some of the best sunset views in California.
2016 Norma and Jerol Sonosky Sustainability Fellows

Four Fellows were supported in Summer 2016 for their graduate research on carbon dioxide recycling, environmental pollution, next-generation solar cells and solar energy storage. The cutting-edge advances these Fellows are pioneering build the critical foundation for a more sustainable future for us all.

- Betsy Melenbrick, USC Chemistry – Development of lightweight flexible single-layer solar cells
- Courtney Downes, USC Chemistry – Capture and H$_2$ storage of solar energy production
- Damir Popov, USC Chemistry – New catalysts for CO$_2$ recycling
- Megan Hall, USC Marine & Environmental Biology – Biomarkers for metal contamination in the environment

2016 Sonosky Fellow, Betsy Melenbrick, USC Chemistry PhD Student

Solar panels are increasing in popularity. Each panel is made up of many cells. These solar panels are primarily made from silicon, which is great at moving electrical charges through itself but not very good at absorbing sunlight. This means that the panels must be manufactured to be very thick to absorb more light, a process which is expensive and energy-intensive and results in heavy, brittle panels.

Alternatively, we know we can make organic semiconductors from primarily carbon-based molecules. The semiconducting polymers are great at absorbing sunlight, which means they can be incorporated into lightweight, flexible solar panels, and they can be manufactured very cheaply. However, polymer solar cells are not yet as efficient at converting sunlight into electricity as silicon, and they do not have as long of a working lifetime. This is due to the fact that organic molecules break down under intense sunlight and the molecules can also move around in the thin film as it is heated by the sun. Both of these processes mean that the solar panel will lose its ability to convert sunlight into electricity as it ages.

My research aims to change the chemistry of the semiconducting polymers to make them more stable so that polymer solar cells will last longer. I am hoping to create solar devices that work for days, weeks, months, or even years after they are made. By extending the working lifetime of these solar cells, I can help make the technology more viable.
ENVIRONMENTAL EDUCATION

Through undergraduate programs on the USC main campus, across Los Angeles, and at our marine laboratory on Catalina, the Wrigley Institute enriches the undergraduate education experience with immersive environmental training.

Writing The Solutions

Working with Wrigley Institute staff this year, numerous students identified sustainable improvements for campus and wrote proposals to turn those ideas into actions. From herb gardens to light pollution analyses, solar generators to SCUBA surveys, students learned how to strategize and enact their environmental goals through grant-writing.

Environmental Studies student Elizabeth Shakhnazaryan successfully crafted a grant proposal to obtain 25 new rain barrels for the Wrigley Marine Science Center. Her project added 1,575 gallons of new water storage at the island, just in time for the 2017 spring rains. Funding acquired by student Elliot Patrick also enabled the Institute and the USC Environmental Studies Program to lead a water bottle giveaway at a USC football game. Volunteers gave away 1000 reusable bottles, encouraging students to use water fill stations at the Coliseum rather than single-use plastic containers.

Sustainability Studies

The Institute’s 490 Directed Research course this spring semester gave students an introduction to green solutions. Taught by Undergraduate Programs Director Dr. Diane Kim, students worked in teams and individually on sustainability issues at Catalina Island including waste, food and water conservation.

Philine Qian did her project on ‘Meatless Mondays’ – understanding the impact of eating meat-free meals one day a week at the Catalina campus. She worked with the kitchen staff and online assessment tools to calculate net impacts. Philine found that Meatless Mondays save water and cost about 20% less than meat-inclusive meals. Best of all, they are supported by 92% of guests in the dining hall. ‘Meatless Mondays’ are now a regular part of the menu.

A Green Spring Break

In March 2017, 22 students spent a week at Catalina doing an alternative spring break called ‘Introduction to Island Sustainability’. The students toured the island to learn about conservation efforts and Wrigley initiatives including aquaculture, kelp biofuels, and food sustainability. The week was supplemented by a sustainability seminar on main campus with panel speakers from across the USC community.
Environmental Internships
Students from disciplines across USC worked as interns with the Wrigley Institute on many of our research and education programs. They contributed to our mainland K-12 school aquaponics education program, conducted SCUBA surveys as part of our kelp biofuel, and analyzed data from the San Pedro Ocean Time-series (SPOT) that samples the ocean waters off of Los Angeles. Students from the USC Cinema School learned to visualize and interpret science while embedded with our summer researchers.

