VIDYAVARDHINI'S COLLEGE OF ENGINEERING & TECHNOLOGY

LOGIN

to explore

2014 | 5th Edition

Department of

Information Technology

Vidyavardhini's College of Engineering & Technology

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FROM HOD'S DESK

I am immensely proud to present to you **fifth edition** of VCET Information Technology's Departmental Magazine ,"**LOGIN…To Xplore** ".The magazine you are holding in your hands right now is the epitome of the zealous activities and profound involvement of the students as well as the staff of the Information Technology Department.

This Magazine will take you through a thrilling journey of fast paced world of changing and emerging IT industry and technologies thereby acquainting you readers with the hitherto unknown marvels of the world of technology. For second, third and fourth year students, it will provide the invaluable inside into what to be ready for, what skill sets are essential in the industry and thus how to prepare themselves for employment. The department staff predominantly the Staff-In-Charges of the I-TECH committee Prof. Anagha Patil and the students who have worked tirelessly for this magazine are to be highly congratulated for bringing out such a fine, informative piece of publication. I hope the IT Department and I-TECH Committee will continue to strive and make mammoth efforts to keep up their good work and raise the bar of their soaring ability.

Happy Reading!

Prof. Chandan Kolvankar

Head Of Department, INFT

VCET

STAFF IN CHARGE

We are happily delighted to present to you the **fifth edition** of "**LOGIN… To Xplore**", the Annual Technical Magazine of the Department of Information Technology. The magazine that you hold in your hands now is an outcome of gruelling efforts of everyone involved in making fuelled by right mix of passion, dedication and determination. The magazine under I-TECH committee was first published in the academic year 2009-2010.The first edition of magazine was named "Dig-It" which was later named as "Login…To Xplore".

The Key Purpose of this magazine is to convey to the readers the trends and developments in the field of Information Technology. In this edition of the magazine the I-TECH committee aspires to provide the students with continual exposure to the ever increasing scope of Information Technology enriching the knowledge based in their chosen field and thereby acquainting them with knowledge pertaining to the IT industry that awaits them for and behalf of I-TECH committee we would like to extend our sincere gratitude to Dr. A. V. Bhonsale- Our honourable principal for his support and guidance as also Prof. Chandan Kolvankar- H.O.D of information Technology Department for constantly encouraging us to make this magazine bigger and better and infusing us with dynamism to succeed in our endeavours. Special thanks to our dedicated Team of Designers, Editors, and PRs as also the entire I-TECH Committee who have put in their heart and soul to the making of this magazine.

We are sure you will enjoy the technological extravaganza this magazine holds.

Prof. Anagha Patil

Staff-In-Charge,

ITECH-Committee

LOGIN-To Xplore

3D Print Everything

3D printing or additive manufacturing is a process of making three dimensional solid objects from a digital file.

The creation of a 3D printed object is achieved using additive processes. In an additive process an object is created by laying down successive layers of material until the object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object.

3D printing is the opposite of subtractive manufacturing which is cutting out / hollowing out a piece of metal or plastic with for instance a milling machine.

3D printing enables you to produce complex (functional) shapes using less material than traditional manufacturing methods.

How Does 3D Printing Work?
It all starts with the creation of a 3D model in your computer. This digital design is for instance a CAD (Computer Aided Design) file. A 3D model is either created from the ground up with 3D modeling software or based on data generated with a 3D scanner. With a 3D scanner you're able to create a digital copy of an object.

3D Modelling Software
3D modelling software comes in many forms. There's industrial grade software that costs thousands a year per license, but also free open source software, like Blender, for instance. You can find some beginner video tutorials on our Blender tutorials page.
3D modelling software is often made to suit the functions of the user's industry. This has resulted in the rise of software suited to specific niches. As a result, there are software applications on the market that cater to aerospace or transportation, furniture design or fabrics and fashion among many others.

For this reason, when you are starting out, the amount of choices can be a bit overwhelming, we recommend starting with Tinkercad. Tinkercad is available for free and it works in browsers that support WebGL, for instance Google Chrome. They offer beginner lessons and have a built in option to get your object printed via a 3D print service.

Now that you have a 3D model, the next step is to prepare it in order to make it 3D printable.

What is the future of 3D printing?

Saving Time and Effort:
3D printing food can save both time and energy when it comes to experimenting with cocktail garnishes or chocolate/sugar cake toppers. Even a trained pastry chef cannot achieve the perfection that 3D printing can products will transform the food industry someday

Food Sustainability:
3D Food Printing has the ability to supply an ever-growing world population as compared to traditional food manufacturing systems. At the same time, food printers could also minimize waste with the use of hydrocolloid cartridges that form gels when combined with water. Even rarely used ingredients like duckweed, grass, insects or algae can be used to form the basis of familiar dishes

Personalized Reproducible Nutrition:
Since 3D food printers follow digital instructions, the idea of being able to make personalized food containing the correct percentage of nutrients for a particular age or gender does not seem so far off. Food printers can easily help determine the exact quantity of vitamins, carbohydrates and fatty acids as per the input, without any hard work

Medical Industry
Medical science is exploiting this technology at an extremely rapid pace. With the advent of this technology, patients around the world are able to experience improved quality of 3D printed implants and prosthetics like never before.

