

# HANA O KE KAI

“Work of the Ocean”

NEWSLETTER OF THE OCEAN AND RESOURCES ENGINEERING DEPARTMENT, Spring 2013, Volume 16

## Chair’s Message

Bruce M. Howe, Chair



A distinguished external team came in April to review all aspects of SOEST, including ORE, with overall very positive results. Comments from their letter and report include: “... especially fortunate to have ... groups of faculty, students, staff ... who willingly provided data and insights...” and “... the review team was impressed by many of SOEST’s programs and their significant contributions to science and society. We hope our recommendations provide a solid basis for advancing this outstanding school.”

Many recommendations were made. A sampling includes: strategic planning, procurement, infrastructure, graduate and post-doc pay, fund raising, and diversity; and for ORE, investigate an undergraduate program and obtain more lab facilities. We will be addressing these in the next while.

Late breaking news – Yaprak Onat, has been selected to be one of the 2013 - 2014 winners of the Denise B. Evans Fellowships, administered by the Hawaii Institute of Geophysics and Planetary Geology. This one year award will be for a full year of support. Congratulations!

## Editor’s Corner

Yaprak Onat, TA



This issue proudly presents the great successes of students, whose journeys started behind the walls of Holmes Hall and continuing through their lives. Obviously, achievements are one of the basic characteristics of ORE Ohana. While the hot weather is testing our persistency to work, I wish you a summer full of

“waves”! I am happy to introduce Andrew Schwartz as a new TA. Thank you so much to all faculty members, students and alumni for helping me to prepare this issue. Any suggestions and comments for future issues are always welcomed.

I hope you’ll enjoy this Hana O Ke Kai!

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## Student News

- **Yaprak Onat** was awarded Denise B. Evans Fellowship for 2013-2014.
- **Justin Stopa** and **John Casilio** were awarded The ORE Outstanding Graduate Student Award.
- **Jerica Nolte** defended her MS Plan A thesis “In-Ocean Experiments of a Wave Energy Conversion Device with a Drogue and Wave Power Calculations ” on May 17, 2013.
- **Max Young** defended his MS Plan B thesis “Feasibility Study of a Manipulator-Held Hydraulic Coring Rig” on April 11, 2013.
- **Peter Anast** defended his MS Plan B thesis Performance Trends of Hagen-Cockerell Raft Wave Energy Converters using WAMIT™ Software on February 14, 2013.

**Congratulations and very best wishes for your future and successful careers!**

## Publications & Events

### Some Recent ORE Publications

- Bai, Y. and **Cheung, K.F.** (2013). Depth-integrated free surface flow with parameterized non-hydrostatic pressure. *International Journal for Numerical Methods in Fluids*, **71(4)**, 403-421.
- Korde, U. and **Ertekin, R.C.**, (2013). An open water submerged device for wave energy focusing and conversion, *Proc. 10th wave and tidal energy conference, EWTEC 2013, Aalborg, Denmark, 2-5 September*.
- Nihous, G.C.**, (2013). Chapter 17: Ocean Thermal Energy Conversion (OTEC) in "The World Scientific Handbook of Energy," G. Crawley ed., World Scientific Pub., ISBN: 9789814343510, 359-372.
- Nolte, J., **Ertekin, R.C.**, Davis, E.P., (2013). In-Ocean experiments of a wave energy conversion device moored to an anchor and to a drogue, *J. of Ocean Technology*, March, **8**, No.1. pp. 72-85.
- Rajagopalan, K. and **G.C. Nihous**,(2013). Estimates of global Ocean Thermal Energy Conversion (OTEC) resources using an Ocean General Circulation Model, *Renewable Energy*, **50**, 532-540.
- Stopa, J.E., Filipot, J.-F., Li, N., **Cheung, K.F.**, Chen, Y.-L., and Vega, L. (2013). Wave energy resources along the Hawaiian Islands chain. *Renewable Energy*, **55**, 305-321.
- Taflandis, A.A., Kennedy, A.B., Westerink, J.J., Smith, J.M., **Cheung, K.F.**, Hope, M., and Tanaka, S. (2013). Rapid assessment of wave and surge risk during landfalling hurricanes: a probabilistic approach. *Journal of Waterway, Port, Coastal, and Ocean Engineering*, **139(3)**, 171-182.
- Yamazaki, Y., **Cheung, K.F.**, and Lay, T. (2013). Modeling of the 2011 Tohoku near-field tsunami from finite-fault inversion of seismic waves. *Bulletin of the Seismological Society of America*, **103(2b)**, 1444-1455.

