

DANIEL BURRUS'

# TECHNO TRENDS

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THE BIG IDEAS THAT ARE  
CHANGING EVERYTHING

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## The Anticipatory Organization™

By Daniel Burrus, CEO of Burrus Research

A few weeks ago, a Fortune 50 CEO shared with me that "The pace of change is now faster than our organization's ability to respond to it." I hear this observation quite often as I travel around the world working with executives from some of the largest companies on the planet. And you might find it interesting to know that many of them are technology-focused companies that create, manufacture, market, and sell various types of hardware, software, or both.

It is no secret that the world is changing at an increasing rate, but in the past few years the increased pace has surprised most. Yet it was all there to see long ago; the problem is that most have not learned how to separate the wheat from the chaff.

### Acceleration<sup>3</sup>

Way back in 1983, after launching my company, Burrus Research, I was studying global innovations in all areas of science and technology on a global level. I came across something that is well known today, but back then very few knew about — Moore's Law. Because of my science and research background, I knew he had created something that could shed light on some of the darkness the future holds. In short Moore's Law states that processing power would double every eighteen months as the price halved.

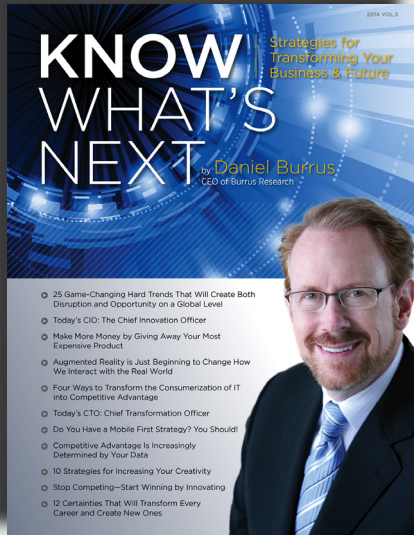
Using this, I could look out to the year 2000 and know how powerful a computer would be, and roughly how much it would cost. Knowing this, I could make predictions about technology-driven change that would be very accurate, but I needed more than Moore's law.



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## TECHNOLOGY NEWS HIGHLIGHTS

### Solar Storage

On the day that Tesla announced they were building a new battery plant, we predicted that the batteries would be used not only for Tesla's growing fleet of electric cars, but also to revolutionize energy storage. The prediction is now becoming reality as Tesla Motors recently announced the introduction of a super-efficient power storage system that finally addresses the challenge of how to tap into solar power when the sun isn't shining. Dubbed the Powerwall, the system was derived from the rechargeable lithium-ion batteries originally designed for their Model S vehicles, and is affordable enough for homeowners, yet scalable for businesses and utilities as well.



The typical household demand for power is higher in the morning and evening, so for homes that are already equipped with solar panels, excess power generated during the day – when sunlight is most plentiful – is generally sold to the utility and purchased back when needed. But the higher demands that this places on power plants and the power losses inherent in the energy grid make this mismatch inefficient and costly. A system like Powerwall will help smooth out fluctuations in the grid and also provide energy security in the event of an outage.

Each battery block measures about 34 inches wide by 52 inches high by 7 inches deep (130cm x 86cm x 18cm) and weighs about 220 pounds (110kg). They operate at 92 percent efficiency with a peak output of 450 volts and 8.6 amps per battery to deliver peak power of 3.3kW (or 2kW continuously), and are compatible with both single-phase and three-phase utility grids. Up to nine packs can be connected together to handle higher energy needs.

The system will be installed by licensed technicians and linked up to the Internet to be managed by Tesla. Two models will be available with price tags of \$3500 for a 10kW version and \$3000 for a 7kW version. Production is scheduled to begin later this year.

For information: Tesla Motors; Web site: [www.teslamotors.com/powerwall](http://www.teslamotors.com/powerwall)

## Magnetic Cooling System

Researchers have discovered a new material that could revolutionize refrigerators, freezers and air conditioners, making them quieter, more efficient, and eco-friendly.



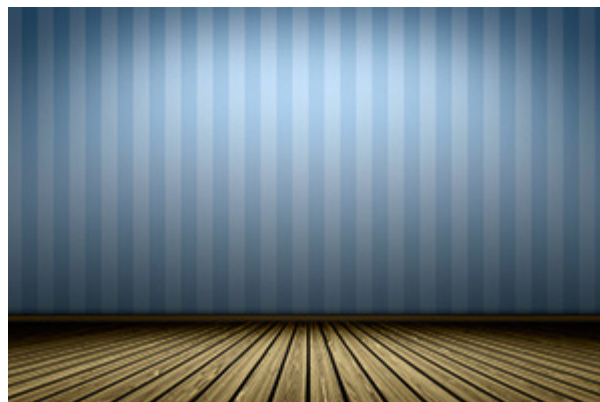
Developed with funds from a U.S. Department of Energy grant and LSU's LIFT (Leveraging Innovation for Technology Transfer) fund, the team has been exploring a number of applications for commercial as well as consumer use.

