Newsletter from the MIT Course 13 Student Engineering Association

Summer 2003 Volume 2, Issue 4

Making Waves

From Waves to Watts: A Sustainable Energy Device

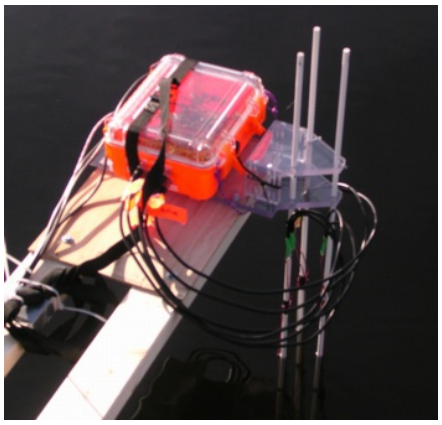
In a drastic departure from past Design of Ocean Systems I classes, this year's 13.017 class did not design an underwater vehicle, or even a surface vehicle, like last year's SWATH model for the Charles. The goal of the class this year was sustainable energy from waves in the Charles River. Their challenge was to determine the power available from the waves in the Charles River, design and construct a device to produce electricity from wave power, and then determine the efficiency of their device.

The class, taught by Dr. Tom Consi and Dr. Franz Hover, was composed of six OE juniors: Kate Baker, Jeremy Chambers, Matt Greytak, Johanna Mathieu, Brian Mueller, and Katie Wasserman. Together they managed to successfully complete half of the stated challenge—determining the amount of wave energy in the river and designing a device to turn this energy into electricity. This fall in 13.018, Design of Ocean Systems II they will attempt to complete the second half of the challenge.

During the first half of the course the class built their own wave probes and successfully measured wave heights in the Charles over a period of 15 hours. They then calculated the significant wave heights and peak frequencies in order to calculate the energy in the river.

Next they did research to determine what sorts of wave energy conversion devices have already been developed, the advantages and disadvantages to these devices, and their applicability for use in the Charles River. Many previous attempts at producing sustainable energy from waves were abandoned in the late 70s because of low efficiency and lack of funding. However, today, with new technologies, lower cost parts, and the ever-growing need for alternative energy sources this field of research is particularly important for us to jump back into.

The class decided to design and construct a free oscillating water column, a hollow cylinder that oscillates at resonance with the waves causing the chamber of air within the cylinder to continuously compress and decompress, producing pneumatic energy. This energy is used to drive one or more turbines, which convert mechanical energy to electrical energy. A system of valves allows the air to flow in the correct direction through the turbines.



The wave probe experiment.

The class has designed the hull of their oscillating water column and run a series of dynamic models to determine how it might behave in water. They have also researched turbines and different methods for energy extraction including piezoelectric materials and linear generators. Their design includes catenary moorings, drawing from offshore platform design experience. Also, they have developed a system of electronics and sensors that will allow them to monitor the motion of their structure, the energy it is generating, and its efficiency. They are looking forward to beginning the construction of their device in September.

Hopefully, the device this year's 13.017 class designed will not only work but also allow efficient conversion of wave energy into electricity. If this does happen it can become a prototype for the next generation of small-scale sustainable energy solutions.

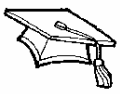
- **Congratulations OE Graduates!**
- **Welcome new Joint Program Students!**
- **Congratulations Award and Scholarship Winners!**

Highlights:

Congratulations to all our OE Graduates!

Undergraduate Graduates:

Stephanie Fried
Meghan Hendry-Brogan
Angus (Kai) McDonald
Sheila Saroglou
Daniel Sura



Advanced Degree Graduates:

Jaehyuck Auh
John Hootman
Vasilios Nikou
Victor Polidoro
Gregory Sabra
Liang Xue
Richard Connell
Kwang Hee Ko
Erik Oller
Bertrand Renard
Lincoln Sise
Michael Temme
Justin Harper
Parker Larson
Georgios Papaioannou
Richard Rikoski
Melissa Flores (Harness)
Konstantinos Psallidas

Graduates, what are you doing now????