3D bio printing of human tissue has been around since 1990s. But of late, the development and the implementation of this technology in medical sciences scientists are making a shift from printing tiny sheets of tissue to entire 3D organs. Layers of living cells are deposited onto a gel medium and slowly built up to form three dimensional structures by using inkjet techniques.

Aerospace & aviation industries
The developments in the metal additive manufacturing sector have largely boosted the utilization of 3D printing technology in the aerospace and aviation industries.

Automotive industry
Despite the fact that the automotive industry was among the earliest adopters of 3D printing, it has for decades relegated 3d printing technology to low volume prototyping applications.

Shushant Shelte

BE-IT

The Chip that Stops Your Slouching

You can probably guess why so many people have posture that causes back pain: “We simply forget” to stop slouching, says Monisha Perkash, whose company, Lumo BodyTech, created the ultimate reminder. Once users clip the Lumo Lift, a chiplike gadget about the size of a thumb, onto their shirt, it analyzes neck and spinal positions and vibrates when they’re less than ideal. Although the system isn’t perfect—it can buzz when you lean for necessary reasons, like taking a phone call—it has exceeded internal sales goals. Half of its users are women, which is impressive given that early adopters for gadgets often tilt male.

How's your posture right now? We'll bet that the moment you saw this headline, you probably sat up straight. We'll also bet that you won't be able to stay that way until the end of the article. Most of us know we should sit up straight, but it can be tiring and hard to remember to do. Enter the Upright, a little wearable device that can train you to sit up straight all on your own.

The Importance of Posture

Sitting up straight is about more than just looking confident. Bad posture can lead to all sorts of issues, from a lack of energy to permanent back problems. A 2006 study found that people who sit with a "flexed posture"—that is, bent forward—experienced more back pain than other participants. And according to the New York Times, the effects of bad posture can "radiate throughout the body, causing back and neck pain, muscle fatigue, breathing limitations, arthritic joints, digestive problems and mood disturbances."

How The Device Works

The Upright is a white silicone stick measuring about 4 inches (11 centimeters) long that's equipped with an accelerometer and a strain sensor. You stick it to your upper or lower back, pair it with an app on your smartphone, and then calibrate it to determine your ideal posture. Once it's calibrated, the device combines data from the accelerometer and strain sensor to identify the moments you're slouching, and vibrates to remind you to sit up straight.

This might sound kind of annoying to wear all day, but there's good news: you don't have to. The company claims you can wear it for as little as 15 minutes a day to train your back muscles for better posture, though the app generates a training schedule that gradually increases your daily wear from five minutes up to an hour per day.

If you'd like to learn more about how you can improve your posture, check out “Exercises for Perfect Posture: The Stand Tall Program for Better Health Through Good Posture" by William Smith, Keith Burns, and Christopher Volgraf. We handpick reading recommendations we think you may like. If you choose to make a purchase through that link, Curiosity will get a share of the sale.

The Lift is worn against your skin right below your collarbone, and it’s clipped to your shirt with a square magnet (in silver or black). When you sit at your desk, you need to "align" the device to your preferred posture. You can easily do this by double pressing the Lift underneath your shirt, which vibrates three times to confirm. At that point, the "coaching session" starts. Every time you shift out of posture, or you slouch, the Lift vibrates. You can set the device to buzz after as little as 3 seconds of slouching or as long as 10 minutes. The company recommends a 2-minute delay, but I set mine at 15 seconds to check how often I was slouching. I realized I slouch often, very often. Don’t get me wrong, the Lumo Lift is fairly discreet and the vibration is gentle, but it did get on my nerves time and again. The reason is the way the Lift actually works.

Sagar Umalkar

BE-IT

The Car That Makes Electric Enticing

For the most part, electric cars have been slow, sexless and stolid to drive—or stunningly expensive. So when BMW, the self-described maker of "the ultimate driving machine," announced it would start selling them, it had a high bar to clear. The I3 delivers. In addition to getting 70 to 110 miles (113 to 177 km) on a single three-hour charge, its novel design allows drivers to use a single -pedal to both accelerate and brake (press down to go, ease up to stop), which results in more energy-efficient driving. And because so-called range anxiety—the fear of running out of juice on the road—remains a top reason people don't buy electric, BMW is pioneering ways to ease customers' doubts. Among them: an optional backup gas motor that can recharge its batteries in a pinch and a program that lends owners a gas-powered vehicle for longer trip.

Choosing a new car is hard. And it's even harder if you're trying to make the decision between a traditional gas-powered car and an electric car such as the Nissan Leaf, Ford Focus Electric or Tesla Model S. So we've listed some of the pros and cons of electric vehicle ownership to help you make an informed decision before you sign the papers for your next car.

