

FUTURE NEWS

TO CONNECT, TO INFORM AND TO INSPIRE

IN THIS EDITION

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How an AI System Can Learn to Think Creatively

by Alston Ghafourifar



Will an AI system ever create art that can equal a work created by a human? Researchers and artists are already making attempts to find out by translating creativity into algorithms. To answer whether these attempts are likely to generate artwork — music, poetry, fiction, visual art — that can pass for human-created work starts with understanding how human creativity functions.

While the potential for rational thinking and mathematical ability in humans are present at birth, we still require education to fully realize these capabilities. So we study the laws of nature, logic puzzles, ethical dilemmas, and so on. Yet even the best of us make the odd irrational decision and give in to one of our many biases.

On the other hand, human emotion, intuition, and creativity needs only a little formal training. Every child will laugh, cry, draw, create, destroy, question, and explore without any prompting, let alone education. Education is used to shape these urges, teaching children to take control of their emotions, direct their creativity, and destroy or create with more precision and consideration.

Computer systems are something quite different. They excel at algorithmic tasks yet lack most capabilities that we consider innately human. They can certainly calculate in milliseconds tasks too complex for a roomful of mathematicians, but just try telling a computer a joke or playing it a love song.

Even at the rapid rate at which advances are happening in artificial intelligence, it's an open question whether an AI system can learn to create art. Yet advances in areas not directly related to creativity suggest it might happen. Algorithms are already completing some of the most difficult logic puzzles humans have devised. AI systems are taking on the challenge of understanding language; others have beaten the best human players in games like go and poker; and now they are taking to the streets to prove how much safer they are as drivers.

Many of these skills are only a short distance away from creativity itself. Language, in particular, follows prescribed organizational rules while also allowing space for artistic pursuits like storytelling and poetry. Yet while we might call

music “organized sound” and visual art to be “organized color,” any old organization won't do for an AI-generated artwork to achieve that most timeless of standards: Art with a capital “A.”

THE MECHANICS OF HUMAN CREATIVITY

It is fascinating that the human brain is wired for both logic and creativity, given how fundamentally different those mental processes are. Logic runs on a set of rules and procedures in an orderly fashion. Creativity and intuition, on the other hand, can be messy, anything but straightforward.

First, we should acknowledge that there are at least two forms of creativity. We might call the inspirational thought that arrives in the shower an example of “a-ha” creativity. Then there's creativity that flows while we're “in the zone,” letting our mind stretch and test rules and norms, like a pianist does when improvising a solo. In both of these circumstances, focus and cognition stand aside to let emotional expression and subconscious freedom take charge.

Mind wandering, that mental state of relinquishing conscious thought to let the mind go where it so chooses, has been linked to creative processes on more than one occasion. Insights emerge from mind wandering as the images and ideas flowing through it strike upon something rich and unexpected. Unlike a mathematical formula or logical construction, these processes are not easily recreated in computer form.

Long before formal psychological research into creativity, artists had caught on to the power of mind-wandering. The surrealist painter Salvador Dali used to hold keys in his hand above a plate as he sat in his chair, aware that in those blissful moments just before sleep, when strange thoughts would creep in, the keys would drop, wake him, and leave him with those ideas he could then use.

Not every shower thought is worthy of being called creative. Some ideas seem ridiculous the next day, some musical transitions are just plain jarring. For creativity to attain Art status takes something far subtler. Creators

must know the rules before they can break them effectively; they must have a sense of what will work to create the feeling, sensation, or effect that they seek. In this way, they are, to an extent, introducing old ideas to new ideas. Artists combine things in new ways and look at them from a fresh perspective, but do so using materials (colors, phrases, melodies) we are already familiar with.

This supports the common notion, so succinctly put into words by Steve Jobs, that “creativity is just connecting things” — though the “just” makes it seem far easier than it actually is. We cannot connect just anything haphazardly and label it creative. It needs a purpose, a point, whether that is to solve a problem or portray an idea. We can teach AI systems to mix things together (imagery, tones, words), but can we get them to do so in a meaningful, artful way?

