

# Headlines

College of Engineering Headlines is produced annually to present highlights of the past year as well as late-breaking December 2012 news, as they appeared in the general media.



Due to limited space, many of the articles appear in excerpted form and are designated by ellipses. These 28 pages represent only a small sampling of news concerning the College of Engineering alumni, faculty, student, and events during 2013.

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**THE WALL STREET JOURNAL • January 14, 2013**

*Burning question:*

## Why is flu common in winter?

By Heidi Mitchell

Scientists have struggled to understand the correlation between cold weather and the flu. This winter has seen a particularly severe flu season for a number of rea-

sons. A wintertime spike in flu cases isn't only because of the chill outside, says **Linsey C. Marr**, a professor of **civil and environmental engineering** at Virginia Tech. It's also because of the condi-

tions inside.

### The Air Test

The link between the flu virus and air humidity has long been studied, but the results were never definitive.

See FLU, page 2

**US NEWS & WORLD REPORT • December 12, 2013**

## Iran's Drone-Downing Claims are 'Garbage,' Expert Says

by Paul D. Shinkman

Iran's ability to down and hack a U.S. intelligence drone remains unlikely. What is certain, however, is some of their technological claims are completely false.

The Middle Eastern country bordering the Persian Gulf says it recently "caught and brought under control" a U.S. drone, using air defense units and control systems from the Revolutionary Guard Navy.

The Iranian government released incomplete photos of the device, which appears to be a Boeing-made ScanEagle long-range unmanned aerial vehicle....

"It's garbage to claim you can extract the drone's electronic information,"

says **Kevin Kochersberger**, a research associate professor at Virginia Tech's **Unmanned Systems Laboratory**. "There are multiple levels of hardware and software-specific design that are impenetrable to reverse engineering."

A credible hacking job would also require knowledge of the ground system that controls the unmanned aerial vehicles, or UAVs, he says, as well as an understanding of the vehicle itself.

"There are so many design-specific characteristics in the vehicle that the information cannot be extracted by somebody casually examining the vehicle,"

See DRONE, page 8

**INFOWORLD  
September 18, 2013**

## Top 20 colleges for computer science majors, based on earning potential

By Ann Bednarz

California is home to the top five computer science schools in the U.S., according to a new salary-centric report from PayScale.

The research company ranked 129 college majors based on the median pay for

See RANKINGS page 13

**POPULAR SCIENCE • April 18, 2013**

## We could eat trees:

### Scientists turn inedible plant cellulose into starchy snack

by Rebecca Boyle

Someday, it will be summer again and it will be time for fresh sweet corn. In the future, you might be able to eat the whole thing, cob and all.

This weird possibility is courtesy of some **scientists at Virginia Tech**, who have transformed cellulose, a mostly indigestible polymer, into helpful, indispensable starch....

Animals like cows and pigs can digest cellulose thanks to symbiotic bacteria in their digestive tracts, but humans can't. It's important in our diets as source of fiber, in that it binds together waste in our digestive tracts. **Y.H. Percival Zhang**, an **associate professor of biological systems engineering at Virginia Tech**, set out to make it a food source.

Since cellulose and amylose are both glucose chains, you would just have to rearrange their hydrogen bonds. This is anything but simple, although essentially Zhang and colleagues used chemistry. They worked with a series of synthetic enzymes to break down the hydrogen bonds in some plant material that would not

See INEDIBLE, page 13

**NEW YORK TIMES • January 29, 2013**

## Researchers Revise Helmet Rating System

By Ken Belson

Researchers whose ratings for football helmet quality have become popular throughout the industry have revised their system to create a more complete method of determining the probability that a player wearing certain helmets will sustain a concussion.

In response to critics who claimed their helmet rating system was mis-

leading, the **researchers at Virginia Tech** said they would use a new method that considers the acceleration from linear blows to the head as well as the impact from blows that rotate the head.

The university's five-point scale, called the STAR system, was previously calculated using only the acceleration from linear blows.

See HELMET, page 3

**WIRED • March 28, 2013**

## This Massive Jellyfish Is Really an Aquatic Spy Robot

by Spencer Ackerman

This five-and-a-half-foot robot jellyfish could be the future of Navy underwater surveillance. Seriously. Maybe. Certainly, if a team of **engineers from Virginia Tech** gets its way.

Meet the Cyro, an autonomous robot with eight mechanical legs ringing its metal chassis, designed to mimic the unique, efficient underwater propulsion of a jellyfish.

See JELLYFISH, page 14

TORONTO TELEGRAPH (ANI) • December 9, 2012

# Why flu virus infects mostly in winter

Scientists have discovered a possible reason why the flu virus is seasonal and tends to infect people mostly in the winter.

They found that the virus survived best at low humidity, such as those found indoors in the winter, and at extremely high humidity.

**Linsey Marr**, associate professor of **civil and environmental engineering** at Virginia Tech, and her colleagues, Wan Yang, of Blacksburg, Va., one of her doctoral students, and Elankumaran Subbiah, a virologist in the biomedical sciences and pathobiology department of the Virginia-Maryland

Regional College of Veterinary Medicine, measured the influenza A virus survival rate at various levels of humidity.

Their study presents the relationship between the influenza A virus viability in human mucus and humidity over a large range of relative humidities, from 17 per-

cent to 100 percent. They found the viability of the flu A virus was highest when the relative humidity was either close to 100 percent or below 50 percent. The results may help explain influenza's seasonality in different regions....

(Editor's Note: This story also ran on UPI on Jan. 11, 2013)

SCIENTIFIC AMERICAN (podcast) • December 27, 2012

# Humidity levels explain U.S. flu winter peak

By Karen Hopkin

Cases of the flu peak in winter in the U.S. But why? A new study suggests it's not the heat, but the humidity. Or lack thereof. Because in temperate regions, the

influenza virus fares best when the weather is dry. That's according to work published in the journal *PLoS One*. [Wan Yang, Subbiah Elankumaran and **Linsey C. Marr**, Relationship between

Humidity and Influenza A Viability in Droplets and Implications for Influenza's Seasonality] Scientists have long debated why flu erupts when the days grow chilly. Is it that

we spend more time cooped up together indoors? Or is there something about the virus that likes it cold and dry?

To find out, researchers suspended influenza

virus in a solution that mimics human mucus. They incubated this infectious soup at different humidities and measured viral survival.

And they found that at low humidity, the

fake mucus dries up and the virus does just fine. But when the humidity tops 50%, the droplets only partially evaporate, leaving behind a solution that's too salty for the virus to thrive....

## FLU - WALL STREET JOURNAL - (Continued from page 1)

Last year, Dr. Marr, her doctoral candidate, Wan Yang, and Elankumaran Subbiah, a professor at Virginia-Maryland Regional College of Veterinary Medicine, sought to put the question to rest. They figured out the flu kept its virulent characteristics best in human mucus, which Dr. Marr took from the dripping nose of her 1-month-old baby. They spiked droplets of human mucus with live flu virus, and then exposed it to air with varying levels of moisture.

In the study, published in 2012 in the journal *PLoS One*, the researchers found the virus survived

best at humidity below 50%, similar to the conditions found indoors in "a really heated building," says Dr. Marr. "The virus is happy if the mucus droplet completely evaporates and leaves it floating around" in the air.

"It's also fine in humidities above 98%, which you find in the rainy season in the tropics," she says, where the conditions outside resemble the environment the virus finds in the body. "But in between, in a humidity of 50% to 98%, the virus doesn't survive very well."

The presence of influenza is quite rare in the spring, summer and fall, when people don't use indoor heating as much and the humidity tends to be in the comfortable 50%-to-70% range, says Dr. Marr. But in the winter, when air from outside is heated and becomes drier, the flu virus survives well.

In other words, give a virus a dry room heated to 70-to-80 degrees Fahrenheit, and you've created the perfect conditions for it to thrive, she says.

As for why this winter's flu season seems especially bad, Dr. Marr believes it is because of the particular strain of the virus, H3N2, which causes "stronger" symptoms, as well as an early start to the season. "There are many, many factors that affect the transmission of influenza," she says. "Humidity and the survival of the virus in airborne droplets is just one piece of the puzzle."

### What You Can Do

A humidifier might be the best product to keep the flu at bay, Dr. Marr says. "If you can humidify to about 50%, but not above 60% [which can cause mold], you might reduce your chances of getting the flu," she says....

RUNNER'S WORLD  
March 18, 2013

## Avoid Pollutants for Breathing No Matter Where You Live

*The quality of air you inhale when you run affects your body and brain*

By Cindy Kuzma

Research links vigorous exercise with improved memory, mood, and mental clarity. But a new study in medicine and science in *Sports & Exercise* reports that running in a polluted urban area could diminish the positive brain boost you would ordinarily get from a workout. Why? Hard exercise makes for faster and deeper breathing, meaning you take in more air—and everything in it. That exposes your body (and brain) to more toxins. Here's how to breathe easier on your runs.

### In the City

Vehicles and industrial sources emit harmful particles and gases that can make your eyes and throat burn, your head ache, your chest tighten, and your breathing labored. Long term, it increases your risk of heart and lung disease.

Manage Your Risk: "The positive benefits of running likely outweigh the risks," says **Linsey Marr**, Ph.D., an **environmental engineering** professor at Virginia Tech. Still, it's best to skip outdoor runs when the air-quality index is 100-plus. To reduce exposure on other

See BREATHING, page 3

VIRGINIA TECH COLLEGE OF ENGINEERING

## Headlines

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**THE WALL STREET JOURNAL • February 1, 2013**

# The Football Nanny State

*By Germano, and Jonathan Glegg*

In his 2012 book “Concussions and Our Kids,” Boston University neurosurgeon Robert Cantu left little mystery about his tome’s intended target: The photo on the cover shows a pack of little kids playing tackle football. Inside its pages, a section heading says: “No tackle football before fourteen.”

As the Super Bowl approaches Sunday, this point of view has become an increasingly trendy one. The talk in New Orleans this week, even by some players, has revolved around whether this collision-centric sport can survive without drastic change. And a growing number of people inside and outside the sport are pushing the debate toward children. “If I had a son,” President Barack Obama told the *New Republic* this week, “I’d have to think long and hard before I let him play football.”

Recent studies performed on former long-time NFL players have left no doubt that playing professional football can be hazardous to one’s brain — and one’s future quality of life. But when it comes to the question of whether the sport is dangerous for kids, it’s not that the evidence is inconclusive — there’s no evidence whatsoever. ...

In October, 2010, NFL commissioner Roger Goodell spoke at a “Keep Youth Sports Safe” conference. He said the league will support laws that bar young athletes from returning

to play too soon after a concussion. “The NFL believes we can make sports safer than they are today,” he said. The league also worked with the Centers for Disease Control and Prevention to create posters to educate kids on concussions. ...

Researchers at Boston University’s Center for the Study of Traumatic Encephalopathy, where Cantu is a co-director, performed a December 2012 study of 85 brain donors who had played football. It found that some people who never played above the college and high-school level also had signs of the disease. “You can have it at the high-school level, no question,” Cantu said in an interview.

**Stefan Duma, a Virginia Tech professor** who is studying the issue, said it would be “incorrect” to rely too much on small pools of brain donors whose families may have suspected there was something amiss. “There is just so little data,” to work with, he said.

There is some research in the works. Researchers are now putting sensors in the helmets of young players to analyze how many hits they take during football games and how forceful they are. Duma, along with researchers at both Virginia Tech and Wake Forest, is conducting a long-term study of how hits to the head affect 119 young football players. Still, Duma said, it may take as many as 20 years to reach a firm conclusion.

**THE NEW YORK TIMES**  
July 25, 2013

## Concussion Study Makes Case for Reducing Contact Drills for Youth Players

*By Ken Belson*

Youth football players are not more vulnerable to head hits in games if they take part in fewer contact drills during practices, a new study published in the *Annals of Biomedical Engineering* showed.

The study, conducted by researchers from the **Virginia Tech-Wake Forest School of Biomedical Engineering and Sciences**, comes amid a debate over how much practice is needed to prepare young players to protect themselves during games and to block and tackle in a safe way.

The study’s conclusion — that the

amount of practice does not influence the number of head hits absorbed during games — may bolster calls to reduce the frequency of contact drills in youth football leagues. N.F.L., college and high school teams have already scaled back the number of contact drills in practices.

“The concern is if we don’t teach kids how to hit in practice, they’re going to get blown away in the games,” said **Stefan Duma**, who runs the School of Biomedical Engineering and Sciences and is one of the co-authors of the

See CONTACT, page 4

**INSIDE SCIENCE TV (video)**  
March 12, 2013

### Why flu season is in the winter

Researchers show that it’s not the cold air on its own that creates the spike in flu cases.

*(Editor’s Note: A different version of this story was also carried on WDBJ7 (CBS) on February 02, 2013; on WVTF Radio on January 04, 2013; and syndicated to NBC, ABC, Fox, Discovery, etc., produced this segment on the flu research of **Linsey Marr of civil and environmental engineering** and Elankumaran Subbiah.)*

## BREATHING

### Runner’s World

(Continued from page 2)

days, run in the morning in parks or near water.

#### In the ‘Burbs

There’s no magic air barrier once you cross into the outskirts; ozone levels are often higher in downwind suburbs than in cities, Marr says. Plus, mowers and weed whackers emit pollutants, and chemicals that kill pests and fertilize grass have been linked to health problems like cancer. ...

**ABC NEWS • October 30, 2013**

## Goodell teaches moms to tackle ‘safely’

*By Jim Litke, AP Sports Columnist*

NFL Commissioner Roger Goodell came to town to teach mothers how to tackle safely.

I am not making this up.

The event, sponsored by the

league and the Chicago Bears, was titled “Football Safety Clinic for Moms.” The intent, no doubt, was to ease fears about letting their sons play the game.

The timing was nothing if not

fortuitous.

Last month, studies by researchers at the **Virginia Tech-Wake Forest University School of Biomedical Engineering**

See TACKLE, page 4

## HELMET - New York Times - (Continued from page 1)

**Stefan M. Duma and Steven Rowson, who teach at the Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences**, where they created the STAR helmet ratings, said they did not expect the new method to lead to drastic revisions in their rankings of football helmets made by Riddell, Rawlings and other manufacturers, because

there is a close correlation between linear and rotational acceleration in head hits.

They said they hoped the more complex method for testing helmets would produce additional details about the impact of head hits and that manufacturers would use the data to design better helmets.

“They can model brain injury risk better in the lab,” said Row-

son, who with Duma published their new method in the *Annals of Biomedical Engineering* on Tuesday. “For us, we don’t care how they reduce acceleration as long as they do.” ...

Duma’s group at Virginia Tech will apply its method to its adult football helmet study that will be released in 2014, as well as in its new hockey helmet rating that will

be released this fall. The university said Tuesday that it would expand its rating system to include youth football, baseball, softball and lacrosse helmets.

*(Editor’s Note: A variation of this article also appeared on: Product Design & Development, RedOrbit, ScienceNews-line, WDBJ Channel 10, WTOP in Washington D.C., Medill News Service)*

THE NEW YORK TIMES • February 2, 2013

# N.F.L. Joins With G.E. in Effort to Detect Concussions

by Judy Battista

NEW ORLEANS — The N.F.L., faced with increasing concern about the toll of concussions and confronted with litigation involving thousands of former players, is

WSLS-10 (NBC) • May 15, 2013

## Virginia Tech adds new football helmet to 5-star safety rankings

Virginia Tech adds a new football helmet to its 5-star safety ranking list, following a new round of impact tests.

... **Dr. Stefan Duma's** team unveiled its 2013 research results for adult football helmets. The testing identified a helmet's ability to reduce the risk of concussion.

Four helmets earned the highest safety ranking of 5-stars: Xenith X2 (newly redesigned), Riddell 360, Rawlings Quantum Plus, Riddell Revolution Speed.

Two new helmet models earned the second highest ranking, 4-stars, joining six previous helmets: SG Adult Helmet (new), and the Schutt Vengeance (new) ....

Each helmet model received 120 impacts at multiple locations and different levels of power, to simulate football game hits. Dr. Duma's team then analyses, combines, and compares the data for concussion risk based on the STAR equation (STAR stands for Summation of Tests for the Analysis of Risk).

Dr. Duma's team found helmets which best manage impact energy, lead to slower head acceleration and a lower risk of concussion....

planning to form a partnership with General Electric to jump-start development of imaging technology that would detect concussions...

The four-year initiative, which is expected to begin in March with at least \$50 million from the league and G.E., is the result of a late October conversation between Commissioner Roger Goodell and G.E.'s chief executive, Jeffrey Immelt, a former offensive tackle at Dartmouth. When Goodell explained his idea of getting leading companies in innovation to join the N.F.L. to accelerate research, Immelt said he wanted to help.

