



The Anchor

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Pushing Coastal Surveying into Shallow Waters

By David Sims

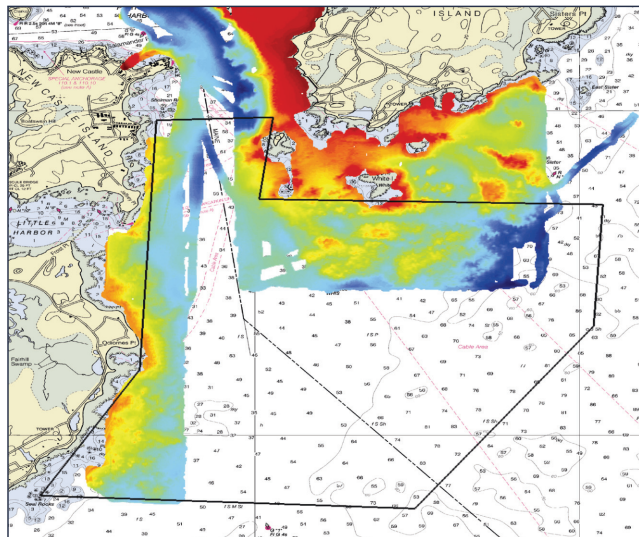
Say "Jet Ski" to aficionados and it will conjure up images of fun in the sun and surf, of throttling up and pounding through waves in a torrent of spray and the wail of a two-stroke.

To **Tom Lippmann**, however, the personal watercraft brings thoughts of wave physics and nearshore bedform evolution, of inertial navigation and acoustic sonar systems, for he uses a uniquely adapted version of the Jet Ski to do research, not recreate.

The coastal region can present unique challenges for bathymetric mapping due to shallow water, rapidly flowing water and shifting sands, breaking waves, and submerged hazards. It turns out that one means of overcoming such challenges is the Jet Ski-turned-research vessel. CCOM/JHC, with Lippmann leading the way, is in the forefront of developing the specific tools and techniques needed to collect nearshore data and apply it to critical coastal-process questions of relevance to NOAA.

Using a modified Yamaha WaveRunner, Lippmann developed the Coastal Bathymetry Survey System, or CBASS, while at the Scripps Institution of Oceanography in 1999. Since arriving at CCOM in 2008, Lippmann's CBASS has increasingly benefited from the Center's expertise in various instrumentation, including multibeam echo sounding and GPS-aided inertial navigation systems. By adapting such systems to the WaveRunner, investigators will eventually be able to accurately examine very small-scale bedform evolution, bottom roughness, and shallow-water seafloor characterization simultaneously for the first time.

The high maneuverability of the WaveRunner makes very shallow water bathymetric surveys possible with acoustic altimeters, particularly in regions where airborne remote sensing systems fail due to water clarity issues or where repeated high-resolution surveys are required because of the rapidly shifting, eroding seafloor. But there are challenges to overcome as CBASS is bolstered with new technologies to increase the effectiveness and reach of its surveying capabilities.



The region of coastal New Hampshire where CBASS has surveyed.

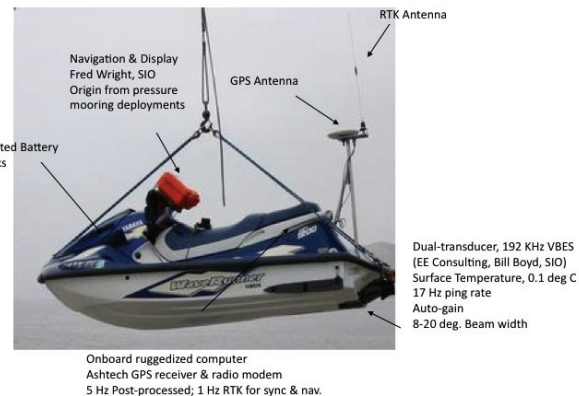
figure out how to baffle the multibeam from the noise. And if the signal from the multibeam returns a clear picture of the seafloor, Lippmann will still need to grapple with properly orienting the now 480 beams (instead of one) to provide a clear image, and thus maps, of the shallow-water seafloor.

