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Daniel Burrus'

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TECHNOTRENDS® NEWSLETTER

The biggest ideas that are changing everything

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Enhanced Location Awareness for Retail

By Daniel Burrus, CEO of Burrus Research

In my book *Technotrends* (Harper Business 1993), I predicted that technology would change how we live, work, and play — and at an exponential rate. That did indeed happen for those of us who were around 23 years ago. As a society, we have become enthralled with using our time as efficiently as possible, yet many of us spend a large portion of time glued to our screens, scrolling through endless social updates and other trivia. I was recently in Italy at a world heritage site, a beautiful ancient city where the majority of people were looking at their screens instead of at the beauty around them. Is this what Steve Jobs had in mind when he released the first iPhone? Is it technology's fault?

> ***The same technology that can give you cancer can be used to cure your cancer.***

Technology is not good or evil. The same technology that can give you cancer can be used to cure your cancer. It's not the tool, it's how you use the tool. A drone can be used to find and save people who are trapped in the rubble of an earthquake, or it can be used to kill them. It's never the tool, it's always about what we decide to do with it. As our personal technology — not to mention all technology — gets increasingly powerful, will you use it to shape a more connected, more collaborative, more enlightened, more abundant future for yourself and others, or will you simply hope the future will be better than the present?

Today's smartphone is a window to the world of both information and knowledge. We have the power to find the solutions to our problems and the answers to our questions with the swipe of a finger or a verbal command. Nearly all of the time, we are in contact with some sort of device that allows for constant communication with the rest of the world. And in the rare case that we are not with our smartphones, tablets, or wearable, we are probably asking the person next to us to borrow their device.

Not long after businesspeople ditched their BlackBerry devices for smartphones and discovered how easy it was to have instant access to people, places, information, and things, we began to shift from an Information Age society to the Communication Age.

Having access to the Internet while on the go is just one element integrated in our smartphones, The convergence of features and functions in today's smartphones, combined with their ability to reach into the cloud and give you access to virtual products and services, as well as turn your smartphone into a supercomputer, has opened the door to unlimited possibilities. There are millions of specialized mobile apps available to smartphone users, which means this handheld piece of technology can do just about anything.

Location services is one smartphone feature

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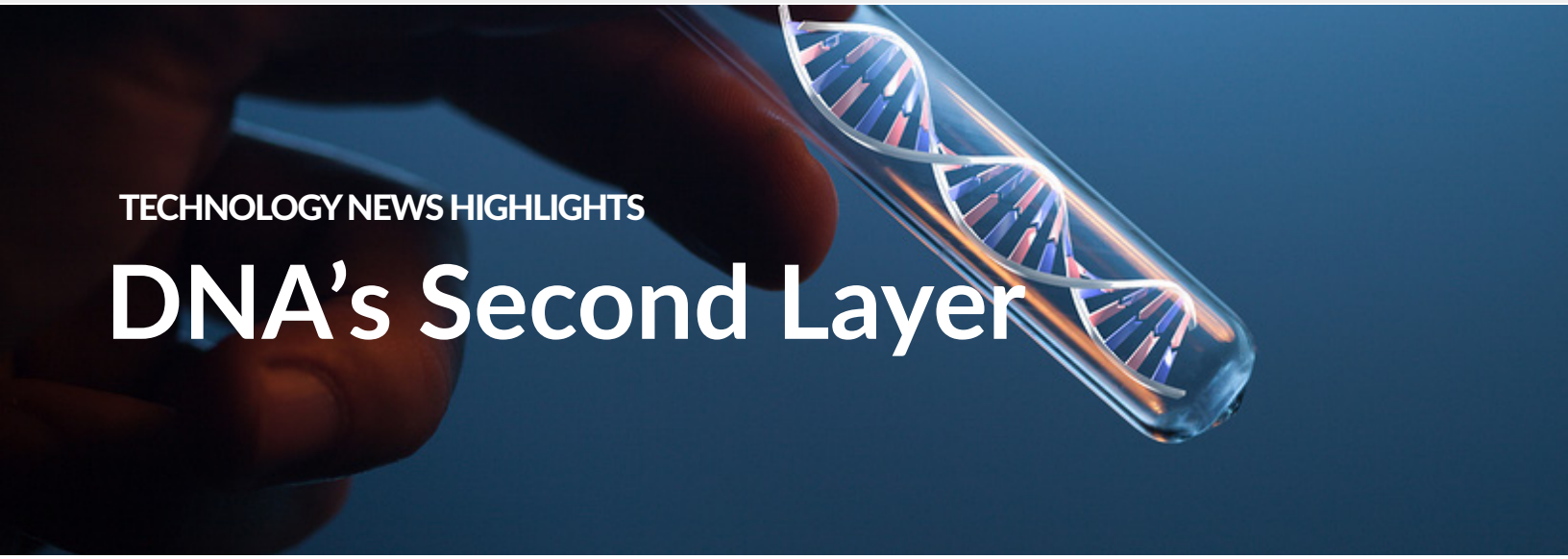

