



Notes from the Edge



Insights into an Evolving Future

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FORECAST

10 grand challenges we'll face by 2050. The BBC *Future Now* has been exploring the biggest problems that humankind faces right now, but what about the big challenges that are brewing for the future? In 30 years, what might be on the world's agenda to solve? It's impossible to predict, but we can get clues from how current trends in science and technology may play out. This article explores the potential big issues of tomorrow including: Human genetic modification, aged populations, climate change/flooding, evolution of social media, geopolitical tensions, safe car travel, resource scarcity, brain enhancement drugs, and AI dependence. [Year 2050 Challenges](#)

Infographic: A timeline of future technology. Making predictions about future technology is both fun and notoriously difficult. However, such predictions also serve a very practical purpose for investors and business leaders, since failing to adapt to changing industry paradigms can completely decimate a business venture, turning it into the next Blockbuster, Kodak, or Sears. Today's infographic from *Futurism* rounds up some of the most interesting predictions about the future, from trusted sources such as *Scientific American* and *The National Academy of Sciences*. [Future of Technology](#)

FUTURE OF WARFARE

The future of technology in warfare: From AI robots to VR torture. Warfare and technology make the perfect partners of destruction. Military innovations from wooden catapults to nuclear bombs have been transforming the way war is waged since prehistoric humans carved arrows from stones some 10,000 years ago. The visions of futurists don't always match the experiences of military personnel, but the battlefields of the future will bear little resemblance to the war zones of today. This article explores robot wars, swarms, smart weapons, augmented reality, virtual reality torture chambers, space wars,

long-range sensors, and dystopian futures such as mosquito populations armed with customized viruses. [Virtual Torture?](#)

New future soldier power-up technology. The Department of Defense wants troops with super strength, telepathy, and immunity from pain. Here are 8 technologies the Pentagon is pursuing to create super soldiers.

1. Bulletproof clothes made of carbon chainmail
2. Synthetic blood
3. Seven-foot leaps and a 25 mph sprint
4. Pain immunizations
5. Freedom from sleep
6. Telepathy
7. Powered underwear
8. Gecko-like climbing gloves and shoes

Universal Soldier

Researcher: In two decades, adversaries at war could cause mass destruction via IoT attacks.

Two decades from now, warring adversaries could conceivably attack each other by sabotaging a population's Internet-connected consumer devices en masse, respected cybersecurity expert Mikko Hypponen predicted at Black Hat Europe 2016. "One thing that I worry about is targeting consumer devices and making them fail physically, making them catch fire," said Hypponen, chief research officer at F-Secure. "You can imagine a conflict when one party of the conflict sets fire to every home in the country that's on the other side of the conflict." [Attack of the Toaster](#)

Kalashnikov's new autonomous weapons and the "Terminator conundrum". Earlier this month, the Russian weapons manufacturer Kalashnikov Group revealed it had developed a range of combat robots that are fully automated and used artificial intelligence to identify targets and make independent decisions. The revelation rekindled the simmering, and controversial, debate over autonomous weaponry and asked the question, at what point do we hand control of lethal weapons over to artificial intelligence? [AK-47 Version 2.0](#)

Medical robotic and autonomous system technology enablers for the Multi-Domain Battle 2030-2050. The Multi-Domain Battle concept is likely to cause severe restrictions on mobility for medical missions and shortfalls in both human and materiel resources due to area denial challenges. Combatant commanders with increased sick or wounded soldiers will face degradation of medical resources and encumbered combat effectiveness without new combat casualty management and force multiplication strategies. Robotic and autonomous or semi- autonomous patient support systems integrated with general purpose unmanned vehicle platforms could serve as force multipliers for medical operations in future environments especially in enabling expedited casualty evacuation. [Robotic CASEVAC](#)

AUTONOMY

The rise of roboships. Before most of us have even had the chance to step into a self-driving car, autonomous technology has taken to the seas. Over the next 20 years, maritime businesses plan to transport goods across the ocean in robo-ships that navigate themselves. European and Asian companies seem to be on the same wavelength, and have already set up agreements and testing areas. Autonomous shipping could lead to safer, more efficient and cheaper journeys, but they aren't an investment that can be taken lightly. So, how do self-sailing ships work, and how will they disrupt the maritime industry? [Roboships](#)

Elon Musk compares driving a non-autonomous vehicle in 2037 to riding a horse today. "In 10 years, I think, almost all cars produced would be autonomous," Tesla CEO and founder Elon Musk told

his audience of more than 30 U.S. governors in Rhode Island back in July. While he believes autonomous systems will comprise the vast majority of newly produced cars by then, however, the shift to self-driving cars outnumbering traditional ones on the roads will take about five to ten more years. With autonomous vehicles predicted to be safer and more efficient than their traditional counterparts, hopefully these owners of the next-generation of “classic” cars will choose to keep them in the garage more often than they take them on the road. [History Rhymes](#)