After years of insisting there was no link between head injuries sustained on the field and long-term cognitive impairment, the N.F.L. has altered rules, fined and suspended

players who hit opponents in the head and contributed millions of dollars for the study of head injuries. ...

The expectation is that new technologies could spring from the collaboration within a few years.

"If they were to be putting more focus on technology for concussion management, that's obviously a good thing," said **Stefan Duma, who teaches at the Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences** and created the STAR helmet ratings system. "I would expect that to bear fruits. We're definitely not 10 years away. I would expect in a two- to five-year window you could have some real advances in imaging's ability to see concussions. Helmets are the same way." ...

CIO • October 28, 2013

## Microsoft's Bug Data Services Available After a Year in Review

by Thor Olavsrud

Microsoft today used the first day of O'Reilly Strata Conference + Hadoop World in New York City to announce that its Windows Azure HDInsight Service is now generally available after a year in preview....

### DNA Sequencing with HDInsight Service

The use cases are many and varied. For instance, **Virginia Polytechnic Institute and State University** has been using the HDInsight Service to aid its life sciences research in DNA sequencing.

Leveraging a grant from the National Science Foundation, **Virginia Tech computer scientists** developed an on-

See DATA page 5

## TACKLE ABC News

(Continued from page 3)

**neering and Sciences** concluded that football players as young as 7 suffer hits to the head every bit as traumatic as those suffered by high school and adult players. Last week, an HBO Real Sports-Marist poll headlined "Youth Football Takes Hard Hit" found that 56 percent of respondents said the risk of long-term brain injury would be an important factor in deciding whether to allow their son to play football....

(Editor's Note: This article also appeared in the *Washington Post* on October 30, 2013, and ran on the *Associated Press* wire service.)

HOMELAND SECURITY NEWSWIRE • October 21, 2013

## Researchers developing outer-shield material for nuclear waste transportation

The integrity and survivability of a nuclear waste package is critically important in the transport of nuclear fuel and high-level waste.

Researchers are working on developing an outer shield material for use in packaging which is resistant to corrosion, radiation, diffusion, and thermal cycling processes that affect fuel packages during long-term storage. The material will

also need to be wear-tolerant and mechanically robust so that it can survive repeated handling and transportation.

**Virginia Tech's nuclear engineering program** has received two awards valued at more than \$1 million from the Department of Energy's Nuclear Energy University Program.

See MATERIAL, page 5

## CONTACT - NY Times - (Continued from page 3)

study. "This shows you can dramatically cut the amount of exposure in practice and have no more exposure during the games."

Last year, Pop Warner, a national organization through which hundreds of thousands of children participate in football, amended its safety guidelines, based in part on the medical wisdom that the brains of young boys are particularly vulnerable. No more than a third of practice time for Pop Warner teams can include contact drills.

About 3.5 million children between ages 6 and 13 play football in the United States, and only a

fraction of them are in Pop Warner leagues. The vast majority play in independent leagues, often with volunteer coaches, referees and doctors.

To determine the vulnerability of young athletes, the study tracked 50 players on three youth teams in Virginia and North Carolina for a season.

The players had six accelerometers placed in each of their helmets measuring how many times they were hit in the head, where they were struck on their helmets and how much their heads accelerated when hit....

**US NEWS & WORLD REPORT • February 4, 2013***Health Highlights:***NFL, GE partnership seeks to improve concussion detection, prevention**

The NFL will partner with General Electric to promote development of new imaging technology that would detect concussions, and also work together to encourage the creation of new materials for helmets to better protect the brain.

The four-year program is ex-

pected to begin in March and will receive at least \$50 million from the NFL and GE, *The New York Times* reported.

New technologies from the collaboration could appear within a few years, according to experts.

"If they were to be putting more

focus on technology for concussion management, that's obviously a good thing," **Stefan Duma, an instructor at the Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences** and creator of the STAR helmet ratings system, told *The Times*.

"I would expect that to bear fruits. We're definitely not 10 years away. I would expect in a two- to five-year window you could have some real advances in imaging's ability to see concussions. Helmets are the same way," Duma said...

**ALABAMA.COM • January 6, 2013****Does college football's future hinge on dramatic rules changes?**

by Jon Solomon

**Finding an acceptable risk**

Redding is a realist. Given football's violent nature, he understands tension will always exist between player safety and the game as the public knows it. That is especially true as he grows more concerned about increasingly bigger and faster players...

Redding said football must change its culture. He views dis-

cipline and teaching as being vital so players understand some hits are too dangerous while they use a helmet he likens to a "missile"...

**Stefan Duma** has studied 200,000 head impacts in football for 10 years at Virginia Tech, which uses sensors in helmets to monitor the severity of hits to the head. He believes college football will have to find an acceptable level of risk the public will stomach.

"In any sport, if any of those risks are much higher, we have to work to modify it to make sure it's a reasonable level," Duma said. "I think that's what you're seeing now in football. It's the rules, it's the coaching, it's the research, it's the best practices.

"Let's bring the head exposures

down to where concussion risks are similar to all of the sports. You can take it to extremes. In that case, the only other logical conclusion is we get rid of bicycles because 100 kids a year die falling off them. I think we need to look at this more holistically at what's an acceptable level of risk for our kids."

**DATA - CIO - (Continued from page 4)**

demand, cloud computing model using Windows Azure HDInsight Service that helps locate undetected genes in a massive genome database.

"Of the estimated 2,000 DNA sequences worldwide, they are generating 15 petabytes of genome data every year," says **Wu Feng, professor of computer science at Virginia Tech**. "Many life sciences institutions simply do not have access to the computational and storage resources required to work with data sets of this size. We're generating data faster than we can analyze it."

Feng and his team used the grant to develop two software artifacts: SeqInCloud, a popular genetic variant pipeline called the Genome Analysis Toolkit (GATK), and CloudFlow, a workflow management framework that uses both client and cloud resources.

SeqInCloud generalizes the GATK pipeline, allowing it to run in the cloud using HDInsight and Azure to maximize portability. Meanwhile, CloudFlow, installed on a researcher's PC, aids interactions with the Windows Azure

HDInsight Service.

"It allows us to compose flexible MapReduce pipelines that simultaneously utilize both client and cloud resources for running the pipeline and automating data transfers," Feng explains. "This is where the HDInsight resource has been particularly useful."...

(Editor's Note: This article also appeared in *IT World*.)

**FAST CO. DESIGN • February 4, 2013****Why NFL helmets will never be concussion-proof**

by Mark Wilson

Imagine that you drive a car straight into a building at 40 mph. Despite airbags and seatbelts, you'd probably feel lucky to be alive. But when an NFL wide receiver meets a safety head-on, we expect them both to get back up to play second down.

See HELMETS page 6

**MATERIAL - Homeland Security Newswire**

(Continued from page 4)

One is an \$800,000, three-year award to develop an outer shield material for use in packaging spent nuclear fuel and high-level waste for prolonged storage. **Leigh Winfrey, assistant professor of mechanical engineering**, and her colleague Mohamed Bourham, professor of nuclear engineering of N.C. State, received this research contract.

A Virginia Tech release reports that the second award for \$300,000 will allow the Virginia Tech nuclear program, housed in the mechanical engineering department, to

purchase a neutron generator system to create a Neutron Irradiation Laboratory.

**Mark Pierson, associate professor of mechanical engineering**, is the principal investigator on this grant, and **Celine Hin, assistant professor of mechanical engineering and materials science and engineering**, and **Alireza Haghghat, director of the Virginia Tech Nuclear Science and Engineering Laboratory, part of the Institute for Critical Technology and Applied Science**, are the co-investigators....

**ENERGY HARVESTING JOURNAL • Jan. 8, 2013****Advanced Wind Blade**

In a move that could put wind energy on equal economic footing with traditional fossil fuels, GE, **Virginia Tech**, and the National Renewable Energy Laboratory will begin work on a project that could fundamentally change the way wind blades are designed, manufactured, and installed.

With most of the cost of electricity for wind tied up in the initial capital investments made in the wind turbines themselves, new technology advancements that reduce these costs could substantially lower the overall cost of wind energy. ...

NEW YORK TIMES • August 19, 2013

## Hits to the Head Don't Differ with Age, Research Indicates

Football players as young as 7 sustain hits to the head comparable in magnitude to those absorbed by high school and adult players, and most of the hits are sustained in practices, not games, according to research to be released.

The findings, which may influence how youth football organizations handle training methods and rules, were included in four studies published by researchers at the **Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences**. The research, though limited, is considered by experts to be a step in the effort to address the relatively shallow understanding of the potential long-term effects of head trauma on young players.

More than 25,000 football players from 8 to 19 years old are taken to emergency rooms seeking treatment for concussions every year, but most of the research on head injuries in football has focused on professional and college players. The new research, which was

presented at the annual Biomedical Engineering Society conference this week, tracked about 120 players in Virginia and North Carolina from seven to 18 over two seasons. Each young athlete wore six devices, known as accelerometers, in their helmets to measure the force, position and direction of the hits, and every practice and game was videotaped to determine how they occurred.

To help determine any changes in brain structure and function, many of the players received magnetic resonance imaging brain scans before and after the season, and after they sustained a concussion. Some players also received magnetoencephalography scans, or MEG scans, to map their brain activity.

"This is a basic study on how many times kids get hit in the head," said **Professor Stefan Duma, who runs the School of Biomedical Engineering and Sciences** and oversaw the youth football studies. "The number of hits and magnitude was a lot higher than people would have estimated. When we pres-

ent it to the parents, everyone is surprised."

... This study demonstrated that some head impacts at this level are similar in magnitude to high-severity impacts at the high school and collegiate level," the authors wrote.

A second study tracked three teams of players from nine to 12 for one season. Nearly 12,000 hits were recorded, or an average of 240 per player. Again, players absorbed more hits during practice, and at higher acceleration rates than younger players.

As a result, "these data suggest that rules designed to restrict player contact in practice are capable of reducing head impact exposure in youth football," the authors wrote....

"While we have immediate data and finding, we're looking at 5- and 10-year students to help us answer the big questions about how much is too much," Duma said. "We are just at the beginning."

*(Editor's Note: This article also appeared in the Toronto Star, the Mississippi Press, and CNBC)*

CNN (Health) • November 21, 2013

## Head impact sensors: On-the-field placebo or danger?

by Stephanie Smith

Wayland, Massachusetts (CNN) – Erik Sweeney hurled his body toward the opposing team's quarterback, wrapped his arms around him and pulled him to the ground.

Seconds later, the back of his helmet socked the grass.

"It didn't hurt or anything," said Sweeney, a 13-year-old cornerback with the Wayland-Weston Warriors in Massachusetts. "It just shocked like, it felt all fuzzy in the back of my head."

Despite that fuzzy feeling, Sweeney was raring to get back into the game. But a yellow light flickering at the base of his helmet caused a trainer on the sideline to stop him.

The light indicated that Sweeney might have suffered a moderate hit to the head. He was held out of the game, and within minutes, post-concussive symptoms began setting in....

Sweeney was wearing one of a growing list of products marketed as "impact sensors" or "head impact

indicators." They are devices – small, relatively cheap, and often outfitted with a flashing light – that are supposed to trigger when a blow to the head is too hard.

The product names evoke on-the-field action ("Shockbox," "Battle Sports" and "CheckLight" are just a few), and they are marketed as an extra set of eyes on the playing field.

But what is that extra set of eyes really seeing?...

Experts who have tested commercially available impact sensors

agree that more independent testing is needed before they are field-ready.

"One of the things we're interested in is when do they trigger and when do they not?" said **Stefan Duma, professor and department head of the biomedical engineering department at Virginia Tech**. "At what levels and in what directions?"

Duma and his colleagues are testing the impact sensors, and while their data are still preliminary,

See IMPACT, page 7

## HELMETS - Fast Co. Design - (Continued from page 5)

What's the difference?

"In a car crash, you stop in a matter of feet. In an NFL impact, you stop in inches," one expert tells me....

Just two years ago, a team led by **Dr. Stefan Duma from Virginia Tech** released the first ever five-star crash rating for football helmets. It's one reason that Duma likens the NFL of today to the auto industry in the 1970s. Originally, all cars were rated by a basic pass/fail crash test, and it wasn't until Congress passed legislation for a five-star crash rating system that car companies had the impetus to do better. The NFL of today is the auto industry of the 1970s.

Before Duma's testing, the same was true for helmets. The industry's only concern was whether football players could take a hit without fracturing their skull or sustaining subdural hematoma. Concussions – or any other traumas – weren't part of testing. So designing helmets became a limbo bar. If a manufacturer came in anywhere below crushed skull territory, their helmet was thrown in the approved pile.

"Our rating system is the first that actually shows people that some helmets are better," Duma says.

"One of the things we wanted to do was provide a mechanism for improved design. You'll

never have a concussion-proof helmet because injury is all about risk. But the better helmets lower your risk. That can be substantial. We found the best helmet lowered risk of concussion by 85%."

### The World's Best Helmet

Duma's top-rated helmet today is the Riddell 360. Priced at about \$400, it features a hard polycarbonate shell to bounce off an impact and an energy absorbing foam lining to absorb the aftershock...

*(Editor's Note: This article also appeared in the Press-Register and The Huntsville Times.)*

**FORBES • October 24, 2013**

# The Kiddie Head-Trauma Study That Could Save, or Kill, Football

by *Bob Cook*

It was a momentous occasion when the Blacksburg (Va.) Bruins youth football team lined up Oct. 15 against their rivals from nearby Riner, Va., the Auburn Eagles. That's because players from both teams were wearing sensors in their helmets that recorded the force of each hit, the first time that's ever happened, according to the Virginia Tech researchers behind the effort.

The researchers, led by **engineering professor Steven Duma**, for a few years have used sensors to track young players. While more research piles up on the damage concussion have done to many pro and college football players, Duma and his group are

concentrating on youth football to get a sense of how hard kids are getting hit early, and the effect that could have on them.

So far, what they've found is that the biggest hits — 40 g ("g" means times the force of gravity) and above (the equivalent of heading a soccer ball) — happen almost exclusively in practice. ...

The data from this game, as well as other games and practices, won't be pulled until after the season is over. It will be interesting to see what it says.

As more evidence comes that adults, having heard scary stories about concussions and football, are getting more nervous about letting their kids play or even watching games, Virginia Tech's youth study

should give some insight into how much risk kids are facing in youth football. Already, prominent researchers have said no one should play tackle football before age 14.

If Virginia Tech's research shows that the bulk of the damage happens in practice, and cutting back on hitting there will make football much safer, parents might feel more at ease about signing their kids up for the sport.

But if the research, and whatever other studies it ties into, shows that kids are at a high risk in practice and games from football, that the long-term damage starts and accelerates at the youngest of ages, perhaps then we will truly, and definitively, see the beginning of the end for football.

**CBS Sports.com • August 19, 2013**

## Concussions and college football: Quotable concussions

CBSsports.com Senior College Football Columnist Dennis Dodd spent the offseason investigating the issue of concussions in college football -- the background on the issue, the competing interests at play in the current debate, and the way forward for the sport.

The details of Dodd's reporting will be revealed in a multi-part series throughout the week, with previous installments of the series indexed.

When researching a series like this, there is a lot one has to leave out. Even in cyberspace, space is limited. My editors have told me so.

Here are some of the best quotes and bits of information that didn't fit over the last three days in my concussion series...

"If you get in a five-star car you can die ... but five-star vehicles reduce your risk as opposed to a one-star vehicle. Same thing with helmets. You can still get a concussion in any helmet but some of them can reduce the risk pretty dramatically." — **Virginia Tech biomechanical engineering professor Dr. Stefan Duma** who has annually rated the safety of football helmets the last four years (Virginia Tech Helmet Ratings).

"We hadn't intended to rate helmets until about four years ago. We started looking and looking and

were surprised there was no data. All people had was the price and what it looked like. It was a huge void." — Duma...

"Our team physician wears a beeper and if there is a high-level hit it beeps." — Duma on the cutting-edge research Virginia Tech is doing on the subject of head trauma. Each time a Hokie gets a hit to his head of at least 98 Gs a helmet sensor records it and that beeper goes off. That player is flagged for examination....

**VOICE OF RUSSIA • November 11, 2013**

## American football: Bad for your boy?

by *Olga Yazhgunovich*

The institute's 304-page report noted that boys who played high school football sustained 11.2 concussions per 10,000 games and practices, well above the 6.9 concussions sustained by lacrosse players, according to data reported by high school athletic coaches. College football players received 6.3 concussions per 10,000 games and practices, according to a separate study. About 250,000 guys under the age of 19 went to emergency

rooms with concussions in 2009 compared with 150,000 in 2001.

At the same time, many athletes were reluctant to admit having sustained a concussion, and coaches continued to push players to keep playing after they are injured exposing them to the risk of longer-term damage...

