

# Making Waves

- **Have a Safe and Happy Summer!**
- **Congratulations Ocean Engineering Graduates!**

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## Farewell to Dr. Tom Consi

As many of you know, Dr. Tom Consi recently accepted a position at the University of Wisconsin. This spring was his last semester at MIT, where he has spent the last 17 years of his career. Dr. Consi was kind to write this last article for Making Waves telling us about his time at MIT and his plans for the future.



**Dr. Consi at the Ocean Engineering BBQ last spring.**

I started at MIT in November of 1987 as a post-doc under Prof. Emilio Bizzi in the Dept. of Brain and Cognitive Sciences. I was a neurobiologist by training (PhD from Columbia U. in 1987) and I worked on the development a nerve shut-off implant while in Emilio's lab.

While at Brain & Cog. I met Anita Flynn, a research engineer who was working for Prof. Rodney Brooks at the time. She invited me to participate in the first AI Lab Robot Olympics. I built a light-seeking robot out of an RC tank. Through Anita I met Rod and the "insect robots" crowd. I thought building robots was so much fun I decided to do a career change and get into robotics. Rod told me of a new marine robotics lab that was being formed under Chrys Chryssostomidis at Sea Grant. I was the second person hired in the AUV Lab and I started on April Fool's Day, 1989.

I started at the Sea Grant AUV Lab as a post-doc, and then was promoted to Research Engineer. I worked on our first two AUV's: the Sea Squirt and Odyssey I. These were both pioneering AUV's that demonstrated the utility of small, relative inexpensive AUVs for marine research. I managed to fuse my interests in biology and robotics with the RoboLobster project. RoboLobster was a tiny, wheeled AUV designed to study underwater guidance using chemical plumes. Chemo-sensing and navigation is used extensively by animals to locate food and mates. RoboLobster's design was inspired by the American Lobster and the project was done in collaboration with Prof. Jelle Atema

of the Boston University Marine Program in Woods Hole, MA. I am proud to say that RoboLobster was an early example of what are now known as "Biomimetic Robots" and it was one of the first of these types off robots to run underwater.

As time went on I found myself becoming more and more involved with the undergraduates in the Lab. In 1995 Mike Triantafyllou and I revised the capstone O.E. design courses, Design of Ocean Systems I & II (13.017/018). I have co-taught them for the remainder of my time at MIT, first with Mike, then with Prof. John Leonard, and most recently with Dr. Franz Hover. In 1997 Chrys gave me the opportunity to move across campus to the Ocean Engineering Dept. to teach as well as do research. The first thing I did at O.E. was build the new O.E. Teaching Lab. I continued to teach 13.017/018 and also developed and taught IAP courses and a spring seminar course that introduced the little Sea Perch ROV to the O.E. Dept. That seminar evolved into the Discover Ocean Engineering Program. I was eventually promoted to Senior Lecturer in the O.E. Dept. and was also the Department's UROP coordinator.

My research while at Ocean Engineering spanned a number of topics. In collaboration with Mike Triantafyllou I worked on flow visualization around live, freely-swimming fish. I also worked on the

**[Continued on page 4...](#)**

## Congratulations Graduates!

The following students received Ocean Engineering degrees at Commencement on June 4<sup>th</sup>:

### Bachelor's

Jeremy Chambers  
Matthew Greytak  
Johanna Mathieu  
Brian Mueller

### Master's

Christian Brown, 13A & 2  
Iason Chatzakis, 13  
Peter Connor, 13B  
Joseph Curran, 13  
Eric Dresser, 13B  
Stephen Geiger, 13B  
Lynn Gish, 13 & 13A  
William Hardman, 13A & 13B  
Wun-Hoa Jai, 13A & 2  
Julie Kitchenka, 13A & 1  
Jwee Min Charles Low, 13  
Karl-Magnus W. McLetchie, 13 & 2  
Costas Pelekanakis, 13  
Cameron Price, 13B & 15  
Jack Ramsey, 13 & 6  
Jason Rhoads, 13 & 1  
Michael Roach, 13B & 1  
Richard Smith, 13A & 6  
Charalambos K. Soultatis, 13A & 1  
Gregory M. Tozzi, 13A & 1  
Adam Vokac, 13B  
Dianna Wolfson, 13A & 13B

### Doctorate's

George Dikos  
Sung Joon Kim  
Hongye Liu  
Jeffrey Stettler  
Jon Withee  
Guangyu Wu

## Seniors, where are you going now?

### **Jeremy Chambers**

Jeremy took a job in New York as a banker in the public finance sector as a public finance analyst. His job starts in early July. It is a two-year program.

