

## In This Issue

Two Keys to Solving the  
World's Energy Crisis

Ultra Highspeed Bluetooth  
Alternative

Spray-On Battery

Prosthetic Retina

Tires From Sugar Cane

Improved Solar Car

Nano-Fiber Swimsuits

Robotic Fish

Stronger-Than-Steel Plastic

Protective Paper

Driver's License Issued to  
Self-Driving Car

[www.burrus.com](http://www.burrus.com)



## Two Keys to Solving the World's Energy Crisis

By Daniel Burrus, CEO of Burrus Research

Make a list of all of the biggest problems on the planet and you'll likely write things like "lack of fresh drinking water," "food shortages," and "air pollution," just to name a few. If you then analyzed the list to pinpoint a single aspect that could help solve all the major problems, you'd likely narrow it down to one thing: **Energy**.

We need energy to do just about everything. Whether you want to convert salt water to fresh water, increase agricultural production, or power a pollution control device, you need energy. In short, for all the biggest problems on the planet, the solution involves, to a great extent, energy.

This means that if we can solve the world's energy crisis, then we can solve some of the biggest problems on the planet. The good news is that we're on our way to doing some major transformations in energy.

One thing we know for sure, though, is that as more people need and use energy on the planet, prices will go up unless we have something to offset the cost of energy. Fortunately, there are two key ways we can maximize energy while offsetting the cost of it, and that is by 1) using more alternative energy sources and 2) making the things that use energy intelligent.

### Alternative Energy Can Make a Difference

Alternative energy such as wind, solar, geothermal, and hydroelectric are on the rise yet are still often criticized because the big payoff from these energy sources is not apparent. This often brings up the question, "Is alternative energy worth it?"

*continued on page 7*

## Know What's Next Magazine



In today's world of technology-driven change, it has never been more important to

Know What's Next!

Technology is transforming how we sell, market, communicate, collaborate, innovate and educate.

Also available on:

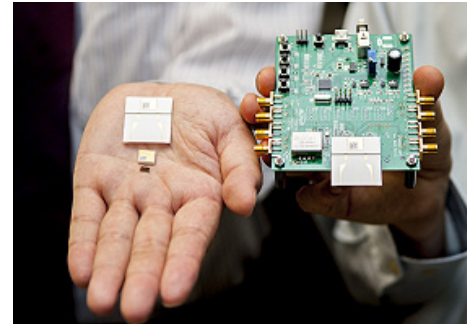


[www.burrus.com](http://www.burrus.com)

## TECHNOLOGY NEWS HIGHLIGHTS

### Ultra High Speed Bluetooth Alternative

Scientists have developed a new high speed wireless technology that's 1,000 times faster than Bluetooth. Called VIRTUS, the new chipset is more than a re-design of existing devices – it's an entirely new technology that sends data in large packets in the mm-wave band. These extremely high frequency (EHF) waves operate at 30-300 GHz range and can transmit information with very low power consumption.



The chipset, which runs at a clock speed of 60GHz, includes an antenna, a full radio-frequency transceiver and an integrated processor, allowing transfer rates up to 2 gigabits per second. At those speeds, an 8GB DVD could be downloaded in about 30 seconds.

The revolutionary technology is aimed at low power devices such as phones and tablets, but allows data to be transferred between multiple platforms including computers, televisions and projectors. This would enable a whole new range of applications including mobile-distributed computing and high definition video streaming.

For information: Yeo Kiat Seng, Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798; phone: +65-6790-5630; email [eksyeeo@ntu.edu.sg](mailto:eksyeeo@ntu.edu.sg); Web site: [www.ntu.edu.sg](http://www.ntu.edu.sg)

### Spray-On Battery

In today's mobile world, developers are continually looking for new and better ways to incorporate battery storage into portable devices. The latest is a lithium-ion battery that can be sprayed onto a surface.

The battery is constructed by spraying in layers and consists of five components – two current collectors, a cathode, an anode and a layer of polymer which acts as a separator. Once they are sprayed

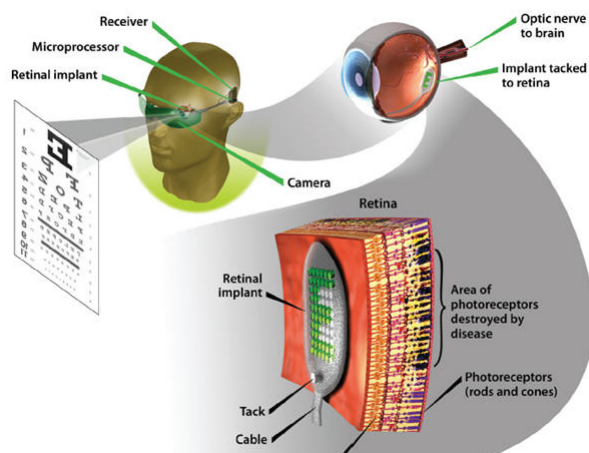


on, the layers are infused with electrolyte, heat sealed and charged.