The NFL also announced a new requirement that an independent neurologist be

See FOOTBALL page 8

## IMPACT

### CNN Health

(Continued from page 6)

a recent drop test involving a few products — conducted in front of CNN cameras — suggested potential problems.

A crash test dummy head was outfitted with three sensors — two with lights that are supposed to switch from green to either yellow or red after a big blow, and one that communicates back to the sideline when a hit is too hard — and a high-quality helmet.

The helmet was dropped from various heights, approximating the force of blows that might be experienced on a playing field.

A drop from five feet, generating a force Duma described as similar to a jarring collision on a football field, did not trigger any of the three sensors.

"That's well into the range of concussion," said Duma. "You would definitely want an alert."

Concussion concerns may lead to fewer boys playing football ...

And at even higher reaches — forces similar to running into a brick wall at full speed, or worse — one system might activate, while the others did not.

The dubious test results, Duma said, underscore the need "to understand what (the products are) measuring, when they're triggering and when they don't, so that parents can have a better understanding of what information they're getting back..."

(Editor's Note: This story also appeared in: KIFI-TV, *Engineering and Technology*, KOAT-TV, KWCH-TV, WANE-TV, plus a host of other TV channels.)

POPULAR SCIENCE • February 7, 2013

## Creator of most efficient supercomputer to start working on drone-bugs

by Colin Lecher

Wu-chun Feng will be getting \$3.5 million over three years for his services.

**Wu-chun Feng, an associate professor of computer science in the College of En-**

**gineering at Virginia Tech,** is the creator of Green Destiny, a supercomputer so efficient it basically ran on a couple of blow dryers' worth of power. He also made a list for ranking the efficiency of supercomputers, called the Green 500,

then turned around and topped the list in 2011 with another computer: HokieSpeed. The next logical step would be to keep making incredibly efficient computers, but instead, Feng is doing something slightly different: making robot drone-bugs.

The Air Force wants someone who can help make more efficient micro-air vehicles, or MAVs, tiny robots that can act do reconnaissance, and they're giving Feng \$3.5 million over three years for the career adjustment. ...

PRODUCT DESIGN &amp; DEVELOPMENT • February 7, 2013

## Multi-million dollar award to accelerate research using supercomputers

**Wu Feng, associate professor of computer science in the College of Engineering at Virginia Tech,** is hoping to herald a new age in multi- and many-core parallel computing that he believes will "transform supercomputing" and in the process improve the speed of micro air vehicles (MAVs).

More than a year ago, Virginia Tech announced the creation of HokieSpeed, a supercomputer so energy efficient that it was the highest-ranked commodity supercomputer in the U.S. on the Green500 List in 2011.

The Green500 compiles a ranking of the most energy-efficient supercomputers in the world, akin to ranking the most fuel-efficient vehicles in the auto industry.

Feng designed and built HokieSpeed, with a National Science Foundation instrumentation grant for a modest \$1.4 million in the supercomputing financial world. By contrast, Feng's price tag represented only one-tenth of a percent of the cost of the 2011 Top500's No. 1 supercomputer, the K Computer from Japan.

Feng believes he and his team can do even better. So does the Air Force's Office of Scientific Research (AFOSR).

The AFOSR has awarded Feng, formerly of Los Alamos National Laboratory – where he designed Green Destiny, a highly energy-efficient, 240-node supercomputer that consumed 3.2 kilowatts of power (equivalent to two hairdryers) and occupied five square feet in 2004 – a core award of \$3.5 million over the first three years of the contract with the option for a two-year extension at another \$2.5 million, or a total of \$6 million over five years to pursue a large-scale interdisciplinary effort.

The goal of the Air Force contract is to achieve a substantial increase in the simulation speed of computational fluid dynamics of its micro air vehicles (MAVs), a class of unmanned aerial vehicles, using accelerator-based supercomputers like HokieSpeed....

From Virginia Tech, the engineering members of the interdisciplinary team include: **Christopher Roy, associate professor of aerospace and ocean engineer-**

See AWARD, page 9

HPCwire  
February 11, 2013

## Green500 pioneer to accelerate mini-drone program

by Tiffany Trader

The Air Force's Office of Scientific Research (AFOSR) wants to design a better class of mini-drones – micro air vehicles (MAVs) in military parlance – and they know just the scientist to help them do it.

**Wu Feng, associate professor of computer science in the College of Engineering at Virginia Tech,** was tapped by the Air Force to head up a large-scale, multi-disciplinary project aimed at reducing the time it takes to simulate the aerodynamics of these tiny aircrafts.

The Air Force is providing Feng and his team with \$3.5 million in funding over three years with an option for a two-year extension and another \$2.5 million.

Feng maintains they can "achieve substantial speed-up over current simulations and provide significantly better utilization

See PIONEER, page 9

## DRONE - U.S. News & World Report - (Continued from page 1)

says Kochersberger. "Therefore it can't really be hacked very easily"...

Iran also claims it took control of the RQ-170 that the U.S. government said crashed there in 2011.

But Kochersberger doesn't believe that's a possibility in this case, adding those techniques are likely beyond the capabilities of the Iranian government barring an "extreme situation of a lot of things going wrong at the same time."

Drones and Iran have likely made headlines in recent years largely due to Tehran's propagand-

da efforts, not lapses by the U.S. military and intelligence circles, he says.

"[Drones] seem to be a hot topic right now. Maybe Iran is picking up on that," says Kochersberger. "They see some sensitivity

in the American public to drones, and possibly consider this another irritant to bring it up."

If anything, intelligence equipment the U.S. employs has become more resilient to attacks, he says.

## FOOTBALL - Voice Of Russia - (Continued from page 7)

required at every NFL game.

Despite these safety measures, more should be done to protect young players. Data compiled by researchers at the **Virginia Tech-Wake Forest School of Biomedical Engineering and Sci-**

**ences** showed that football players as young as seven sustain hits to the head comparable in magnitude to those absorbed by high school and adult players, and most of the hits are sustained in practices, not games.

The report noted that most

concussion symptoms disappear within two weeks as measured by current testing tools but that 10 to 20 percent of concussion sufferers "are still experiencing symptoms anywhere from weeks to months to years later." ...

**HPCwire • November 20, 2013**

# HPC Power Efficiency and the Green500

by *Kirk W. Cameron*

The first Green500 List was launched in November 2007 ranking the energy efficiency of supercomputers.

Co-founder **Kirk W. Cameron** discusses the events that led to creation of the Green500 List, its maturation, and future directions.

## An Early Supercomputer Efficiency “List”

In 2001 the notions of Green HPC and energy proportional computing were unknown. There was no tangible evidence that power was an issue in supercomputers. Vendors simply built large systems to customer specifications. Performance kept increasing exponentially and while performance efficiency was of

interest, power efficiency was not.

My early work in Green HPC was inspired by the tradeoffs inherent to power and performance. I imagined how varying power modes might make supercomputers more efficient. I speculated as to how such technologies would change the way we compute in HPC. But, in the beginning this seemed like a solution looking for a problem. No one at the time believed power was or ever would be an issue in HPC....

## Origins of the Green500 List

Particularly in those early years, I spent a lot of time considering data collection and power measurement. My team built infrastructures and designed tools and methodologies to ac-

See POWER, page 10

**RICHMOND TIMES-DISPATCH • February 15, 2013**

## Va. Tech to do Air Force supercomputing

BLACKSBURG — Virginia Tech is using a multimillion dollar contract award to accelerate research using supercomputers.

The land-grant university in western Virginia said the Air Force's Office of Scientific Research has awarded one of Tech's engineering professors with a three-year, \$3.5 million contract for the research.

The goal of the contract is to use supercomputers to increase the simulation speed of computations for a class of unmanned aerial vehicles called micro air vehicles.

**Associate professor Wu Feng** has pulled together a team of researchers from Virginia Tech and North Carolina State University for

the effort....

*(Editor's Note: This article also appeared in the *Virginian Pilot*.)*

**THE REGISTER, United Kingdom • February 6, 2013**

## Green supercomputer pioneer to model micro drones

by *Richard Chirgwin*

The U.S. Air Force Office of Scientific Research has slung some money in the direction of Virginia Tech to conduct fluid dynamics modelling as part of its Micro Air Vehicle – to you and I, micro-drones – projects.

The wrinkle in the contract, worth up to \$US6 million over five years, is that **researcher Wu Feng** is to bring his skills in low-

power supercomputing to the research.

Feng's CV includes the development of the Green 500 supercomputer list, the creation in 2002 of the Green Density cluster, and more recently, HokieSpeed. At number 11 on the worldwide 2011 Green 500 list, the 2,500-core, 185,000-GPU core HokieSpeed was at the time the most energy-efficient super in America,

and was put together at a cost of just \$US1.4 million.

Back to the current project: the USAF wants better simulation speed for the fluid dynamics research necessary to develop its MAVs, and believes Feng's work with HokieSpeed means he fits the bill....

*(Editor's Note: A version of this story also appeared in *Government Computer News* on 2/20.)*

## PIONEER

### HPCwire

(Continued from page 8)

of the underlying and co-designed hardware-software of a supercomputer.”

Feng is no stranger to innovation. A foremost expert in energy-efficient supercomputing designs, he co-founded the Green500 list in 2007. In 2011, Feng developed and built HokieSpeed, an accelerator-based supercomputer and one of the most energy-efficient systems of its kind....

## AWARD

### Product Design & Development

(Continued from page 8)

**ing; Adrian Sandu, professor of computer science; and Danesh Tafti, professor of mechanical engineering.** Eric de Sturler, professor of mathematics in the College of Science at Virginia Tech, is also a member of the team. From North Carolina State University, Hong Luo and Jack Edwards, both of mechanical and aerospace engineering, and Frank Mueller of computer science, will also be working on this research project....

**THE BALTIMORE SUN • September 27, 2013**

## Maryland, Virginia, New Jersey to team for drone tests

by *Matthew Hay Brown*

Maryland has agreed to work with Virginia and New Jersey on research into unmanned aircraft, a move that could strengthen Maryland's bid to land one of the six drone test sites to be awarded this year by the Federal Aviation Administration.

The three states are among the 25 finalists seeking an FAA-sanctioned site to study how unmanned aircraft might safely be integrated

into U.S. airspace. The FAA is scheduled to announce the six winners by Dec. 31.

In a letter this week to the heads of the U.S. Department of Transportation and the FAA, Gov. Martin O'Malley, Virginia Gov. Bob McDonnell and New Jersey Gov. Chris Christie cite decades of cooperation between the University System of Maryland, **Virginia Tech**, and Rutgers, and say they will work together regardless of which wins the FAA designation....

**VIRGINIA ENGINEER**  
April 8, 2013

## Virginia Tech professor receives ONR cyber security grant

**Danfeng “Daphne” Yao, assistant professor of computer science in the College of Engineering at Virginia Tech,** has received a three-year, \$450,000 grant from the Office of Naval Research (ONR) for research on cyber security. Specifically, Yao will quantitatively detect anomalies in Department of Defense (DOD) computers, mobile devices, command and control servers, and embedded systems.

In order to detect anomalies that might suggest a breach in cyber security, an observer must understand the intended behaviors of computer systems and programs. Once they are understood, then appropriate actions can then be taken, allowing attacks on hardware/software to be thwarted. However, complications arise because program and system behaviors are diverse and often unpredictable.

Yao’s research focus has been on this methodology development for novel, practical, and quantitative anomaly detection. Specifically, she is analyzing causal relations of events and producing instructions for detecting anomalies in computer programs, systems, and networks....

**BIO-MEDICINE • January 24, 2013**

# Virginia Tech computer scientists develop new way to study

In biology, molecules can have multi-way interactions within cells, and until recently, computational analysis of these links has been “incomplete,” according to **T.M. Murali, associate professor of computer science in the College of Engineering at Virginia Tech.**

His group authored an article on their new approach to address these

shortcomings, titled “Reverse Engineering Molecular Hypergraphs,” that received the Best Paper Award at the recent 2012 ACM Conference on Bioinformatics, Computational Biology and Biomedicine.

Intricate networks of connections among molecules control the processes that occur within cells. The “analysis of these interaction

networks has relied almost entirely on graphs for modeling the information. Since a link in a graph connects at most two molecules (e.g., genes or proteins), such edges cannot accurately represent interactions among multiple molecules. These interactions occur very often within cells,” the computer scientists wrote in their paper.

To overcome the limitations in the use of the graphs, Murali and his students used hypergraphs, a generalization of a graph in which an hyperedge can connect multiple molecules....

*(Editor’s Note: Versions of this article also appeared in: PHYS.org, R&D Magazine, Lab Manager Magazine, Nanowork, and Dublin (Ireland) News.)*

**NSF 360 • January 24, 2013**

## Virginia Tech computer scientists develop new way to study molecular networks

Source: Virginia Tech – **Computer scientists at Virginia Tech** developed a new approach to address the shortcomings in the computational analysis of the multiple ways interactions can occur within cells. Their award winning work may lead to further understanding of the interactions between molecules.

## POWER - HPCwire - (Continued from page 9)

curately track power usage in HPC systems. We ported our framework again and again to learn as much as we could about the tradeoffs between power and performance on emergent systems. We also built the first power-scalable HPC system prototype.

**Wu Feng** approached me in 2006 with the notion of creating a list of power efficient supercomputers akin to the Top500. ...

My primary role was to design the power measurement run rules for the first list. ...

After six months of discussion we solicited participation from the broader community. About a year later, in November 2007, we released the first list. The launch of the first Green500 List was an event. ...

**The Green500 List Matures**  
...While the Green500 was a bit isolated initially, it is now part of a thriving community of activists promoting energy efficiency. The Climate Savers Computing Initiative, The Green Grid, and the Energy Efficiency HPC Working Group are just a few of the proac-

tive groups that ensure energy efficiency is now a first-class constraint in HPC design, procurement and management. ...

### Legacy and Future of the Green500

The legacy of the Green500 is the establishment of a consistent, easy-to-follow set of power measurement run rules and the resulting data. Before the Green500 there was no widely accepted methodology for measuring supercomputer power, no way to track energy efficiency from year to year, and thus no way to encourage efficient design. The Green500 power measurement methodology has persisted nearly unchanged for almost seven years laying the foundation for a standardized methodology for collecting supercomputer power data. ...

The Future. Accelerators are here to stay, ... I think we’ll see accelerators dominate the Green500 List until they are replaced by a new technology or abandoned by all.

In every talk I’ve seen by Intel and NVIDIA, the consensus seems to be we are still really in the first

generation of accelerators with several significantly advanced generations to come. ...

It’s been more than 12 years since I started down the Green HPC path. I honestly thought after four to five years we would have exhausted all the interesting problems in HPC efficiency. The Green500 List’s impact has greatly exceeded my expectations. The introduction of a stable and fair methodology to track efficiency has withstood nearly seven years of scrutiny and highlighted the insatiable need for ongoing research. What I failed to appreciate in the beginning was that power efficiency as a problem would transform and perpetuate with every new generation of supercomputer. Like the challenges of performance, reliability, and security, power efficiency is here to stay.

### About the Author

**Kirk W. Cameron is a Professor of Computer Science and a Faculty Fellow in the College of Engineering at Virginia Tech.** Prof. Cameron is a pioneer and leading expert in Green Computing. ...

**NEW YORK TIMES • July 11, 2013**

# Modest Debut of Atlas May Foreshadow Age of ‘Robo Sapiens’

by *John Markoff*

WALTHAM, Mass. — Moving its hands as if it were dealing cards and walking with a bit of a swagger, a Pentagon-financed humanoid robot named Atlas made its first public appearance on Thursday.

C3PO it's not. But its creators have high hopes for the hydraulically powered machine. The robot — which is equipped with both laser and stereo vision systems, as well as dexterous hands — is seen as a new tool that can come to the aid of humanity in natural and man-made disasters.

Atlas is being designed to perform rescue functions in situations where humans cannot survive. The Pentagon has devised a challenge in which competing teams of technologists program it to do things like shut off valves or throw switches, open doors, operate power equipment and travel over rocky ground. The challenge comes with a \$2 million prize. ...

The debut of Atlas on Thursday was a striking example of how computers are beginning to grow legs and move around in the physical world. ...

The Atlas robots, which are made from aircraft-grade aluminum and titanium and each weigh 330 pounds, will take part in the Pentagon contest.

Six of them will be given to companies that are being asked to program them for a competition next year, with a \$2 million prize to the company that programs the robot most able to perform an elaborate rescue mission. The competition will be held at Homestead Miami Speedway in December.

The six teams, which were previously announced, are from the Florida Institute of Human & Machine Cognition in Pensacola, Fla.; Worcester Polytechnic Institute in Massachusetts; the Massachusetts Institute of Technology; TracLabs in Webster, Tex.; the Jet Propulsion Laboratory; and **Virginia Tech**. ...