### **Matthew Greytak**

This summer, Matt will be living at home finishing his fifteen-foot wooden sailboat in his garage. With no other work to distract him, he should have it sailing by the end of July. Matt will divide the rest of his time between ultimate frisbee, hiking, and swimming at the beach. In the fall, he will begin graduate studies at MIT.

### **Johanna Mathieu**

Johanna was recently accepted into the Peace Corps. In September she will be moving to Tanzania to teach high school physics for 27 months. When she returns she plans on attending graduate school, hopefully in the MIT-WHOI Joint Program. This summer she is working at the MIT Office of the Arts, traveling, hiking, and biking.

### **Brian Mueller**

Brian is still unsure of his future plans. This summer he is participating in a sleep study and in the fall he's moving back home to Wisconsin to begin looking for a job.

### **Kathryn Wasserman**

Katie graduated in February (2004) and has been working at the ExxonMobil Development Company (EMDC) in Houston, Texas. She explains, "Wow, is it good to be back in the South! Down here it's like South Florida with better public transportation, decent Mexican food, and the same HUGE cockroaches to make it feel like home." Katie's working at ExxonMobil Upstream Research Company (URC) doing VIV and vessel motions research. In the fall, she plans to start yacht design school.



Contact Anna Michel, [amichel@mit.edu](mailto:amichel@mit.edu), if you would like to purchase a 13SEAs T-shirt.

## 13SEAs Faculty/Student Mixers

By: Gabe Weymouth, G

When you think back to MIT, I am sure the first things that come to mind are probably not the relaxing, stress free hours that you spent socializing with your fellow students. But that is no reason to give up! This year 13SEAs redoubled its effort in this arena, sponsoring a large number of after work mixers.

Once a semester, everyone from the department, including the administrative and research staff, was invited to come down to the Hart Nautical Gallery for dinner, drinks and socializing. These mixers encouraged the mingling of Ocean Engineering students and faculty.

The fall semester student/faculty mixer was a Halloween party, and everyone was encouraged to dress up. Unfortunately, the number of full-blown costumes was small (would you want to give your advisor even more reasons to think you are not playing with a full deck?), but there were some notable appearances such as Sam Adams and a living breathing ice cream sandwich. Next year, we are expecting sightings of slightly more healthy food icons, such as the Jolly Green Giant and the California Raisins.

The spring semester student/faculty mixer took the form of a Cinco de Mayo celebration, complete with Mexican food and drinks, and a bartender with an amazing grasp of fully 15 Spanish words (yours truly). Plans for hanging Piñatas were discussed, but for some reason the museum curator seemed to disapprove of swinging bats inside the gallery – maybe next year.

## SNAME Paper Night Results

Greg Beers, chairman of the SNAME New England Section, announced the winners of the 2004 annual New England Regional SNAME Student Paper Competition at the April regional meeting. Winning papers will now be sent to SNAME for consideration in the National SNAME Student Paper Competition. Congratulations to the winners!

The Graduate Paper Honor Prize was awarded to LCDR **Omri Pedatzur**, Israeli Navy and a graduate student at Massachusetts Institute of Technology for his paper, "Feasibility Study for a Littoral Corvette Ship." LCDR Pedatzur received a certificate from the Section along with a check for \$150.

The Undergraduate Honor Prize was awarded to **Matthew Greytak and Johanna Mathieu**, Massachusetts Institute of Technology, for their paper (co-authored by Anne Baker, Jeremy Chambers, Brian Mueller, and Kathryn Wasserman), "From Waves to Watts: A Wave Energy Conversion Device for the

Charles River Basin". Mr. Greytak was in attendance and accepted the certificates and \$150 prize on behalf of his team.