Benefits

The biggest benefit of electric cars is obvious: You no longer need gas. That's a big deal, since the average American spends between $2,000 and $4,000 on gas every year. Fully electric cars such as the Nissan Leaf, that cost is eliminated -- though electricity isn't free. A plug-in hybrid eliminates a major portion of your gas bill, as well, but it still uses a gasoline engine as a range extender.

Beyond the fuel-saving benefit, EVs offer another major cost savings: maintenance. Since an EV is fully electric, it no longer uses oil to lubricate the engine. That means oil changes are a thing of the past. The same is true for a lot of other expensive engine work that could afflict a gas-powered car. Brakes won't wear as quickly, either, so you won't need to replace pads as often as you do on a normal car.

Electric vehicles aren't just less costly to own, they're often inexpensive to buy, too. The Nissan Leaf, for example, starts around $30,000 -- no small number, until you factor in the available tax credits. Those include a whopping $7,500 federal income tax credit. Many states offer tax credits, as well. As a result, the $30,000 Leaf can easily get below $20,000. Lease payments can be even more enticing, since the leasing company takes the tax credit and passes on the savings to the driver.

Of course, there's another major benefit to owning an electric car. For many drivers, just knowing that they're doing their part to save the planet will be reason enough to take the leap into an EV.

Disadvantages

The main disadvantages of electric car ownership concern range anxiety: the fear you'll run out of juice when you're nowhere near a charging station. Indeed, both the Ford Focus Electric and Nissan Leaf offer a range of approximately 75 miles. For most drivers, that's more than enough to get around -- but many will require a second car, if only to calm their nerves.

Another big disadvantage is that many drivers will have to install a charging station at home. It's not necessary, however, as you can simply charge your EV at work or at various public charging stations. But most shoppers will want a charging station at home, cutting into the cost savings from owning an EV in the first place.

Although EV ownership eliminates many maintenance hassles, such as oil changes, it can also lead to big expenses. These are mostly because of batteries mounted in modern electric vehicles. Overall battery life is expected to be around a decade, and replacement battery packs can be costly. Most estimates put them well into the thousands of dollars.

Finally, EV ownership doesn't eliminate fuel costs entirely. As mentioned, electricity isn't free -- and charging during peak hours can add to your utility bills. Still, many drivers won't see costs increase more than $20 per month, at most.

While it can be difficult to decide between electric vehicles and gas-powered models, we hope our explanation of the benefits and disadvantages can make the choice a little easier.

Samper Sajama

TE-IT

A Reactor That Could Realize Nuclear Fusion

Nuclear fusion—the production of energy from the fusion of hydrogen nuclei—has always been the holy grail of energy: it's endlessly productive and largely clean—and so far, it's remained elusive. But in October, Lockheed Martin said it had achieved a technological breakthrough that will enable it to make compact fusion reactors small enough to fit on the back of a truck within a decade. The design uses "magnetic mirror confinement" to control the reaction. Absent further details on how it works, some outside scientists are skeptical. But if Lockheed really can produce a workable fusion reactor, the world of energy may never be the same.

A private nuclear-fusion company has heated plasma of hydrogen to 27 million degrees Fahrenheit (15 million degrees Celsius) in a new reactor for the first time — hotter than the core of the sun. UK-based Tokomak Energy says the plasma test is a milestone on its quest to be the first in the world to produce commercial electricity from fusion power, possibly by 2030. The company, which is named after the vacuum chamber that contains the fusion reaction inside powerful magnetic fields, announced the creation of the superhot plasma inside its experimental ST40 fusion reactor in early June.

Tokomak Energy is one of several privately funded companies racing to create a working fusion reactor that can supply electricity to the grid, perhaps years before the mid-2040s, when the ITER fusion reactor project in France is expected to even achieve its "first plasma."

Star in a jar

The nuclear fusion of hydrogen into the heavier element helium is the main nuclear reaction that keeps our sun and other stars burning for billions of years — which is why a fusion reactor is sometimes likened to a "star in a jar."

Nuclear fusion also takes place inside powerful thermonuclear weapons, also known as hydrogen bombs, where hydrogen is heated to fusion temperatures by plutonium fission devices, resulting in an explosion hundreds or thousands of times more powerful than a fission bomb.

Proponents of nuclear fusion say it could make many other types of electricity generation obsolete, by producing large amounts of electricity from relatively small amounts of the heavy hydrogen isotopes deuterium and tritium, which are relatively abundant in ordinary seawater.

"Fifty kilograms [110 lbs.] of tritium and 33 kilograms [73 lbs.] of deuterium would produce a gig watt of electricity for a year," while the amount of heavy hydrogen fuel in the reactor at any one time would be only a few grams, Kingham said. That's enough energy to power more than 700,000 average American homes, according to figures from the US Energy Information Administration. Existing nuclear-fission plants generate electricity without producing greenhouse gas emissions, but they are fuelled by radioactive heavy elements like uranium and plutonium, and create highly radioactive waste that must be carefully handled and stored.

Road to nuclear fusion

The ST40 reactor and future reactors planned by Tokamak Energy use a compact spherical Tokamak design, with an almost round vacuum chamber instead of the wider donut shape being used in the ITER reactor, Kingham said.