**FORBES online  
(slideshow)  
December 11, 2012****RoMeLa's Robots****CHARLI-L1****(Cognitive Humanoid Autonomous Robot with Learning Intelligence-Lightweight)**

Meet CHARLI, perhaps the most photogenic of the 20 or so robots that have been developed at Virginia Tech's Robotics & Mechanisms Laboratory (RoMeLa).

**Mechanical Engineering professor Dr. Dennis Hong** founded the research lab in 2004 and continues to oversee it. Eventually, CHARLI could be used for domestic chores or elder care.

**IEEE SPECTRUM • June 27, 2013**

## DARPA VRC Challenge Results:

# Here's Who Gets an ATLAS Humanoid

by *Evan Ackerman*

Today, DARPA is announcing the results of the Virtual Robotics Challenge (VRC) portion of the DARPA Robotics Challenge (DRC). The six top teams will each be receiving a bunch of money, plus a Boston Dynamics ATLAS robot of their very own, which they'll use

to compete in the DRC trials later this year. Let's see who won!

The VRC is just the first stage of the DRC, which runs through the end of next year. By running an initial challenge in a virtual environment, DARPA was able to make the DRC accessible to lots of people who'd otherwise be un-

able to participate due to the cost and complexity of the required hardware. ...

**VRC Winning Teams:**

- WPI Robotics Engineering C Squad (WRECS), Worcester Polytechnic Institute, Worcester, Mass. (Track C, 39 points)
- MIT, Massachusetts Institute

of Technology, Cambridge, Mass. (Track B, 34 points)

- Team TRACLabs, TRACLabs, Inc., Webster, Texas (Track B, 30 points)
- JPL / UCSB / Caltech, Jet Propulsion Laboratory, Pasadena, Calif. (Track B, 29 points)

See ATLAS, page 12

**HPCwire • November 4, 2013**

## Computing model could lead to quicker advancements in medical research

*Source: Virginia Tech*

With the promise of personalized and customized medicine, one extremely important tool for its success is the knowledge of a person's unique genetic profile.

This personalized knowledge of one's genetic profile has been facilitated by the advent of next-generation sequencing (NGS), where sequencing a genome, like the human genome, has gone from costing \$95,000,000 to a mere \$5,700.

So, now the research problem is no longer how to collect this information, but how to compute and analyze it.

"Overall, DNA sequencers in the life

sciences are able to generate a terabyte — or one trillion bytes — of data a minute. This accumulation means the size of DNA sequence databases will increase 10-fold every 18 months," said **Wu Feng of the Department of Computer Science in the College of Engineering at Virginia Tech**.

"In contrast, Moore's Law (named after Intel co-founder Gordon E. Moore) implies that a processor's capability to compute on such 'BIG DATA' increases by only two-fold every 24 months.

Clearly, the rate at which data is being generated is far outstripping a

processor's capability to compute on it. Hence the need exists for accessible large-scale computing with multiple processors ... though the rate at which the number of processors needs to increase is doing so at an exponential rate," Feng added.

For the past two years, Feng has led a research team that has now created a new generation of efficient data management and analysis software for large-scale, data-intensive scientific applications in the cloud...

*(Editor's Note: This article also was published in Bio-Medicine.)*

BBC NEWS • July 12, 2013

## U.S. unveils 'Atlas' humanoid robot test bed

A humanoid robot called Atlas could pave the way for intelligent machines to help in the wake of natural disasters.

The two-metre tall robot was created as a test bed for a U.S. Defence Advanced Research Projects Agency challenge.

The Darpa challenge demands Atlas completes eight tasks that it might have to perform in an emergency.

Six teams have until December 2013 to develop software that will help Atlas complete the tasks....

Like a human, Atlas has two arms and legs and gets around by walking. It sees using a stereo laser scanning system and has gripping hands developed by two separate robotics companies.

Unlike humans, it has a high speed networking system built-in so it can com-

municate with its creators and pipe data back from disaster areas....

The teams will then have five months to refine Atlas's abilities before taking part in a series of trials. During those, a tethered version of Atlas will be expected to complete tasks which include driving a car, removing debris blocking doors, climbing a ladder, finding and closing a valve and connecting a fire hose.

The best performing teams in the December 2013 trials will win funding to continue refining Atlas so it can perform all eight tasks autonomously during the challenge finals in late 2014. ...

The teams taking part include researchers from Carnegie Mellon, Nasa's Jet Propulsion Laboratory, **Virginia Tech**, and hi-tech firm Schaft.

PULSE OF THE PLANET (National Public Radio) • November 4, 2013

## Treating Brain Tumors: New Procedures, New Tools

*Transcript:*

A new form of cancer treatment involves no drugs and practically no surgery. I'm Jim Metzner and this is the Pulse of the Planet.

*Davalos:* Cancer is just when the cells start to go astray and tend to rapidly divide and start behaving abnormally. What we are working on are several different types of cancer: brain cancer, pancreatic cancer and skin cancer.

**Rafael Davalos is an Associate Professor at Virginia Tech and Wake Forest University School of Biomedical Engineering and Sciences.**

*Davalos:* Typically one of the things that the oncologists would like to do is actually cut out the cancer if that's possible. Or, it's usually a combination approach where you cut out the bulk tumor and then you treat the rest of the tumor with some chemotherapeutics. Oftentimes

that's not possible due to the location of the tumor next to critical structures.

That led Davalos and his team to search for other ways to treat tumors.

We've developed a technique that is a minimally invasive surgical probe that you place into the targeted area and deliver a series of electrical pulses that kill the tumor without requiring the surgery and potentially without requiring the chemo-therapeutics. ...

TIRE BUSINESS • May 2, 2013

## Researchers on cusp of creating 'intelligent tire'

FAIRLAWN, Ohio — The technology of imbedding a sensor in a tire to help prevent an auto accident could be just around the corner.

That's the opinion of **Saied Taheri, director of the Center for Tire Research at Virginia Tech University.**

Mr. Taheri, an associate professor in the **mechanical engineering department** at the university, discussed "intelligent tires" in his keynote address April 22 at the ACS Rubber Division's spring technical meeting and education symposium in Fairlawn.

Mr. Taheri told the group progress is being made in developing and implementing tire- and vehicle-related sensory systems and control algorithms that will detect changes in pavement condition, traffic patterns, speed and distance from other vehicles.

With China and India primed to increase the number of vehicles on the road significantly — China alone is expected to add 500 million to 600 million vehicles by the year 2020 — that technology will be important in the interest of drivers' safety. ...

## ATLAS

IEEE Spectrum

(Continued from page 11)

• **TORC, TORC / TU Darmstadt / Virginia Tech, Blacksburg, Va. (Track B, 27 points)**

- Team K, Japan (Track C, 25 points)
- TROOPER, Lockheed Martin, Cherry Hill, N.J. (Track C, 24 points)
- Case Western University, Cleveland, Ohio (Track C, 23 points)

If you're counting, that comes out to **NINE TEAMS**, not the six that DARPA allocated funding and robots for! Here's what happened:

In a demonstration of good sportsmanship, Jet Propulsion Laboratory, which also has a DARPA-funded Track A effort with its own robot, decided to merge its two efforts and offer the bulk of the resources it earned in the VRC to other teams. ...

Each one of these teams is going to get a cool \$750,000 of funding from DARPA. ...

WLSL-10 (NBC)  
May 5, 2013

... For an all out showdown between some of the country's top young engineering minds.

WLSL-10's Tim Ciesco caught up with the team before they left... And has more on ground-breaking project.

If you think a car that gets 80 miles to the gallon sounds great, but impossible ... These **engineering students at Virginia Tech** hope they can prove you wrong.

"We're excited to see and find out what we can actually do when we get it on the road and testing and everything like that."

They're part of the **Virginia Tech hybrid electric vehicle team...**

One of 15 student groups across the U.S. and Canada selected to participate in the eco car 2: plug into the future contest. It's a three year competition organized by General Motors and the U.S. department of energy that challenges students to re-engineer a Chevy Malibu.

"With the five main goals of reducing petroleum energy use and greenhouse gas emissions while maintaining performance, safety, and consumer acceptability... It's really the premiere engineering education competition in the whole nation." They're currently on year two...

DEFENSE-AEROSPACE.COM • May 1, 2013

## Virginia Tech Looks To Lower Noise of Fighter Jets

Have you ever had a fighter jet fly over your home and the noise of the aircraft booms loud enough to rattle the windows? Imagine working on an aircraft carrier or air base, up close to the engines as they take off or land. Even with earplugs, the noise can be deafening.

**Virginia Tech's College of Engineering** is one of several U.S.-based research teams tasked with finding a way to reduce that deafening noise as part of a three-year project funded by the U.S. Office of Naval Research's Hot Jet Noise Reduction program.

The Navy's goal: Reduce noise exposure on the flight deck and its impact on the communi-

ties near air bases or in the path of jet flyovers. The project is related to a broader Navy initiative known as the Noise Induced Hearing Loss program. NASA also is partially funding the project.

"It is a subject that has received very little attention in the military world since it doesn't improve military vehicle performance," said **Todd Lowe**, originally of Richlands, Va., and now an assistant professor in the Department of Aerospace and Ocean Engineering (<http://www.aoe.vt.edu/>).

Yet it has created a problem of hearing loss and damage among military personnel, said

Lowe. Measured in decibels – the intensity of sound perceived by humans, the Navy estimates that jet noise from tactical aircraft can reach 150 decibels on the flight line as sailors and Marines prepare fighters and other aircraft for launching. Take that versus a lawnmower, which typically produces noise levels of 90 decibels.

Lowe is working on the project with **Wing Ng, the Chris Kraft Endowed Professor in the Department of Mechanical Engineering**. Of the total \$4 million project, Virginia Tech is to receive \$600,000 in various stages as research continues....

INNOVATIONS REPORT • January 16, 2013

## Virginia Tech engineers awarded \$800,000 to improve radio spectrum usage

Cognitive radios, the "intelligent" cell phones and police radios that help determine the best way to operate in any given situation, are becoming the radio platform of the next generation of wireless communications. They are also expected to play a major role in tactical communications for the U.S. Navy and for the Department of Defense," said **Thomas Hou, professor of electrical and computer engineering in the College of**

### Engineering at Virginia Tech.

However, a major technical obstacle remains and that is the availability of frequency space on an already crowded wireless array of networks.

Hou and his colleagues **Wenjing Lou of computer science** and **Hanif Sherah of industrial and systems engineering** have proposed some novel solutions for spectrum sharing that may avoid the presence

of interference.

Both the National Science Foundation (NSF) and the Office of Naval Research (ONR) are funding their work on efficient spectrum sharing, although each grant addresses different types of problems and different application domains....

*(Editor's Note: Versions of this article also appeared in: The Virginia Engineer, PHYS.org, Radio-Electronics.com, and GlobalNet.com.)*

VIRGINIA ENGINEER • February 21, 2013

## Virginia Tech awarded construction safety grant

**Virginia Tech's Department of Industrial and Systems Engineering** has received a five-year \$470,703 grant from the National Institute of Occupational Safety and Health to expand its graduate education to address construction-related

occupational safety and health.

The Department of Industrial and Systems Engineering and the Center for Innovation in Construction Safety and Health, now a part of the Institute for Critical Technology

and Applied Science, have engaged in occupational safety and health research and education for the past 35 years, and have been supported by the National Institute of Occupational Safety and Health (NIOSH) to provide graduate training in safety and ergo-

nomics since 1992.

This new award will support the program's expansion into providing additional focused education and training for those seeking careers in occupational safety and health within the construction sector. ...

## RANKINGS

### Infoworld

(Continued from page 1)

alumni from 1,016 schools....

Best schools for computer science majors  
Source: PayScale...

7. **Virginia Polytechnic Institute and State University (Virginia Tech)**

Starting pay: \$66,700

Mid-career pay: \$117,000...

## INEDIBLE - Popular Science - (Continued from page 1)

otherwise be used for food, like corn cobs and leaves. The "enzyme cascade" enabled the cellulose molecules to reconfigure into amylose, which is a form of starch. A key ingredient in this process, a special polypeptide cap, is found in potatoes.

The resulting product is not exactly the future of bread flour, but it can be used as a fiber source, or food-safe biodegradable packaging, perhaps. The remaining portion of the original material was treated with mi-

crobes to produce a form of glucose that can then be used for ethanol. The whole process didn't require any unusual heat or chemical reagents, other than the enzymes themselves, so it would be easy to reproduce on larger scales, Zhang and his colleagues say.

Cellulose is the most common carbohydrate – indeed the most common organic material – on the planet, so using it for food could be a superb way to feed millions of people, they argue....

## JELLYFISH

Wired

(Continued from page 1)

Covered in silicone to replicate the jellyfish's wavy, bioluminescent mesoglea — the jelly, basically — the Cyro weighs a staggering 170 pounds, all thanks to a five-year grant from the Office of Naval Research.

The robot is still a prototype, years away from being in the water. But it represents a new kind of testbed for oceanographic surveillance, the Cyro's basic application. Like the bird- and insect-shaped drones the Air Force is developing, a jellyfish-like spybot has a natural stealth advantage.

"Mimicking a natural animal found in a region allows you to explore a lot better," says Alex Villanueva, a graduate student at Virginia Tech working on the Cyro.

It's a much different model for underwater propulsion than the Navy's used to. Jellyfishes move, uniquely, by flapping themselves about.

"It's not necessarily the best hydrodynamic propulsion mechanism, but the jellyfish has a very efficient metabolism: energy going in comes out as hydrodynamic energy," Villanueva says. The Cyro isn't there yet, but it gets three to four hours of swimming time out of its rechargeable nickel metal hydride battery....

*(Editor's Note: A version of this story also appeared (WITH VIDEO) in: Popular Science, Fox News, BioPortfolio, Grist.org, Innovations Report, KSAZ-TV, KTBC-TV, L.A. Times, Google News, Asian News, Kurzweil Accelerating Intelligence, International (ANI), UPI.com, Eurasia Review, gizmag, iStockAnalyst, Phys.org, Product Design & Development, RedOrbit, Scientific Computing & Instrumentation, Time.com, Youtube, Discovery News, TechHive, DigitalJournal, NBCNews, Counsel and Heal, Reason, R&D Magazine, Wilmington Star-News, WAGA-TV, Small Business IT World, TechEye.net, TG Daily, WAGA-TV, Wireless Design & Development, and World Industrial Reporter.)*

CENTER FOR BIOLOGICAL DIVERSITY • March 4, 2013

## Autonomous robot jellyfish being developed for military surveillance

by Matthew Humphries

Talk about military surveillance and images of unmanned drones come to mind. But typically they are air and ground based units. The US Navy wants to get in on the action, though, and has tasked **Virginia Tech College of Engineering** with developing an autonomous robotic jellyfish.

The project has been ongoing since last year thanks to a 5-year grant from the Office of Naval Research. **A lab in Virginia Tech's Durham Hall** has been outfitted with a tank containing 600 gallons of water that forms the hub of the research. The task is to figure out how a jellyfish functions, and then apply it to a robotic version that could be launched and left to function in the ocean for anything from a few weeks to months and even years.

The first version of this robotic jellyfish was unveiled last year at the lab. It was called Robojelly and was roughly the diameter of a man's hand. Several months later and a second version has been created. This time the robot is called Cryo, measures 5 foot 7 inches in length, and weighs 170 pounds.

Cryo consists of a central core of components in a waterproof shell connected to eight moving arms. Draped over this is a large and soft piece of white silicone, which comes into contact with each of the arms and remains flexible. Combined, the arms and silicone act as a propulsion system mimicking how real jellyfish move around....

*(Editor's note: A version of this article also appeared in: Marine Insight News, Marine Technology Reporter, Defense Systems, Washington Business Journal, and Naval-technology.com.)*

UNITED PRESS INTERNATIONAL • September 23, 2013

## Drug patch treatment sees new breakthrough

An assistant professor with the **Virginia Tech-Wake Forest School of Biomedical Engineering** has developed a flexible microneedle patch that allows drugs to be delivered directly and fully through the skin. The new patch can quicken drug delivery time while cutting waste, and can likely minimize side-effects in some cases, notable in vaccinations and cancer therapy.

News of the delivery technology was published in a recent issue of the scientific

journal, *Advanced Materials*. Leading development of the flexible patch was **Lisett Bickford, now an assistant professor and researcher of biomedical engineering and the mechanical engineering, both part of the Virginia Tech College of Engineering**.

Work on the technology was completed while Bickford was a post-doctoral research associate at the University of North Carolina Chapel Hill....

