Newsletter from the MIT Course 13 Student Engineering Association

Summer 2005 Volume 4, Issue 4

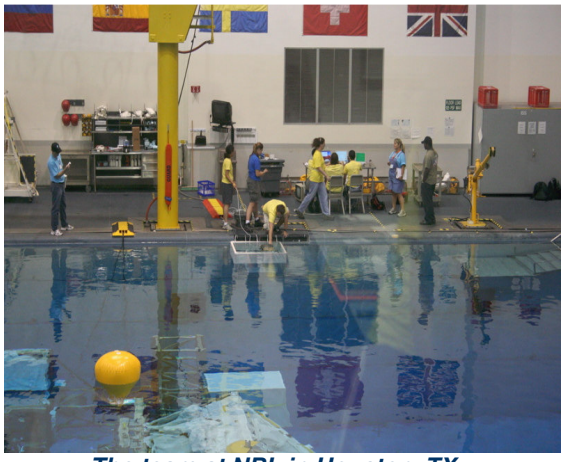
Making Waves

ROV Team's "Mission to Europa"

Contributed by Heather Brundage ('06) and Edward Huo ('08)

The MIT ROV Team participated in the fourth annual ROV competition organized by the Marine Advanced Technology Education (MATE) Center and the Marine Technology Society's (MTS) ROV committee. This year's competition was held from June 17th through June 19th at NASA's Neutral Buoyancy Lab (NBL) in Houston, TX. The traveling team, led by Heather Brundage ('06), was comprised of eight undergraduate students, who were up against fifteen other teams from the US and Canada.

The mission tasks involved diving beneath the "icy surface of Europa" to collect probes, take a water sample and a temperature measurement, and reconnect a telecommunications link to a 'science package'. The mission score was worth roughly half of the overall score, with the other half based on the engineering evaluation, technical report, and poster presentation.



The team at NBL in Houston, TX

Putting the finishing touches on the ROV

MIT's performance was not as extraordinary as anticipated, primarily due to the incorporation of many technologies new to the team. A major difference in this year's ROV was its fiber optic tether coupled with an on-board power supply. Custom-made motor housings and control boards contributed additional complexities for Murphy to act upon. However, no part of this competition was done in vain. The team was able to learn a great deal from their mistakes, and have already started to make plans to continue to use the same advanced technologies in next year's ROV, but integrate them in a more organized and reliable fashion.

The ROV Team is sponsored by MIT's Edgerton Center, ExxonMobil, Prizm, MIT SeaGrant and MIT's Center for Ocean Engineering. The team's website can be found at http://web.mit.edu/rov/www/

- **Participate in DOE to enlighten freshmen in all matters OE! Check out oe.mit.edu/discover or email discoveroe@mit.edu**

- **Congratulations to students with abstracts accepted to OCEANS 2005!**

Highlights:

China's Sailing History: A Special Guest Lecture

Contributed by Matthew Unger, (G)

An Artist's Rendering of the Fleet

On May 5th a standing room only crowd filled the MIT Museum's Clipper Ship exhibit to attend a lecture describing the remarkable sailing history of China in 1400 A.D. The lecture was jointly organized by 13SEAS and the MIT Museum (thanks to Kurt Hasselbalch of the Hart Nautical Gallery). Attendance was estimated at 90 people and included 13SEAS members; ocean/mechanical engineering department students, staff, and faculty; MIT Museum members; and interested local residents. All told, the event was a great success.

The evening's guest lecturer was Dr. Jin Wu, a distinguished oceanic scientist and former Minister of Education of the Republic of China. Dr. Wu is currently the Distinguished Professor of Hydraulic and Ocean Engineering at the National Cheng Kung University in Taiwan. Even more amazing, Dr. Wu's interest in the evening's topic was purely personal and the work he has done to promote worldwide awareness of this subject has been in addition to his regular duties as a professor and researcher.