TECHNOLOGY NEWS HIGHLIGHTS

DNA's Second Layer

For the first time, researchers have confirmed that DNA — the molecules that determine who we are at the most basic level — relies on more than a simple sequence of genes to express all of the complex functions that make up a living organism.

Since Watson and Crick first described DNA as unique sequences of nucleotides (G, A, T and C) that determine what proteins are produced in the body, one question persisted: If every cell in the body has the same sequence, how can different organs perform such diverse functions? For decades, scientists have hypothesized that the key to how the sequences read out lies in the way DNA "folds."

Each cell contains about 2 meters (6 feet) of DNA molecules. In order to fit into a single cell, the molecules are folded into what are known as nucleosomes. This mechanical structure can change from cell to cell and affects which genes are expressed, so only those relevant to a particular organ are read. Researchers recently tested this hypothesis by simulating the formation of DNA nucleosomes in two different types of yeast. The results showed that mechanical cues indeed determined how the cells functioned.

The significance of this work lies in developing a new understanding of the fact that DNA mutations can occur as a result of two separate factors — the sequence and the mechanical structure — a finding that could revolutionize the science of genetics and genetic engineering.

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Robotic Lifeguard

We recently saw a great example of how existing technology can be put to important new uses when the seagoing robot known as EMILY (Emergency Integrated Lifesaving LanYard) rescued 300 migrants from drowning in the Mediterranean.

Originally designed for UAV applications to monitor whale movements during Navy sonar tests, the key component technologies (such as engines and navigation computers) have also been used for aerial surveillance and reconnaissance as well as in surface vehicles for hurricane tracking and search-and-rescue.

Then, as the result of a collaborative effort between the Office of Naval Research and the Small Business Technology Transfer Program, the developer took the technology one step further.

Now EMILY is impacting global humanitarian efforts with lifesaving capabilities that no human could match, including navigating through 30-foot waves and smashing into reefs while travelling at speeds up to 22 miles per hour.

Constructed of Kevlar and aircraft-grade composites, EMILY is virtually indestructible, so she can be thrown out of a helicopter or off a bridge and driven via remote control to her destination. The bright orange, red and yellow body can be easily spotted, but she's also equipped with two-way radios, a video camera and navigation lights. A swift-water conversion kit is also in the works that will include a life vest and helmet for river rescues.

For information: Tony Mulligan, Hydronalix; phone: 502-203-8351; email: info@hydronalix.com; Web site: https://hydronalix.com/

Anti-Mosquito Body Wash

In many parts of the world, mosquitoes are more than just a nuisance — they can be carriers of serious diseases such as dengue fever, which, according to the CDC, infects up to 400 million people annually and is a leading cause of illness and death in the tropics and subtropics.

More than one-third of the world's population lives in areas that are at high risk for dengue, and with no available vaccines, the best defense against contracting the disease is to avoid mosquito bites. This prompted students at a Vietnamese boarding school to look for a solution.

Borrowing on their knowledge of local flora, the students decided to start with a type of lemon grass (known as sa chanh) that was purported to be useful

for driving away mosquitoes and treating certain skin disorders.

The students determined that the plants reach their peak for oil extraction at about four months, so a 40-square-meter plot of land on the school campus was devoted to growing the grass, allowing them to harvest at the optimum time. With the help of their chemistry teacher, in a laboratory only 4 square meters in size, the students successfully extracted the oil, which was then blended into a body wash.

The extracted oil has been certified for quality by the Lam Dong Science and Technology Department, and the resulting product meets thirteen criteria for body wash as established by the Ministry of Science and Technology.

The students have received several awards and are producing the body wash on a small scale. They hope to continue their research into using the sa chanh oil for other cleaners as well as topical medicines.