A critical advance was the use of high-temperature superconducting magnets to create the powerful magnetic fields needed to keep the superhot plasma from damaging the reactor walls, he said.

The 7-foot-tall (2.1 meters) electromagnets around the Tokamak Energy reactor were cooled by liquid helium to operate at minus 423.67 degrees F (minus 253.15 degrees C). The use of advanced magnetic materials gave the Tokamak Energy reactor a significant advantage over the ITER reactor design, which would use power-hungry electromagnets cooled to a few degrees above absolute zero, Kingham said. Other investment-funded fusion projects include reactors being developed General Fusion, based in British Colombia and TAE Technologies, based in California.

One of the most advanced privately funded fusion projects is the compact fusion reactor being developed by U.S.-based defense and aerospace giant Lockheed Martin at its Skunk Works engineering division in California.

The company says a 100-megawatt fusion reactor, capable of powering 100,000 homes, could be small enough to put on a truck trailer and be driven to wherever it is needed.

There is huge need of Nuclear Energy in Future for increased requirement of energy Nuclear energy is important

Bharat Singh
BE-IT

The Supersmart Spacecraft

Mangalyaan, India's Mars Orbiter Mission, is prepared for its Nov. 5, 2013 launch into space. Developed by the Indian Space Research Organization

India is counting down toward the launch of its first mission to Mars on Tuesday (Nov. 5), a mission that — if successful —will place the country in an exclusive club of nations capable of sending probes to the Red Planet. The Indian Space Research Organization will launch the Mars Orbiter Mission at 4:08 a.m. EST (0908 GMT) from a pad at the agency's Satish Dhawan Space Centre in Sriharikota, where the local time will be 2:38 p.m. in the afternoon.

Nobody gets Mars right on the first try. The U.S. didn't, Russia didn't, and the Europeans didn't. But on Sept. 24, India did. That's when the Mangalyaan (Mars craft in Hindi) went into orbit around the Red Planet, a technological feat no other Asian nation has yet achieved. Building the craft cost India just $74 million, less than the budget for the film Gravity. At that price, the Mangalyaan is equipped with just five onboard instruments that allow it to do simple tasks like measure Martian methane and surface composition. More important, however, it allows India to flex its interplanetary muscles, which portends great things for the country's space program—and for science in general.

The risks for the mission are high. It's tough to reach Mars with spacecraft, and more than half of the 40 missions launched to the Red Planet since 1960 have failed. India would be only the fourth country or space agency to deliver a probe to Mars after Russia, the United States and the European Space Agency if the Mars Orbiter Mission succeeds. By coincidence, NASA is planning to launch its own mission to Mars this month on Nov. 18.

India's Mars Orbiter Mission, also known as Mangalyaan, is the country's first mission to the Red Planet. See how India's Mars mission works in our full infographic.(Image: © by Karl Tate, Infographics Artist)
The Mangalyaan spacecraft will launch toward Mars atop an enhanced version of India's Polar Satellite Launch Vehicle rocket. If all goes well, India's Mangalyaan spacecraft should arrive at Mars on Sept. 24, 2014, ISRO officials said.

The mission was initially slated to launch on Oct. 28, but was pushed back when bad weather delayed the ships that will track the spacecraft after it separates from its rocket, ISRO officials said. As the centerpiece of India's Mars Orbiter Mission, the Mangalyaan probe is a 2,976 lb. (1,350 kilogram) spacecraft powered by solar arrays and packed with five instruments to study the surface and atmosphere of Mars. Those instruments include a colour camera for photographic imaging, a spectrometer for surface composition and mineralogy analysis and a methane sensor. The methane sensor in particular is a stand-out instrument as it is designed specifically to seek out methane gas in the Martian atmosphere. Methane has been a target of Mars scientists because while it can be created through geologic processes, it can also be a potential sign of microbial life.

India is not the only country with its eyes set on Mars.

NASA currently has two active rovers — the 1-ton Curiosity rover and smaller Opportunity —on the planet's surface. Orbiters from the U.S. and European Space Agency are also monitoring the planet from orbit.

NASA's next Red Planet mission, the Mars Atmosphere and Volatile Evolution (Maven), is slated to launch from Cape Canaveral, Fla., on Nov. 18. The $671 million Maven mission to Mars is built specifically to study the atmosphere of Mars in unprecedented detail.
NASA is also planning to launch the InSight lander to Mars in 2016 to dig deep underground on a mission to better understand the planet's core.

India's first mission to Mars follows the country's Chandrayaan 1 moon orbiter mission, which helped detect evidence of water ice on the lunar surface. ISRO officials are also developing a second moon probe, Chandrayaan 2, as a follow-up lunar flight.

Tanvi Zunjarro

SE-IT

Wearable devices

WEARABLE computing technology, dating to the 1960s' helicopter pilot head-mounted displays, is not new.1 Even the familiar office identification badge is a type of wearable. But with recent materials science advances driving technology miniaturization and battery improvements, we're standing on the brink of widespread adoption.