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Lippmann, along with hourly employee **Jonathan Hunt**, is currently upgrading CBASS from its single beam sonar to a custom-mounted multibeam and will run tests this winter to determine if the close quarters between the WaveRunner's two-stroke engine and the sonar creates a noise-to-signal problem.

"Will the engine cause acoustic or electronic interference? We don't know, and the only way to determine that is to mount it in the boat, turn everything on, and see what the signal looks like," says Lippmann.

If there is too much interference, Lippmann and Hunt will have to



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Pushing Coastal Surveying into Shallow Waters (cont.)

"We'll have to know the precise direction those beams are heading in order to measure the orientation angle with enough precision and reproduce the fine-scale features we'll be looking for through multiple passes with CBASS," Lippmann explains.

This type of orientation is usually achieved using \$100,000 attitude sensors but, for now, Lippmann will use two combined "rapid response" devices totaling a mere \$1,750 "to see whether or not we can synchronize our systems to reproduce the bottom after making different passes."

Getting the orientation of the beams accurately, Lippmann adds, "is very critical for us because we'll be using the multibeam in very rough water where the dynamics of the vessel would be higher than what is normally encountered on ships."

Additionally, Lippmann plans to put an Acoustic Doppler Current Profiler, or ADCP, onboard the WaveRunner to measure ocean currents in conjunction with the fine-scale depth measurements provided by the multibeam.

Says Lippmann, "The change in the bottom is closely related to the hydrodynamics, like the mean currents that occur in estuaries and shallow coastal waters. An ADCP is essentially another acoustic device that sends out four beams and measures the current in three dimensions in a number of different locations, and this will allow us to measure the velocity of the water in a profile down to the bottom."

He notes that, in time, a few fixed ADCPs will be put in underwater locations and these, in combination with the multibeam and the ADCP on the WaveRunner, will provide a synoptic picture over a relatively large region of complicated flow and bathymetry.

He adds, "All of this will be my main emphasis over the next year, and I'll also be working with CCOM and NOAA further exploring what their needs are in the area of shallow water bathymetry. If we can use these small and relatively inexpensive devices on small boats like the CBASS, this could eventually be of high value to them." ⚓

New Visiting Scholar



Giuseppe Masetti, a visiting scholar from Italy, will arrive at CCOM in January and will be with us through June.

Giuseppe graduated with honors with a B.S. in Political Sciences (2003) from the University of Pisa (Italy) and with a B.S. in International Sciences (2004) from the University of Trieste (Italy). He has served with the Italian Navy since 1999 and, after completing an M.S. in Marine Geomatics (2008) jointly organized by the Italian Hydrographic Office and the University of Genoa, he worked for two years as Operation Manager of the Italian Navy's Hydrographic Ship *Aretusa*. He was engaged in several acoustic mapping projects and he received the FIG/IHO Category A certificate in 2010.

Since 2010, he has been pursuing a Ph.D. course in Systems Monitoring and Environmental Risks Management at the University of Genoa. His Ph.D. thesis deals

the georeferencing and the environmental risk monitoring of shipwrecks in Italian and Mediterranean seas. As a visiting scholar at CCOM, his research will center on the remote characterization of seafloor adjacent to shipwrecks, using mosaicing and analysis of backscatter angular responses.

Giuseppe has been to the United States twice before; both times with the Italian sailing vessel *Amerigo Vespucci*. The first time, during the Tall Ships 2000 trip, he was a cadet and visited the cities of Philadelphia, New York, Newport, RI and Boston. The second time, in 2002, he visited San Diego and Honolulu.

As part of his work, Giuseppe has also traveled to Canada, Japan, China, Vietnam, Thailand, Singapore, Tahiti, Egypt, Morocco, France, Spain, and Portugal, but his favorite country will always be Italy.