Not content with a mere two gatherings a year, 13SEAs collaborated with the Mechanical Engineering Department's graduate student organization (GAME) to hold after work student mixers every month. The mixers were held at either the Muddy Charles Pub or the Thirsty Ear Pub and always featured free pizza and drinks. At first, this proved to be a problem, because the presence of free pizza to grad students is like blood in the water to a bunch of sharks. After a five minute feeding frenzy, the pub would be deserted and have pizza boxes strewn about it like so many inedible life jackets.

Using the time honored engineering practice known as "trial-and-error," it was found that by having the students show up 22-29 minutes before the pizza arrived, social structures between students would be formed which would lead to slower, less dangerous, food consumption. These structures were also likely to persist after the food was gone, resulting in people staying the pub to continue that rare art of "socializing". Further results will be published in appropriate journals.

The mixers were also supplemented with other entertainment; bands and DJs were called in, and a few poker/darts events were organized. While I fear that the Ocean Engineering Department at MIT may not be in danger of becoming known as a party school any time soon, 13SEAs is at least trying to give our students a few moments of calm in the eye of the storm.

The Undergraduate Paper Award was presented to Cadet 1/C Brian Lied, United States Coast Guard Academy, for his paper, "A Design Plan for the Replacement of the Propulsion Plant on the USCG 65' WLR and 75' WLR, WLIC". Cadet Lied was in attendance and accepted the certificate and \$100 prize.

The following presenters also received honorable mentions from the Section for their respective papers: Jennifer Stamp, University of New Hampshire, "Prediction of Roughness Penalties for Propellers and Hulls"; Cadet 1/C Todd DeVries, United States Coast Guard Academy, "Refinement of Procedures to Produce Low Cost Ship Models at the U. S. Coast Guard Academy"; **Meghan Brogan and Katie Wasserman**, Massachusetts Institute of Technology, "Tension Leg Platform Design and Optimization for Vortex Induced Vibration."

## Control of a Planing Hull: An OE Senior Project

By Matthew Greytak, '04

Planing hulls exhibit a notoriously poor performance in rough water; the very mechanisms that produce lift on the hull also cause it to buck and slam in the waves. The goal of my senior project was to design a control system to improve planing hull dynamics, specifically to reduce slamming accelerations in the bow of the boat. Because so many high-speed craft are now powered by waterjets, I decided to use two-axis waterjet thrust vectoring as part of the control system. Dr. Franz Hover



Matt's boat in the Charles River.

and Prof. Michael Triantafyllou were my advisors for this project.

I spent the fall semester designing and building a 44" radio controlled monohull boat model powered by twin waterjets. The waterjets were purchased from a hobby store, and they have built-in thrust vectoring for steering. In the spring I placed a fin in the waterjet stream to steer part of the flow up and down to approximate two-axis thrust vectoring. Data from an accelerometer, a tilt sensor, and a pitch rate sensor are recorded by an onboard computer. The computer runs a PID control system, based on the tilt sensor and pitch rate sensor data, to actively adjust the angle of the pitch fins to try to keep the boat at a constant angle. I wrote a simulation of the entire system in MATLAB to tune the control system and predict the performance of the boat.

When running in waves the control system can reduce the



A close-up of the boat's waterjet's.

slamming accelerations by up to 25%. The simulation predicts approximately the same slamming reduction. The effectiveness of the pitch fins in changing the angle of the boat was the greatest limitation in the system. True thrust vectoring, in which the entire jet stream is redirected, would be more effective. An abstract for this project was accepted to the student poster competition of the OCEANS 2004 conference in Kobe, Japan.

## Farewell to Dr. Tom Consi, continued from page 1

biomechanics of undulating fins in seahorses and knife fish. In 1998, I met Prof. Elazer Edelman of the MIT/Harvard Division of Health Sciences and Technology and we have collaborated on two unusual and exciting projects. The first was an attempt to use the electric field-generating cells of the knife fish (a relative of the electric eel) to stimulate mammalian heart cells. The long-term goal was to see if these unusual cells could be used to make an all-cellular heart pacemaker. Unfortunately, we were unsuccessful in getting the electric cells to trigger the heart cells. Our next project, which is ongoing, is to develop a new assay system for blood vessel growth (known as angiogenesis to bio-med types) using the tailfin of the zebra danio, a common freshwater fish. If we succeed, then we will have a powerful tool for rapidly and inexpensively studying this important process.