The patented concept utilizes what is known as a magnetocaloric material, which is heated and then placed inside a magnetic field. When it cools to room temperature, the field is removed and the temperature drops further, creating a cooling effect. Although the idea is not new, the innovation comes in being able to produce the reaction at room temperature. This requires the use of pure gallium, which is rare and expensive.

Although the technology is still in the early development stage, this solution addresses many issues that have prevented magnetocaloric materials from moving forward as a viable alternative. So, look for magneto-refrigerators coming available in a decade (or so).

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## Luminescent Wallpaper



A new wallcovering, which recently debuted at the Designblok exposition in Prague, illuminates an entire room with soft, ambient light. Called Lighting Wallpaper™, it consists of individual decorative, flexible tiles that can be easily installed on any surface using double-sided copper tape. The tiles contain no wires, bulbs or LEDs, and their unique construction creates a pleasant light that's equally bright at all points.

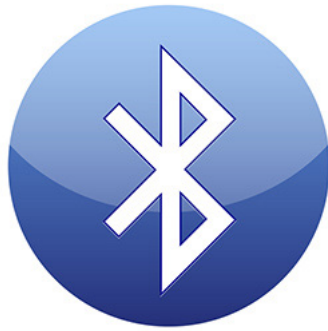
A layer of zinc-sulfide with metal additives (such as copper) is sandwiched between two layers of electrically conductive plastic, which form a pair of electrodes that function as a capacitor. When an AC voltage is applied to the electrodes, the metal additives discharge in a series of flashes about sixteen times per second. This is perceived by the human eye as a constant but subtle glow.

The tiles can emit up to 100 candlepower per square meter while consuming less than 100 Watts per square meter of lighted area. In other words, an array of twenty "Flower and Circle" tiles, each measuring 50 centimeters (19 inches) square and having about 13 percent lighted area, consumes about as much electricity as a 60Watt bulb, with a working life of approximately 50,000 hours.

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## “Sipping” Energy

There are two ways to extend the battery life of wearables – improve the battery technology, or improve the efficiency of the wearable device.



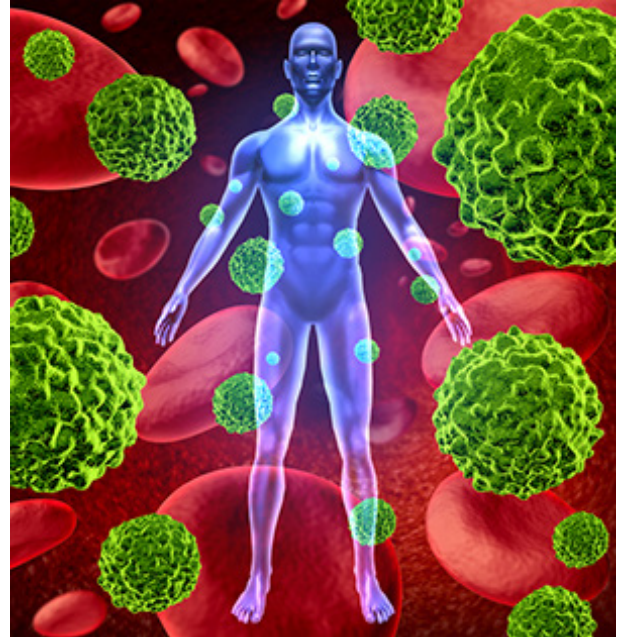
Recently, a leading semiconductor company made great strides toward the latter with the development of new technologies that operate using very low voltages.

Much of the power consumed by wearable devices is taken up by the Bluetooth devices that allow them to communicate with smartphones. As a result, products like the Apple Watch need to be charged daily (at least). The new technology combines sub-one-volt Bluetooth radio with a proprietary stack and profile design for efficient data transfer at very low power levels, which could extend the battery life of wearable devices by 60 percent or more.

These low power devices could also represent an important advancement toward the development of energy harvesting technologies (such as motion, piezoelectric, thermal or even solar) to power wearables without the need for batteries at all!

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## Boosting Cancer Immunity



A new protein has been discovered that exploits the innate ability of a person’s immune system to kill abnormal cells, offering new hope in the fight against cancer. Although little is known about the molecule or how it works, scientists are hopeful that it will lead to development of more effective treatments, not only for cancer but for viruses and chronic diseases as well.

The body’s immune system fights off cancer by producing T-cells, however, the cancer often grows faster than the number of T-cells needed to fight it, resulting in a poor prognosis. In addition, certain cancers actually suppress immune function, tipping the scales even further in the wrong direction.