In his spare time, he enjoys reading, netsurfing and tropical freshwater fishkeeping. We will be officially welcoming Giuseppe to CCOM on January 28th, as part of a post-seminar welcome reception for new staff, students and visitors. ⚓



In an effort to get to know some of our newer staff members, we asked Jonathan Beaudoin and Christopher Parrish a few questions. Jonathan is a Research Scientist and Chris is an Affiliate Professor in addition to his current position as Lead Physical Scientist in the Remote Sensing Division of NOAA's National Geodetic Survey.

Jonathan Beaudoin

What are your main research interests?

I'm working at improving the understanding of how refraction of sound in the water column affects echosounding accuracy. Though we have methods to correct for raybending effects due to refraction, there's still a big gap between oceanographic knowledge and hydrographic practicalities. Ideas that might seem second nature to acoustical oceanographers are still a long way from being practical knowledge to the hydrographic community and I aim to help fix that.

Tell us a little about your family...

My wife and I are high school sweethearts, we met on the school bus on the first day of class in 1992. We were married ten years later and now have a wonderful 4 year old daughter, Amy (she'll be 5 in February). My wife has two cats whose existence I tolerate. Barely.

Where did you grow up?

I'm from a military family so it's a short question with a long answer:

- Kingston, Ontario (2 years): learned to walk
- Stuttgart, Germany (3 years): learned to share and speak German at a German kindergarten
- Petawawa, Ontario (6 years): learned to read/write, chased frogs, built forts in the woods
- Edmonton, Alberta (3 years): junior high, paper route and being pimply
- Petawawa, Ontario (4 years): high school, attempted rock star fame despite my nerdiness
- Calgary, Alberta (2 years): struck out on my own, worked for 2 years before university

What did you want to be when you grew up?

"Plan A" was to be a marine biologist, but then I developed a healthy fear of sharks after watching Jaws. It's hard to tell that what I'm currently doing is "Plan B." If this marine geomatics stuff ever falls through, then "Plan C" is to be a lounge singer in Vegas.

Favorite vacation spot?

The family cottage on the Miramichi River in Loggieville, New Brunswick. Failing that, anywhere in a canoe.

Place you've never visited but that you'd like to see someday?

The North Pole. But not via canoe.

Favorite dessert?

That's easy: Pumpkin pie.

Is it okay to call you "Jonny B"?

Yes, it's been a nickname for as long as I can remember. ⚓

Christopher Parrish

What are your main research interests?

My research interests are varied, but almost all my work falls within the broad field of remote sensing. Sensors that I've worked with to date include airborne and spaceborne multi- and hyperspectral imagers, high-resolution digital aerial cameras, and light detection and ranging (lidar) systems. Recently, much of my work has involved developing and comparing new lidar waveform processing strategies for generating dense, detailed point clouds in which vertical structure of vegetation and human-made features is well characterized. Applications of this work include coastal wetlands vegetation mapping, as well as extraction of shallow bathymetry from bathymetric lidar waveforms.

I'm also working with colleagues from both NOAA and CCOM-JHC on a collaborative, multi-phased research project analyzing shoreline positional uncertainty. To date, this work has focused primarily on uncertainty of shoreline derived from one specific type of lidar sensor, but we are currently extending the work to cover other sensors and processing workflows. Shoreline change, geometric and radiometric sensor/data calibration, and sensor fusion for coastal mapping applications are other areas of my research.

Tell us about your family...

My wife, Deb, and I have a five-year-old daughter, Katie, who started kindergarten this year and a twelve-year-old yellow lab, Sadie. We enjoy outdoor activities, reading, movies, and theater. Sadie particularly likes any activity involving food.

Where did you grow up?

Primarily on the west coast, although I've lived in a lot of different places.

What did you want to be when you grew up?