My new position is Associate Scientist at the Great Lakes WATER Institute, sort of a "marine" lab dedicated to the Great Lakes. It is right on Lake Michigan in Milwaukee and it is a part of the University of Wisconsin, Milwaukee. I am building my own lab that will focus on both robotic and biological projects. Right now, I'm developing small, easily deployable, autonomous underwater observatories for the long-term observation of fish and other small aquatic creatures. A key part of the observatory will be mobile

underwater cameras and light sources that can re-position themselves to get the best image of a creature under study. I think that the WATER Institute is a great place to do underwater robotics, it is right on a lake that, for all practical purposes is an Ocean.

### Advice to students:

1. Think clearly and take the time to plan and organize your projects and coursework. A little bit of planning will yield big dividends (i.e. more success in your courses) and will serve you well throughout your careers.

2. When you decide on a career find out where things are "happening" in your particular field and go there. Take me for example, it would have been nearly impossible for me to switch into robotics had I not already been at "robot central" (MIT) and met some of the leaders in the field.

3. Don't eat in the Teaching Lab and slam the door when you leave to make sure it's locked :)

Finally, I wish the ROV team the best of luck - let me know how it goes!

## Speakers Needed!

If you or someone you know would like to give an ocean related talk to our department please contact Anna Michel (amichel@mit.edu). Speakers are needed for the Fall 2004 13SEAs luncheon lecture series.

## Summer Surfing!

Stay tuned for more information about the learn to surf class and the Ocean Engineering – Mechanical Engineering Surfing competition coming this summer. For more information contact Graduate Student Dan Sura, (dsurfer@mit.edu).

## What is a Sverdrup?

Scripps recently digitized a classic book in the field of oceanography, *The Oceans*, by Sverdrup, Johnson, and Fleming. Although, the book was originally published in the early 1940's much of the material is applicable today. The book is free online

<http://ark.cdlib.org/ark:/13030/kt167nb66r/>

## MOTN Cruise!

"CRUISING DOWN THE CAPE COD CANAL": A three-hour cruise aboard the *Viking* leaving from the Onset Town Pier on July 12, 2004 at 6:00 PM.

\$50 for MOTN members

\$60 for non-members

RSVP by July 7, 2004 to Virginia Bard

([vbard@whgrp.com](mailto:vbard@whgrp.com)) and make checks payable to MOTN.

## Beginning SCUBA

By: Tadd Truscott, G

13SEAs helped eight students become certified SCUBA divers this year. The first time divers got quite a shock when they entered the water, and were forced to practice their skill sets in 48° water wearing wetsuits. The brave students were Steve Laverty, Ioannis Bertsatos, Iason Chatzakis, Arthur Jai Wun-Hoa, Bill Hardman, Julie Higgins, Brendan Gotowka, and Tadd Truscott. Many thanks to their instructors Halston Taylor and Doug Siccio).



Beginning divers enter the water for the second day in a row.

## Advanced SCUBA

By Jordan Stanway, '06

This spring, four 13SEAs members earned their PADI Advanced Open Water SCUBA Certifications. Karl McKletchie, Anna Michel, Jordan Stanway, and Addie Yandell made a total of eight dives over the course of two weekends. Instructed by Genevieve Stewart and Jenny Wu of PG Dive ([www.pgdiver.com](http://www.pgdiver.com)), we completed the requirements for dry suit certification at the same time, and three of us (Karl, Anna, and Jordan) also earned the Enriched Air Nitrox rating. We did a variety of dives, including navigation, night, peak performance buoyancy, search and recovery, and wreck. Most of the shore dives were at Back Beach in Rockport, MA. The deep and wreck dives were on the *Chester Poling* off a charter



Jordan, Anna, Karl (with a pink donut), and Addie on their way out to dive.

from Cape Ann Divers. We got down to 87 feet. The water was cold (39°), but we weren't, thanks to the dry suits, and the experience was an overall success.

## Applied Subsea Technologies Luncheon

By Jordan Stanway, '06

On April 28, 2004, Applied Subsea Technologies President Mike Lombardi came to speak to 13SEAs about the rebreather his company is developing for release to recreational, scientific, commercial, and military markets. The CCR2000 is a computer-controlled, fully closed-circuit rebreather. It has two separate,

redundant computers, along with many other safety features. It promises to open up the earth's "innerspace" (200-1000fsw) to research and other activities.

