

THE NAKED SINGULARITY

Last Chance for Donuts Brings Record Number of Breakfasters

Well Really I don't know if anyone will show up. It would be kind of funny if no one did. More donuts for me in that case.

It's all winding down and wrapping up, but we all know that last week is the worst, right? In the next few weeks students brains and teachers red pens alike will be sucked dry and rendered useless for the foreseeable future. Survive it for sweet sweet freedom and a few weeks respite.

So are you going somewhere warm? How bout cold? How bout home? Breaks are nice every once in a while but so is daily life. Just know come January there will still be donuts every other week, a meeting in between, and a warm room in Robeson to study in. See you then!

OWEN HELPED!

WHY DIDN'T YOU? I LIKE PICTURES AND STORIES AND IDEAS ALIKE. CATCH ME NEXT TIME!



In this Slightly Less So but Still Special Issue

-IT'S OVER!!!

-You Hear About that Bacteria Stuff?

-Well not quite...

-Weather Time

-Donuts > Exams



VIRGINIA TECH'S FAMED DUCK POND plays host to a different breed of waterfowl come winter time. I don't know about you but the wind coming off that end of the Drillfield definitely feels arctic. Weather will be on page 2



WE TOTALLY WON! Well that game at least. 11 for 11 aint a bad way to finish a season. Think we'll make it 12 for 12! Monday, January 3rd, 2011 folks. It'll be on some big channel I'm sure so you have no excuse not to watch.



IF FOUND THIS PICTURE ON GOOGLE IMAGES. It's the first floor of Robeson. Now as long as you keep this stack of papers near you you can pretend you're there. Staring down pictures of long hallways is relaxing.

A Battery Made With Paper

by Robert F. Service

news.sciencenow.org

Paper has been getting beat by electronics for years. But it may be about to stage a comeback. Researchers are reporting that they've made batteries and other energy-storage devices by printing layers of carbon nanotube-based ink atop standard photocopy paper. The result is a highly conductive sheet that can carry a charge and be easily incorporated into a flexible battery. Because of paper's low cost, that could help lower the price of batteries used in electric vehicles, wind farms, and other renewable sources.

The idea of using paper to make a lightweight, flexible battery isn't new. Researchers led by Robert Linhardt, a chemist at Rensselaer Polytechnic Institute in Troy, New York, first explored the concept 2 years ago. They cast a thin film of cellulose--the same starting material used to make paper--and laid it over conductive carbon nanotubes. The hope was that the cellulose would serve as a sturdy structural material to hold the other components for making a battery, and it did. But the two layers remained independent and could split apart if flexed.

Yi Cui, a materials scientist at Stanford University in Palo Alto, California, had also been exploring using plastics and other types of thin layers as the structural supports for batteries and supercapacitors (which store energy as static charge, unlike batteries that undergo chemical reactions). But the plastic layers also didn't connect well with the conductive nanotubes placed on top. Conventional copy paper has a highly porous structure. So Cui and his colleagues wondered if

that could serve as a good support for their nanotubes.

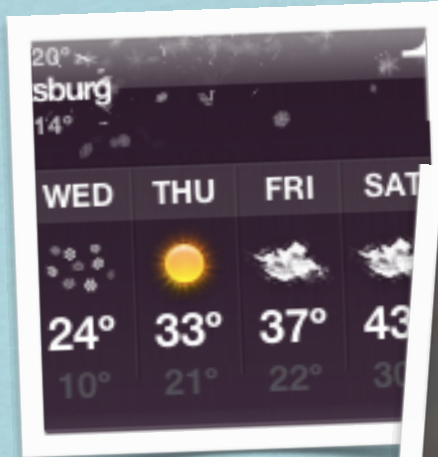
The researchers created an "ink" of carbon nanotubes suspended in water and an organic surfactant. They then heated the paper in an oven to drive off the water. The nanotubes bonded tightly to the paper fibers, creating a highly conductive sheet of paper that functions even when rolled up. The team then used these conductive sheets as components in both lithium-ion batteries and supercapacitors.

The paper batteries can store up to 7.5 Watt-hours per kilogram (Wh/kg), the team reported online this week in the Proceedings of the National Academy of Sciences. That's not quite up to the level of lead acid batteries, which store roughly 30 Wh/kg. But because the cost of nanotubes is coming down, and because paper is cheap and durable, it could open the door to cheaper batteries for large-scale energy storage.

"It's quite innovative and an important contribution," says

Linhardt. The fact that the nanotubes and paper fibers hold tight is critical, he adds, because it now enables engineers to make batteries in almost any shape. Paper's strength could also help battery makers reduce the thickness of the electrodes they use to make batteries, which in many cases are made thick to provide structural support for the batteries. And that reduced amount of electrode material could further reduce the battery's cost.