Summer 2016:
- Christina Brous, USC Cinema (Science Animation Intern)
- Matthew Enloe, USC Environmental Studies (Aquaponics Intern)
- Madison Fitts, USC Cinema (Science Animation Intern)
- Jacqueline Hernandez, USC Environmental Studies (Grantwriting Intern)

Fall 2016:
- Nikki Egna, USC Environmental Studies (SPOT Intern)
- Ignatious Hoh, USC Environmental Studies (SPOT Intern)
- Diane Montenegro, USC Environmental Studies (Aquaponics Intern)
- Daphney Oliveira, USC Environmental Studies (Aquaponics Intern)
- Tim Suh, USC Environmental Studies (Aquaponics Intern)

Spring 2017:
- Paige Haines, USC Environmental Studies (Aquaponics/Kelp Intern)
- Ignatious Hoh, USC Environmental Studies (SPOT Intern)
- Tiana Huling, USC Environmental Studies (Aquaponics Intern)
- Sage Tyler, USC Environmental Studies (Aquaponics Intern)
- Devin Manion, USC Environmental Studies (Aquaponics Intern)
Research Experiences for Undergraduates Summer Program

Each summer, we welcome students to Catalina Island for an 8-week intensive research mentored program, funded by the National Science Foundation. 2016 was the 4th year of the program. Students came from across the country to work with USC mentors in cutting-edge environmental research, oceanographic cruises and special seminars.

- Emily Cheung, Skidmore College – Aquaculture research using genomics for selective breeding of bivalves
- Madison Elizabeth Guest, USC – Effects of size-selective mortality on sex-changing fishes/ecological impacts of an invasive macroalga
- Nolan Adam Luevano, Cal State Univ. Dominguez Hills – Reconstructing the hydrology of Catalina Island using GIS
- Aliya Malabanan, Mt. St. Mary’s Univ. – Microbial diversity and function in an aquaponics system
- Shannon Matzke, Louisiana State Univ. – Nitrogen fixation rates associated with the invasive kelp species, *Sargassum horneri*
- Paul Alexander Solis, Cal State Univ., Dominguez Hills – Biodiversity survey of marine tardigrades at Catalina Island
- Abbey Elizabeth Vinson, Univ. N. Carolina, Chapel Hill – Effects of size-selective mortality on sex-changing fishes/ecological impacts of an invasive macroalga
- David Varisco, Univ. of Maryland-College Park – Ecology and genetic variability of the stalked barnacle *Pollicipes polymerus*

“In one summer I have learned more lab and field techniques than I have throughout my whole undergraduate career.”

- REU Student 2016
Field Courses at the WMSC

Graduate and undergraduate experiences are offered at Catalina Island year round, both for USC students and students from around the world.

Summer 2016:

- **USC Maymester Classes: 4-week short courses at Catalina on various topics:**
  - BISC 431L – Aquatic Microbiology
  - BISC 457L – Methods in Marine Biology and Biological Oceanography
  - ENST 480 – Integrated Ecosystem Management in Micronesia

- **USC Environmental Studies - Water and Soil Sustainability Course**
  Field course exploring island sustainability, at USC’s marine lab and Avalon on topics of waste, power, and water

- **Cal State Northridge Pimu Catalina Island Archaeology Field School**
  Students learn survey and excavation methods along with cultural resource and environmental policies while immersed in 9,000 years of Catalina’s cultural history

- **International Geobiology Course**
  Graduate course exploring the coevolution of the Earth and its biosphere

- **USC Global Environmental Microbiology Summer Course**
  Field-based course run by USC Center for Dark Energy Biosphere Investigations introducing undergraduates to microbiology and microbial ecology

- **USC Spatial Sciences – Spatial Data Acquisition Course**
  Exploring global positioning systems, maps, geocoding, and other kinds of sensors as geospatial data sources

- **USC Scientific Diving Program**
  Research SCUBA instruction associated with the American Academy of Underwater Sciences (AAUS)

Fall 2016:

- **Cal State University Marine Biology Semester**
  Semester-long undergraduate program at Catalina

- **UCLA Catalina Semester**
  4-week field station stay as part of UCLA’s Marine Biology Quarter

Spring 2017:

- **USC Environmental Studies 490 Sustainability Research**
  Independent student semester research into food, water, energy and waste at Catalina Island

- **Spring Break Programs**
  Mt. St. Mary University – ‘Microbial ecology and sustainable food systems’
  USC – ‘Sustainability on Catalina’
In 2016-2017, thousands of people interacted with the Wrigley Institute at our island facility and in mainland school programs, lifelong learner opportunities and special events. Our committed scientists and staff lead these programs to translate science to the public and foster widespread appreciation for the natural world.

