Notes from the Edge

Insights into an Evolving Future

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RESOURCE SCARCITY

Wheat's Genetic Mapping Cracks Massive Code in a Boost to International Food Security. An international team of scientists has published the world's most comprehensive analysis of the wheat genome, which would help researchers to breed for traits like disease resistance. The study's co-author, Professor Harvey Millar from the University of Western Australia, said the data will also help enhance food security. “The Food and Agriculture Association of the United Nations (FAO) have put a big requirement to say we really have to increase crop yields before 2050 to a level that almost seems unimaginable — to actually try and double crop yields by 2050 if we are going to feed people,” Millar said. “One of the problems farmers have is that not only do they have long term problems — things like drought and salinity and frost where we don't really have ideal solutions, and sometimes it’s taken a long time for new varieties to come through — this should speed [up] the rate at which new varieties are available.” **Editing Wheat**

Disease-resistant and Drought-resistant Rice (Without Sacrificing Yield)? Rice is one of the most important staple crops, responsible for providing over one-fifth of the calories consumed by humans worldwide. Diseases caused by bacterial or fungal pathogens present a significant problem, and can result in the loss of 80 percent or more of a rice crop. Decades of research into the plant immune response have identified components that can be used to engineer disease-resistant plants. However, their practical application to crops is limited due to the decreased yield associated with a constantly active defense response. “Immunity is a double-edged sword,” said study co-author Xinnian Dong, professor of biology at Duke and lead investigator of the study. “There is often a tradeoff between growth and defense because defense proteins are not only toxic to pathogens but also harmful to self when

overexpressed," Dong said. "This is a major challenge in engineering disease resistance for agricultural use because the ultimate goal is to protect the yield." While a disease resistance characteristic is certainly welcome news, rice crops remain fragile in drought conditions. Scientists at the RIKEN Center for Sustainable Resource Science (CSRS) hope to change that. RIKEN scientists and their collaborators tackled this issue by developing transgenic strains of rice that are more resistant to drought. Transgenic lines in two species of rice showed higher yield, greater biomass, lower leaf-rolling, and greater fertility than unmodified rice. **Rice 1** **Rice 2**

Global Food Policy Report Spotlights Urbanization. The International Food Policy Research Institute (IFPRI) has released the *2017 Global Food Policy Report*, and this year's report looks at the impact of rapid urban growth on food security and nutrition while considering how food systems can be transformed to improve the future. A 2014 UN report states that by 2050, 66 percent of the population is projected to live in urban areas, bringing extra stress to agricultural production from things like environmental degradation, extreme weather conditions, and a lack of land to use for crops and livestock. Rapid urbanization and population growth are expected to put further pressure on the global food system. [*The problem won't be production, it will be distribution. We already produce plenty, but we waste a lot. See here and here.—Editor*] **Global Food Policy Report**

URBANIZATION

Mass Migration to Urban Centers Advances Urgency to Create Safe Cities. The global urban migration can be expected to improve living standards, but it will also be fraught with new kinds of threats and challenges to urban infrastructure, resources, security procedures, and emergency response systems. The safe city concept has been developed to help government stakeholders, city mayors, and law enforcement mitigate these demands. Leveraging the connectivity now found in core security and safety technologies, safe city solutions are helping city leaders to better protect their citizens from a range of threats including crime, terrorism, and natural disasters, according to a new whitepaper by IHS Markit (link in article). The safe city is ultimately a government-driven approach to security. However, multiple stakeholders must be involved. The continuous evolution of technologies, city structure, and security requirements, means a broad range of expertise is needed to make safe city projects a success. **Safe Cities**

What Smart Cities of the Future Will Look Like. The emergence of Internet of Things technology is driving the development of smart cities in many booming metropolitan areas around the world. The visions that planners have for these cities are bold—from autonomous buses and free Wi-Fi throughout Barcelona to LED streetlights in Los Angeles that have sensors to monitor their conditions. Tangible benefits are all falling into place, like security, savings and sustainability, as well as attracting residents and businesses that want to capitalize on lower operating costs and position themselves at the forefront of the smart city revolution. The author of the below article highlights some trends in the emerging social and digital arena: Making smart synonymous with secure, saving money through efficiency, and driving innovation through conservation. **Smart Cities**