WEATHER AND STUFF



* It's almost over. That was a cold few days but good things cant last forever. Oh yeah... I love cold so don't diss it. I hear everybody whining but when else can you wear long underwear 24/7



This dude knows how to survive Blacksburg weather. Bet you his face is never cold. Throw on a stylish sweater and some kind of awesome hat and you're set

Random Numbers of Interest

Days till Christmas 15

Days till Hannukah 1/-6

Days till E&M final 4/5

People still reading 4

Need for filler YES

Issues under my belt 2

Doubt's Brew About Nasa's New Arsenic Life

by Lisa Grossman

Wiredscience

An arsenic-loving microbe found in a salty lake, which was touted last week as a potentially new form of life, is under heavy fire from the scientific community.

The microbe, a bacteria called GFAJ-1, can apparently use arsenic instead of phosphorous to build its DNA, a trick no other life form has ever managed.

A team of astrobiologists pulled the bacteria from Mono Lake in eastern California and starved it of phosphate, the molecule most organisms prefer for building their DNA backbones, while force-feeding it arsenate, the analogous form of arsenic.

The bacteria continued to grow despite the poisonous diet, prompting the researchers to assert that the microbes had successfully swapped arsenic for phosphorous. The team, led by NASA astrobiologist Felisa Wolfe-Simon, published their results in *Science* Dec. 2, accompanied by a very excited NASA press conference.

But other biologists started raising red flags almost immediately, questioning the methods the team used to purify the DNA and asking why the researchers skipped certain tests.

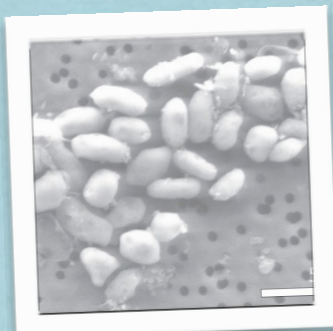
"It seems much more likely that the arsenic they're seeing is contaminating arsenic that's going along for the ride," biologist Rosie Redfield of the University of British Columbia told *Wired.com*.

Redfield posted a biting critique Dec. 4 on her research blog. As of today, the post has received more than 40,000 hits.

She points out that the team didn't properly clean their DNA before or after running it through a standard device for separating DNA and RNA from other molecules, a technique called gel electrophoresis.

Cleaning the samples would require "a little kit that costs \$2 and takes 10 minutes, and then you have pure DNA that you can analyze," Redfield said. The researchers used this method elsewhere in the paper, but not in the critical experiment that was supposed to show arsenic was incorporated into the bacteria's DNA.

YEAH... SAME FORMAT



* *Nasa scientists claim this bacteria used arsenic instead of phosphorous to build it's, life essential, DNA. Critics claim the Bacteria seem bloated and unnatural while questioning the scientific rigor of the experiments.*

"That's just asking for contamination problems," she said. The arsenic they found could have been hanging around in the gel, not in the cells, she added. "It's as if they wanted to find arsenic, so they didn't take a lot of trouble to make sure they didn't find it by mistake."

In a guest post on the blog "We, Beasties," Harvard microbiologist and geochemist Alex Bradley raised another issue.

The NASA team immersed the DNA in water, where arsenic compounds quickly fall apart. If the DNA was really built from arsenate, it should have broken into pieces, Bradley wrote. But it didn't. That suggests the molecules were still using stronger phosphate to hold themselves together.

A thorough review on *Slate.com* by science writer Carl Zimmer raises a host of other problems with the paper. Zimmer spoke with nearly a dozen outside experts for the story (and more for ongoing updates on his blog), nearly all of whom think the NASA team failed to support their claims.

A similar story by Alla Katsnelson on *Nature's* news site points out the arsenate-eating microbes appear fat and bloated, a possible sign that they are sequestering toxic substances. Rather than continuing to grow in number and thrive, the bacteria could have been getting fatter as they stored up just enough energy for survival.

The authors of the original paper have so far declined to respond to these criticisms, at least to journalists. A NASA spokesperson also publicly dismissed blog-based critiques, saying any discussion should be confined to scientific journals.

"That's kind of sleazy given how they cooperated with all the

media hype before the paper was published," Redfield said.

But senior author Ronald Oremland of the U.S. Geological Survey spoke to an audience of scientists at NASA Headquarters in Washington, DC Dec. 7, which was streamed live over NASA TV. Apparently against his own policy, Oremland fielded several questions about specific tests the team could have performed on the microbes.

Most of them, he said, were "certainly worth doing" and "an area for future work."

"There's a laundry list of things," he said. "We can't do everything."

Oremland also indirectly addressed the backlash in the blogs.

"I'm not surprised by pushback from the scientific community and bloggers. That's part of the process," he said. "But those are arguments about how many angels on the head of a pin. The only way this is going to get settled is if people reproduce these experiments on their own."

Redfield agrees that more studies are needed, and that the best place for scientific back-and-forth is in peer-reviewed journals.

"But putting it out just so people can comment on it directly is also extremely valuable," she said. Scientists have always discussed their work in non-peer-reviewed channels, such as letters or conferences, she notes. "It's just working faster and better now because we have things like blogs. That just lets the science be so much more powerful. In a lot of ways this is how science is supposed to work."