Earthwatch
This year, the Wrigley Institute began hosting groups from the internationally known Earthwatch Program. A citizen-science adventure organization, Earthwatch gathers non-scientists for travel to remote locations to assist scientists in their ongoing research. At Catalina, Earthwatch groups assist USC scientists and Wrigley Institute staff in monitoring our coastal environment. The expedition is called ‘Conserving Marine Life Along Catalina’s Coast’ and focuses on activities and changes in Catalina’s special Marine Protected Areas.

Food for Thought Program
Now in its second year, the highly successful ‘Food for Thought’ program brings aquaponics and Wrigley Institute expertise into middle and high school classrooms in South Los Angeles. Growing food and fish together in a closed system, aquaponics platforms teach students about food webs, water chemistry, engineering and other disciplines through hands-on discovery learning. The program unites science educators from the Wrigley Institute and USC SeaGrant, and also involves USC undergraduates who serve as mentors as schools explore science through these systems.

Chamber Day
2017 represents the 43rd year of our lifesaving hyperbaric chamber program at the USC Wrigley Marine Science Center. Our annual Chamber Day helps raise awareness about diving safety and raise funds to keep our chamber open 365 days a year. This year’s event was attended by an impressive 155 people for dive trips at Catalina and tours of the chamber facility, followed by 404 guests for a dinner event at the Aquarium of the Pacific.
As the Institute’s commitment to sustainability grows, our Catalina facility reflects these ideals through both research investments and campus improvements.

**Sustainability Park**
Neighboring our touch tank area, the marine laboratory is installing a new ‘Sustainability Park’ to feature sustainable initiatives, technologies and student projects at the island. This evolving installation is the brainchild of the institute’s new Sustainability Task Force made up of island and mainland staff. The task force is leading efforts to improve campus sustainability, model resource conservation strategies for our visitors, and identify small projects for USC undergraduate and graduate research.

**Catalina Harbor Longlines**
An exciting new aquaculture research installation in Cat Harbor (on the backside of Two Harbors) is allowing researchers such as USC Prof. Sergey Nuzhdin to grow oysters and mussels outside of the laboratory. The longline array hangs a series of cages below the surface in shallow waters. This allows the bivalves housed inside to feed naturally on ocean plankton, growing to adulthood well beyond sizes that can be sustained in the laboratory. As multiple generations of these mussels and oysters are bred at the WMSC, USC researchers will conduct long-term research into their genetics and potential stock improvement for the shellfish industry.

**Water Conservation**
As the 2016-2017 academic year began, Catalina Island was under Stage 3 water rationing, mandating a 50% reduction in water use by all residents and guests. Although the spring rains alleviated this water shortage, it served as a sobering reminder that water conservation is a vital part of California living. Water reclamation and production methods are continuously being introduced at the WMSC. Today these include solar desalination stills, rain barrels, ‘sky water’ capture systems and behavior modification programs to encourage water-wise choices by our guests.
Visitors to the WMSC

Our marine laboratory welcomed hundreds of visitors in 2016-2017 including advanced researchers, graduate and undergraduate students, school groups and the public.

<table>
<thead>
<tr>
<th>Count</th>
<th>Category</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Faculty Researchers</td>
<td>USC</td>
</tr>
<tr>
<td>21</td>
<td>Faculty Instructors</td>
<td>USC</td>
</tr>
<tr>
<td>105</td>
<td>Other Faculty Visitors</td>
<td>USC</td>
</tr>
<tr>
<td>9</td>
<td>Faculty Researchers – other institutions</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Faculty Instructors and Visitors – other institutions</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Postdoctoral Researchers – USC and other institutions</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Other Postdoctoral Visitors – USC and other institutions</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Research Technicians</td>
<td>USC</td>
</tr>
<tr>
<td>32</td>
<td>Research Technicians – other institutions</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Graduate Student Researchers – USC</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Graduate Student Researchers – other institutions</td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>Graduate Student Course Participants – USC and other institutions</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Other Graduate Student Visitors – USC and other institutions</td>
<td></td>
</tr>
<tr>
<td>702</td>
<td>Undergraduate Students</td>
<td>USC</td>
</tr>
<tr>
<td>321</td>
<td>Undergraduate Students – other institutions</td>
<td></td>
</tr>
<tr>
<td>761</td>
<td>K–12 School Program Visitors</td>
<td></td>
</tr>
<tr>
<td>285</td>
<td>Scientific Divers</td>
<td></td>
</tr>
<tr>
<td>568</td>
<td>George and MaryLou Boone Center for Science and Environmental Leadership Mission Groups</td>
<td></td>
</tr>
<tr>
<td>1125</td>
<td>Public Visitors (including 438 ‘Saturdays at the Lab’ guests)</td>
<td></td>
</tr>
</tbody>
</table>
George and MaryLou Boone Center for Science and Environmental Leadership

Synopsis of Meetings: May 2016 – May 2017

USC Neurobiology Faculty Retreat – Gathering for the Neurobiology Section of the USC Department of Biological Sciences, a community of faculty, students, post docs and technical specialists.