Melissa Flores (Harness)
I am moving to San Diego with my husband right after graduation. I am going to serve as the First Lieutenant on the USS Preble, a Navy destroyer. After my 1 1/2 years or so on the ship, I hope to finish my Navy service in oceanography.

LT Erik Oller
I have been assigned to Portsmouth Naval Shipyard in Portsmouth, New Hampshire to take part in coordinating the overhaul and upkeep of submarines for the US Navy.

Justin Harper
I will be working at a private ship design firm in the Annapolis, MD area this summer, as well as traveling. I'm also pursuing a patent for a low-resistance hull form design that I developed, with the help of the MIT Technology Licensing Office.

Bertrand Renard
My short-term plans include another Masters or a PhD, either in Ocean Acoustics, Fluid Dynamics or Cryogenics. My long-term goals lie in applied research or research engineering, and possibly a shift to administrative work in France.

Parker Larson
I am moving to San Diego to work at the shipyard for General Dynamics-Nassco as a Production Associate. Also, I'm getting married in August.

John Hootman
I have accepted a position as a Naval Architect in a Navy civil service professional development program based out of NSWC Carderock Division. I will rotate through a number of Navy offices doing work ranging from research and development to shipyard supervision. My goal is to be involved in the design and management of future naval vessel concepts. In the meantime, I will be taking the summer off to take some vacation, buy a truck, and spend some time camping, and eventually to move myself to the DC area.

Meg Brogan
This summer I'm working for ExxonMobil in Houston doing structural analysis of a mooring system for an FPSO to be deployed off of the western coast of Africa. I then return to MIT for another two years to complete a S.M. in (13) Naval Architecture/Marine Engineering and another S.M. in Ocean Systems Management. After that, I'm going straight back to the south…never to be seen or hear from again... hee hee ha ha!

Victor Polidoro
I'll be going to work at the Seagrant AUV lab. I'll also continue to work with the flapping foil AUV at the Tow Tank.

Kai MacDonald
This summer I plan on doing some traveling and surfing in Mexico as well as relaxing back home in California. Starting next fall, I will continue on for a Master's Degree here at MIT in Ocean Engineering.

Sheila Saroglou
After graduation I'm off to Ohio first, then St. Louis, Tallahassee, and D.C. Sometime this summer I'm going to visit Meg in Houston as well. Then in mid-August I start work at Electric Boat in Connecticut, where I will be working in the hull structures group.

LCDR Michael Temme
I am a LCDR in the US Navy and will be working for Commander, Submarine Forces Atlantic Fleet. I will be the Type Desk Officer in the N4 (Submarine Maintenance) Office responsible for scheduling and tracking depot level maintenance for all the Atlantic Fleet Submarines. I will be residing in Chesapeake, VA.

Stephanie Fried
Starting in September I will be again chained to a lab, beginning work towards a Masters. In the brief respite of freedom before then I'm going to be lazing about, traveling, and catching up with family I haven't had a chance to see since I started college.

OCEANS Update...

The following MIT students have been chosen to participate in the 2003 MTS/IEEE Oceans Student Poster Session:

Sheila E Saroglou
The Design And Construction Of A Model Small Waterplane Area Twin Hull Vessel With Dynamic Control System.

Kathryn Wasserman
Dynamic Buoyancy Control Of An ROV Using A Variable Ballast Tank

Meghan Hendry-Brogan
Tension Leg Platform Design Optimization For Vortex Induced Vibration

Micaela Pilotto
Non-Linear Dynamic Analysis With Deterministic And Random Seas: The Case Of Minimum Platforms

Ursula Wilborn
Savannah (Georgia) Estuary Sediment Radiogeochemistry

Karl-Magnus Mcletchie
Drag Reduction of An Elastic Fish Model

David Sutherland
The Role Of Eddies In A Laboratory Study Of The Antarctic Circumpolar Current

iQuarium to hit the Infinite Corridor

Audrey, Katie, and Aaron pose for the camera.