Will the High-Tech Cities of the Future Be Utterly Lonely? Humans are inherently social animals, and our health suffers if we're cut off from social ties. So it's no wonder the so-called loneliness "epidemic" is being called a public health crisis. One pervasive source of our loneliness is technology. While it offers an easy way to keep in contact with friends—and meet new people through dating and friendship apps—technology's omnipresence encourages shallow conversations that can distract us from meaningful, real-life, interactions. By 2050, more than 66 percent of the world's population will be living in so-called "smart cities." While smart, connected cities could be great for efficiency, some worry they could be putting technology before humanity. Thanks to self-service checkouts and home delivery services, technology is creating less of a need for us to actually interact with those around us. Message

bots, like Google Assistant, Siri, and Amazon's Alexa, will soon be able to suggest restaurants, hotels, and other local landmarks. In a future where robots sound and objects look increasingly sentient, we might be less inclined to seek out behaviors to abate our loneliness. There lies the possibility that human-like [*emotional AI?—Ed.*] robots of tomorrow could kill our dwindling urge to be around other humans. As tech companies develop creative solutions to make cities more efficient, we can only hope they'll be mindful to the effects of change on city-dwellers' wellbeing; after all, loneliness, and the health ailments that come with it, isn't conducive to the productive economies we need to solve the problems of the future. **Hi-tech, Crowded, and Lonely**

The Next Twenty Years in Local Government. In a 2015 report, the Alliance for Innovation, an organization focused on transforming local government, released a report covering 44 trends that will impact the future of cities. The trends are aligned along the forces of *resources*, *technology*, *demographics*, and *governance*, and the report concludes with implications, questions for consideration, and recommendations for local governments to implement in order to manage risk.
44 Trends for Local Government

HUMAN CAPITAL

Rise of the Machines Could Jeopardize Millions of Millennial Jobs. The research arm of McKinsey & Company predicts that millennials may face increasing economic uncertainty in the coming years, as the jobs they most commonly fulfil become increasingly automated. The consultancy giant conclude that while less than 5% of jobs can be completely replaced by technology, over 60% of all work activities could be automated by 2055. **Rise of the Machines**

Mid-Sized Japanese Firms Invest in Robots and Automation Due to Labor Shortage. Mid-sized companies in Japan are planning to buy robots and other equipment to automate a wide range of tasks, including manufacturing, food and beverage, earthmoving, and hotel room services in an attempt to overcome the country's growing labor shortage. The Japanese government says it sees a larger proportion of investment being dedicated to increasing efficiency. Revenue at many of Japan's robot makers rose in the January-March period for the first time in several quarters. The way Japan copes with an aging population will provide critical lessons for other aging societies, including China and South Korea [*And most of Western Europe—Ed*.], that will have to grapple with similar challenges in coming years. **Robots Solve Labor Woes**

BLOCKCHAIN

[*As promised, more Blockchain until I understand it…—Ed*.]

What Next for Blockchain? Bitcoin isn't mainstream yet [*See recent rates—Ed.*]**,** and some skepticism of the digital currency remains. But the buzz surrounding the technology underlying it—blockchains—has started to take a different tone. Blockchain, headquartered in Luxembourg, is a company that provides a software platform for digital assets. Its product offerings are on the forefront of advancing blockchain technology. In this interview Liana Douillet Guzmán, senior vice president for growth, discusses what areas are ripe for development and how the story is changing.
Next for Blockchain