The new form factor could also make solar power more practical by removing the need for large storage batteries. Because it uses standard spray-painting methods, it's also easily scalable for commercialization.

For information: Pulickel Ajayan, Rice University, Department of Mechanical Engineering and Materials Science, 6100 Main Street, Houston, TX 77005; phone: **713-348-5904**; fax: **713-348-5423**; email: [ajayan@rice.edu](mailto:ajayan@rice.edu); Web site: [www.rice.edu](http://www.rice.edu)

## Prosthetic Retina



Age-related macular degeneration (AMD) is a common cause of blindness in developed countries, affecting one in every eight people over the age of 85. In AMD, the portion of the retina

that enables people to distinguish fine detail loses its ability to translate light into electrical signals. This results in a loss of vision at the center of their field of view, making it difficult (if not impossible) to function independently.

Now researchers have developed a silicon implant that could restore sight to AMD sufferers. It receives video images from a camera mounted on a set of goggles. The images are converted to electrical current that stimulates cells in the retina, generating an image that the patient can see. The prosthetic retina operates wirelessly, receiving its power from the goggles as well, making it easier to implant than current devices.

For information: Keith Mathieson, University of Strathclyde, Institute of Photonics, Wolfson Center, 106 Rottenrow, Glasgow G4 0NW, United Kingdom; phone: +44-(0)141-548-4901; fax: +44-(0)141-552-1575; email: [keith.mathieson@strath.ac.uk](mailto:keith.mathieson@strath.ac.uk); Web site: [www.strath.ac.uk](http://www.strath.ac.uk)

## Tires from Sugar Cane



Tire producers may be using a derivative of sugar cane for commercial manufacturing as early as 2013. The new liquid-rubber additive, made from a farnesene-based biomass product, replaces some of the petroleum-based components used in today's tires.



Experiments are currently underway to verify the performance of the new tires. By binding the rubber and carbon back together more tightly, it is expected that they will deform less, giving them lower resistance and energy loss, thereby increasing fuel efficiency.

*For information: Kuraray Co. Ltd., Ote Center Building, 1-1-3, Otemachi, Chiyoda-ku, Tokyo 100-8115, Japan; phone: +81-3-6701-1000; fax: +81-3-6701-1005; Web site: [www.kuraray.co.jp/en/](http://www.kuraray.co.jp/en/)*

sent a viable addition for example a battery + solar hybrid vehicle.

The two-seater, touring style car is due to be unveiled in May 2013 and will participate in the World Solar Challenge race – 3,000 kilometers using only solar power – scheduled to take place in Australia in October of next year.

*For information: Friedbert Pautzke, Bochum University, Lennerhofstrasse 140, D-44801, Bochum, Germany; phone: +49-(0)234-321-0343; fax: +49-(0)234-321-4983; email: [friedbert.pautzke@hs-bochum.de](mailto:friedbert.pautzke@hs-bochum.de); Web site: [www.hs-bochum.de](http://www.hs-bochum.de)*

## Improved Solar Car

The world's first totally solar-powered car has barely finished its first tour and the next generation is already in the works. The main difference is that the new model will be fitted with drive motors on all four wheels.

The air core motors use highly efficient electrical steel cores to maximize power efficiency, and the new solar-powered vehicle provides a perfect platform for investigating how performance can be optimized.

While solar power alone may not be practical for day-to-day use (due to variable cloud conditions) it does repre-



## Nano-fiber Swimsuits



Swimmers at this summer's Olympic games will undoubtedly be wearing the latest in fiber technology to gain a competitive edge – like the Aquaforce Infinity swimsuit, which is made of two different nylon materials (front and back) to minimize drag in the water. The traditional rubber or silicon in the hems has also been replaced with a proprietary “nano tape” to prevent slippage without inhibiting blood flow.

The tape consists of ultrathin fibers that are 7,500 times finer than a strand of hair. Bundled together, they form a

rough surface with three times the friction force of polyester.