Between 1405 and 1423, the Chinese Empire financed seven remarkable sailing voyages with the purpose of discovering new lands and peoples. Unlike later European explorers like Columbus, Magellan and da Gama, who took a very few number of ships on each voyage; the Chinese explorers created large sailing armadas (between 50 and 300 ships) for each voyage. The mariner Zheng He commanded the voyages, which each utilized a crew of approximately 28,000 men.

As the last of the voyages were ending, the Chinese Emperor's government began to dissolve. A fire tore through the Forbidden City and destroyed all the collected knowledge of foreign lands, included these seven voyages of discovery. Soon thereafter, the Emperor died and his replacement abruptly changed China's open foreign policy to one of isolation from the rest of the world. As a result of the great fire and this policy shift, there are very few records of Zheng He's seven voyages.

Due to this loss of records, not only are there many unanswered questions, but there is very little public awareness of China's sailing history. Dr. Wu's lecture discussed the historical background of Zheng He's voyages, as well as the research that is currently being conducted. Furthermore, the lecture highlighted several events and celebrations commemorating these seven voyages. Dr. Wu has given this lecture throughout the U.S. and Asia, and has focused on the contemporary significance of Zheng He's voyages. He has strived to raise public awareness of China's long lost sailing and exploratory past; and based on the reactions of the crowd, Dr. Wu's goal was definitely achieved.

Matt Unger, Dr. Wu, Kurt Hasselbalch

Congratulations Ocean Engineering Graduates!!!

Bachelor of Science

Jesse Austin-Breneman
Anne Baker, Feb. 05
Jesse Chandler
Jeffrey Gilbert
Olivia Leitermann
Margaret Loftus
Cosimo Malesci
Adrienne Yandell, Feb. 05

Master of Science and/or Master of Engineering

Thomas DeNucci, II & XIII-A
Matthew Fox, XIII-B
Georgios Gougoulidis,XIII-A & B
Robert Gould, XIII-A & B
William Greene, II & XIII-A
Cale Holman, XIII-B & XV
Andrew Johnson, VI & XIII-A
Mark Johnson, XIII-A & B
Chih-Kuo Lee, XIII-A)
Kwang Lee, XIII Feb. 05
Wenyu Luo, WHOI
Jennifer Mann, XIII
Angus Kai McDonald, XIII
Bryan Miller, VI & XIII-A
Harish Mukundan, XIII Feb. 05
Nikolaos Petrakakos, XIII-B
Michael Plumley, II & XIII-A
Jan Rybka, II & XIII-A
Jonathan Rucker, VI & XIII-A
Peter Small, II & XIII-A
Alexander Sichel, XIII-B
Brian Thomas II & XIII-A
Kai Torkelson, XIII-A & B
Daniel Wang, VI & XIII-A
Edward West, VI & XIII-A
Andrew Wiggins XIII
Robert Wolf XIII-A & ES
Fragiskos Zouridakis, XIII-A & B

Doctorate

Erik Anderson, Feb. 05 WHOI
Ryan Eustice, WHOI
Kelli Hendrickson
Yi-San Lai, Sept. 04
Young-Woong Lee, Feb. 05
Irena Lucifredi, Feb. 05
Oscar Pizarro, WHOI Sept. 04
Christopher Roman, WHOI
Luis de Souza, WHOI Feb. 05
Xiaoqing Teng, Feb. 05

Newly minted grads:
Kwang Hyun Lee, Jennifer Mann, Harish Mukundan, Andrew Wiggins

OE Graduating Seniors: Where Are You Going?

Jesse L. Austin-Breneman
Jesse is biking across the country during the summer. After that, he'll be working at Boston Latin Academy as a Math Teacher.

Jesse Chandler
I'm going to be working at Susquehanna International Group in Philadelphia. They are a "leading institutional sales, research, and market making firm..." My title is Assistant Trader. For the summer (most of June) I am driving cross country from Indianapolis to California and back to New Jersey where I live. For July and August I'll be home chillin' out on the beach and playing poker in Atlantic City.