Mike gave a talk on the CCR2000 and then opened up for questions and to let people look at the unit. A few MIT Scuba Club members tried on the unit and found it to be surprisingly light. I will be working with AST this summer, modifying the CO<sub>2</sub> scrubber cartridge and learning how to dive this rig, so stay tuned for updates.

## Alum Spotlight in his Own Words

By John Hootman, G '03



John in front of a boat in Singapore.

I'm sure that everyone has heard the phrase "Join the Navy and See the World"...who would have thought that would apply to a Civil Servant working for the Navy? Recent Course 13/13B Alum, John Hootman (G '03), is embarked on an exciting adventure on the other side of the world:

### What are you doing now?

I have been riding the USS *Kitty Hawk* around the Western Pacific for almost three months. While onboard I have been experiencing what it is like to live on a ship at sea for months on end, learning the complicated and vital roles and missions that an aircraft carrier and its escorts fulfill, and exploring many different ships to see how they operate and have been engineered and built.

### Where have you been?

I have visited Hong Kong; Busan and Osan, Korea; Singapore; and Perth and Fremantle, Australia. Near the end of this four-month assignment I will spend a number of weeks living in Japan.

### What are the two coolest things you've been able to do?

I've flown on and off of the carrier on helicopters and a supply plane that can carry passengers. Being catapulted off a carrier is the coolest ride I have ever taken; it was like a whole roller coaster ride condensed into 2 seconds. I've also been able to watch jets take off and land from literally feet away. The flight deck of an aircraft carrier is quite possibly the world's most hazardous work environment but the carrier's crew makes it work safely; it is an amazing experience, especially at night.

### Describe your current position and role in support of the Navy.

I am a Naval Architect for Future Ship Concepts. We work at the very beginning stages of ship design, translating the Navy's requirements for future needs into actual ship design alternatives. This assignment

will provide valuable practical experience throughout my career as I design ships of the future. It has also given me a greater appreciation and deeper respect for the sailors that make sacrifices and meet challenges in the defense of our country.

### So, where do you work and how are you doing this?

I am based out of the Naval Surface Warfare Center, Carderock Division, and am participating in the Navy's Acquisition Intern Program. This program allows me to change jobs every four months for two years to gain a better understanding of the Navy's engineering organizations and our role in support of the fleet.

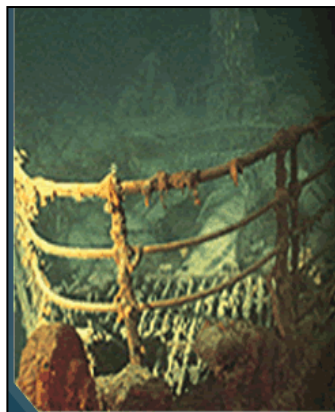


John on a helicopter ride.

## Return to Titanic...

OE Alumnus Katy Croff is currently part of Dr. Bob Ballard's Return to Titanic Expedition. To learn more about this exciting voyage, tune in to the National Geographic Channel on Monday, June 7, 2004 at 9pm.

<http://tsunami2.nationalgeographic.com/channel/titanic/>



## Goodbye to Thalia Garalis!

Thalia Garalis, the current Department of Ocean Engineering administrative assistant to the financial administrator, will be retiring on June 30<sup>th</sup>. She has been at MIT for 30 years, 13 of which were spent in the Department of Ocean Engineering. Goodbye Thalia and good luck for the future!