Wearables are devices worn on the body in items such as watches, glasses, jewellery, and accessories. Or in the body—ingested or surgically implanted. They consist of three modular components: sensors, displays, and computing architecture. A wearable device may include one, two, or all three functions. A smart watch may contain narrowly purposed sensors that gather data about the user and his or her environment, but it may have limited display functionality and no computing power. Computing may occur in the cloud or on a multipurpose device such as a smartphone. The display may be on a nearby screen or in a pair of smart glasses, or it may even use an ear bud or pendant for verbal response.

Think of wearables as an ecosystem—expanding capabilities that are individually interesting but more compelling when combinations are harnessed. This modularity is allowing new manufacturers to enter the market, driving demand from both consumers and enterprise users.
The mobile revolution placed powerful, general-purpose computing in our hands, enabling users to take actions in the digital world while moving about in the physical world. By contrast, wearable technology surrounds us with devices that primarily enable other devices with digital information, which in turn support us in taking real-world actions.

The primary goal of wearables is to enable users to take real-world actions by providing relevant, contextual information precisely at the point of decision making. Wearables shine in scenarios where using a laptop, phone, tablet, or other conventional device may not be appropriate4 as well as in making use of the data gathered by sensors. Meeting this goal requires generating data in

real time and intelligently pushing it to a device or devices according to the user's current context—just-in-time digital logistics. These use cases suggest that wearables may be most valuable deep in an organization's operations, rather than in customer-facing applications.

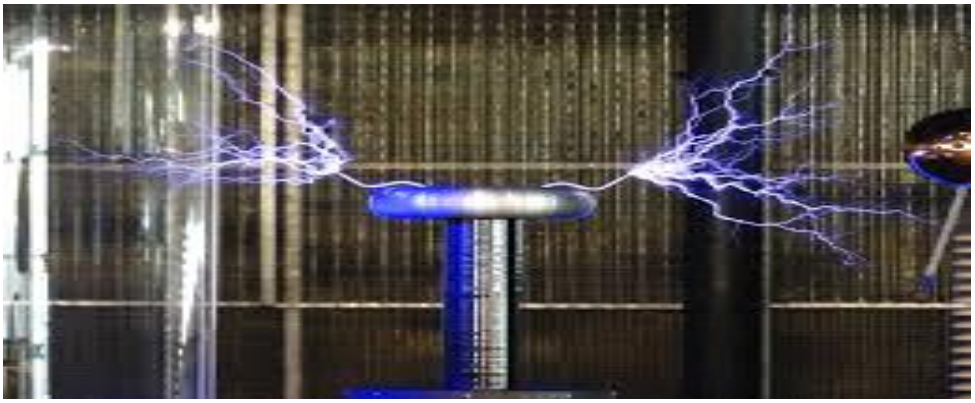
2013 saw an explosion of wearable devices in consumer products, with the "quantified self" movement leading the charge. Fitness and activity tracking devices are predicted to top $1 billion in sales in 2014.14Athletic consumer apparel brands such as Nike, Adidas, and Under Armour have either launched wearable technology products or publicly shared plans to enter the market.

The trend is being embraced in the broader fashion and consumer goods industries, with a wide range of emerging categories. Heapsylon manufactures Sensoria smart socks, which track how much a user is exercising. The company has plans to expand the platform to help prevent and manage falls and foot injuries and to collect information that health care professionals can use to provide better-quality care.16Reebok's CheckLight beanie measures the intensity of blows to the heads of athletes participating in contact sports, sending an alert when a blow is moderate or severe.17 Huggies announced prototype sensor-laden diapers that can tweet parents when their infants need to be changed.18 And more products are coming, as demonstrated by the high number of wearables on display at the 2014 Consumer Electronics Show.

Akshara Katakia

TE-IT

Wireless Electricity



In development for Toyota cars, Intel PCs and more

We already have wireless Internet and wireless phones. Why, then, are everyday appliances still shackled to the wall? To be sure, there are a few power-mat chargers for small gadgets like phones. But WiTricity, based in Watertown, Mass., is thinking big. Its technology—involving a plug-in coil that creates a magnetic field, which in turn powers objects as far away as 8 ft. (2.4 m)—has been tested on Toyota electric cars (with charging mats), Intel PCs (with charging pads) and more. Within 10 years, says CEO Alex Gruzen, rooms could be wired so that all appliances—lamps, TVs, stereos—pull power from a central charging base.

What's the trick?

"We're going to transfer power without any kind of wires," says Dr Hall, now Chief Technology Officer at WiTricity, a start-up developing wireless "resonance" technology. "But, we're not actually putting electricity in the air. What we're doing is putting a magnetic field in the air." It works like this: WiTricity builds a "Source Resonator," a coil of electrical wire that generates a magnetic field when power is attached. If another coil is brought close, an electrical charge can be generated in it. No wires required. "When you bring a device into that magnetic field, it induces a current in the device, and by that you're able to transfer power," explains Dr Hall. And like that, the bulb lights up.