Bickford, with her research team, including Chapel Hill

graduate student Katherine A. Moga, were able to develop a new flexible microneedle patch that forms to the skin directly — think a regular household bandage — and then fully pierces the skin and dissolves. Bickford said the softer, more malleable and water-soluble material also allows for more precise control over the shape, size, and composition of the patch, with little to no waste....

*(Editor's Note: This article also appeared in: AllVoices, Asian News International, AzoNanotechnology, e! Science News, Nanowerk — Online, Netindia123.com, News-Medical.net, Newstrack India, PHYS.org, ScienceDaily, ScienceNewswire, TruthDive, Toronto Telegraph, Nanotechnology Now, Nature World News, Roanoke Times, Science World Report, Big News Network, Innovations Report, Manufacturing Chemist — Online, Toronto Telegraph, World Pharma News, Medical News Today, mediLexicon.)*

WSLS-10 (NBC) • April 2, 2013

## Virginia Tech, UVa. to work on I-66 infrastructure test project

by WSLS Staff

Governor Bob McDonnell today launched a research project with the University of Virginia and **Virginia Tech**, which will use a section of Interstate 66 in Fairfax County as a test bed for connected-vehicle and connected-infrastructure technology. The four-square-mile test bed is located on I-66 between the Capital Beltway

(Interstate 495) and Nutley Street, and on parallel U.S. 50 and U.S. 29.

Speaking about the announcement, Governor McDonnell remarked, "This test bed will allow Virginia researchers to develop a range of applications that will result in faster infrastructure repair and maintenance, better emergency-response times and incident and congestion management. ...

**WORCHESTER TELEGRAM & GAZETTE • April 29, 2013**

# Nerds get revenge on 'Big Brain Theory'

*By David Wiegand*

How many reality competition shows end with the host telling a contestant, "Pack your plasma torch and go?"

None that I know of, but that's what the Discovery Channel is banking on with its new series "The Big Brain Theory: Pure Genius," premiering

at 10 p.m. Wednesday.

If the title makes you think of a certain CBS hit sitcom about a bunch of nerds, well, "bazinga" — that's the point.

The male and female nerds on "Big Brain" theory are real-life Sheldon Coopers and Amy Farrah Fowlers, and some of them are just as odd as their

fictional TV counterparts. ...

The contestants pair off in two teams and compete with each other to solve scientific problems. ...

The other team is led by former NASA robotics specialist **Amy Elliott, now pursuing a Ph.D. in mechanical engineering at Virginia**

**Tech.** Her team operates like a well-oiled machine, but that doesn't necessarily ensure eventual success.

In the end, one of the contestants is sent packing by the judges.

*(Editor's note: A version of this article also appeared in: Indiana Gazette and the Cape Cod Times.)*

**WASHINGTON SQUARE NEWS • August 25, 2013**

## Women are needed in the computer sciences

*by Marcelo Cicconet*

What would TV comedy be without stereotypes? Certainly very different, considering that the most watched sitcom in the past season relies heavily on the trope that a blonde girl's IQ could be higher, and that technology and science-oriented guys utterly fail at socializing.

Although shows like "The Big Bang Theory" are obviously meant to entertain and not to influence the career paths of a young teenager, unfortunately they fuel the perception that science is for socially-awkward geeks — a perception that drives people, especially women, away from fields in computer science.

According to the The National Center for Women & Information Technology, in 2010

only 18% of computer and information science graduates were women, down from 37% in 1985. Data from the Higher Education Statistics Agency also shows the downhill-trend continuing — 17.4 percent in 2012....

Some schools are taking action to bring more women into fields of technology. At University of Texas at Austin and **Virginia Tech**, new female students share housing with more experienced female engineering students, reducing intimidation and creating a sense of community. ...

**BAIRD MARITIME  
November 18, 2013**

### Interferry:

#### Safety a key concern

Ferry and passenger vessel safety was a key theme at Interferry's thirty-eighth annual conference, with panel discussions focusing on the human element of safety, concerns over design and safety in developing nations....

Three presentations featured innovations with potential to improve ferry safety in developing nations. **Leigh McCue-Weil, associate professor in Virginia Tech's aerospace and ocean engineering department**, demonstrated two mobile phone apps devoted to small craft motion and vessel drills....

**ROANOKE TIMES • October 8, 2013**

## Roanoke touts reduction of its carbon emissions

*by Matt Chittum*

It's amazing what a difference changing a few light bulbs can make. OK, more than a few.

Roanoke swapped out old-fashioned bulbs for energy-efficient LED bulbs and other energy-efficient lighting in city facilities, street lights and even traffic signals in recent years, a move that was a major contributor to the city reducing its carbon emissions by 15.4 percent and saving \$577,000 in energy bills. Those savings were bought by about \$2 million in capital costs.

Putting LED bulbs in traffic signals alone accounted for one-third of the 4.2 million kilowatt-hours reduction in the city's electricity usage since 2005, according to a report to the Roanoke City Council on Monday. The report took stock of the city's goal to reduce its carbon emissions — which contribute to global warming — by 12.5 percent before the end of 2014. With nearly a year and a half to go, the city is ahead of pace by nearly 3 percentage points, said **Sean McGinnis, director of green engineering at Virginia Tech**, who drafted the report using data provided by city staff.

The measures, which also included things like using digital controls for heating and cooling in some buildings and using hybrid and electric vehicles, lead to savings against what the city would have paid had the energy saving efforts not been made, McGinnis said. Rising fees for electricity, gasoline and diesel meant the city's energy costs still increased by \$5.2 million, or about 51 percent, but they would have gone up by nearly \$600,000 more, he said.

"This is real money in our pockets," McGinnis said. ...

**WDBJ-7 (CBS)  
September 17, 2013**

## Long lines for Virginia Tech's 34th Engineering Expo

*by Orlando Salinas*

The lines were long Monday outside Squires Student Center at Virginia Tech.

2013 marks the 34th year that Virginia Tech's held what's called the "**Engineering Expo**" on the second floor inside Squires. Billed as the second largest student-run career fair in America, the Engineering Expo began at 10 am Monday and the line snaked around Squires....

ROANOKE TIMES  
April 14, 2013

## Google tests self-driving car at Virginia Tech's Smart Road

by Jacob Demmitt

Google has teamed up with Virginia Tech researchers as it works to bring its vision of cars that can drive themselves one step closer to reality.

The technology giant has spent the past month in Blacksburg putting amateur test subjects behind the wheel of one of its self-driving cars at the **Virginia Tech Transportation Institute's Smart Road**. The drivers were confronted with a range of scenarios and judged on how they responded.

Semiautonomous cars switch control back and forth between the driver and the vehicle. Among other questions, Google wanted to know how well people were able to manage these transitions.

The research has been a collaboration involving the company, Tech and government organizations such as the U.S. Department of Transportation. Google supplied the car, Tech the expertise and the DOT \$2 million worth of funding....

On Tuesday, VTTI and Google hosted a carefully orchestrated media event to show off what their tricked-out Lexus can do.

... The car looked pretty standard, but had a spinning device on the roof that helps it keep track of where it is. It's equipped with laser range finders, radar and cameras to monitor its surroundings and react accordingly. ...

BBC NEWS • April 14, 2013

## Blind drivers at the steering wheel

by Damon Rose

How would you feel if a blind person pulled up next to you in a car?

This time last year, Google released a video showing a blind man driving a car. He was seen going to a local drive-through restaurant near his home in San Jose, California, and later collecting dry cleaning without any difficulty.

Steve Mahan, the driver, heads the Santa Clara Valley Blind Center and hadn't been in the driver's seat of a car since giving up his license eight years earlier after losing 95% of his sight. On this occasion, the only action he performed was to press a start button. He couldn't control

the car independently, but the video showed an intent to make driving more accessible and safe for everyone.

Innovations in automated driving have led to speculation that blind people may be able to take to the wheel. But do they want to drive – and could it become a reality?...

... **Virginia Tech** has adapted a vehicle with audio signals, laser scanners and devices such as vibrating gloves. These give clues to the driver about which way to turn the steering wheel or when to brake. They've successfully tested it at low speeds on a dedicated private speedway track....

BALTIMORE BUSINESS JOURNAL • October 8, 2013

## NSF-backed DC I-Corps kicks off first cohort with 20 federal laboratory, university, and regional inventors, entrepreneur teams

COLLEGE PARK, MD/PRNewswire-USNewswire/ – DC Innovation Corps (I-Corps), the new, National Science Foundation-backed program aimed at translating the region's vibrant research community into successful startups and licensed technologies, kicks off its first cohort this week at the George Washington University with 20 teams of inventors and current and aspiring entrepreneurs.

The cohort launches with a diverse mix of teams from the Children's National Medi-

cal Center, Johns Hopkins University, University of Maryland, the George Washington University, **Virginia Tech**, George Mason University, and regional entrepreneurs from the Emerging Technology Center, Maryland Technology Enterprise Institute (Mtech) and bwtech@UMBC.

DC I-Corps guides entrepreneurial teams through an intense, seven-week program based upon the Silicon Valley-tested Lean Startup Model, which emphasizes developing a Minimal Viable Product, gathering extensive feedback from potential customers (a minimum of 100), pivoting and iterating.

Teams seek a product-market fit for their innovation while developing a repeatable and scalable business model.

"Nothing lays a better foundation and prepares startups for the rapid change and challenges of the 21st century than the Lean Startup Model," said DC I-Corps Director Edmund

Pendleton. "We believe that combining this methodology with the research churning from world-class universities and federal laboratories in this region is the equivalent of releasing lightning from a bottle. Great companies that bolster the region's economy and bring important products into our lives are bound to emerge."

Teams selected for DC I-Corps, segmented by institution, with brief descriptions of the technologies they are developing and entrepreneurial lead, include... **Virginia Tech ...**

Dynamic Safety Systems: worker safety system with online reporting tools and data analysis. Entrepreneurial Lead: Brady Redfearn, graduate student.

A joint effort of the University of Maryland, the George Washington University and Virginia Tech, DC I-Corps focuses on innovations coming from engineering fields, medical/health/life sciences, and physical and computer sciences.

See DC I-CORPS, page 17

EDTECH • April 25, 2013

## The converted: Tablet PCs and convertible tablets gain footing on campus

by Amy Burroughs

Colleges and universities that incorporate tablet PCs into curriculums find the devices to be a powerful blend of laptop and slate, especially when faculty are prepared to make the most of what tablets offer....

Highlighting the work of professors who embrace technology encourages others to follow suit, says **Dale Pokorski, director of information technology for the Virginia Tech College of Engineering**. "Peer mentoring is probably the best way: having one faculty member, who is well respected, adopt a product and help other faculty members do it," she says.

**Virginia Tech's College of Engineering** requires its 7,000 students to buy one

See TABLETS, page 17

**BLUEFIELD DAILY TELEGRAPH (Bluefield, W.Va.) • February 6, 2013**

## VT, CONSOL team to research carbon storage alternatives

*by Greg Jordan*

GRUNDY, Va. — A pilot project for technology that could both reduce carbon dioxide emissions and enhance the extraction of usable methane is getting underway in Buchanan County, Va.

Virginia Tech's Virginia Center for Coal and Energy Research is teaming with CONSOL Energy Inc. on exploring potential carbon storage alternatives to be conducted in Buchanan County, Va., Virginia Tech announced in a statement Tuesday.

What is being tested is the potential of using coal seams that cannot be mined as storage for carbon dioxide. The project between the Virginia Center for Coal and Energy Research and the Cecil Township, Pa.-based CONSOL

Energy is being funded by the U.S. Department of Energy's National Energy Technology Laboratory....

CONSOL Energy will donate the use of three coalbed methane wells in the pilot project to be conducted by Virginia Tech's Department of Mining and Minerals Engineering part of the College of Engineering....

"The research will test the ability to inject carbon dioxide into coal seams that cannot be mined, as well as the potential to enhance coalbed methane recovery," said Michael Karmis, the Stonie Barker Professor of Mining and Minerals Engineering at Virginia Tech and director of the research center. "I must praise the tremendous cooperation of the gas operator, CONSOL Energy's CNX Gas; and the mineral

owner, Harrison-Wyatt LLC, whose generosity helps make this most important research possible."

"The results of this test will be vital to assess the potential of geologic storage in Appalachian coal seams as a safe and permanent method to mitigate greenhouse gas emissions while enhancing coalbed methane recovery," Karmis said....

**TIMES NEWS • October 4, 2013**

## Carbon Capture: Virginia Tech professor says 'entire new industry is being created'

*by Stephen Igo*

WISE — Carbon capture and utilization storage (CCUS) technologies are still a long way from commercial application but possess promising economic potential, Dr. Michael Karmis said during a lecture at The University of Virginia's College at Wise on Friday.

"An entire new industry is being created," said one of the nation's leading experts on the topic. "Simply having (carbon dioxide) reservoirs is an economic resource."

Karmis is a Stonie Barker professor at Virginia Tech's Department of Mining and Minerals Engineering and director of the Virginia Center for Coal and Energy Research. ...

**TRI-CITIES.COM • October 6, 2013**

## Coal emerges as issue in race for governorship

RICHMOND — Coal has emerged as a defining issue in the race for Virginia's governor, and the stark divide between Republican Ken Cuccinelli and Democrat Terry McAuliffe has grown wider with the release of new federal pollution limits on coal-fired power plants.

The political debate centers on potential job losses southwest Virginia's coal industry would sustain under the proposed pollution guidelines.

Cuccinelli contends that McAuliffe is complicit with the Obama administration's proposed regulations, which he contends would devastate the state's rugged, economically depressed coalfields region.

In Virginia, however, mining and miners have been shed at a steady pace over the last two decades, primarily for geological rather than political reasons, and well ahead of this pitched race for governor....

"A lot of what's underground in Buchanan County ends up on the world met market," said Nino Ripepi, an assistant professor with the Department of Mining and Minerals Engineering at Virginia Tech. "I think we had record exports last year of coal on the world market. If that stays strong, we'll continue to mine our met deposits."

But he agrees with Hudson that most of the coal to be found in Virginia simply is not economically viable to mine.

"We've mined the easier-to-get coals,"

he said. "I don't see it getting back to 1990 levels, by no means..."

*(Editor's Note: This article also appeared in: The Washington Post, Dayton Daily News, Elkins Inter-Mountain, Enquirer-Herald, Fort Mill Times, Houston Chronicle, Intelligencer, The Online Journal, Lexington Herald-Leader, Marietta Times, Middletown Journal, News Leader, NewsOK.com, Seattle Post-Intelligencer, Times Leader, Times Union, Tyler Star News, Weirton Daily Times, Wetzel Chronicle, and WHAS-TV.)*

## DC I-Corps - Baltimore Business Journal - (Continued from page16)

The program builds upon the successful National Science Foundation (NSF) I-Corps initiative, but expands its scope to cover researchers and technologists with no prior NSF affiliation or support....

*(Editor's Note: This article also appeared in:*

*Asian Hospital & Healthcare Management, Bio-Portfolio, Cloud Computing Journal, The Herald, iStockAnalyst, IT News, KAIT-TV, KBMT-TV, KCAU-TV, KCBD-TV, KCEN-TV, KCTV-TV, KEYC-TV, KEYC-TV, KFJX-TV, KFMB-TV, and KHQ-TV.)*

## TABLETS - EdTech - (Continued from page16)

of four convertible tablets: the Fujitsu T732 or T902, the Lenovo Thinkpad X230T or the HP Revolve 810 G1. The devices have worked well, Pokorski says, with one caveat: "If the faculty member continues teaching the same way they've always taught, you're not going to see a lot of change in learning outcomes."

Students report the most satisfaction with

tablet PCs when professors use them interactively, Pokorski says. In a survey of faculty last year, more than 48 percent used tablets to annotate slides, but a smaller percentage adopted interactive tools. However, the college's first-year classes are paperless: Students submit work digitally, and many professors use DyKnow for interactive learning....

DUBLIN (Ireland) NEWS • August 20, 2013

## Equipping construction helmets with sensors can detect onset of carbon monoxide poisoning

Research calling for the use of a wearable computing system installed in a helmet to protect construction workers from carbon monoxide poisoning, a serious lethal threat in this industry, has garnered the **Virginia Tech** investigators a Best Paper Award from a prestigious scientific and engineering community.

This award will be presented at the August 17-21, 2013 Institute of Electrical and Electronic Engineers (IEEE) Conference on Automation Science and Engineering.

Carbon monoxide poisoning is a significant problem for construction workers in both

residential and industrial settings. The danger exists because the exhaust from gasoline-powered hand tools can quickly build up in enclosed spaces and easily overcome the tool's users and nearby co-workers.

In the paper, the researchers explained how they integrated a pulse oximetry sensor into a typical construction helmet to allow continuous and noninvasive monitoring of workers' blood gas saturation levels.

The results of their study showed that a user of this helmet would be warned of impending carbon monoxide poisoning with a probability of greater than 99 percent.