An astronaut. This was a pretty serious ambition when I was a kid. I remember drinking Tang and eating freeze dried food packets to train for my intended vocation.

Favorite vacation spot?

I'm writing this while in Vienna. This is a work-related trip, but Vienna is a great place to vacation, as well—especially at this time of year, with all the lights and fresh snow on the ground.

Place you've never visited but that you'd like to see someday?

I've been to 49 of the 50 states. The only one I haven't been to, Hawaii, is one of the top places I'd like to visit.

Favorite dessert?

This is a tough one, as I haven't met too many desserts I don't like. Turtle cheesecake, creme brulee, and Ben & Jerry's Cool Britannia (sadly, no longer available) are a few favorites. ⚓

Middle School Comes to CCOM

In early December, 7th and 8th graders from the Oyster River Middle School toured CCOM as part of their underwater research unit. Stephanie Ward's 7th grade students, and Michele Martin's 8th grade students began their visit in the video classroom, where they watched a video about CCOM/JHC by **Briana Sullivan**. Next, **Andy McLeod** gave a tour of the High Bay, focusing on the buoy programs, the Phoenix ROV, the CBASS jet ski, and the engineering and wave tanks. The tour ended with **Will Fessenden** in the Presentation room, and an overview of the telepresence console.



Andy McLeod perches on a buoy while explaining to the students how buoys are used in the work of CCOM researchers.

The unit was an extension of the work that Stephanie and Michele did with the Nautilus Live program last summer; Dr. Robert Ballard and his team mapped the Black Sea and the Aegean Sea while Stephanie and Michele worked as Educators Ashore, taking part in the distant expedition from the comfort of the CCOM Presentation room.



Will Fessenden demonstrates the telepresence console to the students—the same one their teachers used last summer as part of the Educators Ashore program.

Back in the classroom, the middle school students explored the Nautilus Live website and read blogs written by scientists and educators on the ship. They also built model AUVs out of empty water bottles, and added mass to see if they could make them neutrally buoyant. They tested their models and gathered data about the height of the model in a water column, using large fish tanks. They followed up by writing formal lab reports about their findings. Students completed a follow up activity in which they designed a bumper sticker, poem, or song that incorporated information they learned on the trip to CCOM. ⚓



Seventh graders hoist themselves up on the edge of the wave tank to get a better view.

New Awards at CCOM

The following grants have recently been awarded:

Lee Alexander - U.S. Army Corps of Engineers, "Inland Electronic Charting Initiative"

Lee Alexander - U.S. Coast Guard, "Development of AIS Application-Specific Messages"

Yuri Rzhanov - U.S. Geological Survey, "Seafloor Video Mosaic Research"

Yuri Rzhanov - NOAA, "SteroFish"

Colin Ware - NSF, "HCC: Small: Interactive Causal Networks"

Tom Weber - ONR, "Modeling Statistics of Fish"

Monica Wolfson - Exxon Mobil, "Fault Thermal Structure and Stress Transfer Modeling to Assess Seismic Hazard along Segmented Oceanic Transform Faults"

Congratulations to all! ⚓

Sustainability in Chase



Maureen Claussen is our new UNH CCOM Sustainability Steward. In this voluntary position, Maureen's responsibilities will include attending monthly steward meetings where speakers will share best practices and up-to-the-minute data regarding campus sustainability issues. Maureen will keep us informed about UNH policies related to sustainability, including policies regarding energy and water use, recycling, purchasing, and transportation.

Look for email announcements and flyers posted around CCOM that will give tips on how to save resources and promote sustainability at CCOM.