[Blockchain technology could power driverless cars.](#) We most commonly associate blockchain technology with digital currencies and other financial transactions. But there are other potential uses for blockchain’s distributed ledger, where data can’t be changed, forgotten, or stolen. Because blockchains do not rely on a central authority to store and verify data, they do not have a single point of failure, where malfunction or hacking could spell disaster for autonomous vehicles on the road. The ability to compile, mine, and analyze data on a blockchain could be instrumental in making autonomous vehicles a safe and viable option. [New Use of Blockchain](#)

MEDICAL TECHNOLOGY

[DARPA invests \\$65 million in developing gene editing technologies.](#) Just a few weeks after DARPA announced a major investment in developing brain-computer interface technology, the US government department has revealed another major project. The Safe Genes program is set to invest US\$65 million over four years in seven teams that will investigate ways to make gene editing technologies safer, more targeted and potentially even reversible. “The field of gene editing has been advancing at an astounding pace, opening the door to previously impossible genetic solutions but without much emphasis on how to mitigate potential downsides,” says Safe Genes program manager Renee Wegrzyn.

The program has three main technical objectives: to develop processes that allow greater control of genome editing in living systems, to develop countermeasures that protect genome integrity in populations, and to investigate a way to remove engineered genes from living systems. [Safe Genes](#)

[Lab-grown organs could power 'Blade Runner' replicants by 2049.](#) Biotechnology has advanced at a stunning rate since the original *Blade Runner* was released in 1982, and the raw materials for building replicants — synthetic humans made from “organic substances” — are actually becoming quite plentiful in real life. Scientists have made immense progress in the creation of miniature lab-grown organs and tissues, making replicant science a lot more plausible than fans might expect, for better or for worse. The article features a roundup of the replicant parts scientists can now grow in a dish including: Mini Brains (used for Alzheimer’s/neurological research), Micro Hearts (used for drug research), 3D-Printed Cartilage (used for transplants), and Mini Breasts (used for cancer research). [Printing Organs](#)

ARTIFICIAL INTELLIGENCE

[Have we reached peak AI hysteria?](#) At the recent annual meeting of the National Governor’s Association, Elon Musk spoke with his usual cavalier optimism on the future of technology and innovation. From solar power to our place among the stars, humanity’s future looks pretty bright, according to Musk. But he was particularly dour on one emerging technology that supposedly poses an existential threat to humankind: artificial intelligence. Musk called for strict, preemptive regulations on developments in AI, referencing numerous hypothetical doomsaying scenarios that might emerge if we go too far too fast. Luckily, if history is any guide, the height of this hysteria means we’re probably on the cusp of a period of deflating dread. [The Boy Who Cried Wolf](#)

[China's artificial intelligence revolution.](#) On July 20, China’s State Council issued the “Next Generation Artificial Intelligence Development Plan”, which articulates an ambitious agenda for China to lead the world in AI. China intends to pursue a “first-mover advantage” to become the “premier global AI innovation center” by 2030. Through this new strategic framework, China will advance a “three in one” agenda in AI: tackling key problems in research and development, pursuing a range of products and

applications, and cultivating an AI industry. Accordingly, China seeks to ensure that scientific and technological advances can be readily turned to dual-use applications, while military and civilian innovation resources will be “constructed together and shared.” [Tip of the Algorithm](#)

ENERGY

Energy and climate scenarios 2050. The European Union has set a long-term goal of reducing greenhouse gas emissions by 80-95% by 2050. But getting there will be a huge challenge, according to the European Commission’s energy roadmap 2050, which listed some fundamental changes that need to happen in order to transform out energy system. The European Commission’s energy roadmap 2050, published in 2011, listed some fundamental changes that need to happen in order to bring Europe towards a low-carbon energy system. [Energy Roadmap](#)

RESOURCE SCARCITY

Resource scarcity is known to influence migration and settlement patterns, as well as competition and conflict. Depending on the report reviewed, experts forecast that global agricultural production will need to increase by 50 to 70 percent by 2050 to account for the world’s growing population — projected to hit 9 billion people in the same year. Compounding the issue is that more than a dozen supply chains and trade routes that facilitate global food trade are vulnerable to unforeseen crises or climate change which could adversely affect global food supply and prices.

A new MIT study finds that certain hotspots in the US will experience severe reductions in crop yields by 2050, due to climate change’s impact on irrigation. Decreased precipitation, which means reduced runoff into water basins that feed irrigated fields, will impact cotton and maize production in the Southwest and hay, grasses, and other crops grown to feed livestock in the Northwest.

[Better Farming](#) [Vulnerable Chokepoints](#) [Water Shortage](#)

FUTURES ASSESSMENT DIVISION

The *Science Fiction Futures* anthology, the *MCSEF*, and previous editions of *Notes from the Edge* can be found at the link:

[Futures Assessment Division](#)

“Let us not go over the old ground, let us rather prepare for what is to come.” – Marcus Tullius Cicero



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.