



Notes from the Edge



Insights into an Evolving Future

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FUTURE OF TECHNOLOGY

Futurists Explain Why Technology Will ‘Disappear’ in 2030. Tens of billions of devices, sensors, vehicles, and people will become interconnected over the next 10 to 15 years as the so-called Internet of Things (IoT) expands from about 11 billion connections today, to 30 billion by 2020, to 80 billion by 2025. And, in fact, those estimates may prove low. But the good news is that estimates will become increasingly easier to make. [Why Tech will Disappear](#)

BIG DATA AND SECURITY

Connected Devices Give Spies a Powerful New Way to Surveil. There is little doubt that the web is the greatest gift that any intelligence agency could have ever asked for. Security agencies and commercial entities can easily collect information about every user on the net. Thankfully, you’re still free to do as you like in the physical world, unencumbered by constant observation—right? Well, not for long. The same data-collection revolution that has happened in the online world is about to repeat itself in the physical world because of the Internet of Things. [Spy Power](#)

The Most Underutilized Source of Data for Smart Cities. The value of data and analytics to improve efficiency is well understood. What resource manager doesn’t want to do more with what he or she has, especially if it’s funded with public money? For city planners, traffic and transport managers, and retail shopkeepers alike, making the best use of assets is not just a necessity, it’s a competitive advantage. [Underused Data](#)

Smart City Tech Would Make Military Bases Safer. The same connectivity that allows overseas extremists to make personal threats with the click of a button could also enable quicker, stronger, and more comprehensive security responses at the nation's military installations. Put simply, a base that employs smart technologies is safer. Of course, the promises of innovative technologies can sometimes be oversold or just plain wrong. But proven smart technologies may offer significant advantages for military installations. The smart military base is overdue.

Smarter Cities, Safer Bases

TECHNOLOGY

Quantum Computers Ready to Leap Out of the Lab in 2017. Quantum computing has long seemed like one of those technologies that is always 20 years away. 2017 could be the year that the field finally sheds its research-only image. Computing giants Google and Microsoft recently hired a host of leading researchers, and have set challenging goals for this year. Their ambition reflects a broader transition taking place at start-ups and academic research labs alike: to move from pure science towards engineering. Whereas classical computers encode information as bits that can be in one of two states, 0 or 1, the 'qubits' that comprise quantum computers can be in 'superpositions' of both at once. This, together with qubits' ability to share a quantum state called entanglement, should enable the computers to essentially perform many calculations at once. And the number of such calculations should, in principle, double for each additional qubit, leading to an exponential speed-up.

Quantum Leap out of the Lab

Researchers break data transfer efficiency record. Researchers at the Department of Energy's Oak Ridge National Laboratory (ORNL) have set a new record in the transfer of information via superdense coding, a process by which the properties of particles like photons, protons, and electrons are used to store as much information as possible. The ORNL team transferred 1.67 bits per qubit, or quantum bit, over a fiber optic cable, a major achievement in the quest to adopt quantum communication to modern networking technology. And because the team used conventional laboratory equipment such as common fiber optic cable and standard photon detectors, they have brought the technique one step closer to practical use. **Bandwidth Bandits**

Printed human body parts could soon be available for transplant. Every year about 120,000 organs, mostly kidneys, are transplanted from one human being to another. Sometimes the donor is a living volunteer. Usually, though, he or she is the victim of an accident, stroke, heart attack or similar sudden event that has terminated the life of an otherwise healthy individual. A lack of suitable donors, particularly as cars get safer and first-aid becomes more effective, means the already-limited supply of such organs continues to grow even more limited. This has led researchers to study the question of how to build organs from scratch, and the answer may be 3-D Bio-printing.

Faster, Please

Directed energy atmospheric lens could revolutionize future battlefields. Within the next 50 years, scientists at BAE Systems believe that battlefield commanders could deploy a new type of directed-energy laser-and-lens system called a Laser Developed Atmospheric Lens. This would enhance commanders' ability to observe adversaries' activities over much greater distances than existing sensors. At the same time, the lens could be used as a form of 'deflector shield' to protect friendly aircraft, ships, land vehicles, and troops from incoming attacks by high-power laser weapons that could also become a reality in the same time period. It works by simulating naturally-occurring phenomena and temporarily—and reversibly—changes the Earth's atmosphere into lens-like structures to magnify or change the path of electromagnetic waves, such as light and radio signals.

Atmospheric Lens

FUTURE OF ARTIFICIAL INTELLIGENCE

Our Bots, Ourselves. In the coming decades, artificial intelligence will replace a lot of human jobs, from driving trucks to analyzing X-rays. But it will also work *with* us, taking over mundane personal tasks and enhancing our cognitive capabilities. As AI continues to improve, digital assistants—often in the form of disembodied voices—will become our helpers and collaborators, managing our schedules, guiding us through decisions, and making us better at our jobs. We'll have something akin to Samantha from the movie *Her* or Jarvis from *Iron Man*: AI “agents” that know our likes and dislikes, and that free us up to focus on what humans do best, or what we most enjoy. [Our Bots, Ourselves](#)

Heart of the Machine. What will the future human-machine team look like? Foresight colleague Richard Yonck's new book, *Heart of the Machine*, explores the next giant step in the relationship between humans and technology: the ability of computers to recognize, respond to, and even replicate emotions. Yonck argues that emotion, the first, most basic, and most natural form of communication, is at the heart of how we will soon work with and use computers.