Southall Environmental Associates, Inc. – Organization to increase understanding and management of marine and terrestrial ecosystems, working with scientists, industries, decision-makers, and the public.

USC Hearing & Communication Neuroscience – Graduate and post-graduate training program in audition and vocal communication, affiliated with USC graduate programs in Linguistics, Psychology, and Neuroscience.

LAC+USC Medical Center Doctors Course – Residents from LA County/USC Medical Center’s Emergency Medicine Department learn about diving and hyperbaric medicine at the Catalina hyperbaric chamber.

Institute for Wildlife Studies (IWS) Volunteers – IWS Bald Eagle Cam moderators support the IWS Bald Eagle Restoration Program to deepen their understanding of the environment in which the eagles live.

USC International GeoBiology Course – An intense, multidisciplinary summer course exploring the coevolution of the Earth and its biosphere, working in research groups to solve relevant questions.

USC Fraser Lab Retreat – Part of the USC Translational Imaging Center, their goal is to develop new technologies for the imaging of biological structure and function.

USC Psychology Conference – ‘Advancement in the Science of Habits’ - a 3-day conference on economic and psychological processes relevant to consumer habits.

NASA Astrobiology Institute (NAI) ‘Life Underground’ Meeting – A partnership between NASA and 12 NAI Teams located at universities and research labs. USC’s ‘Life Underground’ team informs the astrobiology community and guides the search for extraterrestrial life.
Oregon State University Workshop – This workshop on Genome-wide SNP genotyping with 2bRAD aims to train biologists in the application of these methods in non-model systems.

Balboa Yacht Club Board Meeting – The Balboa Yacht Club, the largest single membership group that supports the Conservancy, held their annual board retreat at the Boone Center.

USC Center for Dark Energy Biosphere Investigations – Community College Instructor Workshop about research by the Wrigley Institute and C-DEBI scientists, and methods to integrate the information into their current curriculum.

USC Marine and Environmental Biology Department Retreat – Annual USC Marine and Environmental Biology graduate student and faculty retreat.

USC Vice President of Student Affairs QI Program – QI is the Division’s Leadership Development Program, which prepares employees to be leaders within their department, the Division, and the profession.

Generating the Future: USC Polymathic Student Retreat – A student cohort in collaboration with invited faculty engage in the topic of futurism from multiple, polymathic modes and perspectives.

USC Mork Scholars Leadership Retreat – Sophomore Mork Scholars join USC Trustee John Mork and President C.L. Max Nikias for a leadership retreat.

USC Keck Parents Association – Hosted by Drs. John and Karla Heidelberg, the USC Keck Parents Association visits the Wrigley Marine Science Center. Discussions included WIES sustainability initiatives.

UCLA Bioinformatics Retreat – Bioinformatics Interdepartmental Ph.D. Program is one of ten Home Areas within the UCLA Graduate Programs in Bioscience.

California Department of Fish and Wildlife (CDFW) Scientific Diving Training – CDFW divers are certified to Scientific Diving Standards in intensive training that employs lectures, fieldwork and in-water evaluation of diving skills.

2016-17 ADVISORY BOARD

Terry Scot Adams
Todd M. Bauer
Tony Budrovich
Brock J. Dewey
Nancy L. Fein
Lynda Boone Fetter
Philip W. Hagenah

J.R. Johnson
Tyler Kelley
Bruce M. Kessler
Sam King
Andrew John Littlefair
Robert B. McKnight, Jr.

Diane Sonosky Montgomery
Breene Murphy
Calen Offield
Maria Pellegrini
Alison Wrigley Rusack
Stephen Scully
Andy Zinsmeyer

USC Wrigley Institute for Environmental Studies
3454 Trousdale Parkway, CAS 200
Los Angeles, California 90089-0153
Phone: (213) 740 - 6780 • Email: wies@usc.edu
Website: wrigley.usc.edu