Wireless homes

Don't worry about getting zapped: Hall assures that the magnetic fields used to transfer energy are "perfectly safe" -- in fact, they are the same kind of fields used in Wi-Fi routers.

In the house of the future, wire-free energy transfer could be as easy as wireless internet.

If all goes to WiTricity's plans, smartphones will charge in your pocket as you wander around, televisions will flicker with no wires attached, and electric cars will refuel while sitting on the driveway.

WiTricity has already demonstrated the ability to power laptops, cell-phones, and TVs by attaching resonator coils to batteries -- and an electric car refuelled is reportedly in the works.

Hall sees a bright future for the family without wires:

"We just don't think about it anymore: I'm going to drive my car home and I'm never going to have to go to the gas station and I'm never going to have to plug it in. I can't even imagine how things will change when we live like that."

World outside
Beyond these effort-saving applications, Hall sees more revolutionary steps.

When Hall first saw the wireless bulb, she immediately thought of medical technology -- seeing that devices transplanted beneath the skin could be charged non-intrusively.
WiTricity is now working with a medical company to recharge a left-ventricular assist device -- "a heart-pump, essentially."

The technology opens the door to any number of mobile electronic devices which have so far been held back by limited battery lives.

"The idea of eliminating cables would allow us to re-design things in ways that we haven't yet thought of, that's just going to make our devices and everything that we interact with, that much more efficient, more practical and maybe even give brand new functionality."

What's next?
The challenge now is increasing the distance that power can be transferred efficiently. This distance -- Hall explains -- is linked to the size of the coil, and WiTricity wants to perfect the same long-distance transfers to today's small-scale devices.

For this reason, the team have high hopes for their new creation: AA-sized wirelessly rechargeable batteries.

For Hall, the applications are endless: "I always say kids will say: 'Why is it called wireless?'"

"The kids that are growing up in a couple of years will never have to plug anything in again to charge it."

Seema Panday

TE-IT

ZMapp, for offering clues to a potential cure for Ebola

In the scramble to find a cure for the mysterious Ebola virus, medical innovators turned to the very cutting edge of experimental research to find treatments that could slow, or perhaps even stop, the outbreak. For now, the best candidate among these appears to be ZMapp, a cocktail of monoclonal antibodies developed by researchers at San Diego-based Mapp Biopharmaceutical. In one experiment, ZMapp appeared to stop the spread of the virus in monkeys within five days of being infected. Although the drug had never before been tested in humans prior to 2014, it was given to several victims of the Ebola virus.

We're at the bold start of a new era in virology, in which medical innovators must accept that viruses such as Ebola are not random Black Swan events, but rather, events with familiar patterns that can be tracked and stopped. This will require new thinking about how to attack viruses, as well as a potential re-evaluation of the costs that society is willing to endure to bring new treatments to market. As in the case of ZMapp and Ebola, it may mean speeding up the trial period or forgoing certain testing in order to get a treatment into the hands of more people.
Bavari and Warren were happy for the help but also overwhelmed as well as uncertain whether anything they were getting would actually work. Most of the compounds were developed for other diseases. Bavari, who is chief scientific officer of USAMRIID, compared the screening effort to trying to catch apples by holding a basket under a peach tree.

Fortunately, at least one apple seems to have fallen. In spring 2014, when the threat of the virus was starting to make headlines, Gilead Sciences shared part of its vast library of nucleosides and nucleotides with USAMRIID. Thus began a fast-moving collaboration that resulted in GS-5734, a nucleoside prodrug that has shown a remarkable ability to clear the virus in infected monkeys and is already being tested on healthy humans.

Gilead's compound is a bright spot in a lean pipeline of Ebola drug candidates. Despite intensive work to find Ebola treatments and multiple clinical studies to evaluate their merit, scientists still aren't sure which molecules are effective. They continue to press for answers while also preparing the world for the next epidemic—be it from the strain that caused last year's outbreak or a different virus.

SCRAMBLING FOR A CURE

As cases of Ebola multiplied last year, government agencies, aid groups at the front lines of the epidemic, drug companies, and other stakeholders all worked together to determine how to design and roll out clinical trials for the handful of Ebola drugs that showed promise in infected monkeys.

Through that process, the infectious disease community learned that "we can accelerate the system," says Daniel Bausch, a virologist at Tulane University and an Ebola expert. But setting up trials "has not been an easy process. It's been kind of messy, and there has been mud wrestling and arguments and starts and stops." Much of the arguing was over how to design clinical trials. Purists such as the Food & Drug Administration wanted a traditional randomized controlled trial, meaning some patients get the standard of care plus an experimental drug and others just get the standard of care. Such trials are best at delivering clear answers about the efficacy of a treatment. On the other end of the spectrum were advocates for single-arm trials, in which every patient receives the therapy. These trials might not provide a definitive sign that a drug works, but they at least allow drugs to be ruled out.

In the end, some studies were launched on a middle ground: They had an adaptive design that allowed investigators to get early peeks at the data and stop the study if a drug looked effective. But by the time agreement was reached about clinical trial design, the epidemic had hit its peak and was starting to abate. That was good news for public health but bad news for evaluating available drug candidates. As studies finally started to roll out, there were fewer and fewer patients available to enroll in them.