For information: Descente Ltd., 1-4-8 Mejiro, Toshima-ku, Tokyo 171-8580, Japan; phone: **+81-03-5979-6006**; fax: **+81-03-5979-6107**; Web site: [www.descente.co.jp/en/company/index.html](http://www.descente.co.jp/en/company/index.html) or [www.descente.com](http://www.descente.com)

## Robotic Fish

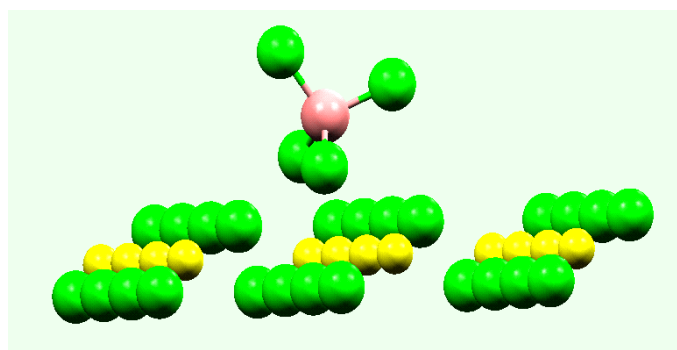


A European research project known as SHOAL has developed a “school” of robotic fish for monitoring pollution in aquatic areas. The goal is to eliminate the need for traditional sampling and analysis methods and obtain real-time information on the levels and possible sources of pollution.

Each fish weighs about 35 kg (77 pounds) and contains a variety of sensors for detecting different pollutants, pressure, temperature, battery status and attitude heading. They utilize artificial intelligence (AI), functioning either independently or as a swarm, to create 3-dimensional maps of polluted areas and calculate where it likely originates. They're even capable of returning to base for recharging. Other potential applications for robotic fish include underwater security, diver monitoring and search-and-rescue.

For information: Luke Speller, BMT Group, Ltd., Goodrich House, 1 Waldegrave Road, Teddington, TW11 8LZ, United Kingdom; **+44-(0)20-8943-5544**; fax: **+44-(0)20-8943-5347**; email: [lsPELLER@bmtmail.com](mailto:lsPELLER@bmtmail.com); Web site: [www.bmt.org](http://www.bmt.org) or [www.roboshoal.com](http://www.roboshoal.com)

## Stronger-than-Steel Plastic



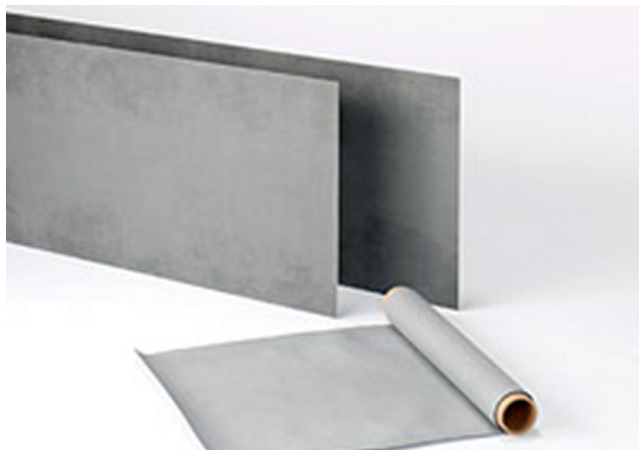
Israeli scientists have developed a new catalyst that makes polypropylene strong enough to replace steel in a variety of applications. For example, because of its high melting point, the new material may be substituted for many traditional steel parts in cars, resulting in lighter vehicles that are more fuel efficient. At a weight ten times less than steel and one hundred times less than concrete, plastic would offer a tremendous advantage over other raw materials for many uses including pipeline construction.

Because plastic pipes can now be made stronger than steel, they can be used in applications that required steel in the past. In addition, since plastics are less prone to breakage and leaks, plastic pipes could result in more efficient water use. In addition, durable plastics are easier to produce, consuming less energy and requiring fewer raw materials.

For information: Moshe Kol, Tel Aviv University, School of Chemistry, Shenkar Building, Tel Aviv 69978; phone: **+972-3-640-7392**; fax: **+972-3-640-9293**; email: [moshekol@post.tau.ac.il](mailto:moshekol@post.tau.ac.il); Web site: [www.tau.ac.il/index-eng.html](http://www.tau.ac.il/index-eng.html) or [www.tau.ac.il/chemistry/kol](http://www.tau.ac.il/chemistry/kol)

## Protective Paper

A new paper has been developed that has radiation-blocking properties similar to lead without the potential harmful side effects. At a standard thickness of 0.3 mm (slightly more than one-one hundredth of an inch) it can be cut and folded like ordinary paper, yet a single piece



will block 50% of the radiation from a typical x-ray.

The key to its superior shielding properties is a new technique that incorporates tungsten directly into the paper fibers at a high density. Applications include protective gear for use in radiation-contaminated areas and for walls or curtains in radiology areas of clinics and hospitals.

Samples are available at a cost of about \$100 for a 20-inch square.