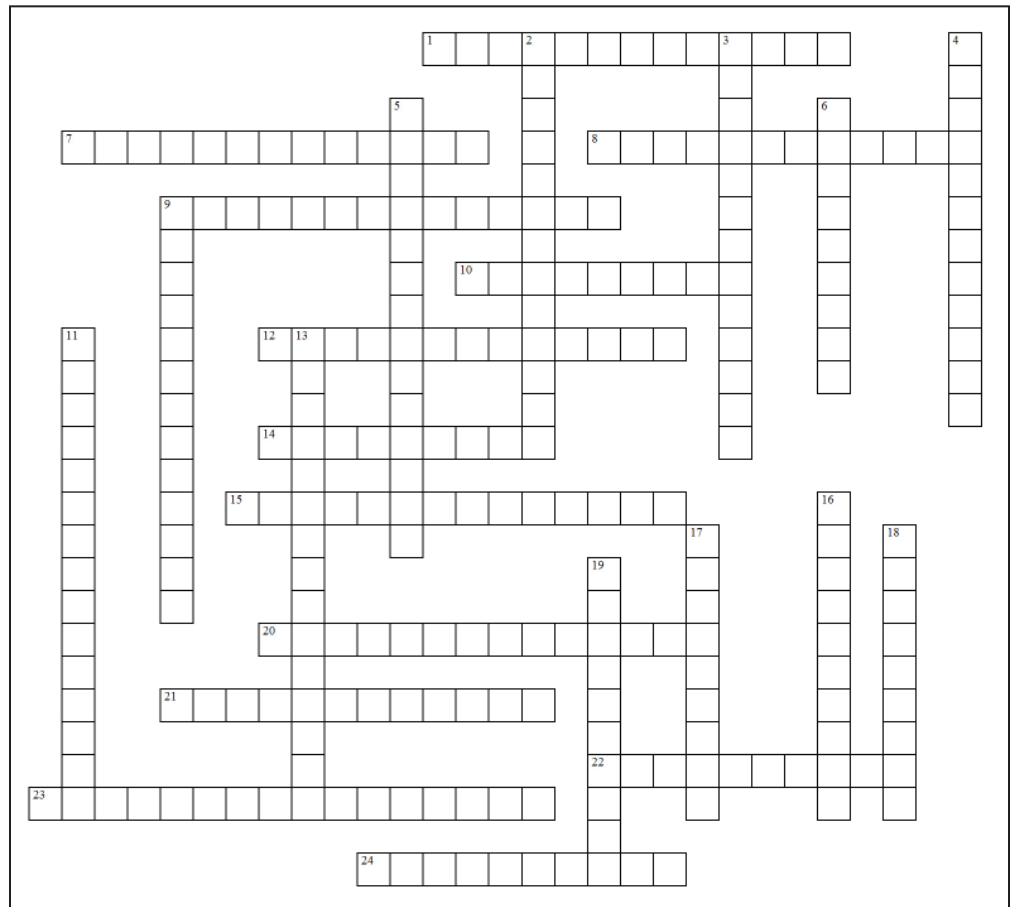
For more information go <http://www.sustainableunh.unh.edu>. ⚓

For more information to go <http://www.sustainableunh.unh.edu>. ⚓

CCOM/JHC Student Crossword Puzzle

Test yourself to see how well you know our students. Each answer to the puzzle is one of the names listed below.

- Nastia Abramova
- Jorge Alavera
- Chukwumi Azuiki
- Tami Beduhn
- Sean Denney
- Olumide Fadahunsi
- Christy Fandel
- Rohini Grandhi
- Nikki Kuenzel
- Amaresh Kumari
- Carlo Lanzoni
- Lindsay McKenna
- Dandan Miao
- Garrett Mitchell
- Ken Nilrat
- Brian O'Donnell
- Chot Osiri
- Jett Pason
- Roshan Ranaweera
- Hadar Sade
- Hiro Saito
- Maddie Schroth
- Munna Uddin
- Rohit Venugopal
- Monica Wolfson