The new discovery occurred while testing genetic mutations in mice, where it was noted that a specific mutation resulted in ten times the number of T-cells. That mutation was linked to a specific protein called lymphocyte expansion molecule (LEM), which also exists in humans. Subsequent experiments on human cells have shown that



the protein promotes the growth of cytotoxic T-cells, allowing the body to produce enough to potentially overcome cancer.

The researchers are hoping to begin conducting trials of a new genetic therapy based on their work within three years.

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## Robotic Kitchen



The kitchen of the future was recently unveiled at the Messe Fair in Hanover, Germany, complete with utensils, appliances and a pair of robotic hands to do the cooking. It's the dream kitchen for people who don't cook, and for those who do, it's a way to experience the culinary delights of some world-class chefs without leaving home.

The hands alone (which are manufactured by another firm) took 18 years to develop and are controlled by 24 motors, 26 microprocessors and 129 sensors. The system is trained by mimicking the actions of a master chef who prepares a signature dish wearing special sensor-studded gloves. The

chef's movements are recorded from various angles and synthesized into a three-dimensional template which is used to program an algorithm that drives the robotic kitchen. The robot captures the subtleties of movement with amazing accuracy and consistency, assembling ingredients, cooking them in the appropriate pots, pans or oven, and then serving them up with the flair of a professional.

The system will be supported by an online library of more than 2,000 recipes from top chefs around the world, but when users feel the urge to prepare their own recipes, it can simply be switched to manual mode and used as a normal kitchen. Or, they can train the system to prepare their own favorites using the same high-tech gloves.

The robotic chef isn't yet trained to use knives, but future versions are expected to have that capability. For now, ingredients need to be prepared in advance and placed in preset positions. And there's one other drawback – like most professional chefs, the robotic version doesn't do dishes. However, the developer plans to add a dishwasher before releasing the first consumer version in 2017, which will carry a price tag of about \$15,000.

*For information: Mark Oleynik, Moley Robotics; Web site: [www.moley.com](http://www.moley.com) or Shadow Robot Company Ltd., 251 Liverpool Road, London N1 1LX, United Kingdom; phone: +44-20-7700-2487; Web site: [www.shadowrobot.com](http://www.shadowrobot.com)*

## Energy Efficient Plastic Production

Polyethylene is the most common plastic in the world with about 80 million metric tons being produced each year for use in everything from grocery bags to medical implants to bullet-proof vests. But the process for making this ubiquitous plastic is extremely energy-intensive. In the U.S. alone, the

amount of power used in the production of ethylene is equivalent to that generated by seven average-sized nuclear power plants – more than 46 million megawatt hours



per year. Now a new material has been developed that could make the process much more efficient.

A large portion of the power expended in making polyethylene goes to separating ethylene from a nearly identical chemical, ethane, through a costly distillation technique. The new compound has 13 times more separating power than the materials currently used. The improved performance is attributed to the addition of silver ions which enable the compound to distinguish between ethylene and ethane molecules, “grab” the ethylene molecules from the mixture and then release them once the ethane has been removed.

One drawback is that the silver ions are more prone to picking up contaminants, and since the gas mixtures being used are by-products of petroleum refineries, they can contain impurities which would inhibit the selectivity of the silver ions. But the researchers are hopeful that this can be addressed in the molecular carrier being used.

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## Artificial Chameleon Skin

A thin, chameleon-like material that changes color on demand could offer some intriguing possibilities for a new generation of display technologies, camouflage, and sensors capable of detecting even the smallest structural defects.

Rather than using traditional optics, the color-shifting material operates on the same principle as diffraction gratings – evenly spaced slits

that spread light into its component colors.

But instead of slits, the scientists etched tiny ridges into a single thin layer of silicon approximately 120 nanometers thick. The ridges reflect a specific wavelength of light depending on the size of the spaces in between them. Then it was noted that the spaces (and therefore the color) could be shifted by flexing or bending the material. So the bars were partially embedded into a flexible layer of silicone to create a “skin” that is very thin, perfectly flat and easy to fabricate. It also reflects extremely pure, vibrant colors – from green to yellow to orange to red – with 83 percent efficiency.



As a display, the surface would be ideal for outdoor presentations or entertainment venues. In industrial or architectural applications, color-changing sensors could be used to indicate stress or structural fatigue on equipment, bridges or buildings. The next step will be to scale the process for larger commercial applications.

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# The Anticipatory Organization™

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After more research, I came up with the Law of Digital Storage and the Law of Bandwidth — which, in short, would closely mirror Moore's doubling prediction for processing power. In 1983, I put them together, calling them the Three Digital Accelerators, and I started writing and speaking about how they would drive predictable exponential change and economic value creation for decades to come.