*For information: Toppan Printing Co., Ltd., 1-5-1, Taito, Taito-ku, Tokyo 110-8560, Japan; phone: **+81-3-3835**; Web site: [www.toppan.co.jp/english/](http://www.toppan.co.jp/english/)*

## Driver's License Issued to Self-Driving Car

The Las Vegas Motor Vehicle Department recently issued a driver's license to Google's self-driving car, making it the first autonomous vehicle to operate legally on standard roadways without the need for human intervention.

Originally released in 2010, the driverless car uses a combination of radar (radio detection and ranging), lidar (light detection and ranging), video sensors and aggregated data from human drivers to navigate safely.



*For information: Sebastian Thrun, Stanford University, Computer Science Department, 353 Serra Mall, Gates Building 154, Stanford, CA 94305; phone: 650-723-2797; fax: 650-725-1449; email: [thrun@stanford.edu](mailto:thrun@stanford.edu); Web site: [www.robots.stanford.edu](http://www.robots.stanford.edu)*

## Solving the Energy Crisis

*continued from page 1*

To answer that question, let's look at an event that recently occurred. On May 27th and May 28th of 2012, half of all of Germany's energy needs were met by solar. This happened for only a few hours on each day, but let's look at the bigger picture by asking, "How much power was actually produced by solar in order to meet half of the country's energy needs?" The answer is an amazing 22 gigawatts. How much is 22 gigawatts of power? It's equivalent to the output of 20 nuclear power plants!

You might think, "So what? It was only for a couple of hours on two days." The point is that solar energy is getting more efficient and effective, and it can and will have an increasingly dramatic impact on society.

Of course, there's more research and innovation that needs to be done to make solar energy even more efficient and effective. And there's more to do in terms of learning how to store solar power. But the point is that you can create a lot of power from solar.

Interestingly, Germany isn't the only place having some amazing results with alternative energy. In Denmark,

which is one of the world's leaders in wind energy, they often produce more energy from their wind turbines than the entire country can use, so they export the excess energy. This doesn't happen every day, but it is happening.

Likewise, according to PJM Interconnection, a U.S. regional electronic transmission operator, in localized parts of the United States there are times of the day when the energy demand is low and the wind blows strongly enough that we're producing more than 100% of the energy we need in those geographic areas.

When we hear these types of milestones they often seem like isolated incidents. This then causes many people to believe that alternative energy isn't giving us the payoff we thought we could get. However, if you use the rear-view mirror as a way to look at the future of alternative energy and renewable sources, then alternative energy doesn't look that great. But if you stop using the rearview mirror and start using the windshield to look at the future, then you can see that there are many more technological advances on the horizon that will make it better. That's when you see how great the future of alternative energy can be...and that alternative energy really is worth it.

### Intelligent Energy Is on the Way

For our energy sources to be more efficient and effective, they have to be more intelligent. In other words, everything that uses energy, as well as the energy grid itself, has to be able to "talk" to each other so that load and usage can be maximized.

Energy intelligence and advanced energy management systems involve technology called M2M (machines talking to machines). This technology is so ripe for development and rapid deployment that China expects to have over one billion machines talking to each other by

the end of the decade.

By getting machines to talk to other machines, by putting intelligence in everything that uses energy (including buildings and appliances), and by making the electronic grid a smart grid that can get smarter each year, we can do amazing things.

How amazing? The American Council for an Energy Efficient Economy just completed a study. They estimated that the United States could slash 12% to 22% of our energy needs and usage just by using advanced energy management systems. And that's not all...by 2015 the US Department of Defense believes they can cut up to 30% of the entire department's energy needs simply by using better energy management software and making things intelligent.

We're in the process of making cities more intelligent, including the roads, the stop signs, the traffic lights, and anything that uses energy. Currently, though, most of the things that use energy are dumb and they're not connected other than to get power. But if we connect them to make them intelligent, then suddenly you can reduce energy use tremendously just as the demand is increasing.

If we don't implement intelligent energy management for our cars, buildings, roads, and everything that uses fuel and energy, the cost of energy will rise fast. What's interesting, though, is that the price of intelligence is going down just as the power of intelligence is going up, and that's thanks to Moore's Law. In other words, processing power doubles every 18 months as the price drops in half. So the cost of making things intelligent is dropping very quickly. That's something to capitalize on.



*Technotrends is published 12 times a year by Burrus Research, Inc., a research and consulting firm that monitors global advancements in science and technology and their direct impact on business and consumers. Mary Norby, Editor P.O. Box 47, Hartland, WI 53029-0047. To subscribe, call 262-367-0949 or email [office@burrus.com](mailto:office@burrus.com). ©2012 Burrus Research, Inc.*