What began with three MIT undergraduates (Aaron Sokoloski, Mechanical Engineering, Audrey Roy, EECS, and Katie Wasserman, Ocean Engineering) and their crazy idea, is now a fully funded Microsoft iCampus Research project with a budget of $30,000. Their project, the iQuarium, is an interactive virtual aquarium for science and engineering undergraduates that uses actual flow field data to display the vortices behind swimming fish. Unlike existing flow field visualization tools, the iQuarium will be easy to use and learn basic concepts from, especially how fish use vortices to swim very efficiently.

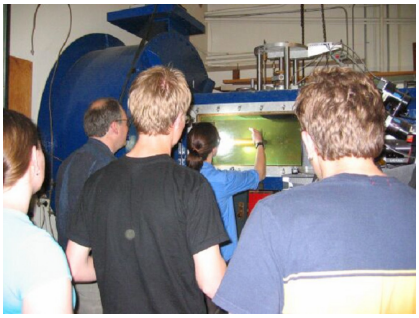
Dr. Qiang Zhu and Dr. Yuming Liu are helping the iQuarium team use Flex 3D flow field visualization software to gather lots of flow field data. The iQuarium team will put all this data in the iQuarium's library. The iQuarium's own software lets the user call data from this library by interacting with the system in various ways. The end result is a display of the vortices in the wake of a swimming fish in near-real time.

The iQuarium will be in Building 11 on the Infinite Corridor, in front of the Student Services Center. Building 11 renovations to make room for the iQuarium display are already underway. People walking by will see very realistic swimming fish on a 60" screen. As they approach the iQuarium, the fish will scatter, reacting to input from the camera above the display. iQuarium users can press a button, and instantly, vortices appear behind the swimming fish. They can change the viewing angle of the display with a joystick, to see the fish swimming from above, below, swimming towards them, away from them, straight across the tank, or in any direction. Curious users can press another button for explanations of fish propulsion and its applications, such as underwater vehicles like the Robotuna.

The iQuarium is a colorful aquarium display that is not only interactive and fun, but educational. The iQuarium will brighten hallways, teach basic fluid flow, and introduce students to an exciting field that they might never have considered: ocean engineering. MIT students are already thinking about computers. Now they will think about computational fluid dynamics. They're already thinking about robotics. Now they will think about marine robotics. They're already thinking about engineering. Now they will think about ocean engineering.

Katie looks into the future. iQuarium will feature interactive display panels in the infinite corridor.

Webbies at MIT



Propeller water tunnel testing at MIT, by members of the Webb senior class.

The Webb Institute Senior Class visited MIT during the first few days of May to perform experiments in the OE Water Tunnel (WT). The seniors spent two days working in the WT to study propeller/rudder interactions and observe varying forms of cavitation under the guidance of Dr. Rich Kimball, PhD '01. The students were performing these experiments as part of their Propeller Design and Vibrations course taught by Webb Professor Jacques Hadler. They hope to publish their findings in a SNAME transaction paper soon.

To encourage interaction between MIT and Webb, 13SEAs hosted a special lunch at the MIT Museum. Hart Collection Curator Kurt Hasselbalch provided personal tours of the ships plan and half hull collections, which are not typically open to the public. The tour included and introduction to the Hart Collection and its mission (which is much larger than what is displayed on the first floor of Building 5), and displayed many plans and half hulls from significant and famous designers of the past few centuries. The event also included a very nice lunch and general mingling between MIT and Webb students amongst the MIT museum's public collection. We hope such cooperation between Webb and MIT will continue. 13SEAs thanks Kurt for all of his help in making this event a success!

Congratulations...

to the following Ocean Engineering graduate students who have earned NDSEGs for 2003/2004:
Meghan Hendry-Brogan, Karl-Magnus McLetchie, and Gregory Tozzi.

Karl has also been awarded a SNAME Graduate Scholarship.

Great job!

Katie Wasserman and Johanna Mathieu have each been awarded a Dean Horn Scholarship for their excellent research projects!
Katie has also won an MTS ROV Student Scholarship and the ASNE Undergraduate Award!

Press Release!!

Harold Burnham's latest schooner, FAME, a 62-foot replica of a War of 1812 privateer, was launched June 14th from the Essex Shipbuilding Museum. Visit www.SchoonerFame.com.