[Heart of the Machine](#) [Time Magazine Books in Brief](#)

EU considers “electronic personhood” for robots. From warehouse machines to surgical assistance devices, there are now over 1.7 million robots already in existence worldwide. If current trends continue, industrial and personal service robots could outnumber humans by the 2040s. Despite their rapidly increasing numbers and abilities, robot use is still not well-regulated. The European Parliament has proposed a new legal framework to govern the rapidly evolving fields of robotics and artificial intelligence (AI). The European Parliament's Legal Affairs Committee has voted by a majority of 17 votes to two, with two abstentions, to create a robot “bill of rights” covering a range of issues relating to automation and machine intelligence. [Robot Rights](#)

FUTURE OF TRANSPORTATION

The Tech Trend Too Strong to Slow Down. Don't ever be surprised when technology advances ahead of even the most ambitious, optimistic predictions. Look no further than the driverless auto trend to prove that statement right. In tracking the driverless vehicle trend for the last several years, one thing is very apparent: You can't trust at face value what you hear from automakers and their tech affiliates about the progress they are making. The Institute of Electrical and Electronics Engineers predicts that by 2040 driverless vehicles will make up 75 percent of cars on the road. Inside the engineering labs at universities, projections for fully automated vehicles able to navigate complex metro traffic patterns will become reality much sooner, perhaps within the next decade. [Driverless Cars... Soon](#)

Uber Elevate. H/T to Mitch Erikson at DHS for this article: A 98-pp “Uber Elevate” white paper. Uber spends much of the 98-pp analyzing the challenges as well as economic feasibility (they calculate “Yes”). This is not a simple gee-whiz piece. Uber wants this to catalyze a national conversation. Some of us are still thinking about downloading the Uber app. Others are Uber-addicts. Some will drive the 57 ‘Vette “till they pry the wheel out of my cold dead hands.” Some will resist sharing a ride, even though we think nothing of sharing an elevator ride. Some will say: “Can I get one, like, tomorrow?” We all adopt and adapt at different rates. We all will be in for a dazzling ride as our transportation future unfolds. Fasten your seat belts. [Uber Elevate](#)

The Future of Maritime Transportation: Rolls-Royce Crewless Ships Could Take to the Seas by 2020. Rolls-Royce's quest to bring crewless ships to sea is charging ahead after the engineering giant said it has been working with Government-backed groups on the project. The company plans to release its first fleet of autonomous ships by 2020, a move that could cut sea transport costs by 20%.

[Future of Maritime Transportation](#)

ECONOMICS

World economy predicted to double in size by 2042. A new report by PricewaterhouseCoopers (PwC) forecasts the global economic changes between now and 2050. [The long view: how will the global economic order change by 2050?](#) projects a long-term power shift away from the established advanced economies to continue over the period from now to 2050, as emerging market countries boost their share of world GDP in future decades, despite recent mixed performance in some of these economies. This study forecasts GDP growth to 2050 for 32 of the largest economies in the world, which together account for 85% of global GDP. [Future Economy](#)

FUTURES / FORESIGHT

Billionaires Say They'll End Disease: Evolution Says Otherwise. Human beings are not machines; they are complex organisms. It's one thing to throw money at the problem of driverless cars, it's quite another to throw it at a complex, adaptive systems (the human body) confronted with another complex, adaptive system (disease). Will money be able to overcome evolution? Only time will tell, but science is new to this fight. [Evolutionary Fight](#)

What Faux Futurists Cost the Rest of Us. Every entrepreneur thinks they possess the invention that will catch fire and solve our needs. The problem is that there are humans involved, and humans are... well... human. [Faux Futurists](#)

New National Security Adviser is a Futurist with Warnings about Technology. The author of this article gives some background about the new National Security Advisor, Lt. Gen. H.R. McMaster, who has been described as the "Army's own futurist." He holds complex views on technology, cautioning against technological hubris as a solution to modern warfare. The General is no technophobe, but he dismisses conceptions of the future of war that "cut against war's political nature, war's human natures, war's uncertainty, and war as a contest of wills." [NSC's Futurist](#)

FORESIGHT NEWS

NATO Science Fiction Futures. Our colleagues at [NATO ACT](#) have produced a collection of science fiction futures worth review. They take a different approach (basing stories on possible trends rather than creating them out of an alternative future world) and consider implications. Click the cover page art at the right:



Science-Fiction Futures. Futures Assessment Division is proud to announce the release of the *Science Fiction Futures*, a supplement to the 2015 MCSEF. The project began earlier this year in coordination with the Atlantic Council [Art of the Future Project](#). The *Science Fiction Futures* anthology, the MCSEF, and previous editions of *Notes from the Edge* can be found at the link: [Futures Assessment Division](#)



"The man who has anticipated the coming of troubles takes away their power when they arrive."
– Seneca

This newsletter is intended to highlight issues and ideas which may prove significant in the evolving future. In keeping with our focus on both alternative futures and analysis, items in this bulletin will generally be of an alternative nature, or drawn from atypical sources.