### Upcoming Meetings and Conferences

- OMAE2013 in Nantes, France from June 9-14, 2013. <http://www.asmeconferences.org/OMAE2013/>
- OCEANS'13 MTS/IEEE Conference in Bergen, Norway, from 10-13 June 2013. <http://www.oceans13mtsieeebergen.org/index.cfm>
- Underwater Acoustics Conference UAC2013, Corfu, Greece, 24-28 June, 2013, [www.uam-conferences.org/](http://www.uam-conferences.org/)
- 23rd International Offshore (Ocean) and Polar Engineering Conference will be held in Anchorage, Alaska, USA from June 30 to July 5, 2013. <http://www.isopec2013.org/>
- ICCOE 2013 : International Conference on Coastal and Ocean Engineering in Zurich, Switzerland July 30-31, 2013. <https://www.waset.org/conferences/2013/zurich/iccoe/>
- OCEANS'13 MTS/IEEE Conference in San Diego, USA from September 23-26, 2013. <http://www.oceans13mtsieeebergen.org/>
- ASLO Ocean Sciences Conference, Honolulu, USA from February 23-28, 2014.
- OMAE2014 in San Francisco, USA from June 8-13, 2014. Abstract submission deadline: September 30, 2013. <http://www.asmeconferences.org/omae2014/>
- ISOPE'14 in Busan Korea, from June 15-20, 2014. Abstract submission deadline: October 20, 2013. <http://www.isopec2014.org/>

## ORE Student Research

### SNAME Annual Meeting of UH and West Coast Chapters

The latest SNAME meeting was held on April 24th. ORE PhD student Justin E. Stopa presented his research titled "Forecasting and Hindcasting Wind Driven Wave Environments". Spring 2013 semester is the last term for Jerica Nolte who has served as UH SNAME Student Section Chair. Jerica is passing the torch on to Yaprak Onat. Justin's abstract of the study is given below.



Justin Stopa and Jerica Nolte

The ability to describe the ocean wave climate and its changing nature is of great importance for commerce, recreation, coastal land-use, and hazard mitigation. Wave observations are often limited temporally, spatially, and/or by the parameters to describe the environment. Numerically generated wave data have proven to be a valuable resource by complementing the limitations of observations. Hindcasting waves can provide a detailed description of the wave environment for many ocean engineering applications while forecasting waves can help assist in the short term planning. Two example hindcasts will be demonstrated: 1) 2000-2009 using the National Center for Environmental Predictions (NCEP) final analysis (FNL) winds to force a nested spectral wave

model 2) 1979-2009 using NCEP's Climate Forecast System Reanalysis (CFSR) winds to force a mosaic spectral model. Descriptions of the creation each dataset will be given including its special features and limitations. The 10-year hindcast focuses on the wind and wave environment near Hawaii while the 31-year hindcast describes the global wind and wave environment. Lastly a demonstration and description of a wave forecast model will be given ([oceanforecast.org](http://oceanforecast.org)).

### 2012-2013 The Outstanding Students

The Outstanding Graduate Student Award was given to two very deserving individuals this year. **Justin Stopa** got a Bachelor's Degree in Mathematics from the College of New Jersey in the Spring of 2005. A NOAA summer internship followed during which he developed a keen interest in spectral wave modeling. He then enrolled in the Ocean and Resources Engineering Department where he excelled, completing his MS studies in the Fall of 2007 which required an additional 33 credits of undergraduate engineering classes. He passed the PhD qualifying exam

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## ORE Student Research

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in the Spring of 2008, advanced to candidacy last year, and plans to graduate this Summer. He is in the process of applying for post-doctorate fellowships to pursue his broad research interests. These interests primarily hinge on spectral wave modeling with applications to studies of ocean wave energy, wave-induced atmospheric infrasound signals, and global wave climate, which is the focus of his PhD dissertation. He already has a remarkable publication record, with several first-authored papers in prestigious journals, such as *Journal of Geophysical Research*, *Geophysical Research Letters*, *Ocean Modeling*, and *Renewable Energy*. Justin has developed strong collaborative relationships in the scientific community, working for example with Dr. Tolman of NOAA NCEP, one of the lead developers of WAVEWATCH III. He has also produced broadly available regional hindcast wave data sets that have been used extensively by scholars and engineers.