Jeff Gilbert
I got a job in Lexington Mass. with OASIS, an ocean acoustics consulting firm founded by MIT alumni. I start this summer, and I'm really looking forward to it.

Olivia Leitermann
I'm entering a Course 6 PhD program here to study power electronics and systems.

Maggie Loftus
I'm working for MIT this summer and next year. I'm working with Sea Grant on education outreach programs like building Sea Perches, and aquaculture, and growing eelgrass. I'm taking over for Brandy Wilbur while she is on maternity leave.

Cosimo Malesci
I am part of the 5 years program to get a combined BS and MS in the Dept. of Ocean Eng. (or ME whatever you want). I am currently working on my thesis which is about 2D methods to analyze the sea keeping of multihull vessels. The goal is to develop a new interactive set of programs for seakeeping analysis. These toolbox of programs will allows the naval architect to include seakeeping analysis much earlier in the design spiral improving the overall design process. I plan to graduate in December 2005. This summer I will be working as an intern at Soto Acebal Arquitectura Naval in Buenos Aires, Argentina, designing a new hi-tech 130' sailing yacht. In addition, I will keep working on my thesis.

Goodbye to Stephen Malley!

Stephen Malley will be leaving his position as Student Coordinator of the OE Department to work in EECS. He started working in the OE Department in February of 2004, and throughout his time here he guided students through the ME merger process, helped many figure out their academic and career paths, and generally kept us out of trouble. Besides spending over 10 years of his life working in various departments at MIT,

Stephen has traveled all over the world—whether it was serving in Vietnam, to visiting Thailand, Japan, Hawaii, and Europe. He also has had a variety of interesting jobs that didn't involve stressed out college students:

"In the early 80's, I went to work in the gas drilling boom towns of the Texas and Oklahoma panhandles. I traveled to wells to sell chemical to prevent corrosion in drill pipe and monitor the levels of chemical protection in the drilling rigs. Some of those wells drilled as deep as 36.000 feet. That's six miles of drill-pipe. They were drilling into a place called the Anadarko Basin, covering most of Western Oklahoma and North Texas. The theory was that the Basin is actually an ancient seabed which is now buried at about 15,000 feet and it solidified like cement. Theoretically it should trap gas rising from deep in the earth. I guess they were right almost every well hit gas. One well went over 36,000 feet and hit molten sulfur."

He says that his favorite parts about working in the department were the students and staff. "I found the students very cooperative and responsive when I asked for help. There was always someone willing to volunteer to give a tour to a visiting student or sit in a booth and talk to prospective OE students. The staff stopped by regularly to help or talk or just be available. I enjoyed being able to absorb so much about the work you guys do to understand the ocean and its resources. I'm proud to have been a small part of a department that was over 100 years old."

Good luck to Stephen in his new department, and he will be missed!

So, you want to be the coolest kid at the OE socials?

These treasure chests of knowledge will make you the most interesting person there!!!

The weather last spring was miserable for many a suffering student, but the *Alexandrium fundyense* loved it. These guys, a.k.a. red tide alga, thrived from being brought into shore from the storms, and received abundant sunshine and food, causing the red tide bloom over the past summer to be the largest in New England since 1972, costing the shellfish industry about $3 million dollars per week. (PBS)

Scallywags! There is further evidence that the remains of a 350-ton ship wreckage off the coast in Beaufort Inlet, N.C. are indeed that of *Queen Anne's Revenge* (a.k.a. Blackbeard's pirate ship). So far, 24 cannon have been recovered. (National Geographic)

Legend has it that back when he was the Postmaster General, good old Ben Franklin recognized that ships sailing from England to the colonies would take longer to make the journey than those traveling in the opposite direction. This wasn't to imply sailor's avoidance of stepping onto British soil, but rather a keen observation of the nature of the Gulf Stream.