As the first professional futurist to accurately identify the Exponential Change curve in '83, I can tell you it was much harder to get people excited about all of the transformational changes that would happen, because the time frame was so far off. Let's face it: it took 20 years to go from a five-megahertz chip to a 500-megahertz chip, and while I knew it would happen, I still had to wait like everyone else. However, thanks to the power of doubling, it only took less than a year to double that — and that was years ago, now.

The point is that today, we are in what one could call the Big Deal phase, because the Digital Accelerators have reached a point of exponential change that is creating dramatic change in very short periods of time.

Why did Netflix start out by renting DVDs of programs instead of starting with a streaming video model from the beginning? The Three Digital Accelerators were not ready yet.

## Agility's Good, but Not Enough!

We are all good at reacting and responding, putting out fires, and managing crises. In addition, organizations large and small have learned how to be lean and agile, and how to best execute a strategy at a high level.

However, despite these skills, General Motors still declared bankruptcy, Blockbuster closed its last store, and Blackberry quickly moved from leading to bleeding. And let's not forget Hewlett-Packard, Sony, Dell, and a host of other companies who failed to thrive despite their leaders and workers being constantly busy.

To thrive in this new age of hyper-change and growing uncertainty, it is now an imperative to learn a new competency — how to accurately anticipate the future.

This may seem impossible, but it's not. The future is there for you to see when you know where and how to look for it. And when you and your employees master this skill, you'll be able to create what I call an ["Anticipatory Organization™."](#)

Based on three decades of research and applying the principles I've developed to organizations worldwide, I have developed a way of separating what I call Hard Trends from Soft Trends. Over the years, I've written about this extensively in books and articles.

A Hard Trend is a projection based on measurable, tangible, and fully predictable facts, events, or objects. It's something that will happen: a future fact that cannot be changed. In contrast, a Soft Trend is a projection based on statistics that have the appearance of being tangible, fully predictable facts. It's something that might happen — a future maybe. Soft Trends can be changed, which means they provide a powerful vehicle to influence the future, and they can be capitalized on.

This distinction completely changes how individuals and organizations view and plan for the future. Understanding the difference between Hard and Soft Trends allows us to know which parts of the future we

can be right about. When you learn how to analyze trends in this way, you can accurately predict future disruptions, identify and solve problems before they happen, and practice what I call “everyday innovation.” This enables you to solve challenges and problems faster, and see opportunities that were impossible just a few years before. In other words, you become anticipatory rather than reactionary.

Based on decades of research and working with top executives from some of the most innovative companies on the planet, I refined our Hard Trend Methodology into a proven business model for turning accelerating change into an advantage. I call it the [Anticipatory Organization™ Model](#). An Anticipatory Organization applies the methodology of separating Hard Trends that will happen from Soft Trends that might happen to their innovation and decision making processes. Employees of an Anticipatory Organization understand that those who can see the future most accurately have the biggest advantage. They actively embrace the fact that many future disruptions, problems, and game-changing opportunities are predictable and represent unprecedented ways to gain advantage. Employees know that it's better to solve predictable problems before they happen, and that predictable future problems often represent the biggest opportunities. They know that being anticipatory means modifying plans to keep them relevant and from becoming obsolete before they are implemented, based on the Hard Trends that are shaping the future. They are confident and empowered by having a shared view of the future based on the Science of Certainty.

What is the Science of Certainty? Once you can separate Hard Trends from Soft Trends — once you

can differentiate between the things you know will happen from the things that might happen — you can accurately define the certainties, going forward. For example, we know that the iPhone 7, 8, and 9 will all have faster processing chips than those before them. We know that after 3G and 4G will come 5G and 6G in a predictable way. And we know that we are putting more and more in the cloud — that we're going to increasingly use cloud computing.

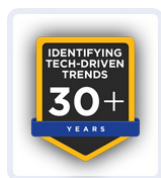
Those are technical examples. Here are some non-technical ones: We know that Baby Boomers are not going to get younger. We know that governments are going to continue, all over the world, to issue future regulations. We know the cycles of nature, that after winter comes spring.

In other words, there is so much we can see that it's absolutely possible to create certainties using the Hard Trend/Soft Trend model I've developed.

Why is this so important to business? Because strategy based on certainty (on Hard Trends) has low risk, while strategy based on uncertainty (on Soft Trends) has high risk. Also, when you have certainty, you have the confidence to say “yes,” to move forward, to hire, to start businesses. When you have uncertainty, it's like a giant roadblock. You're stuck and you don't move forward.

To succeed in business, these days, simply being lean and agile is no longer enough. You and your team need to harness the ability to anticipate the future. In fact, I see this as being the most important missing competency that we've seen for decades. So learn how to anticipate today, before your competitors do.

**Burrus**  
Research



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