Welcome...

new MIT/WHOI Joint Program students Celeste Fowler, Brendan Gotowka, Jasper Hartsfield, and Taiwei Wang.

Looking for speakers...

for the fall lunch seminar series. Email amichel@mit.edu if you would be interested in presenting a talk to the OE department!

13SEAs Spring Seminar Series

Professor John Delaney of the University of Washington presented the Neptune Project on March 19th. The Neptune project's goal is to set up a network of underwater observatories in the Pacific Ocean. Over 3,000 kilometers of fiber-optic/power cable will be laid to allow scientific instruments to remain on the ocean floor for conducting long-term studies of the seafloor and ocean. At this seminar, students learned about all of the components that will be needed to build this complex observatory. Ocean engineering will play a key role in building the Neptune Project as new instruments, AUVs, and structures will be needed.

The seminar series continued with a dinner talk by Physical Oceanographer Ellyn Montgomery from the Woods Hole Oceanographic Institution. Her talk discussed the design of a high resolution profiler, which is a deep ocean capable free vehicle that acquires profiles of P,T,S and Microstructure. This vehicle raises the question: what is an autonomous underwater vehicle? Because vibration from propulsion systems throw off sensitive instruments, the vehicle surfaces and submerges via autonomous buoyancy control, but it has no propellers, no water jets, and no flapping foils. No propulsion at all.

The seminar series culminated in a luncheon talk by Omri Pedatzur, 13A student in Naval Construction & Engineering. He presented his work on "High Velocity Air Filtration for Marine Gas Turbine." His talk illustrated how he and his team assessed a real-life problem, evaluated potential solutions using numerical and experimental techniques, and then designed and implemented a dramatically improved air filtration system that is being retrofitted to many ships.

SNAME Announces Paper Competition Winners

The New England Section of SNAME recently announced the winners of the annual SNAME Paper Competition. John Hootman and Konstantinos Psallidas with "Forecasting System and Theater Level Impacts of Technology Infusion on Conventional Submarine Design" won the Graduate Honor Prize and Richard Camilli with "Kemonaut: An Odyssey Class AUV Platform for the NEREUS Underwater Mass Spectrometer" came in a close second with the Graduate Paper Award. Johanna L. Mathieu with "A Chemical Sensor to Aid in the Search for Archaeological Sites" won the Undergraduate Honor Prize and Karl-Magnus W. McLetchie with "Drag Reduction of an Elastic Fish Model" won the Undergraduate Paper Award. Congratulations to all of the winners who will be traveling to the SNAME conference in San Francisco in October to receive their awards!

Greg Beers, P.E, Hwee Min Charles Low, Karl-Magnus W. McLetchie, John Hootman, Konstantinos Psallidas, Johanna L. Mathieu, and Meg Hendry-Brogan at the award presentation.

Hello, Goodbye, and Congrats

On Thursday, May 29 the Ocean Engineering Departmental held a celebration at the MIT Faculty Club to celebrate the recent promotions of several professors, welcome a new professor, and say goodbye to several professors.

Congratulations to Professors John Leonard and Nick Makris who each recently earned tenure. Welcome Tim McCoy, our new Navy Associate Professor of the Practice. Also, we begin to say farewell to Professors Chip McCord and John Amy who soon will complete their stays at MIT.

International Student Offshore Design Competition (ISODC)

Since IAP two undergraduates (Katie Wasserman and Meg Brogan) have been working on the International Student Offshore Design Competition (ISODC) with Professor Triantafyllou. The ISODC is a SNAME and ASME sponsored design competition with the goal of encouraging interest in offshore engineering. Students (teams of up to 6 people) design an offshore "structure," such as a Tension Leg Platform (TLP), spar buoy, FPSO, etc, and create an extensive web page demonstrating their design. The design must encompass five fundamental areas of offshore engineering, and three more technical areas such as the detailed mooring characteristics of the system, tendon behavior, and/or detailed structural analyses. If the design places high enough in the competition, the team will be invited to present at the SNAME annual meeting. Unfortunately, since this is the first year that any MIT undergraduate students have participated in the competition and since the MIT team has only two members, compared to the six members that most teams have, expectations aren't too high.