"Getting things in place in the recent Ebola epidemic was quick compared to past experiences," says Edward Cox, director of FDA's office of antimicrobial products. "But it's clear we need to think and plan to figure out ways to get trials in place even more quickly to be able to answer questions about which therapies are helping patients." Between the delays in starting trials, problems with trial design, and the usual setbacks encountered in clinical testing, experts are having a hard time pointing to a clear winner among the drugs that were assessed. "If anything, treatment options have become more limited than they were last year," USAMRIID's Warren says. "We have some new things on the table, but some treatments that were previously used in patients were either shown to be ineffective or they've been discontinued."

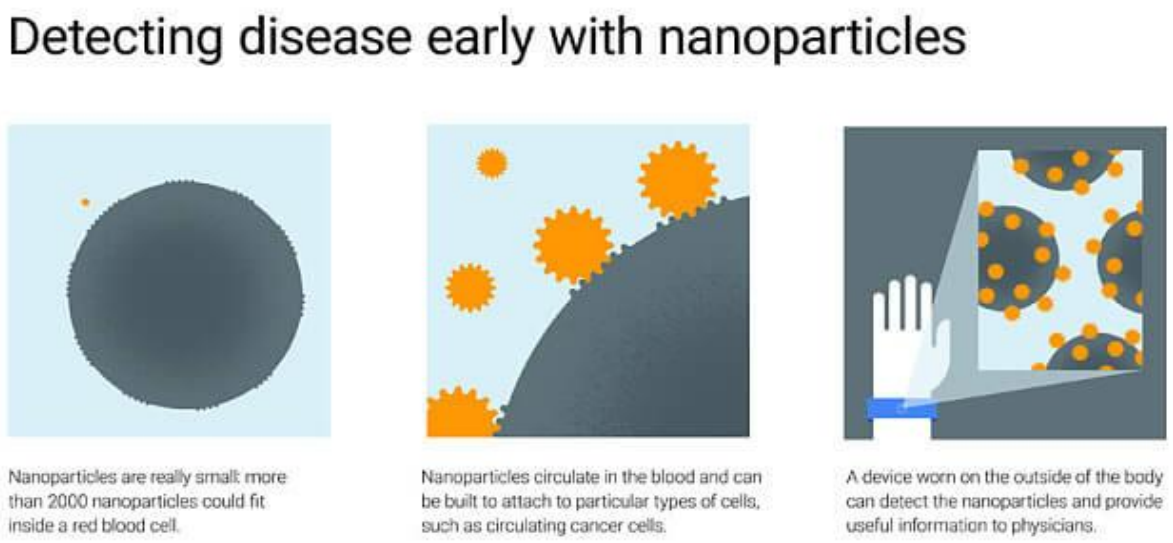
Tekmira Pharmaceuticals, which has since been renamed Arbutus Biopharma, pulled the plug on a Phase II study of its RNAi-based drug TKM-Ebola-Guinea after an early analysis of the data suggested it wasn't effective. Meanwhile, an RNAi drug developed by Sarepta Therapeutics that had shown some promise in monkeys never gained traction.Only the antibody cocktail ZMapp—famously given to the first two American aid workers infected during the outbreak—and the antiviral favipiravir have demonstrated signs of working. The clinical trial of ZMapp continues, and Ebola experts believe it has at least some efficacy based on its use in foreign aid workers who contracted the virus.

Sameer Sajjan
BE-IT

Google's Cancer Detection Pill

Google is attempting to develop a pill that would send microscopic particles into the bloodstream in an effort to identify cancers, imminent heart attacks, and other diseases.

Andrew Conrad, the head of life sciences inside the company's Google X research lab, revealed the project on Tuesday morning at a conference here in Southern California. According to Conrad, the company is fashioning nano particles—particles about one billionth of a meter in width—that combine a magnetic material with antibodies or proteins that can attach to and detect other molecules inside the body. The idea is that patients will swallow a pill that contains these particles, and after they enter the bloodstream—attempting to identify molecules that would indicate certain health problems—a wearable device could use their magnetic cores to gather them back together and read what they've found.



