10 "Game Changing" Technologies Poised to Transform the World in 2015

The past year has witnessed a series of startling advances. In March, researchers at Harvard used a **3D printer to construct a blood vessel**. It is an advance that could prove critical in printing fully functioning kidneys. In May, scientists at The Scripps Research Institute **revealed** they had created a new life form by adding DNA "letters" not found in nature. The breakthrough could lead to the development of new medicines and new materials. In June, the Fraunhofer Institute **unveiled a simple fuel cell** with an output of one kilowatt—enough to power a single home. Later, Lockheed Martin went public with plans for **a modest-sized nuclear fusion reactor** that might power an entire city. If either technology scales, it could end the utility industry as we know it. In July, Google and Novartis said they were teaming up to create **a new "smart" contact lens** capable not only of automatically adjusting its focus but also of monitoring the glucose levels in a diabetic. Longer term, the lenses might be upgraded to deliver drugs and detect cancer. In September, researchers at IBM announced they had created **a new neurosynaptic computer chip** capable of sensing, tasting, feeling, hearing and understanding its environment. It is an advance that could usher in an age of new "cognitive computing" by allowing computers to function much like the human brain. And in October, a paralyzed man **regained the ability to walk** after receiving a cell transplant.

Each development is an extraordinary advance and each heralds a brighter future. Alas, the aforementioned successes are still some years away from widespread adoption. This does not imply that game-changing advances aren't on the near-term horizon. They are. Here are ten breakthroughs from the past year that figure to "change the game" in 2015:

1. **Artificial Intelligence:** IBM officially opened its **Watson supercomputer headquarters** in Manhattan this fall, and everyone from bankers to veterinarians are now employing the technology. The former are using it to create individually tailored portfolios, while the latter are tapping into its immense power to rapidly diagnose the best treatment for your pet. Combined with the fact that Watson is adding a second language (Spanish) to its repertoire and it won't be long before

companies across the globe are embracing machine intelligence to uncover new insights, identify and solve problems as well as improve customer service.

2. **Genomic Advances:** Due to the relentless improvement (and the growing affordably) of gene sequencing technology, over 228,000 individuals had their genome sequenced in 2014. As a result, Google and others are now **analyzing these genomes** in the hopes of making new medical discoveries. As the connections between genes and disease are better understood, pharmaceutical companies will need to adjust to a world where personally tailored drugs—and not "blockbuster drugs"—become the new norm. The broader healthcare industry may be even more affected due to promising new advances in the field of **genomic surgery**. Already, genomic editing has been demonstrated to cure some patients of HIV, and soon single gene diseases—such as sickle cell anemia—may be eliminated because of our ability to perform microsurgery on genes. Interestingly, the latter development may also impact the agriculture industry by making it possible to produce plants that can grow faster. The net result is that in the near future significantly less water, fertilizer and pesticides may be required to produce each pound of food.
3. **More Affordable Desalination Technology:** Fresh water is in short supply around the world. Two recent advances could turn this shortage into a surplus. Researchers at MIT and the University of Manchester have, independently, discovered how **graphene might remove the salt from seawater** quickly and affordably. Elsewhere, the creation of a "**Seawater Greenhouse**" portends a day when fresh water may be conveniently harvested from the ocean using nothing but sunlight. In addition to positively affecting global agricultural output, an abundance of fresh water might also ease geopolitical stress in a number of regions around the world.
4. **Rapid Diagnostics:** Theranos, a promising new start-up, has teamed up with Walgreens to offer an innovative new blood test that can be used to perform **70 different diagnostic tests** with a mere 25 microliters of blood. Another start-up, **rHealth**, has created a hand-held device that can diagnose hundreds of diseases using a single drop of blood. The good news is that as these technologies improve, the amount of time and money people will save by having multiple diseases rapidly, accurately and affordably diagnosed will be immense. The bad news is reserved for

lab diagnostic technicians who will see the need for their services evaporate over the coming years.

5. **3D Printed Houses:** A private company in China has successfully built **a giant 3D printer capable of printing ten full-size houses in a single day**. Currently, the houses are modest and aren't aesthetically appealing but as the technology matures the houses will become more attractive, affordable, and customizable. Urban planners, builders and real estate agents will all need to stay abreast of developments in the field because the technology may demand that they rethink many aspects of their jobs.
6. **Virtual Reality:** In March, Facebook shocked the business world by purchasing**Oculus Rift** for $2 billion. At the time, Mark Zuckerberg justified the purchase by saying, "*There are not many things that are candidates to be the next major computing platform, and this acquisition is a long-term bet on the future of computing*." A hint of virtual reality's far-reaching future appeared this fall when Lexus announced it was using an Oculus-based simulator to allow customers to experience the "feel" of driving a new Lexus automobile without actually visiting a dealership or even stepping into a real vehicle. The impact of virtual reality technology on many other "physically-based" businesses will be profound.
7. **Half-Price Gasoline:** Due to advances in fracking technology and horizontal drilling, natural gas production in North America has exploded over the past decade. This increased production is one reason gasoline is now under $3-a-gallon in many parts of the U.S. It is possible that gasoline prices could plummet even further. Chemists at **Siluria**, a new start-up, claim to have created a new catalyst that efficiently converts natural gas into water and ethylene, and a second that then converts the ethylene into gasoline. If the process scales, consumers will have a lot more discretionary income and businesses, large and small, will need to adjust to a new era of "cheap energy."
8. **Nicotine Vaccine:** Smoking still kills an estimated 8.6 million people worldwide every year, and tobacco is a multi-billion dollar global industry. Both figures could soon be dramatically reduced thanks to a **promising new vaccine** being developed by researchers at Virginia Tech that helps smokers overcome their nicotine

addiction. The vaccine works by blocking or, at least, limiting the physiological pleasure that nicotine elicits in the brain.

9. **Project Loon:** As impressive as the growth of the Internet has been over the past 15 years, less than a third of all people on the planet have Internet access. Google hopes to change this beginning in 2015 with the wide-scale deployment of "**Project Loon**"—an elaborate network of high-altitude balloons designed to deliver high-speed wireless Internet service to all 7 billion people on the planet by 2020. In combination with the prolific growth of mobile devices, high-quality massive open online education courses (MOOCs), and digital currencies, it is plausible that many of the components necessary for sustained economic growth will soon be in place across the globe.
10. **Cure for Type 1 Diabetes:** Scientists in Britain have demonstrated that they were able to **make hundreds of millions of pancreatic cells** from stem cells using industrial-sized bioreactors. More significantly, the cells have already proven successful in treating diabetic mice. If the process can be replicated in humans, the advance would not only make daily insulin injections unnecessary for millions of people around the globe, it would offer a cure for type-1 diabetes—a disease that costs the U.S. health care system an estimated $15 billion every year. One researcher has said the advance would be "a medical game changer on par with antibiotics."

The complete elimination of diabetes, smoking or genetic diseases will not occur overnight. Nor will a world of clean and affordable energy, abundant freshwater, 3D printed houses or worldwide high-speed Internet access miraculously appear by the end of 2015. But then Rome wasn't built in a single day either. It was, however, started in a single day, and 2015 is sure to witness the birth of a better, brighter future.

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