For information: Vo Nhu Son, Deputy Headmaster, Dak R'Lap Boarding School, Dak Nong Province, Vietnam

New Therapy for Stroke Victims

In the U.S. alone, nearly 800,000 people suffer from a stroke, the leading cause of long-term disability.

While physical therapy helps to restore some motor function, approximately half of them will end up with profound movement problems.

But a procedure known as deep brain stimulation (DBS) is slated to begin clinical trials that could improve the effects of physical rehabilitation in victims of ischemic stroke.

DBS has been used in the past to treat the tremors associated with Parkinson's disease. Electrodes are inserted into the brain and connected to a stimulator (similar to a pacemaker) implanted in the chest just under the skin.

The big difference is that, in the case of Parkinson's, the goal is to reduce motion/tremors, while the goal of the present application is to develop those parts of the brain that control movement.

Studies have shown that rats receiving DBS developed twice as many synapses between nerve cells as those not receiving it. They also developed a higher level of proteins associated with brain plasticity.

By implanting the electrodes in those areas of the brain that communicate with the damaged regions, researchers hope that the effects of physical therapy will be greatly enhanced, leading to more complete recovery and restoration of movement.

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3D Printed Stadiums

As Qatar looks forward to hosting the 2022 World Cup, scientists and engineers are exploring how to design stadiums that will endure the desert climate. To avoid the summer heat, the competition has been scheduled to take place in November. But winter poses other weather challenges, including sand storms, which need to be considered.

Planners are looking to build and/or renovate at least eight stadiums in preparation for the games, and 3D printing is playing a major role in architectural design.

Stadium models are placed in a wind tunnel that simulates a sand storm using smoke-filled air. Lasers measure the turbulence at various points as the design is tweaked to minimize the impact of high, hot winds.

3D printing allows architects and engineers to design structures that will be usable year-round and well beyond 2022.

In addition to making the stadiums more comfortable for players as well as fans, maintaining the architectural character of the buildings — such as the sweeping Bedouin tent design of the existing Al Bayt stadium — is a prime consideration.

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Sketch Recognition

Imagine being able to shop for your ideal pair of shoes simply by sketching them on your touch-screen device. That's the goal of SketchX, a computer program that can recognize sketched images and retrieve search results better than text-based systems. Using a technology known as fine-grained, sketch-based image retrieval (SBIR), the new program is superior to using verbal descriptions, particularly when the level of detail needs to be precise. Even traditional photo searches are not as effective, since they tend to restrict the results too narrowly.

Designed to emulate the human brain by processing arrays of simulated neurons, the system was "trained" by matching about 30,000 photos and sketches. Tests have demonstrated a top-10 retrieval accuracy (i.e., the product is displayed on the first page) of close to 100 percent on some object categories.

The technology could revolutionize online retailing, which is still primarily designed around category-level search techniques and can be cumbersome to browse. With touchscreens becoming more ubiquitous,

sketching could easily replace text and photos as the search method of choice.

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Training Your Brain

Yet another application for neuro-stimulation (this one less invasive) is designed to help athletes prime their brain for improved physical performance. Dubbed Halo Sport, the device sends a stream of electrical impulses to the motor cortex — the area of the brain that controls voluntary movements and planning. In turn, the energized neurons send stronger signals to the muscles, allowing the wearer to supercharge his or her workout and gain greater benefit from every repetition.

In initial testing, subjects from the U.S. Olympic ski team improved their propulsion force by 31 percent and Air Force drone pilot trainees demonstrated a 50 percent reduction in training time using the device. It is also being tested selectively by NBA and MLB players. However, questions are already being raised as to whether "neuro-doping" with a device like Halo Sport constitutes a violation of anti-doping regulations.

The first devices, which were released in February, were sold out in less than a week at a price of $750.

For information: Halo Neuroscience, 735 Market Street, San Francisco, CA 94103; phone: 415-851-3338; Web site: https://www.haloneuro.com/

Redesigning Concrete

Concrete — the most widely used, man-made material in the world — requires a huge amount of energy to produce. A random mixture of crushed rock and stones, combined with a cement paste, its strength and durability are also highly variable depending on the internal structure of the components.

So researchers are looking at ways to better control concrete's overall properties while coming up with a recipe that's more sustainable to produce.

