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Electric potential

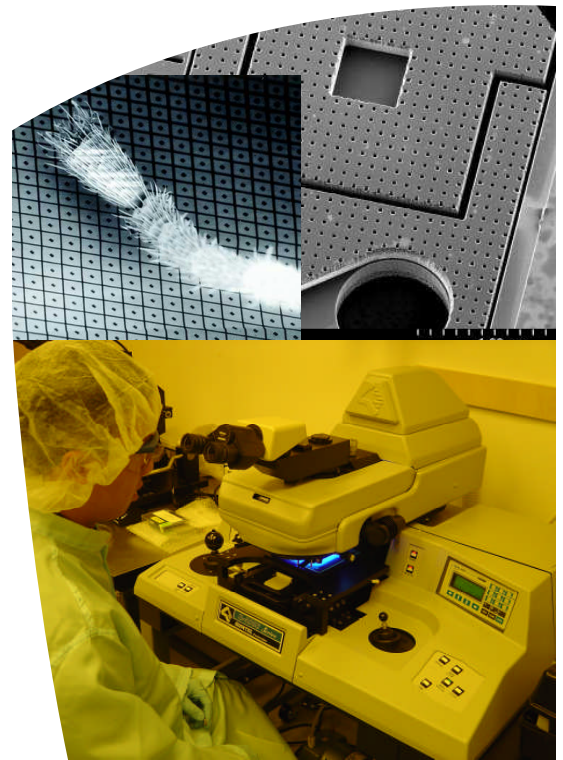
NEWS YOU CAN USE ABOUT THE ELECTRICAL AND COMPUTER ENGINEERING MAJORS AT THE US NAVAL ACADEMY.

Micro-Electro-Mechanical Systems (MEMS) is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through microfabrication technology.

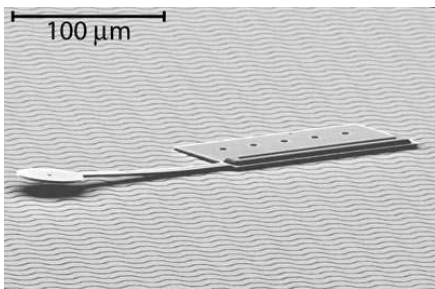
Electrical Engineering Opens MicroFab Lab

Micro-Electro-Mechanical Systems Wow. What a mouthful – for a mite that is. MEMs technology is quickly finding its way into every day devices from televisions to automobiles to biomedical applications. MEMS-based sensors are a crucial component in automotive electronics, medical equipment, smart portable electronics such as cell phones, PDAs and hard disk drives, computer peripherals and other wireless devices. MEMs sensors in the automotive industry are used for crash detection in airbag systems. The Digital Light

Processor (DLP) used in many HDTVs today are another application of MEMs technology. DLPs contain a rectangular array of up to 2 million hinge-mounted microscopic mirrors; each of these micromirrors measures less than one-fifth the width of a human hair. Every major market has now embraced the technology. Here at USNA, in our new microfabrication laboratory, we now have the ability to make MEMs. Students have the opportunity, available at few other schools for undergraduates, to design and manufacture MEMs.



MIDN 1/C Dan Ku exposes a silicon chip to ultraviolet light as part of the manufacturing process. Silicon chips are built layer by layer, using light and chemistry.



LITTLE LEAGUE SOCCER?

“Little League” takes on a whole new meaning for some of our seniors. This year midshipmen will be participating in the new nanogram league of RoboCup, an international robotics competition. Using the new microfabrication laboratory in Rickover hall, these students are building tiny robots – the width of a human hair in size – that will push around a little puck on a millimeter-sized playing field. Soccer hooligans will have to cheer them on through the microscope.

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Solar Powered Boat Attempting to Set Record at 20+ Knots

SOLAR SPLASH is the World Championship of Solar/Electric boating. It is an international intercollegiate competition.

The U.S. Naval Academy's solar powered racing boat "Das Goat" is being retooled and rewired in an attempt to break the 20 knot barrier. We talked to LT Pete Stevenson, a veteran in the world of solar boat racing to find out what the real story is behind the Solar Splash competition. USNA fields a boat every year built and raced by Midshipmen.

If you've ever been moving at 20 knots over the water, you know it's fast.

LT PETE STEVENSON

Q: Pete, what is the big deal with 20 knots?

A: 20 knots is fast. If you've ever been moving at 20 knots over the water, you know it's fast. These boats are designed to hit that speed off the line. They need a lot of acceleration. To get there, we need to be planing.

Q: What is planing?

A: This is the same thing you see on a hydrofoil. Those guys get up to 60 plus knots. The boats you see on Miami Vice – they're planing too. Surfboards: yet another planing watercraft.

Q: What are you doing different this year?

A: Last year we did extremely well in the endurance portion of the competition. We lost most of our points in the sprint. Therefore we are focused on making our boat faster. This means getting more current from the batteries. Last year we drew about 200

amps, but we should be able to get 300-400 amps. That would make a huge difference. We are also investigating hydrofoils that would provide some of the lift required to plane.

Q: How are you going to get that juice, er, I mean current?

A: Well, part of this is about good electrical design. We have a couple of firsties who know about these kinds of things. They are looking at batteries and circuit design. For example, they are going to be minimizing a thing called Thevenin equivalent resistance. Think of that as being the battery's resistance to delivering maximum current. But on our boat, we don't have just one battery. We have a bank of batteries. They've got to put it all together as a system.

Q: What other electrical systems do you have on this boat?

A: We have the solar panels of course. That right there is a pretty significant piece of technology.

Between the panels and the rest of the system comes a thing we call a buck down converter. The buck down converter is analogous to the transmission in your car. Most simply, it's like the gears on your ten speed bicycle.

We also have electrical motors that draw the power. These motors have to be carefully selected to be efficient at the required power level. It is important to match the motor to the load which is controlled by the RPM's and the size of the propeller.

Q: You say the "Buck Converter" is like the gearing on my bicycle?

A: Right, it's just like that except it's electrical.

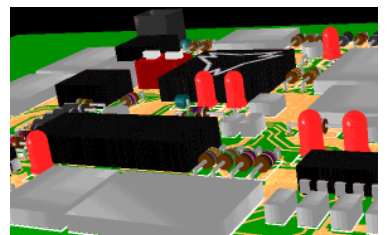
Q: You say electrical as if you are Dr. Evil and talking about laser equipped man eating piranhas...

A: Yes, I know. I confess, I enjoy this stuff.

USNA Students Attend 2006 Biometrics Consortium

Biometrics are automated methods of recognizing a person based on a physiological or behavioral characteristic. Among the features measured are face, fingerprints, hand geometry, handwriting, iris, retinal, vein, and voice.

The U.S. Naval Academy's Biometric Signal Processing Lab will try to recognize your face on the way to the library, but the 1/C and 2/C Midshipmen pictured on the left might be working on how to do that and more. They attended the recent Biometrics Consortium Conference to learn more about the latest in Biometric technology. Biometrics may someday replace other forms of identification, just like in the movie *Minority Report*, making identity theft a thing of the past.



Senior Design Projects Tackle IED Threat

Several EE Senior Design Projects are focusing on the Improvised Explosive Device (IED) threat this year. Two Red Cell (create an IED) and two Blue Cell (Defeat an IED) teams have been working on ways to predict and defeat this horrific real world threat facing our troops in Iraq.