Meg and Katie have completed the basic weight, balance, hydrostatic and hydrodynamic design of a TLP. The TLP is modeled after Brutus, a Shell owned vessel operating in approximately 3,000 ft of water in the Green Canyon Block of the Gulf of Mexico. Using VIVA, a commercially viable VIV code, the TLP tendons were analyzed to determine the stress and fatigue they might experience due to Vortex Induced Vibration at the specific location the TLP is designed for using eight different current profiles. Katie and Meg have also started modeling the hull and superstructure in Abaqus to use finite element analyses to determine its behavior to gravity and wave loadings. The web page, http://web.mit.edu/ktwass/Public /isodc.html contains all of the Matlab code, VIVA results, and basic info on the project. Most of the interesting results are in the Appendices link off of the Design Report webpage. Many of the design issues pertinent to offshore platform design aren't really covered in the basic undergraduate curriculum. As a result, the students have independently learned about Bretschneider spectrums, VIV, eddy current events, mooring and other geotechnical problems, and many other interesting and important engineering issues.

Designing a system that weighs well over 35,000 tons and sits in 3,000 feet of water and subject to hurricanes and rogue current events is extremely challenging and rewarding. Katie and Meg are very grateful to Professor Triantafyllou for his patience and his time. If you are interested in keeping track of their progress, keep checking the webpage!

Discover Ocean Engineering 2003 Needs You!

The 6th Annual Discover Ocean Engineering Freshman Pre-orientation Program will be held Tuesday, August 19 to Friday, August 22. We are looking for Ocean Engineering graduate and undergraduates students to participate in our activities and talk to our DOE students. Here's your chance to be a big sister/brother to a scared, impressionable incoming frosh - impart your hard-earned wisdom and otherwise help a new student adjust to life at MIT. We need people to attend the following events:

Tuesday, 8/19: 5pm - cookout and sailing on the Charles, certified sailors especially needed.

Wednesday, 8/20: Noon - Lunch with the DOE students
6pm – Dinner cruise on the Charles River

Thursday, 8/21: Noon - Lunch with the DOE students
Afternoon – O.E. Lab Tours

Friday, 8/22: 2pm - Boston Harbor cruise on the RV Edgerton (from the New England Aquarium)
6pm - DOE final party

If you have an interest in one or more of these activities contact either **Tom Consi** (consi@mit.edu) or **Eda Daniel** (eda@mit.edu). You can learn about DOE at our web site: http://oe.mit.edu/discover/

Alumni Spotlight in His Own Words: Dave Ricks

At this point in my career, things are really getting good! I'll try to describe how I got from point A to point B, with the caveat that the world is always changing, and I couldn't follow my own footsteps exactly if I had the chance to do it all over again. Life involves opportunities coming and going, with us judging when to make a change.

I got a Bachelor's and a Master's from the OE department in 1983. My favorite course was Kim Vandiver's course in mechanical vibration. Then I worked at Electric Boat in Connecticut on noise radiated from submarines. That experience was very good because it allowed me to see the practical constraints on real hardware, but after a couple of years, I realized I was the kind of person who should have a Ph.D. as a passport to do research. I went back to the OE department and I got a Ph.D. in 1994 in acoustics, which I love as acoustics is an extension of vibration into more dimensions.

Dave Ricks (in the foreground playing the silver trumpet) plays in the Alumni Band. When he was a student her was a member of the MIT Jazz Festival Ensemble. Photo courtesy of Laura Wulf.