Blockchain Technology Has the Power to Let Us Build an Entirely New Internet. The Internet has democratized access to information—texts, videos, and ideas have become widely available, transmittable, and our ability to communicate with each other, organize, and choreograph our activities has exploded. Simultaneously, the Internet allowed us to generate, strategically collect, and deploy, rich data about people, programs, companies, markets, and societies. But a small, exclusive group of users siphoned this data off, to store in guarded silos and leverage for private gain. To resist the privatization of data, the open source community movement produced Linux, Wikipedia, and countless more

platforms, tools, and projects that succeeded. But it lost the battle for control of the Web 1.0 and 2.0, where the winners were personal data collectors, repackagers, and vendors like Facebook and Google. There is a shift coming, from an Internet of information to an Internet of value, where we frictionlessly exchange and communicate with no intermediaries.
A New Internet?

BIOTECH

DARPA Is Planning to Hack the Human Brain to Let Us "Upload" Skills. The DARPA Targeted Neuroplasticity Training (TNT) program is exploring ways to speed up skill acquisition by activating synaptic plasticity. DARPA hopes that building up that ability by subjecting the nervous system to a kind of workout regimen will enable the brain to learn more quickly. If the program succeeds, downloadable learning that happens in a flash may be the result.
I know Kung Fu

The Military is Using Human Brain Waves to Teach Robots How to Shoot. Modern sensors can see farther than humans. Electronic circuits can shoot faster than nerves and muscles can pull a trigger. Humans still outperform armed robots in knowing what to shoot at—but new research funded in part by the Army may soon narrow that gap. Researchers from DCS Corp and the Army Research Lab fed datasets of human brain waves into a neural network—a type of artificial intelligence—which learned to recognize when a human is making a targeting decision. Machine learning relies on highly structured data, numbers in rows that software can read. But identifying a target in the chaotic real world is incredibly difficult for computers. The human brain does it easily, structuring data in the form of memories, but not in a language machines can understand. It's a problem that the military has been grappling with for years. We often talk about deep learning. The challenge there for the military is that that involves huge datasets and a well-defined problem," Thomas Russell, the chief scientist for the Army, said at a recent National Defense Industrial Association event. "Like Google just solved the Go game problem." Their research branched out of a multi-year, multi-pronged program called the Cognition and Neuroergonomics Collaborative Technology Alliance. The goal, one day, is a neural net that can learn instantaneously, continuously, and in real-time, by observing the brainwaves and eye movement of highly trained soldiers doing their jobs. **Target Selection**

TECHNOLOGY

10 Breakthrough Technologies 2017. These technologies all have staying power. They will affect the economy and our politics, improve medicine, or influence our culture. Some are unfolding now; others will take a decade or more to develop. But you should know about all of them right now.
Breakthrough Technologies

The Smartphone is Eventually Going to Die—This is Mark Zuckerberg's Crazy Vision for What Comes Next. Last month, we brought you Elon Musk's prediction of the demise of the smartphone. Recently, during the Facebook F8 conference in San Jose, California, CEO Mark Zuckerberg laid out his roadmap for the next 10 years. Highlights include artificial intelligence that can talk to computers as easily as chatting with humans, a world without screens where we type with our brains, and "hearing" with your skin. The second link below looks at what Google, Facebook, and Microsoft believe will be the "next big thing": 3D augmented reality headsets that will beam the feed directly into your eyes. In conjunction, advances in AI mean we will be interacting more on virtual personal assistants (VPAs) like Siri or Alexa. Exchanges between VPAs and users are expected to grow 20% in just the next two years. Eventually, VPAs may be 3D projected holograms, able to hold entire conversations and offer services and information at an impressive scale. The author opines that augmented reality will replace our smartphone, TV, and computer, integrating the virtual world and the real one seamlessly.
Death of Smartphones **What's After Smartphones**

FORESIGHT

Bill Gates Has Seven Predictions for the Future. Bill Gates has been almost prophetic in his past predictions. His 1999 list was hauntingly accurate, foreseeing the advent of price comparison websites [*Thanks, Honey! —Ed*], smartphones, social media, and bots. The linked article is a selection of seven of his insights over the last few years. **Gates' Predictions**

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

"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.