ACROSS

- 1 One of his hobbies is breaking toys apart to see what they're made of
- 7 She has a Golden Retriever named Jake
- 8 Her first concert was the Backstreet Boys (at the age of 10)
- 9 This student recently became a father (hint—it's not Munna)
- 10 This GEBCO student is addicted to the 'net
- 12 This student was nicknamed "Fred" by a certain CCOM faculty member who shares his first name
- 14 He is married to a lawyer—they have a very long distance relationship for the next few years
- 15 As an undergrad, she presented a poster outlining the shoreline changes of Little Mussachuck Creek
- 20 Her favorite month is March—because she loves spring (and the end of a long winter—both in NH and in her home country), and because it's her birthday month
- 21 This student's son is looking forward to the first NH snowfall
- 22 This student rocks a pair of yellow sneakers
- 23 This student is from the 8th most populous country in the world; it's also the country with the 3rd fastest growing economy in the world
- 24 He attended Aina Haina Elementary School in Honolulu

DOWN

- 2 Her hobbies include "talking a lot," and her favorite dessert is black forest cake with ice cream
- 3 This student likes "horsing" around
- 4 This student is completing a 2nd Master's degree at UNH
- 5 He likes Metallica, and (sometimes barefooted) mountain climbing
- 6 His favorite place to play golf is back home at the Plutaluang Navy Golf Course
- 9 She grew up in Rochester, NY and had a cat named Lisa
- 11 He likes the Grateful Dead, and salt water aquariums
- 13 This GEBCO student requires very little sleep and keeps late hours
- 16 This GEBCO student can often be found singing
- 17 This GEBCO student loves new technology
- 18 This student has been dubbed "the GEBCO photographer"
- 19 This student's hobbies include fencing

The answers will be posted in the 2nd floor kitchen.

New CCOM Post-Doc, Tom Butkiewicz

Tom Butkiewicz will start his new position as post doctoral fellow at CCOM in January. Tom will be working as part of Colin Ware's Data Visualization Lab group. Tom was awarded a Ph.D. in Computer Science from the University of North Carolina at Charlotte in 2010.

New students

CCOM will have three new students in January:

- **Kevin Jerram**, Ocean Engineering MS
- **Abu Mustapha**, Earth Sciences MS. Abu was also a GEBCO student in 2004-2005.
- **David Pilar**, Computer Science Ph.D.

Kudos

Colin Ware received the UNH Excellence in Research Award. The award is one of the UNH Faculty Excellence Awards, given each year to a small number of outstanding faculty recognized for their achievements in teaching, scholarship and service. Read more about Colin and his work at <http://www.unh.edu/faculty-excellence/2010/uwide.cfm?image=ware>.

Linda Prescott and **Brittany Edgar** recently completed the two-day UNH Social Justice Educator training course. The Social Justice Educator Training (SJE) is a professional development opportunity for UNH faculty, staff and graduate students to further diversity awareness.

Sam Greenaway successfully defended his Master's thesis "Linearity Tests of a Multibeam Echosounder" on Sept. 1st and **Dan Pineo** successfully defended his dissertation "The Application of Computational Modeling of Perception to Data Visualization" on December 13th. Congratulations to them both!

Lloyd Huff Retires

On Thursday, December 16th, CCOM staffers gathered in the break room to say goodbye to **Lloyd Huff**. Lloyd has been at CCOM since its inception in 1999, and was instrumental in the creation of the Center. We wish him well in his future endeavors!

CCOM Holiday Party

The annual CCOM holiday party was held on Friday, Dec. 17th at the Portsmouth Gas Light Restaurant. Nearly 80 attendees, including faculty, staff, students and their families, enjoyed pizza, appetizers and the now traditional CCOM Yankee Swap. A special thank you goes out to **Tessa Lippmann** for her help with the Yankee Swap organization and cake-cutting.



See more pictures from the party on our Flickr site, http://www.flickr.com/photos/ccom_jhc/.

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Images are provided by the Center, unless noted otherwise. This issue's banner graphic is bathymetry of the Kingman-Palmyra Line Islands Ridge Channel Systems, courtesy of Dr. Jim Gardner and the 2010 Law of the Sea Cruise.

We welcome comments and suggestions.