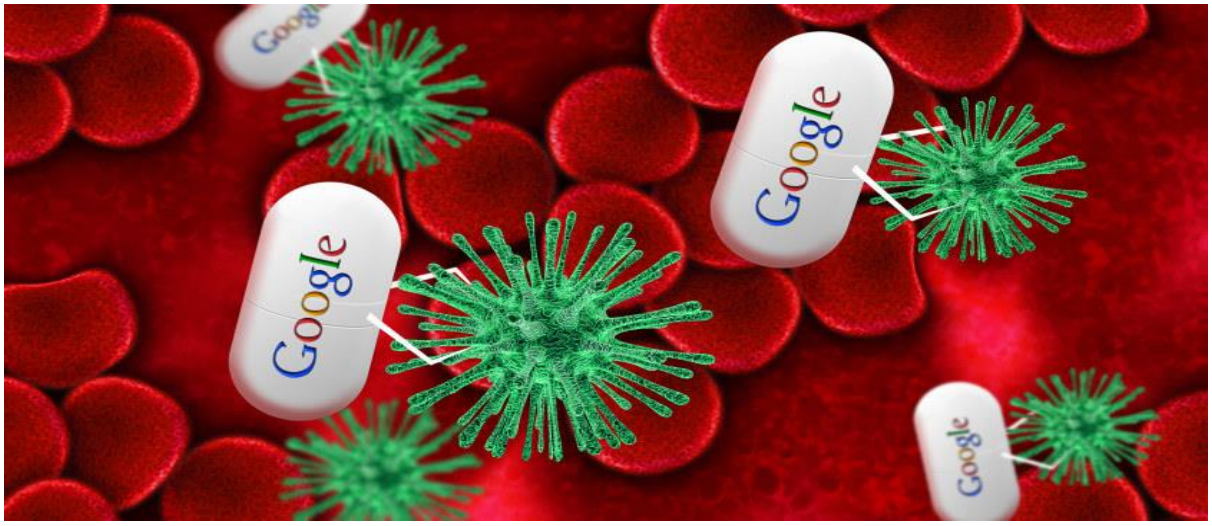
"Because the core of these particles is magnetic, you can call them somewhere," Conrad said, indicating that you could use a wearable device to gather them in the superficial veins on the inside of your wrist. "These little particles go out and mingle with the people, we call them back to one place, and we ask them: 'Hey, what did you see? Did you find cancer? Did you see something that looks like a fragile plaque for a heart attack? Did you see too much sodium?"

Known as the "Nano particle Platform," the project is part of a wider effort inside Google to develop new technologies capable of improving healthcare. "Google X's job is to take on big problems, to try to find clever solutions to big problems, and one of the problems we decided to tackle was healthcare," Conrad said. "The way in which we envision doing this is inverting the paradigm in medicine—which is currently reactive and episodic—to a new paradigm that is

proactive and cumulative." As Conrad put it, this involves building "gizmos" that can monitor your health in new ways.

In January, for instance, the company unveiled a contact lens that would let diabetics monitor blood glucose levels through the tears in their eyes. As with this contact lens, Google does not intend to sell its nano particle pills and accompanying wearables. Instead, it will work with third party medical companies to bring the technology to market.
Conrad said "there is a lot of evidence" that these nano particles are safe and that similar nano particles are already used in some medicines available today and in contrast agents used in magnetic resonance imaging, or MRI, tests. These particles would be expelled from the body, he explained, through urine.

The wearable device that reads these particles, Conrad said, could be configured to send information, across the internet, back to a doctor. The idea, he explained, is that you or your doctor could monitor your health in a more consistent way. "So, you get a more continuous monitoring, rather than episodic monitoring," he said.



Pooja Bhosle

TE-IT

The Copenhagen Wheel

The Copenhagen Wheel is a self-contained rear wheel electric bicycle system which transforms a traditional bicycle into a hybrid e-bike. The app-connected Wheel is equipped with an electric motor, battery, and suite of sensors that work together to seamlessly amplify a rider's pedal power by up to ten times. The Copenhagen Wheel was developed at MIT's Senseable City Lab in 2009 in partnership with the city of Copenhagen, and unveiled at the 2009 United Nations Climate Change Conference. In December 2012, Assaf Biderman, a co-inventor of the Wheel and Associate Director of the MIT Senseable City Lab, founded Superpedestrian Inc. with an exclusive license to commercialize the Wheel. After several years of engineering, testing, and validation, the Copenhagen Wheel officially launched in the U.S. in April 2017, and in Europe in October 2017

The Copenhagen Wheel contains a custom brushless motor, advanced sensors, control systems, and a lithium-ion battery, all enclosed within the rear wheel hub. The control system interfaces with a range of sensors measuring actual torque, power and acceleration to monitor a rider's effort when pedalling. The Wheel responds to a rider's inputs by providing the appropriate level of assistance at each moment, creating a seamless ride experience. The wheel's battery is charged via an external cord that fits a standard wall outlet. "Electronic Braking Assistance" while riding will partially recharges the wheel when coasting or backpedalling. With a full charge, the wheel's reported range is up to 50km (31mi), with variations depending on assist mode and terrain.

Copenhagen Wheels are custom built to fit each customer's bicycle. The Wheel is compatible with steel or aluminium bicycle frames, and requires rear rim brakes. The Wheel connects to the App via Bluetooth, and enables riders to personalize their cycling experience from their smartphone. A smartphone also acts as a digital key, automatically when ready to ride, and communicating with the cloud in real time. A self-diagnostic safety system monitors components within the Wheel and proactively responds to events within milliseconds, protecting both rider and Wheel. Superpedestrian releases frequent updates to the Wheel App. Superpedestrian is currently working on future versions of the Copenhagen Wheel with updated features and wider compatibility. In the meantime, over-the-air firmware updates and app updates are available to current riders.

Bharat Singh

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