The award-winning research and resulting paper was written by Jason B. Forsyth, of Durham, N.C., and a Ph.D. candidate in computer engineering, his adviser **Thomas L. Martin, professor of electrical and computer engineering, Deborah Young-Corbett, assistant professor of civil and environmental engineering and a member of the Myers-Lawson School of Construction**, and Ed Dorsa, associate professor of industrial design....

"This helmet is only a first step toward our long-term vision of having a network of wearable and environmental sensors and intelligent personal protective

gear on construction sites that will improve safety for workers," according to their report. "While this helmet targets carbon monoxide poisoning, we believe there are compelling opportunities for wearable computing in reducing injuries due to falls, electrocution, and particulate inhalation, as well as workers on foot being struck by vehicles..."

(*Editor's Note:* This article also appeared in: *Innovations Report, ScienceNewsline, News-Medical.net, NetNewsledger.com, Electronic Component News, Laboratory Equipment, MDLinx.com, mediLexicon, Times of Northwest Indiana, R&D Magazine, and Wireless Design & Development.*)

NEWS-MEDICAL.NET  
June 11, 2013

### Virginia Tech's Chang Lu awarded new NIH grant for research on cancer

Progress made in the technology development for studying protein-DNA interactions, conducted by **Chang Lu, associate professor of chemical engineering** and a core faculty member of the **School of Biomedical Engineering and Sciences at Virginia Tech**, has led to the National Institutes of Health (NIH) awarding a new project to continue his groundbreaking work.

Working with Albert Baldwin, a cancer biologist of the University of North Carolina at Chapel Hill, they are advancing the development of a specific technology that Lu said could "revolutionize the study of molecular mechanisms involved in cancer development in multiple aspects."

Lu and Baldwin are using an investigative procedure called chromatin immunoprecipitation (ChIP) to examine the protein binding to DNA sites that can lead to cancer....

(*Editor's Note:* This article also appeared in: *BioPortfolio.*)

WTOP-FM Online • August 8, 2012

## Creators of Hard Hat-Mounted CO Monitor Win Award

By combining wearable computing with a non-invasive blood monitor, **researchers at Virginia Tech** have come up with a hard hat-mounted system for preventing carbon monoxide poisoning, Douglas McCormick reported Aug. 21 in *IEEE Spectrum*. His report said the researchers won the IEEE Transactions in Automation Science and Engineering's Best Paper Award for their achievement.

... "Extending the electronic measurement of our lives into the workplace, researchers at Virginia Tech combined wearable computing and prevention-through-design to develop a practical sensing and alarm system that can tell when a worker's blood oxygen level is cratering and prevent carbon monoxide poisoning."

The authors of the paper

are Jason Forsyth, **Thomas L. Martin, Deborah Young-Corbett**, and Ed Dorsa, McCormick reported.

He said they combined a

pulse oximeter, a radio transmitter, a nine-volt battery, and a 3.3-volt regulator into a system that adds little weight to the hard hat....

HealthCanal.com • July 1, 2013

## New microfluidic chip can help identify unwanted particles in water and food

A new process for making a 3-D microstructure that can be used in the analysis of cells could prove useful in counterterrorism measures and in water and food safety concerns.

The research, conducted by members of **Virginia Tech's Microelectromechanical Systems Laboratory in the Bradley Department of Electrical and Computer Engineering**, is the focus of a recent article in the *Institute of Electrical and Electronic Engineers' Journal of Microelectromechanical Systems*.

In their engineering laboratory, the researchers developed a new microfabrication technique to develop 3-D microfluidic devices in polymers. Microfluidics deals with the performance, control, and treatment of fluids that are constrained in some fashion, explained **Masoud Agah, director of the laboratory**.

See CHIP, page 19

**NSF SCIENCE360 • August 20, 2013**

# Try clapping your wet hands: *A physics lesson from engineers*

**Sunny Jung** continues to redefine the views on the laws of physics, and in doing so, impacts the research on topics as varied as drug delivery methods to fuel efficiency.

In a paper appearing this month in *Physical Review E*, Jung and five colleagues reported on the dynamics of squeezing fluids using a simple experiment of clapping with wet hands. As an engineer, Jung described “this outburst of fluid motion” as the unusual physical phenomenon.

Earlier in his career, **Jung, an assistant professor of engineering science and mechanics at Virginia Tech**, made headlines in *the New York Times* for his study with peers from MIT and Princeton on how a cat exploits fluid inertia to defeat gravity and actually pulls liquid into the feline’s mouth. The implications of this research can be used in understanding more about the technology of microfluidics, the behavior of fluids at the microscale level, including pharmaceutical drug deliveries into the fluids in the human body.

In a different study involving liquids, Jung showed how certain identical flows of fluids, normally thought to coalesce to form a single mass of fluid, would not if the speed of the flow was increased beyond a certain threshold.

Understanding this reaction of fluid flows has implications for the mixing of fuel fluids in order to maximize combustion to attain fuel efficiency.

Jung’s achievements in fluid flow won him the 2010 international Milton Van Dyke award from the American Physical Society. He had only received his doctorate in physics five years earlier from the University of Texas at Austin....

Now, Jung’s most recent paper on fluid flow speaks to the reaction of thin films of liquid when compressed vertically between two objects. The film is ejected radically and generates fluid treads and droplets at a high speed. Other comparable fluids such as gasoline and oil

behave similarly but a very viscous fluid such as honey would not.

Oil companies are interested in this research because of the oil separation process. In this process, “such interfacial dynamics of multi-phase fluids serve as one of the fundamental mechanisms,” Jung explained.

*(Editor’s Note: This article also appeared in: Chem Europe, Science News, Laboratory Equipment, Phys.org, Product Design & Development, RedOrbit, and ScienceDaily.)*

**RESEARCH AND DEVELOPMENT • November 27, 2013**

## A celebration of a Persian mystic leads to better understanding of dynamics

**James Hanna** likes to have fun with his engineering views of physics.

So when he and his colleague Jemal Guven visited their friend Martin Michael Müller in France on a rainy, dreary day, the three intellects decided to stay in. Guven, absent-mindedly switching between channels on the television, stumbled upon a documentary on whirling dervishes, best described as a Sufi religious order, who commemorate the teachings of 13th century Persian mystic and poet Rumi through spinning at a fixed speed in their floor

length skirts.

“Their skirts showed these very striking, long-lived patterns,” Hanna, the engineer, recalled.

The film caused physicists Guven and Müller to think about structures with conical symmetry, or those shapes that can be defined as a series of straight lines emanating from a single point.

By contrast, Hanna, the engineer with a physicist’s background, thought about rotating flexible structures, namely strings or sheets.

The three put their thoughts together and the whirling dervishes became the inspiration

for a technical paper appearing in the Nov. 27 issue of the *New Journal of Physics*, published by the Institute of Physics and the German Physical Society. They gave their work the slightly bemusing title of “Whirling skirts and rotating cones...”

In terms of the impact of their work, it widens the scientist’s understanding of the dynamics of flexible objects and of pattern formation in rotating systems.

They may also “shed some light on the previously known instabilities of turbine disks and hard disks,” Hanna said....

## CHIP

HealthCanal.com

(Continued from page 18)

As a result of this work, **Agah, associate professor of the Bradley Department of Electrical and Computer Engineering and of the Virginia Tech-Wake Forest School of Biomedical Engineering and Sciences, and Amy Pruden, professor of civil and environmental engineering at Virginia Tech**, have received a National Science Foundation award of \$353,091 to use the technology and develop new microchips named 3D- $\pi$ DEP standing for “three-dimensional, passivated-electrode, insulator-based dielectrophoresis” for pathogen detection.

The NSF grant will allow them to focus on the isolation of waterborne pathogens that represent one of the “grand challenges to human health, costing the lives of about 2.5 million people worldwide each year,” Agah and Pruden said....

**POPULAR MECHANICS (slideshow) • January 2, 2013**

## The 10 Tech Terms to Know in 2013

by Rachel Z. Arndt

In 2013 we will sequence DNA faster and cheaper than ever, design radios that intelligently find open spectrum amid the crowded airways, and charge EVs without plugging them in. Consider this your cheat sheet for the year in tech. ...

### Co-Robotics

Old-school industrial robots work best alone — try to help an assembly-line welding bot and

you’ll probably get welded. But the next generation of robots will work closely with humans, augmenting our capabilities and compensating for our weaknesses. That’s why the National Robotics Initiative is pouring up to \$50 million a year into co-robotics. ... A key first step to robot-human interaction: full-size humanoids such as UPenn and **Virginia Tech’s SAFFiR**, which will help fight fires.

FORBES • November 6, 2013

## When Is Improved Safety Not Worth The Price?

by *Jeremy Anwyl*

A few weeks back I had the opportunity to speak at the Governor's Highway Safety Association's (GHSA) annual conference alongside safety heavyweights ...

I am going to let you in on a

little secret. You know the numbers we often hear—things like 27% of all accidents “involve” cell phones or 16% of accidents are caused by “rubbernecking”—there is not much hard data to back them up. It is not that people are trying to intentionally mislead, it's

the source data that is lacking. ...

Each jurisdiction has its own way of doing things and there is limited standardization. The result is data that is ambiguous and open to interpretation.

This is why **Tom Dingus**,  
**Director of the Virginia Tech**

**Transportation Institute** is right when he says we know a lot less than we think we know about why people crash.

A good example of this is distracted driving, which is an issue that has become synonymous with cell phone use. ...

AUTOMOTIVE SAFETY ENGINEERING online • July 2, 2013

## SAE International Launches New Scholarly Journal on Transportation Safety

WARRENDALE, Pa., — A new scholarly journal focusing on accident prevention and occupant protection – specifically accident reconstruction, injury investigation, intra-vehicle safety mechanisms, and mitigation related to human travel – is now available from SAE International.

*The SAE International Journal of Transportation Safety* encompasses basic research as well as issues of vehicle design and infrastructure.

...Editor-in-chief of the journal is **Dr. Warren Hardy**, an associate professor of mechanical engineering at **Virginia Tech** and Wake Forest universities. He serves as the director of the **Virginia Tech-Wake Forest University Center**

**for Injury Biomechanics** on the Virginia Tech campus and holds a bachelor's degree in Engineering Science (Bioengineering option) from the University of Michigan; and a master's degree in Mechanical Engineering (Biomechanics) and a PhD in Biomedical Engineering from Wayne State University.

His research interests are impact and injury response and tolerance, macro- and micro-mechanisms of trauma, and automotive crash testing; his teaching interests are biomedical instrumentation design and experimental methods in impact biomechanics trauma. ...

*(Editor's Note: This article also appeared in: Markets.financialcontent.com)*

NEWS TRIBUNE (Tacoma, Wash.)  
August 24, 2013

## Red-light camera always there

by *Mark Huffman of Consumer Affairs*

Cameras at traffic signals, known to drivers as “red light cameras,” are there to catch you if you blow through a red light. The chances of a police officer being at the intersection to nab you are pretty remote. But the camera is always there.

When a car runs a red light the camera captures the license plate number. A few days later, the driver receives a picture of their car going through an intersection, along with a ticket.

But these cameras have become increasingly controversial ... There have been a number of lawsuits against municipalities that employ them ... by drivers who have challenged the legality or validity of their tickets.

And there is a larger issue. Municipalities ... have discovered they are a lucrative source of revenue at a time of shrinking budgets. There is a growing suspicion that cities and towns are adjusting the timing of the lights to write more tickets....

The timing of yellow lights is a significant issue for drivers under the best of circumstances. For drivers, it requires a judgment call, unlike the unambiguous red and green signals.

“There are circumstances, as you approach a yellow light, where the decision is easy,” said **Hesham Rakha**, professor of civil and environmental engineering at **Virginia Tech**, who conducted a 2012 study of yellow light timing. “If you are close to the intersection, you keep going. If you are far away, you stop. If you are almost at the intersection, you have to keep going because if you try to stop, you could cause a rear-end crash with the vehicle behind you and would be in the middle of the intersection anyway.”...

THE VIRGINIAN-PILOT • June 10, 2013

## Researchers say smart roads technology is coming

by *Dave Forster*

The director of research reminded his audience to stay under the tent during the demonstration. The shade felt nice because the sun was high and everyone was standing around in a parking lot, but **Tom Dingus'** main concern was making sure nobody got run over.

The spectators moved closer together. The name tags clipped to their lanyards identified many as employees of one government acronym or another.

The first act in Dingus' show went like this: A white Cadillac backed out of a parking spot just as a motorcycle drove

behind it. The car chirped at its driver to alert him of the imminent collision. The Cadillac stopped. Crisis averted.

It was hardly cutting-edge stuff on its face. Commercials have peddled this kind of feature on expensive cars for years. What's different is how Dingus and his researchers have done it. What excites them is how their work could improve road safety and combat traffic jams, even speed up pothole repairs.

“Literally hundreds of applications,” said Dingus, who in his younger years looked a little like Richard Dreyfuss' scientist character Matt Hooper in “Jaws,” judging by

the old photo on his bio page. He now has a broad white goatee.

**Dingus is the director of the Virginia Tech Transportation Institute**, and he's talking about what could be done with vehicles that can talk to each other and talk with the road. The researchers call it “connected vehicles” and “connected infrastructure,” and Dingus says government agencies, car companies and universities are working on it.

He estimated the technology will be widely available to the public in five to 10 years....

**A consortium of universities led by Virginia Tech** is helping advance the field. ...

**CNN MONEY • December 22, 2013**

# Military competition shows off the latest robots

by *Jose Pagliery*

The age of walking, climbing, driving robots is here – but they're more toddlers than terminators.

They're slow. They trip and fall. Some even break their ankles or wrists.

The latest in robotics was on display the past few days at a racetrack just south of Miami, Fla., part of a \$2 million competition funded by the U.S. military.

Engineering teams from high-tech companies and top universities showed off their designs, ranging from crawling models that look like spiders to heavy, hulking humanoids.

In all, 13 teams were competing for a \$2 million award from the U.S. Defense Advanced Research Projects Agency to be handed out next year.

Competitors ranged from well-funded researchers at the Massachusetts Institute of Technology to hobbyists with Team Mojavaton in Colorado. They even came from abroad, including the Japanese startup Schaft ... and Hong Kong University.

Throughout the demonstrations, the smell of oil hung in the air as robots made their way across test tracks. The aim was to test how well the machines could open doors, turn valves and keep their balance on uneven terrain.

The engines of some of the robots made a low hum, while others let off a high-pitched wail.

There were seven copies of the Atlas robot – a two-legged, 300-pound creation by Boston Dynamics, which was acquired by Google last week. All looked alike, but each performed differently, because the software teams had designed different versions of its brain.

**A robot called Thor, built by Virginia Tech,** looked oddly human while driving a four-wheeled buggy through a winding track – its right arm turning the steering wheel and its left arm hanging casually off the side.

In fact, many engineers are racing to build robots with human-like dimensions and functionality so they can step through doorways, climb ladders and turn pressure valves.

The need for such robots was made urgent in

the aftermath of the Fukushima nuclear power plant disaster in Japan, when cleanup crews need machines to venture into zones too dangerous for humans, said Arati Prabhakar, head of DARPA.

Engineers say robots able to perform simple human tasks would lead to applications well beyond rescue and disaster mitigation, however.

The scientists building these bots see a robust future for robotics in home health care and precision manufacturing, but they are leery to predict when that will happen.

Even if robotics has a long way to go, Google's entry was seen by those at the DARPA challenge as a sign the field is about to explode with advancement.

"This robotics challenge will change the way people perceive humanoid robots," said **Dennis Hong, a mechanical engineering professor at Virginia Tech.** "I envision them doing dishes, talking out the trash, doing the laundry. The future is quite near, but we've got a long way to go."

**ROANOKE TIMES • April 2, 2013**

## Safety on I-77 a long-fought battle

by *Laurence Hammack*

On the good days, the view from Interstate 77 on Fancy Gap Mountain offers sweeping vistas of the countryside below.

On the bad days — Sunday was one of them — fog reduces visibility from miles to feet, transforming a scenic drive into a potential traffic nightmare.

Highway officials have known for years of the hazards that exist on a stretch of I-77 in Carroll County where the mountains of Virginia give way to the flat land of North Carolina.

The Virginia Department of Transportation has spent about \$5 million just in the past two years on higher-visibility signs, better highway markings and other measures intended to improve safety on a 12-mile stretch of interstate known for its chain-reaction pileups.

Yet dangers remain, as became clear on Sunday after three people died and dozens were injured in one of the worst incidents to date....

The state has enlisted the help

of researchers at the **Virginia Tech Transportation Institute** to find better ways to address the problem on I-77.

"Fog is by far the worst driving condition, because it's such a pervasive limiter of visibility," said Ronald Gibbons, director of the institute's

Center for Infrastructure Based Safety Systems.