Prof. Nihous gives Justin Stopa his award for behalf of Selection Committee

**John Casilio** received his Bachelor's Degree in Aerospace Engineering from the US Naval Academy in 2006. Since then, he has pursued a career in the Navy's Civil Engineer Corps, where he currently holds the rank of Lieutenant at the Patuxent River, MD Naval Air Station. During deployment, he distinguished himself in a tour of duty in Iraq's Al Anbar Province, providing support to the Marine Expeditionary Forces. He enrolled in the MS program of the Ocean and Resources Engineering Department in the Fall of 2011 while working part-time in Pearl Harbor. Despite his professional and family responsibilities, he successfully completed his graduate studies in the Fall of 2012. John not only obtained very good grades, he also proved to be an outstanding researcher with a passion for solving engineering problems. Working with Dr. Greeson, he analyzed the thermal behavior of the electro-mechanical umbilical cable of SOEST's new remotely operated vehicle (ROV).



John Casilio

The recipients are recognized for their potential to make significant contributions in the field of Ocean Engineering.

## Inside ORE

# Iroquois Point Beach Nourishment Project

**S**ea Engineering Inc. invited the ORE faculty, staff, and students for a visit to Iroquois Point. It is the site of a major coastal engineering project involving construction of nine T-groins and placement of 95,000 cubic yard of sand along 4,000 feet of shorelines. A beach restoration project is estimated as \$14 million, it is described as the largest ever undertaken in Hawaii.



The shorelines between the completed groins are already taking the expected shape even without any sand fill. On March 13th, Prof. Cheung led ORE students to see the construction sequence and view before/after nourishment aerial photos in a single visit. Sea Engineering Inc. supplied the following general information about the project.

The Iroquois Point housing area is located on the central south shore of Oahu, immediately west of the Pearl Harbor entrance channel. The project area extends along 4200 feet of shoreline, from the western boundary of the housing area at the Puuloa rifle range, to the east of Keahi Point and wastewater pumping station at Hammer

Point. Chronic erosion and shoreline recession, coupled with back-shore flooding due to wave overtopping of the low lying shore, have resulted in abandonment and demolition of 16 shoreline homes. The survey shows erosion over 6700 cubic yards per year.

Sea Engineering Inc. proposed beach nourishment and stabilization plan, designed based on proven engineering principles, consists of nine T-head groin structures extending along the Iroquois Point housing area shoreline, dividing the beach into eight cells 400 to 450 feet long. Groin stems are 150-170 ft long with elevation +4.8' mllw. Total head length was 140-180 ft with elevation +5.3' mllw, extending seaward from the approximate existing low

water line. The groins are constructed of 2000 to 4000 pound armor stone, 2 stones thick, over a 200 to 400 pound stone core, with 1 V: 1.5H side slope. Sand fill with appropriate characteristics to match the existing sand id placed to the design beach plan and section within the cell, with a design slope of 1V:10H up to a crest elevation of +6 feet. The rock groin beach stabilization structure increases habitat for small fish and provide solid substrate for colonization.

The project was completed on May 7, 2013, and has reportedly held up well versus the recent south swell. The difference before/after is really incredible.

For detailed information <http://www.seaengineering.com/>

## The sea itself is our laboratory

Dr. Lora Van Uffelen



**T**he title of this article is a quote from Dr. Walter Munk in the documentary film “Waves Across the Pacific,” which nicely describes the ORE601 “Observational Methods” laboratory class and was screened on the first day of class to set the tone for the semester. The class focused on performing experiments at sea and getting hands-on experience with oceanographic instrumentation and technology.

This year marks the 50th anniversary of the experiment described in “Waves Across the Pacific,” in which waves generated by Antarctic storms were measured by pressure sensors at various points along great-circle routes all the way up to Alaska. One of the wave measuring stations was right here in Oahu, off of Kewalo Basin. The ORE601 class also deployed Aquadop and Seabird instrumentation to measure waves at the nearby site at Kilo Nalu during this past semester.

This film highlighted by contrast the advances in technology that have been made in the past 50 years. The class had a good chuckle when Dr Munk described the state-of-the art punch card technology:

“For this expedition, the data would be recorded on punch tape equipment for direct input into a computer. I was frightened by the idea of using such fancy digital equipment on remote islands, but I agreed it was necessary because of the large volume of data we anticipated collecting.”

The punch cards were flown to La Jolla, CA for processing by a “high-speed” computer. The documentary states that it would have taken somebody with a desk calculator 2000 years to process the 10 million data points that were collected over the summer-long experiment. With their high-speed computer, it took *just* a week! Quite a difference from today’s processing speeds!

Wave data is far more easily accessed today with online oceanographic data resources. The class performed spectral analysis on wave buoy data available from the CDIP website. Online resources were also used to design a Seaglider deployment based on oceanographic information available from PacIOOS explorer and other online resources. We had a guest speaker from the US Coast Guard come to talk about how data from these same resources are used for Search and Recovery Operations.