The R/V FLIP (Floating Instrument Platform" is a "355-foot spoon-shaped buoy", which flips from a horizontal to vertical position, flooding its ballast tanks with 700 tons of seawater. (ONR)

The shortfin mako is believed to be the fastest shark, swimming at speeds up to 20 miles per hour. (National Geographic)

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Location

Current (Before Renovation): 1-106
Late Summer (Before Renovation): 3-309 (Pappalardo)
Fall (After Renovation): 1-112

Alumnus Spotlight in His Own Words: Paul Weber

As reported to Bridget Downey ('06)

Paul Weber, pictured onboard the CARNIVAL VALOR, the newest Carnival 'Fun' Ship.

What originally attracted you to MIT?

My undergraduate studies were in Naval Architecture and Marine Engineering, and I was fortunate enough to have a number of internships across the breadth of the marine industry. The internship I enjoyed the most was working for an International Shipping Company. I quickly realized if I ever wanted to broaden my career opportunities outside the company's technical department, I needed additional education. Against that background, I thought the 13B degree program was the perfect next step.

When did you graduate?

I graduated in 1993.

Describe your current career and position?

Currently, my position is Vice President of Technical Sourcing for Carnival Corporation and plc. Carnival has a portfolio of 12 distinct brands comprised of the leading cruise operators in both North America, Europe, and Australia including Carnival Cruise Lines, Holland America Line, Princess Cruises, Seabourn Cruise Line, Windstar Cruises, AIDA, Costa Cruises, Cunard Line, P&O Cruises, Ocean Village, Swan Hellenic, and P&O Australia. At the conclusion of this current newbuilding program in 2006, these brands will operate 86 ships. My role is to lead the Corporate Technical Sourcing efforts working with all the Procurement and Operations staff in all brands.

Prior to my current position, I was with the Stolt-Nielsen Transportation Group for nearly 10 years in a number of technical and commercial roles. Prior to my departure, I was the Procurement Manager for the 100+ ship management group.

What did you enjoy about OE at MIT?

Its hard to separate one thing from the MIT experience—living in Boston, the friendships, the joking, Talbot House OE ski trips—but the one thing that stands out is the closeness with the faculty and their openness. They enjoyed the teaching as much as we enjoyed being the students.

How did OE at MIT help prepare you for work in the real-world?

There has not been one day of work since my graduation when I haven't been able to link something I am currently doing to the unique mix of courses and research required for the 13B degree program. I believe the graduates of this program are uniquely positioned for positions within the International Shipping Community.

Is there anything else you would like to mention?

I always got a kick out of reading the inscription under the dome in Building 7 "Established for the Advancement and Development of Science, its application to Industry, the Arts, Agriculture, and Commerce." The 13B degree program provided the ideal combination of Ocean Engineering, Transportation, and Business studies emphasizing the Industry and Commerce aspect of the statement.

It is a mistake and a disservice to the students for MIT to stop offering the 13B degree. I feel that it is important for MIT to find a way to provide the opportunity for students to take the 13B subjects as part of another degree program if the 13B program cannot be maintained.

Paul lives outside of Fort Lauderdale, Florida with his wife, Kim, and two children, Caroline (4) and Paul-Christian (2). His email address is pweber@alum.mit.edu.

Student Spotlight: Ryan Eustice

Ryan, his wife Karen, and son Noah

Ryan Eustice just graduated from the MIT/WHOI Joint Program in Ocean Engineering in June where he received his PhD degree while working with advisors John Leonard (MIT) and Hanumant Singh (WHOI). Ryan is a member of the Deep Submergence Lab at WHOI where he and fellow classmates Chris Roman and Oscar Pizarro (both OE PhD graduates), along with WHOI advisor Hanu Singh, developed the SeaBED AUV --- a 2000 m rated terrain-following hover-capable AUV designed for imaging research. When we caught up with Ryan this July, he had just gotten back from a successful 2-week SeaBED AUV cruise in Greece where they were doing deep-water archaeological surveys.

So what were you guys doing in Greece?