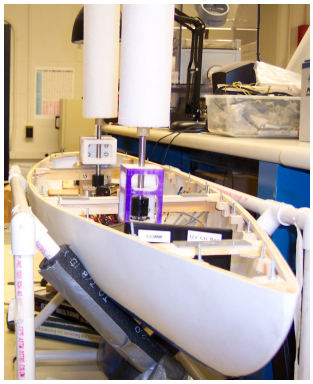
After graduating, I worked for a few years in northern Virginia on underwater acoustics. That was the obvious or logical thing to do with my domain expertise. But in the past few years, things have gotten much more interesting as I've met people who evaluate new concepts for sensor systems in a division of SAIC (Science Applications International Corporation). We have a great mix of people with backgrounds in different fields. Now I'm able to take my domain expertise in wave propagation over to the field of signal processing, where we make similar constructive and destructive interference happen in algorithms for filtering, estimation, and detection. Being able to visualize waves physically has been a huge asset to complement other people who understand things in different terms. I couldn't be happier with my talents being put to good use.

Now I'll see if I can summarize how things have turned out so well. First, inside myself, I have some affection and enthusiasm for some technical work. Second, MIT gave me some solid skills for analytical thinking. Finally, I was able to build some word-of-mouth about my skills and meet people face-to-face. From here on in my career, it's all about knowing people and doing things for those people.

A Model Flettner Rotorship- Sheila Saroglou Describes Her Senior Project

In 1924, Anton Flettner built a rotorship, the *Buckau*. Instead of using traditional sails, the *Buckau* was outfitted with two rotating cylinders. The flow of air past the cylinders coupled with the rotation of the cylinders cause a net force to act on the ship. This phenomenon is known as the Magnus effect. For my senior project I built a remote controlled, small-scale model of a Flettner rotorship. The ultimate goal of this project was to create a teaching tool to illustrate the Magnus effect and its application to ship design.

The Magnus effect creates lift much like a curve ball in baseball. Basically the rotating ball creates a vortex around the center, which, coupled with the wind flowing around the cylinder or ball, creates a pressure differential. This pressure difference causes a lift force that becomes the thrust used to move the vessel. Flettner calculated that the rotors needed to be 1/10 the size of the original sail to produce an equivalent amount of thrust. Based on this design principal, and a combination of theoretical and experimental Magnus effect data, I wrote a program that would allow you to input wind speed, rotor size, and rotor speed and would output the predicted speed of the boat.



Based on these design parameters, I constructed rotors and mounted them on the ship and finally was able to test it in the Charles River. The boat was set up so that the rudder was remote controlled, while the motors were turned on to a preset speed. It could be seen that the spinning rotors did indeed create a thrust force. I created three sets of different sized rotors that are easy to install. In addition, the boat can be converted between the current rotor system and the old sail system fairly easily, so that more quantitative tests can be preformed in the future.

Student Spotlight: Claudio Cairoli

Where and when were your born?
I was born in Como, a beautiful city by a lake in Northern Italy on January 10th, 1975.

Tell us about your academic accomplishments.
You mean besides managing to not being kicked out of daycare? Seriously, I have a MS in Mechanical and Aerospace Engineering from University of Virginia and a MS in Naval Architecture and Marine Engineering for MIT. I do not have a BS, although I finished four years in the Aerospace Engineering Dept at the Polytechnic of Milan in Italy. I am currently working on my Doctorate.

What topic are you doing your thesis on?
I am writing a free-surface flow simulation program to calculate the total resistance for surface piercing vessels, in particular I am interested in sailing yachts.

How did you end up in UVA? MIT?
Well, it's kind of a complicated story. During my fourth year in Milan I realized I wanted to spend a year abroad studying. In Europe there is a student exchange program called "Erasmus" that allows students to go to a different university for a year, take courses there, and then easily transfer the credits back to your school. I was considering going to the Royal Institute of Technology in Sweden, when I was proposed a new exchange program between some European and some American engineering schools. I decided to try it and the three alternatives in the US were: University of Virginia, Oklahoma State University, and Texas A&M. The choice was made simply looking at a map and realizing that UVA was the only one close to the mountains, the ocean, and some big cities like Washington DC. Unfortunately when I arrived at UVA, I quickly discovered that, because of big differences between the US and Italian college systems, the exchange program, as planned, would have not worked. However, before I had to make the decision of going home, I was asked to stay at UVA as a graduate student even though I didn't have a bachelor's degree, because I had completed four years in Milan. So I decided to stay and planned to go back to Italy after two years instead of nine months. But it didn't exactly work that way, because after my first year in Virginia, a couple of professors asked me to stay for a Ph.D. At that moment, I decided that if I was going to stay in the US for a doctorate it had to be in what I was interested, which is sailing yacht design. After some research, I found Prof. Milgram in this department, so I came to Boston to talk to him. I then applied to MIT and got in.