The class had the opportunity to see the ROV Jason and AUV Sentry, both part of the Woods Hole Deep Submergence Laboratory, when they were in Honolulu preparing for a cruise. We also made a trip down to Makai pier and got a chance to crawl inside the Pisces submersibles. While we were there, we also gained hands-on experience driving a small Seabotix ROV from the pier.

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## Inside ORE

### The sea itself is our laboratory

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In the classroom, Matlab-based software was used to design deep ocean moorings. The class also designed and deployed a small mooring at the Kilo Nalu site. The mooring supported a Seabird Micro-CAT temperature and pressure sensor and was successfully recovered after a week-long deployment. In a separate experiment, the class deployed a number of different metal parts in the ocean, both with and without an anode to observe the effects of salt water on different materials in the galvanic series.

One of the highlights of the course was a 3-day student cruise aboard the *R/V Kilo Moana* (documented on Youtube at <https://www.youtube.com/watch?v=F21aZWsz3II>). The class got their hands dirty manning tag lines, operating and monitoring the CTD, and learning about mooring operations.

It was a busy semester for the nine venturesome grad students, and this course could not have happened without their full engagement and a lot of outside

help. I would like to take this opportunity to thank the ORE faculty, our guest speakers, and those who made our field work possible. Special thanks to Natalie Nagai, Chris Kontoes, Carly Fetherolf, Kimball Milliken, Max Cremer, Brian Bingham, Mark Merrifield, Doug Luther, Betsy Seiffert, Jennie Mowatt, and Ethan Roth.



## The ALOHA Cabled Observatory continues to provide data from 4728 m water depth 100 km north of Oahu.



This video frame shows a deep-sea lizard fish attacking an aristeid shrimp. Jeff Drazen and Aharon Fleury (UH Oceanography) have analyzed the first month or so of video data. Fifteen species were identified, with shrimp and other invertebrates making up 93% of the ~450 observations of animals per month. More numbers and diversity have been observed than expected. (<http://aco-ssds.soest.hawaii.edu>). Bruce Howe.

## ORE Alumni

### Former ORE, Patrick Sullivan won UH 2013

**S**ullivan got his master's (1981) and Phd. (1985) in our department. Since 2007, Sullivan has served on the UH Manoa College of Engineering dean's council and was a former adjunct faculty member in the Department of Ocean & Resources Engineering. Here is an article about Sullivan published on uhalumni.org

Dr. Patrick K. Sullivan founded Oceanit in 1985. The self-funded research and development technology incubator employs more than 160 scientists, engineers and professionals, providing innovative solutions in aerospace, engineering, information technology and life sciences. Oceanit produces cutting-edge innovations in biophotonics, neurotoxin detection and optics, and develops technology for missile defense, managing space debris and environmental applications. Sullivan brings more than 35 years of entrepreneurial, business and scientific experience to Oceanit's "idea factory" business model, which has

developed extensive technical infrastructure, such as Hawai'i's first and only optical design and fabrication center, and nanotechnology focused on nano-composites and sensors. Sullivan's 28 years of CEO experience and broad background in scientific innovations, team building and business has enabled Oceanit to spin out Hoana Medical, Inc., a medical device company that raised nearly \$45 million in private equity, as well as \$12 million in federal funding. In 2006 Hoana Medical brought to market its first FDA-approved product, which is focused on delivering intelligent medical vigilance to acute care hospitals and has been used by more than 100,000 patients in hospitals throughout the U.S.

Sullivan has served on numerous boards and commissions, including those of the Ocean Research Advisory Panel (appointed by the Secretary of the Navy), Parker Ranch and the High Technology Development Corporation. He currently serves on the boards of Rehabilitation Hospital



Patrick Sullivan

of the Pacific and Hoana Medical and is a member of the Chamber of Commerce of Hawai'i Military Affairs Council. Sullivan has developed nationally-focused research programs, such as the National Defense Center of Excellence for Research in Ocean Sciences, and the National Electric Vehicle Demonstration program, both collaborations with the Defense Advanced Research Projects Agency. He also serves as the honorary consul to the Republic of Indonesia in Hawai'i.

## New in ORE

### Carolyn Schaab

Carolyn has enrolled to Masters program in Spring 2013. She went to James Madison University in VA and graduated in 2004. She likes hiking and traveling.

*ORE welcomes its new semester and wishes her luck!*



Final Page

Your Gift to the ORE Enrichment Fund

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**Foundation**  
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**Hana O Ke Kai**

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**ENGINEERING THE OCEANS SINCE 1966!**

*"Our knowledge is a little island in a great ocean of nonknowledge."*

*Isaac Bashevis Singer*