We used our AUV, SeaBED, to do fine-scale acoustical and optical mapping of ancient shipwrecks of archaeological interest. The idea behind using vehicles like SeaBED for this type of work is that they provide access beyond diver depths and can map with superior quantitative accuracy and precision in only a matter of hours. For example, a single 2-hour SeaBED dive can alone produce over 3000 high-resolution, high dynamic-range images completely covering a wreck site. This data can be used to produce high-quality photomosaics and/or quantitative 3D texture-mapped models complementing standard acoustic microbathymetry maps.

How did you get interested in AUVs?

Well, my original intent for grad-school was to pursue a PhD in aerospace. In fact, all of the other graduate programs I applied to, besides MIT, were for aerospace. When doing my web research on graduate school programs, though, I somehow stumbled across a link to a webpage about MIT's AUV program. Needless to say I was immediately hooked on the exciting application domain and cutting-edge technology. So in a nutshell that's what lead me to MIT and I'm glad I did.

What was your dissertation research on?

As you may know, GPS doesn't work underwater due to the attenuation of electromagnetic waves in water, therefore precision navigation is still a hard problem for underwater vehicles. While standard methods exist such as long-baseline (LBL) acoustic navigation (a sort of "underwater GPS") or bottom-track Doppler Velocity Logs (DVLs) (i.e., a dead-reckoned approach that integrates measured vehicle velocity), neither of these methods is completely ideal. LBL requires the tedious deployment of infrastructure, while DVL navigation error, though infrastructure free, monotonically drifts with time. Hence, exploratory surveys by AUVs are currently limited by a lack of easily obtainable precision navigation.

To overcome current navigation limitations, my dissertation research focused on a novel large-area visually-augmented navigation framework that fuses motion cues from overlapping seafloor imagery with onboard sensor navigation data. As underwater vehicles routinely collect imagery of the seafloor for science, from an engineering perspective we can also use this same data to help the vehicle navigate. Essentially, the concept involves getting the vehicle to "recognize" places that it has previously been, much like you or I do when walking around campus. Each time the vehicle revisits a portion of the seafloor that has been previously mapped, the idea is to register the currently viewed imagery with previously stored images to obtain a zero-drift vehicle position fix. As an example of its applicability, demonstrated results include the fully autonomous processing of the largest visually navigated underwater dataset to date using data from a ROV survey of the wreck of the RMS Titanic (vehicle path length over 3.1 km, and mapped area exceeding 3100 m^2). Other immediate applications for this technology besides near-seafloor AUV navigation include autonomous ship-hull inspection for homeland security, navigation for planetary exploration, and large-area structure-from-motion.

What are your plans for life after graduation?

I'm moving to Baltimore this August to do a 12-month post-doc working with Louis Whitcomb in his marine robotics lab at the Johns Hopkins University. I'll be working on an NSF sponsored project to develop multi-vehicle navigation algorithms for teams of heterogeneous AUVs. The application focus of this project is to enable large-scale exploration for hydrothermal plumes. After that, I'll be packing up
my stuff and moving to the University of Michigan, Ann Arbor, where I'll begin a faculty position with their Naval Architecture and Marine Engineering department starting September 2006. My research pursuits include building a strong marine robotics lab of my own, so as a shameless recruiting plug if you have any interest in pursing a PhD degree that involves AUVs, computer vision, navigation, multiple vehicles, robotics, etc, then please contact me as I've got my eyes-peeled for good students. ;-)

Ryan, Chris Roman, and Neil McPhee with the SeaBED AUV in the foreground... (note the life aquatic red hats :)

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Looking Ahead...

Date	What's going on?
Aug 3-7	AUV Comp. (SPAWAR, S.D. CA)
Aug 20	MIT/WHOI Grad Picnic
Aug 23-27	DOE
Sept 7	First Day of Classes
Sept 19-23	MTS/IEEE Oceans (Wash.,D.C.)
Oct 19-21	SMTC&E

Highlights in the next Making Waves...

- OE Class of 2008
- Beginning of the 2005-2006 School Year
- And as always… spotlights on Ocean Engineering professors, students, and alums!

Look for the next Making Waves in Fall!

Ocean ENGINEERING