## 13.017/13.018 Challenge 2004: Build a Sail Boat with Flettner Rotors

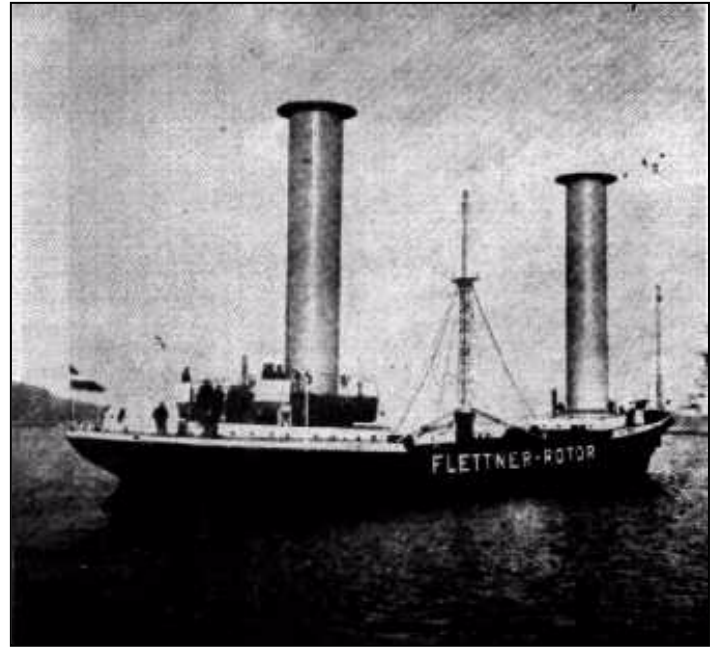
By Jesse Austin-Breneman, '05

It was with great excitement that the Ocean Engineering Class of 2005 awaited our challenge from Dr. Franz Hover and Dr. Tom Consi. No one knew what the challenge was, but had we had been warned that it was the most exciting to date. The challenge did not disappoint. Our professors charged us with constructing and outfitting with instruments a model sailing yacht. Several students in our class were excited about boat and this fit their interests perfectly. However, the wide range of topics and tasks from the construction of the boat to the selection and installation of the instruments made the project one we all could enjoy.

On top of characterizing the performance of the model sailing yacht, we were also tasked with retrofitting the boat with Flettner rotors. The test was to compare the rotor performance to that of conventional sails. At the start of the class, none of us knew what Flettner rotors were or how they worked. We were quickly brought up to speed by Flettner's book, which was handed to us on the first day. Additional research supplemented Flettner's work and the team developed a good understanding of this alternative sail configuration.

The Flettner rotor consists of a spinning cylinder in oncoming flow. The cylinder introduces circulation into the flow, creating lift. In this way, the rotor acts much like a conventional sail. If the cylinder spins at speeds several times higher than the flow velocity, it can produce much higher lift coefficients than the traditional sail. This is just one of the potential advantages of using the Flettner rotor. There are several disadvantages as well, including power consumption and lower performance at certain angles of sail.

The team accomplished much towards completing its goal this spring. The experimental test plan for comparing the two methods was determined. A



A picture of the original Flettner Rotor Ship from <http://www.grc.nasa.gov/WWW/K-12/airplane/cyl.html>.

preliminary design of the Flettner rotors was also completed. The boat and the instruments to carry out the plan are in varying stages of completion. All the instruments are selected and purchased. The boat and the instruments are mostly completed on an individual scale, but need to be integrated into a final system. Next fall, the rotor assembly will have to be developed. The data acquisition as well as control system will also have to be completed. Although we have many challenges ahead of us, we remain confident and excited about continuing our work on this project next term.

### Discover Ocean Engineering 2004



The 7<sup>th</sup> annual Discover Ocean Engineering (DOE) Freshman Pre-Orientation Program will be held from Wednesday, August 25<sup>th</sup> to Saturday, August 28<sup>th</sup>. Ocean Engineering undergraduate and graduate students are encouraged to participate in several of the DOE events and talk to DOE students about MIT and Ocean Engineering. If you are interested in helping out, please contact Dr. Richard Kimball, Director of Discover Ocean Engineering, 2004. You can also visit <http://oe.mit.edu/discover> for more information about the program.

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- |  |  |
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**Looking Ahead...**

Date	What's going on?
June 7	MOTN Cruise
June 7- Aug 17	Summer Session
June 17	SNAME New England Meeting Sailing Yacht Design Topic Newport, RI
June 17	MTS/IEEE OES New England Meeting Army Corps of Engineers Presentations Tufts University
July 4	Independence Day
July 17	MTS New England Fundraiser Pig Roast and BBQ
Sept 6	Labor Day
Sept 7	Registration Day
Sept 8	First Day of Classes for Fall

**Look for the next Making Waves in September! Highlights will include:**

- Results of the 2004 MATE/MTS ROV Competition
- "How I Spent My Summer Vacation"
- Spotlights on Ocean Engineering alums, students, professors, and staff