By simulating foggy conditions on the institute's so-called Smart Road, researchers have been testing the effectiveness of signs and other equipment to be used on future I-77 improvements. ...

**VIRGINIA BUSINESS • March 12, 2013**

### Virginia schools score well in rankings

Virginia schools ranked well in the latest lists of top business-related programs compiled by *U.S. News & World Report*....

**(Virginia) Tech** ranked 24th among graduate engineering programs while U.Va. was 38th. Tech's civil graduate engineering program tied for seventh with the Massachusetts Institute of Technology and the University of Michigan....

**KFSN-TV • March 21, 2013**

### Vringo and VTIP announce partnership

Vringo, Inc. ... announced a partnership with Virginia Tech Intellectual Properties (VTIP), the licensing arm of ... **Virginia Tech.**

Through the partnership, VTIP has provided exclusive rights to patented wireless technology that

will enable Vringo to conduct related research and development and secure future licensing rights. This technology was developed at **Virginia Tech's Wireless@VT research group**, one of the largest university wireless research groups in the United States. ...

**HOMELAND SECURITY NEWSWIRE  
October 21, 2013**

## Nuclear waste package critical for safety

The integrity and survivability of a nuclear waste package is critically important in the transport of nuclear fuel and high-level waste.

Researchers are working on developing an outer shield material for use in packaging which is resistant to corrosion, radiation, diffusion, and thermal cycling processes that affect fuel packages during long-term storage.

The material will also need to be wear-tolerant and mechanically robust so that it can survive repeated handling and transportation.

**Virginia Tech's nuclear engineering program** has

See NUCLEAR, page 22

WIRED • November 1, 2013

## How do snakes fly?

### Just ask your favorite graphic chip

by Robert McMillan

**Jake Socha** has been studying flying snakes since 1996, and he still doesn't know exactly how they do it.

But he's getting closer – thanks to the magic of 3D printing and high-power computer simulations that use the graphical programming units, or GPUs, that now power everything from game consoles to supercomputers....

**Socha, a professor of engineering science and mechanics at Virginia Tech**, has studied three species of these snakes – all of which live in southern Asia.

They seem to use air travel as a kind of defense mechanism, flattening their bodies into an aerodynamic wing-like shape and then flinging themselves off of a tree. They drop fast and then even out in a kind of undulating and spooky-like glide. They can easily cover 30 feet, if they drop from a tall enough tree.

Now that the first flying snake computer models have been built,

the researchers hope to build more complex, three-dimensional simulations that will tell them more about how the motion of the snake affects things and whether the animal might be able to get additional lift by positioning the back part of its body behind the front – much like a bicyclist drafts the person in front.

Either way, the simulations are important steps toward understanding the flying snake. Scientists know about the snakes' basic movements in the air, but there's still a lot to learn Socha

says. "The question I'm still most interested in is how exactly does the animal produce its aerodynamic force and how does it maintain control in the air."

So why care about the flying snake? Socha says his work into this very novel type of flight could be applied to build a whole new kind of autonomous robots.

"Maybe you can build a search and rescue robot that is able to get into cracks like a snake and go through rubble and emerge from the top of the pile and jump off and glide somewhere else." ...

R&amp;D MAGAZINE • March 5, 2013

## Nature's phenomena might teach engineers new tricks

Lizards and frogs are about to take up residence in the laboratories of **Virginia Tech's College of Engineering**.

The engineers and scientists

want to learn more about the water-running lizard's ability to dart across a water surface. In engineering terms, that means how it increases its locomotion efficiency by producing more force on its power stroke and less drag on its recovery stroke.

And these engineers are surprised at how some frog species can jump out of the water, starting from a submerged position, using only one power stroke, to catch a flying insect that may be some 40 cm — or three times its body length — above the surface. As problem-solvers, they want to understand how this small reptile achieves such high propulsion.

The National Science Foundation is also curious. The government agency has a Physics of Living program that funds research projects at the interface of biology, mathematical modeling, physics, and engineering. NSF has awarded **Sunghwan Jung**, principal investigator, **along with Jake Socha**, both assistant professors of engineering science and mechanics, and **Pavlos Vlachos**, pro-

See TRICKS, page 23

ASEE PRISM  
March / April 2013

## Stephanie Adams, Leader and Mentor

Whether it's for veterans, women, minorities, or the odd person out in a team project, **Stephanie Adams** will figure out a way to make engineering education work. She might urge colleges to award course credit for military technical training, for instance, or tell professors they can't just stick three or five students together and expect a seamless unit. If there's a theme that runs through the career of this interdisciplinary engineer and ASEE leader, it's a commitment to the student whose promise might get overlooked in the normal course of things, to the detriment of both the student and engineering. Mentoring figures high in her approach, as underscored by the Holling Teaching/Advising/Mentoring Award she received during her decade at the University of Nebraska-Lincoln. "I would not be where I am today without a whole lot of people," Adams says. "Therefore, I have an obligation to help those behind me, both professionals and students."

The daughter of educators – her father's climb into college administration took the family from Virginia Beach, Va., to Syracuse, N.Y., and then to South Bend, Ind. – Adams at first hoped to become a doctor, then got excited about biomedical engineering while recovering from knee surgery in the ninth grade. She went on to major in mechanical engineering. After a series of internships at 3M Corp., her interests turned toward systems and industrial engineering, and then to education. Her doctorate at Texas A&M combined engineering, management, and education, giving Adams the language to express as an educator "things that I knew intuitively." With a break for a National Science Foundation/AAAS fellowship in Washington, she

See ADAMS, page 23

## NUCLEAR

### Homeland Security Newswire

(Continued from page 21)

received two awards valued at more than \$1 million from the Department of Energy's Nuclear Energy University Program.

One is an \$800,000, three-year award to develop an outer shield material for use in packaging spent nuclear fuel and high-level waste for prolonged storage. **Leigh Winfrey, assistant professor of mechanical engineering**, and her colleague Mohamed Bourham, professor of nuclear engineering of N.C. State, received this research contract.

A Virginia Tech release reports that the second award for \$300,000 will allow the Virginia Tech nuclear program, housed in the mechanical engineering department, to purchase a neutron generator system to create a Neutron Irradiation Laboratory. **Mark Pierson, associate professor of mechanical engineering**, is the principal investigator on this grant, and **Celine Hin, assistant professor of mechanical engineering and materials science and engineering**, and **Alireza Haghighat, director of the Virginia Tech Nuclear Science and Engineering Laboratory, part of the Institute for Critical Technology and Applied Science**, are the co-investigators....

**TRICKS**

R&D Magazine

(Continued from page 22)

fessor of mechanical engineering, a little over a half a million dollars to investigate the water entry and exit problems that are apparent in engineering mechanics based on a better understanding of biology.

“Since there are no engineered systems that operate under conditions similar to these reptiles and amphibians, we have an opportunity to learn how nature effectively uses the interaction of these forces. From our findings we hope to be able to develop bio-inspired systems such as faster dipping and coating processes for materials engineering, or even water-walking robots,” Jung said....

**ADAMS**

ASEE Prism

(Continued from page 22)

moved between teaching, administration, and research at the University of Nebraska – Lincoln and Old Dominion University and now heads the Department of Engineering Education at Virginia Tech’s College of Engineering. Her series of awards over the years includes the 2008 DuPont Minorities in Engineering Award from ASEE. A gregarious yet forceful presence at ASEE conferences, Adams chairs the Public Interest Council I and is nearing the end of a two-year term on the Board of Directors. She will serve on the Nominating Committee next year. Expect to see her playing key roles at ASEE into the future.

**IN THE CAPITAL • November 8, 2013**

**Solar panel installation serves as a lab for graduate engineering students**

by Molly Greenberg

A solar panel installation on the roof of the Virginia Tech Research Center in Arlington is not only helping out with the LEED credentials of the seven-story building it resides in and keeping energy costs at an all-time low, but also offers graduate engineering students access to a whole slew of data. It’s a laboratory of sorts, one that the curious engineers can’t help but enjoy as an advantageous opportunity for hands-on learning.

“We are able to collect data about solar

radiation, wind speed, and ambient and solar panel temperatures that allows us to create mathematical models for solar panel performance under various weather conditions and seasons,” Saifur Rahman, a professor of electrical and computer engineering and director of the Virginia Tech Advanced Research Institute, said in a statement. “From this we can determine how much power can be generated from a certain number of solar panels in similar climates.”...

**THE VIRGINIA ENGINEER • May 3, 2013**

**Mirrors Make Solar Energy Cost Competitive**

If the current national challenge to make solar energy cost competitive with other forms of energy by the end of this decade is met, Ranga Pitchumani, the John R. Jones III Professor of Mechanical Engineering at Virginia Tech, will have played a significant role in the process.

U.S. Secretary of Energy Steven Chu announced the Department of Energy’s SunShot Initiative in Febru-

ary 2011. Its objective was to reduce the installed cost of solar energy systems by about 75 percent in order to allow widespread, large-scale adoption of this renewable clean energy technology. Following the announcement, Pitchumani was invited to direct the Concentrating Solar Power (CSP) program for the SunShot Initiative towards its ambitious goals.

Pitchumani is a leading expert in the field of concen-

trating solar power. He and his research group at Virginia Tech have developed novel thermal energy storage technologies for concentrating solar power applications that are widely published.

He is the overall conference chair for SolarPACES 2013 this year, the foremost international meeting in the area of concentrating solar power systems, and is an editor for *Solar Energy*....

**CONTROL ENGINEERING • APRIL 25, 2013**

**Concentrating Solar Power Emerging**

by Greg Hale

Solar energy is feasible and the potential benefits can be staggering, however, the costs remain a barrier to full adoption.

There are now two solar energy goals: Make the technology cost efficient and make the technology more robust.

That is where Ranga Pitchumani, the John R. Jones III Professor of Mechanical Engineering at Virginia Tech, comes in.

Pitchumani is working toward achieving the goal set out in February 2011 in U.S. Secretary of Energy Steven Chu’s Dept. of

Energy SunShot Initiative. Its objective was to reduce the installed cost of solar energy systems by about 75% in order to allow widespread, large-scale

adoption of this renewable clean energy technology.

Following the initiative, Pitchumani started directing the Concentrating Solar Power

(CSP) program for the SunShot Initiative.

“The SunShot goal is to get solar energy technologies to achieve cost-parity ...

**WVTF RADIO • November 18, 2013**

**Solar Energy for a Rainy Day**

The cost of solar panels has dropped so much in recent years that they’re becoming more common everywhere you look. But storing the energy for a rainy day has been a problem.

Now another form of solar electricity promises to extend the reach of the sun’s energy and help make existing fossil fuel plants more sustainable.

It’s called “Concentrating Solar Power” or “C-S-P.” Utility scale power plants use mirrors to reflect and focus sunlight. The resulting heat spins a large turbine to make electricity, the same way conventional power plants do. But coal and natural gas can generate electricity on demand. And thanks to CSP, so can the sun. The

See ENERGY, page 24

**ENERGY HARVESTING  
JOURNAL online  
March / April 2013**

## Researchers hope to reap benefits of energy harvesting

University of Texas at Dallas researchers and their colleagues at other institutions are investigating ways to harvest energy from such diverse sources as mechanical vibrations, wasted heat, radio waves, light and even movements of the human body. ...

At a recent scientific conference held at UT Dallas, experts from academia, industry and government labs gathered to share their latest research on energy harvesting. Energy Summit 2013 focused on research initiatives at UT Dallas, Virginia Tech and Leibniz University in Germany, which form a consortium called the Center for Energy Harvesting Materials and Systems (CEHMS). ...

CEHMS co-director **Dr. Shankh Priya, professor of mechanical engineering and the James and Elizabeth Turner Fellow of Engineering at Virginia Tech**, collaborates with (Dennis) Smith (of UT Dallas). ....

## ENERGY

### WVTF Radio

(Continued from page 23)

heat stored in solid or molten materials and used on demand the way fossil fuels are.

**Ranga Pitchumani**, is chief scientist and director of the Concentrating Solar Power program for the U.S. Department of Energy Initiative, and a **professor of mechanical engineering at Virginia Tech**.

"Concentrating solar power plays very nicely with conventional fossil generating sources. By virtue of the fact that the turbine is the same for any thermal power generation plant you can actually integrate Concentrating Solar Power to add a boost to a fossil generation plant very easily and there are plants that exist of that kind." ...

Pitchumani oversees a number of projects across the nation aimed at streamlining the adoption of solar power. ...

**WALL STREET JOURNAL • June 11, 2013**

# How Spies May One Day Predict The Future

by *Rachael King*

The Intelligence Advanced Research Projects Activity, a little-known U.S. government organization, is developing analytic programs for the National Security Agency that could make recent revelations about the NSA's activities look antiquated by comparison. Rather than reviewing archival data, it may use current data to predict the future....

Certain of its programs are not classified. One such program is Open Source Indicators, which reviews a range of publicly available sources, such as Tweets, Web queries, oil prices and daily stock market activity, to gauge the likelihood of certain "significant societal events," according to a program announcement posted on FedBizOpps.gov. The goal of the program is to develop continuously automated systems that use information from these sources to predict when and where a disease outbreak, riot, political crisis or mass violence might occur. Currently, the proj-

ect is focusing on events in Latin America....

It may sound like a far-fetched idea, but already that project has correctly predicted events, days in advance. For example, researchers were able to accurately forecast sudden protests that occurred in Paraguay when the president was impeached, said **Naren Ramakrishnan, the Thomas L. Phillips Professor of Engineering at Virginia Tech**.

Mr. Ramakrishnan is leading a team of about 60 people from the University of Maryland, Cornell University, Children's Hospital of Boston, San Diego State University, University of California at San Diego and Indiana University and two companies CACI International Inc. and Basis Technology.

The team can earn up to \$13.3 million if it's funded over the full three-year term of the project.

The project was also able to accurately predict a Hantavirus outbreak in Argentina last year, said Mr. Ramakrishnan. The team is trying to find which pieces of

data most accurately forecast an outbreak. For example, project team members are looking at the numbers of cars parked in hospital parking lots from satellite images and trying to figure out if an increased number of cars in the parking lot can be an early indication of an increase in disease outbreak, he said.

IARPA keeps a log of all the predictions forecast by researchers and checks them against articles in local newspapers to determine which ones were accurate. Each month, his group gets a report card from IARPA telling the researchers how well they performed.

Mr. Ramakrishnan says his researchers are trying to preserve individual privacy as they create their algorithms to mine this data. "In the case of civil unrest, we haven't come to the point of modeling government opposition groups," he said. His group is trying to predict when and where a protest might occur, but not the individuals who are participating in that protest. ...

**BBC NEWS • July 4, 2013**

# Hacking competitions seek cybersecurity superstars

by *Sune Engel Rasmussen*

The attack started a little after 08:00.

Numbers streamed across the computer screens in cryptic order, containing disguised codes that could make the whole system collapse. The mission: find the intruding language, isolate it, and keep the system safe.

In the basement, about 80 young adults, mostly in their late teens and 20s, sat in silence, hunched over laptops, exchanging only a few words of strategy and nods of approval.

As the offensive got underway the sound of hundreds of fingers tapping on keyboards were drowned out by the thumping bass of Swedish House Mafia, blasted from the speakers in the corner.

The battle was the final leg of a four-day cyber camp, hosted by the U.S. Cyber Challenge and **Virginia Polytechnic Institute and State**

### University.

As part of the camp, a dozen teams raced against each other in a so-called "capture the flag" competition. In this case, flags are strings of information on websites that don't belong there. Teams score points depending on the difficulty of isolating the rogue data. From the sidelines, future employers watch, waiting to be impressed.

American corporations and government entities face cyber-attacks every day, and are in dire need of people to defend them. These college students may be the country's best hope....

"After coming to this camp, there's so many ways to branch out. I've discovered a lot of options," says Nicholette Fortune, 19, from Brooklyn, New York, and one of the few women among the contestants. "I haven't had hands-on experience, so this is great for a first time," she says....

**WASHINGTON POST • December 9, 2013**

# Increase in miscarriages coincided with high levels of lead in D.C. water, study finds

by Carol D. Leonnig

Late-term miscarriages and spontaneous abortions occurred at an unusually high rate among Washington women from 2000 through 2003 — during the same time frame that lead levels were dangerously high in the city's drinking water, a study has found.

The increase in fetal deaths was an anomalous spike for the District, and the rate of women losing advanced pregnancies returned to average levels in 2004. That is the year that a *Washington Post* story alerted the public to the widespread lead problem in tap water, and federal health officials began urging children and pregnant women to instead drink filtered or bottled water.

The study findings, which are scheduled to be published in the journal *Environmental Science and Technology*, do not prove that the city's lead crisis caused fetal deaths or miscarriages. But the results show a significant correlation between the two events.