What's been your most memorable social experience at MIT?
Answer for Faculty to read: I don't have time for social life as all my time is dedicated to research. For everybody else: I don't think I can single out one single memory, but just few days ago a good friend of mine that started at MIT almost at the same time that I did went back to Greece because he finished his three-year program. It then hit me that it has been already three years since I moved to Boston, which means I've been having a great time. I met great friends both at and outside of MIT.

What's been your most memorable educational experience at MIT?
I have to say, and some might think this is cheesy, the "Sailing Vessel Design" course that my advisor taught. It was a great opportunity to learn yacht design from a person that has been doing that for decades at a really high level. Most of the courses, however, that I took at MIT have been challenging and interesting.

How does Boston life differ from Italian life?
People often ask me this question and I find that is not easy for me to answer it. The biggest difference, which is also why it is difficult to make a comparison, is that when I was in Italy I was living with my family and commuting to school every day while here I live alone. Socially things are not very different, as I go out with friends here as I did back in Italy, maybe what we do is somewhat different (there's usually a lot more drinking involved here). And I try to go snowboarding, in the winter, and sailing, in the summer, as much as I can, even though at least for snowboarding, I'm not up to the same level as I did back in Italy because there it is a lot cheaper. Also comparing the educational part, in Italy you do research only when you start working on you final thesis and before then it is only course work, while here I spend most of my time on research.

When you finish with your PhD, what do you want to do?
I would like to stay at MIT after graduation and keep developing my program beyond what I need to do for my Ph.D. In 5-10 years I would like to be working as a yacht designer and be living somewhere other than Boston, like the West Coast or maybe even Australia or New Zealand, not because I don't like Boston, but because I found that I like to try to live in different places and have different experiences.

Making Waves Staff

Editor in Chief
Johanna Mathieu

Contributors
Claudio Cairoli
Tom Consi
Meg Hendry-Brogan
John Hootman
George Katsoufis
Anna Michel
Dave Ricks
Sheila Saroglou
Kathryn Wasserman

We're on the Web!
web.mit.edu/13seas

Submit your news, notes, and OE anecdotes to:
13seas-news@mit.edu

13SEAs Officers *13seas-officers@mit.edu*

President Ms. Anna Michel
Vice President Ms. Kathryn Wasserman

Treasurer Mr. Karl-Magnus McLetchie
Secretary Ms. Johanna Mathieu

SNAME SSC Members Mr. John Hootman, Ms. Meghan Hendry-Brogan
Public Relations Ms. Adrienne Yandell

GSC Representatives Ms. Deanelle Symonds, Mr. George Katsoufis
President Ex-Officio Ms. Katherine Croff

Members at Large Ms. Jessica Donnelly, Mr. Stephen Fantone, Mr. Cosimo Malesci
Advisors Mr. Gregory Beers, MTS; Dr. David Burke, SNAME/ASNE; Prof. A.D. Carmichael, SNAME/ASNE; Mr. John Irza, IEEE/OES; Prof. Alexandra Techet, MIT OE

Looking Ahead...

Date	What's going on?
July 4	Independence Day
August 9	Thesis due for Sept Grads
August 19-22	**Discover Ocean Engineering**
Sept. 2	Labor Day
Sept. 3	Registration Day
Sept. 4	First Day of Classes
Sept. 6	**13SEAs Pizza Party!!!**
Sept. 6	Registration Due

Highlights in the next Making Waves...

- Results of the MATE ROV Competition
- The Ocean Engineering Summer Barbeque
- "How I Spent my Summer Vacation" Essays
- Discover Ocean Engineering 2003
- And as always… spotlights on Ocean Engineering professors, students, and alums!

Look for the next Making Waves in mid-September!

Ocean ENGINEERING