Once again taking a lead from nature, the first step was to study what gives some of the most durable natural materials (such as bone, shells, coral, and deep-sea sponges) their strength and how that relates to physical properties. For example, on a microscopic scale, they discovered that the onion-like structure of the silica layers in a deep-sea sponge provided a mechanism for preventing cracks, while the brick-like structure of mother-of-pearl increased toughness.

But translating microscale properties into macroscale structures requires mesoscale thinking, so they developed a framework that allows scientists and engineers to study how particular ingredients will impact the overall properties of concrete.

The framework allows data from techniques like electron microscopy and x-ray diffraction, which are used to characterize various materials, to be plugged into a model that would identify the relationships between components to determine the best mix for performance and longevity. The goal is to extend the life of concrete by two or three times, which would be

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Enhanced Location Awareness

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that we tend to take for granted. There is not much thought given when we open the map on our phone and find exactly where we are in the world pinpointed on a map. Oftentimes finding directions to a desired location is as easy as typing an address into the search bar and tapping start. Many of us now skip tapping and typing altogether and simply say where we want to go, and the device plots the best course. In a matter of seconds you are on your way from your current location via the shortest route to your destination. It does not get much easier than that.

Nonetheless, many of us are not aware of how our smartphones live up to their name. How are these devices so smart? Let's start by focusing on just one element, the GPS functionality you have access to, so we can start to see how the pieces fit together to form an amazing abundance of new opportunity.

How do we get from point A to point B, sometimes without knowing our own surroundings? Thanks to a small component in your phone, you have access to a large network of Global Positioning Satellites, which provide the device coordinates of where the phone or

tablet is located at any given time. This combines with access to geographic information systems (GIS) in the cloud to instantly capture and present spatial data that provides users with the ability to not only locate themselves, but their surroundings. If a smartphone did not have this location awareness, typing "Starbucks" into the map or into an Internet search bar would not be very helpful. A coffee shop across the country or even across the world might appear as the answer to your search, instead of the one right down the street.

Increasingly, organizations are harnessing our obsession with instant gratification using smartphones and tablets by tapping into this location component. As you might guess, we now have enhanced location awareness services that can work within buildings; these are being used as a tool to increase sales for businesses,

while saving consumers time and money.

Enhanced location awareness provided by in-building systems gives consumers the opportunity to find what they are looking for anytime, anywhere, and in anyplace. Because location is taken into account when a customer searches for a specific place or item, a more accurate answer is found. The perfect extra-large and extra-thin flat screen television that you have been looking for can now be located at the electronics store a few miles away or a few aisles away if you are already in the store.

Not only does this save consumers time when navigating where to find a product, but it also allows businesses to get people in the door, ready to purchase merchandise.

More and more organizations are using a combination of a new generation of Radio-Frequency Identification (RFID) on their products that tie to in-store systems via location-aware sensors, and GIS to attain a better understanding of where people are and what they are looking for. Knowing when a person on a mobile device is in a retailer's location gives the business insight as to when advertisements, deals, and specials should be presented on the user's smartphone. People are essentially awarded with savings by doing nothing more than entering a certain area, and businesses ultimately profit from this knowledge.

Another technique used by retailers to get customers through their doors is Geo-Social Marketing. This new type of marketing takes into account people who have "checked in" at a store on social media or via an app, providing those individuals with advertisements, deals, and savings. An increase in the presence that an organization has on a person's mobile device, from social media to ads on other websites, increases the chance that person will purchase products from the company. Geo-Social Marketing allows businesses to capture the attention of people who are likely to become customers, or who already are, instead of wasting efforts on reaching those individuals who may not be the target audience.

Enhanced location awareness has created a large space in the market of consumer apps. Augmented Reality and Geo-Social Marketing are beginning to create a niche for businesses to create mobile device applications for consumers to use on the go. The platform allows customers to find and purchase products while on the move, giving retailers a better sense of what the user is looking for, while bringing a convenient, one-stop shop to life on the user's smartphone.

Businesses that utilize enhanced location awareness gain a tremendous competitive advantage. By better understanding when and where to employ marketing strategies, retailers more productively reach their customers.

Consumers are looking for quick and easy ways to purchase what they need, and want to know exactly where to go. By tapping into what consumers are looking for and when, organizations can increase the likelihood that the customer chooses their products instead of the competition.

Consumers want what they want, when they want it, and enhanced location awareness is increasingly being utilized by retailers large and small to fit these desires. By embracing this powerful tool, businesses are meeting the needs of their customers in new and powerful ways.

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