Lead is an extremely toxic metal, and ingestion of lead paint dust and high doses of lead in water have been traced to brain damage, behavioral problems and developmental delays in children. Exposure to lead has also been linked to miscarriages. In the early 1900s, lead-laced pills were used to induce abortions.

The study, by **Virginia Tech environmental engineer Marc Edwards**, contrasts sharply with government-led health studies

that were released amid an outcry after people learned of hazardous lead in the water in 2004. Those studies largely rejected the notion that the water had harmed public health.

The data seem “to confirm the expectation, based on prior research, that about 20 to 30 extra fetal deaths occurred each year that the lead in water was high,” Edwards said.

One rushed and disputed analysis by the Centers for Disease Control and Prevention asserted in April 2004 that there was no indication of health trouble from the water problem, even among children in homes with the highest lead levels in the water. Under repeated criticism, the CDC published a corrected analysis in 2010, acknowledging that this overarching statement

had been misleading and based on incomplete data.

Today, the city's drinking water has historically low levels of lead. But Edwards's study looks back at that period when the city had some of the highest lead spikes in water ever recorded in the United States. ...

George Hawkins, the new director of the water authority, said Edwards's study provides helpful research and raises worrisome questions about the impact of the lead spike on public health.

Today, he said, the city's lead levels are at historic lows. He said the agency also closely monitors homes when pipes are being replaced and encourages the use of filtered water....

**CHICAGO TRIBUNE • September 25, 2013**

# EPA: Modernizing Chicago water system may boost levels of lead

by Michael Hawthorne

Dangerous levels of lead are turning up in Chicago homes where pipes made of the toxic metal were disturbed by street work or plumbing repairs.

According to a new federal study, data suggests the city's aggressive efforts to modernize its water system could inad-

vertently pose health risks.

The problem starts with lead service lines that Chicago installed across the city until the mid-1980s to connect water mains with homes. Researchers at the U.S. Environmental Protection Agency found that spikes of lead can leach into tap water when those pipes are altered by water main replacements, meter installations or street work....

Most homeowners likely are unaware they could be drinking tainted water.

Under federal rules, utilities rarely are required to warn residents that work is being done or tell them they can take steps to reduce their exposure to lead....

Lead is so hazardous that the EPA and the Centers for Disease Control and Prevention say there is no safe level of exposure....

“We owe it to people to tell them that their water might not be safe to drink,” said **Marc Edwards, a professor of civil and environmental engineering at Virginia Tech University** who wasn't involved with the EPA study but has reached similar conclusions in his own research.

*(Editor's note: This article also appeared in the *Aberdeen News*.)*

**THE DATA CENTER JOURNAL • August 23, 2013**

# Engineers and economists team to make communications superhighways viable

The needed spectrum to carry additional communications traffic exists, but government-regulated allocations has some of this space off-limits to wireless providers. An answer is to share the use of the communications spectrum superhighways in the sky that already exist.

“However, one of the critical challenges that needs to be addressed for spectrum sharing is the problem of spectrum security and enforcement,” said **Jung-Min “Jerry” Park, Virginia Tech associate professor of electrical and computer engineering**. “The primary concern is the interference experienced by primary users due to rogue transmissions by maliciously intended secondary users when the two groups operate in

the same band.”

To counter this problem, Park and his colleague **Patrick Schaumont, also an associate professor of electrical and computer engineering**, Michelle Connolly, professor of practice in economics at Duke University, and Nelson Sa, assistant professor of economics at Vassar College, are the principal investigators on a new \$1.2 million award from the National Science Foundation's Secure and Trustworthy Cyberspace program.

Virginia Tech holds the largest portion of this interdisciplinary funding, receiving approximately \$898,000 of the overall budget.

Their goal is to make trustworthy spectrum sharing technically and economically viable....

BBC NEWS ONLINE / INTERACTIVE • April 29, 2013

# Is there really a north-south water taste divide?

by Kathryn Westcott

Every year a slew of U.S. localities fight over who has the tastiest tap water. These blind tasting competitions are yet to take off in the U.K., but many would stick up for their tap water as the best.

There are many things that divide the north and the south of Britain – politics, the weather – but water is probably the oddest.

You'll often hear people extol the virtues of drinking water that originates from their area – whether it's the Lake District, the Pennines, Welsh Hills or Scotland's Highlands.

Northerners protest about having to drink London tap water, but then there are Londoners who swear the city's "hard" water is superior to areas with "soft."

But is there any science behind these taste preferences?...

Most tap water tends to come from two main sources – surface water from lakes, streams and rivers, and groundwater. Surface water tends to be soft, containing fewer minerals, and acidic by nature, while groundwater tends to be harder. Water suppliers sometimes blend the two and the mix" could

change from one day to another.

...Soft water is thought to have less of a "taste" than hard. But what exactly is it that people appear to "taste?"

"Like any food and beverage, we bring our personal sensitivities to tasting water, and this can be to do with genetics, age and experience," says **Dr. Andrea Dietrich, professor of civil and environmental engineering and a water tasting expert at Virginia Tech** in the U.S.

When people talk about the taste of tap water, she says, they are not being quite accurate. "Taste" is often confused with "flavour."

Flavour is a mixture of sensory information – taste, smell and the tactile sensation that is known as "mouthfeel" (so you might experience water as feeling "light" or "heavy" in the mouth).

Four basic taste sensations are recognised by our taste buds – bitterness, sourness, sweetness and saltiness. But, according to Dietrich, we can detect something like 10,000 odours.

Sourness is not associated with water, but bitterness, for example, can be caused by magnesium chloride and calcium chloride.

When we swallow, volatile odours are pushed back into the nose, the taste of, say minerals, and odours from naturally occurring compounds combine to create flavour, she says.

So what flavours then might people experience with water?

Softer water, says Dietrich, can have a different "ecology" to hard water.

"There are two classes of organism in water – the cyano bacteria, which is commonly known as blue / green algae, and actino mycetes, which are responsible for the damp or earth smell."

"What people describe as an earthy or musty 'taste' will usually occur in water as a by-product of the ecology."

Given that odours can cue recall of a memory – an "earthy" flavour might evoke the joys of the hills and valleys to one person, but an unpleasant damp-in-the-basement experience to another.

And, some people are more highly tuned when it comes to the senses.

"Sense, taste and smell and vision and hearing have a normal range, but there can be a hundred-fold between the ability of people to discern a taste or odour – it's not uncommon," says Dietrich.

*(Editor's Note: This article also appeared in LondonWired.)*

BIOFUEL DIGEST • November 3, 2013

## American Society of Civil Engineers gives U.S. energy, water infrastructure a D+ grade

by Jim Lane

In Virginia, the American Society of Civil Engineers gave energy and water infrastructure a D+ grade for 2013.

"More than five million miles of pipeline exist in the U.S. alone, and worldwide, countries annually install approximately 500,000 miles of pipeline with a market value of more than \$50 billion," said **Sunil Sinha, associate professor of civil and en-**

**vironmental engineering at Virginia Tech.** "Pipelines crisscross our communities near our homes and schools, yet little attention is paid to this critical infrastructure until catastrophic failures occur."

"Unfortunately, the pipeline infrastructure is aging and already operating outside its design limits. How a nation operates, retrofits, and expands its pipeline infrastructure will help

determine the quality of life for future generations and that nation's competitiveness in the global economy," he added.

In 2010 Sinha led the development of a National Pipeline Infrastructure Database.

This database is "like a Wikipedia for the drinking water and wastewater utilities except users do not have editing privileges," Sinha said....

VIRGINIA BUSINESS • March 31, 2013

## Offshore wind: Gaining momentum

### Area off Virginia coast is one of two sites that could see commercial development

By Garry Kranz

It's a windy day in Virginia Beach, but the Atlantic Ocean sparkles in the midday sun. Huge container ships make their way toward the Norfolk-based Port of Virginia, hauling items that range from blue jeans to jelly beans.

The sprawling port, which operates four terminals in Hampton Roads, is a major consumer of electricity, and Virginia's coastal waters could be key to meeting future energy demands.

Roughly 23 nautical miles out to sea lies

a coveted 113,000 acres. Nine companies, including Dominion Virginia Power, are bidding for a federal lease to develop these coastal waters into the first utility-scale offshore wind farm in the U.S. It could be in operation within the next decade.

If developed as envisioned, experts say, this territory would help diversify Virginia's fuel supplies and keep electricity rates low.

Just as significantly, Hampton Roads would emerge as the main link in a U.S.-based supply chain for the offshore wind industry, includ-

See WIND, page 27

NEW YORK TIMES • December 31, 2013

# F.A.A. Picks Diverse Sites to Carry Out Drone Tests

by Matthew L. Wald

The Federal Aviation Administration will authorize test sites for drone aircraft in upstate New York, New Jersey and at least eight other states, the agency said on Monday, preparing for a time when unmanned aircraft of various shapes and sizes cruise over the landscape.

The agency picked six institutions to operate test locations, which will explore how to set safety standards, train and certify ground-based pilots, ensure that the aircraft will operate safely even if radio links are lost and, most important, how to replace the traditional method for avoiding collisions. Integrating the aircraft into the nation's airspace, set by Congress for 2015, will be phased in gradually.

Already, federal investigators have linked one drone aircraft to a problem that would have been almost inconceivable if a pilot had been on board: The engine failed, and no one noticed.

The F.A.A. did not say precisely where the test flights would go, but it did say that selections were made with an eye toward diversity, including operations in areas of heavy air traffic, like the Northeast, and Nevada's border with California.

While the public is mostly aware of drones like Predators, Global Hawks and other high-altitude, long-range planes operated by the government, Monday's announcement covers commercial and private aircraft.

These include electric helicopters that a landlord could use to

inspect a rooftop water tower; midget helicopters, which can fly close to power lines and are started by yanking a cord like the one on a chain saw; and Styrofoam planes that run on lighter fluid and can fly over fields to look for agricultural pests. Police and fire departments are among those eager to operate drones.

Competition to host the test sites was fierce, with state economic development agencies predicting the expansion of a major industry.

The six winners, chosen from a field of 25, included Griffiss International Airport, a former Air Force base near Rome, N.Y., which will fly some tests from Cape Cod in Massachusetts, and **Virginia Tech**, which will fly in Virginia and has an agreement with Rutgers University in New Jersey for testing there as well. Virginia Tech plans to conduct "failure mode" testing — finding out what happens if the aircraft's control link is lost.

The other winners were the University of Alaska, which plans to test in Hawaii and Oregon as well as Alaska, the State of Nevada, the North Dakota Department of Commerce, and Texas A&M University Corpus Christi. Michael P. Huerta, the administrator of the F.A.A., said the sites provided diverse geography, climate and air traffic density.

Mr. Huerta said the choice of the six institutions marked a milestone for the aircraft, whose proponents prefer to call them "unmanned aerial systems." But he said that while a 2012 law sets

2015 as the year by which they should be integrated into an airspace shared with conventional airplanes, "we would envision that that would be a staged process, as we learn more about what these aircraft are, and how they interact with other aircraft."

The phase-in could be by type of drone or by type of airspace, or some other factor. The research will continue until 2017, the F.A.A. said. Flights are expected to begin within six months.

The basic concept of integrated airspace is that everything in the sky — manned or not — will use the Global Positioning System to determine its location, and will radio that information to the ground, where a computer will develop a whole picture and

send that to all pilots. Sophisticated drones could use that data without human intervention to sense conflicts with other aircraft. ....

The F.A.A. has put several privacy requirements in place for the test program. Site operators will be required to publish privacy policies, covering how they will use the data they gather and how long they will retain it, among other steps.

... Daniel R. Benson, a New Jersey state assemblyman, said: "You want to see the technology being tested. It's going to mean we're at the cutting edge and hopefully it will bring jobs in the future."

But he added, "any new technology also brings new concerns."

FORBES • April 3, 2013

## Could Hydrogen Breakthrough Revive the Fuel-Cell Car?

by Jeff McMabon

Researchers at Virginia Tech have found a way to efficiently extract hydrogen from plant materials, overcoming one of the obstacles that led the Obama Administration to put hydrogen fuel-cell technology on the back burner.

"We think this discovery is a game-changer in the world of alternative energy," said **Y.H. Percival Zhang, an associate professor of biological systems engineering**. Zhang led a Virginia Tech team that developed a way to produce large

quantities of hydrogen from xylose, an abundant simple sugar that makes up 30 percent of the cell walls of plants....

At Virginia Tech, Zhang has been researching ways to use enzymes to extract hydrogen from plant biomass.

Reported in a recent issue of *Angewandte Chemie* (subscription), the breakthrough came when the team submitted xylose to a cocktail of 13 enzymes, producing hydrogen at low temperatures....

According to Virginia Tech, Zhang's discovery is endorsed by Jonathan R. Mielenz, the group leader of the bioscience division at the Oak Ridge National Laboratory.

"The key to this exciting development is that Zhang is using the second most prevalent sugar in plants to produce this hydrogen," Mielenz told VT. "This amounts to a significant additional benefit to hydrogen production and it

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## WIND Virginia Business (Continued from page 26)

ing the building of Colossus-size wind turbines and the specially constructed ships needed to transport them. That activity would bring thousands of new jobs. ...

The flurry of activity has longtime advocates of offshore wind cautiously optimistic. Dominion's test project is of particular interest because it may prove that offshore wind can generate electricity at a cost comparable to traditional fuel sources, says

**George Hagerman, a Virginia Tech professor and director of research at the Virginia Coastal Energy Research Consortium, (VCERC)**, a nonprofit group composed of nine Virginia universities.

"The reason businesses are attracted to Virginia is because of our low-cost and stable energy prices. We can't afford to install large amounts of new generation that cost more than the portfolio we already have," Hagerman says....

EDUCATION WEEK • February 1, 2013

## Engineering Neglected in Draft Science Standards, Some Advocates Say

by Erik Robelen

The latest draft of the common science standards is sparking criticism from some engineering education proponents, who say the document gives the discipline short shrift and represents a step backward from an earlier public draft.

"The whole process started very well, and they did a very good job in the beginning," said Ionnis Miaoulis, the president of the Museum of Science in Boston, which developed the Engineering Is Elementary program. "Engineering appeared as a core element, but now it has been diluted significantly." ...

**Mechanical Engineering Group Generally 'Very Supportive'**  
Another organization, the

American Society for Mechanical Engineering, identified several ways to strengthen the standards but was mostly upbeat about their content. ...

**Mary Kasarda, an associate**

### REVIVE

Forbes

(Continued from page 27)

reduces the overall cost of producing hydrogen from biomass."

Mielenz predicts Zhang's process could reach the \$100 billion hydrogen marketplace in three years....

*(Editor's Note: A version of this article also appeared in: UPI, Energy Daily, energybiz Insider, Green Car Congress Innovations Report.)*

**professor of mechanical engineering at Virginia Tech** who helped craft the ASME response, said she's genuinely pleased that engineering continues to have a foothold in the standards.

"We're happy to see engineering in the standards," she said.

"We know that's a big deal. ... We think there needs to be some guidelines on the engineering-design process. It will be unfamiliar to a lot of teachers. If those are articulated a little better, that would strengthen the new standards."

VIRGINIA BUSINESS • September 12, 2013

## MACH37 opens at CIT in Herndon

**Virginia Tech** and the Center for Innovative Technology (CIT) announced a new partnership Thursday during the opening of MACH37, a Northern Virginia-based cybersecurity accelerator.

The organizations will develop a virtualized test environment housed in **the Hume Center at Virginia Tech's Research Center** in Arlington. The goal is to open the cyber test range by next fall for use by companies entering the MACH37 program and university research projects.

MACH37 is designed to facilitate the creation of cybersecurity companies in the commonwealth.

THE ROANOKE STAR • August 20, 2013

## Tech Undergraduate Women Help Steer Engineering Research Program

by Cecilia Elpi

Every year, the National Science Foundation provides grant support to fund research initiatives through Virginia Tech's Research Experience for Undergraduates Program. This year, this support was targeted to encourage undergraduate women to engage in tire engineering research at the university's Center for Tire Research.

This summer, **Saied Taheri, associate profes-**

**sor of mechanical engineering in the College of Engineering and director of the Center for Tire Research**, is mentoring three women engineers across various research projects.

"This program is aimed at training the next generation of engineers for tire and automotive industries. It provides students with hands on/ minds on experience with cutting edge technologies," said Taheri....

The three women in this program are

among 10 undergraduate students collaborating on similar projects. According to a 2011 report from the American Society for Engineering Education, the percentage of women who graduated with a bachelor's degree in engineering was 18.4 percent.

Virginia Tech's engineering program is ranked eighth among 348 schools by the number of bachelor's degrees awarded to women according to this report....