ATTEMPTS AT ARTIFICIAL CREATIVITY



Image from berlingamescene.com and reproduced with permission

The extreme challenge of not only figuring out how creativity works but teaching it to an intelligent machine has not stopped researchers from trying. There are numerous examples of AI systems that can compose music, write articles, and create visual art. And some of it is difficult to distinguish from human-made art.

Gaetan Hadjeres and Francois Pachet, from the Sony Computer Science Laboratories in Paris, trained their AI system on the chorale cantata music of Johann Sebastian Bach. These compositions were chosen, as MIT Tech Reviewnotes, “because the process of producing them is step-like and algorithmic.” The AI system was trained using 352 of Bach’s chorales, which were transposed into different keys, for a total of 2,503 compositions. When it came to producing its own Bach-infused chorale, the AI system managed to convince more than half of 1,600 listeners — including professional musicians and music students — that the harmonies were from Bach himself.

Bach doesn’t appear to challenge AI as much as poetry does. In a competition run by Dartmouth, judges were tasked with reading 10 sonnets, 14-line poems with prescribed rhyming schemes. Some were written by a human, others by a machine. In this case, all of the judges were able to recognize the artificial compositions.

What about attempts at AI-generated fiction? One machine learning enthusiast shared an introduction to setting up a deep writing neural network in a post on Medium. He used the methodology to train a deep learning algorithm on the first four books of the Harry Potter series and shared the results. While the AI-generated fiction is an entertaining read, J.K. Rowling hardly needs to worry:

“The Malfoys!” said Hermione.

Harry was watching him. He looked like Madame Maxime. When she strode up the wrong staircase to visit himself.

“I’m afraid I’ve definitely been suspended from power, no chance — indeed?” said Snape. He put his head back behind them and read groups as they crossed a corner and fluttered down onto their ink lamp, and picked up his spoon. The doorbell rang. It was a lot cleaner down in London.

In the visual arts, AARON has been around for some time. The child of artist Harold Cohen, AARON was born in 1973 as Cohen became increasingly interested in computers and the potential they had to paint for themselves.

In a BBC interview about intelligent machines, Cohen said AARON had “become autonomous enough to disturb the guy who wrote the program.” Yet Cohen denied that AARON was truly creative, believing that the system’s true creativity was many years away: “I don’t deny the possibility that, at some point in the future, a machine can make something approaching art — but it is going to be a lot more complex than teaching a car to drive around a city without a driver, and it isn’t going to happen next Wednesday or even in what is left of this century.” In the years since AARON’s creation, the system has produced many vibrant-colored abstract paintings.

APPRECIATING MACHINE-MADE ART

One important question remains. How are we going to feel about Art produced by intelligent machines? Will we appreciate the creativity and design? Or will it seem cold and distant, denying us an emotional connection to it?

One school of thought says that the value and meaning of art exist independent of its creator. On the other hand, many believe that the story behind a piece of art and information about the artist can influence our perception of the artwork. You can test your own view with a thought experiment: Imagine standing in front of a painting by a noteworthy artist. Now imagine learning that the painting was a forgery, a copy of the original. Would you still find enjoyment in it? If every brush stroke, hue, and detail were precisely the same, would you value it the same?

Psychologist Paul Bloom notes in an interview on what people value most that when we’re shown an object or a person’s face, “people’s assessment of it ... is deeply affected by what you tell them about it.” This idea was demonstrated in an experiment in which a violinist plays a piece of music in a D.C. Metro station and collects \$32 in donations. What passersby were not told was that the violinist was Joshua Bell, who has recorded more than 30 albums and performed at the White House. Bell was playing a Bach composition considered one of the most challenging ever written. Just days earlier, Bell had played the piece in Boston’s Symphony Hall, where ticket prices eclipsed \$100. Would more people have stopped to listen to him play if they had known all of this? Almost certainly. Yet the music would have been the same.

CREATIVITY WILL REMAIN A HUMAN DOMAIN FOR SOME TIME

As it stands today, creativity remains a human affair. While these AI attempts are noble in their artistic pursuits, each still falls short of the benchmark set by artists of our own kind. The musical compositions were the most convincing artifacts, yet were chosen specifically for their algorithmic style. In most other domains, the algorithms displayed an inability to break the rules in a purposeful fashion, often sticking to the norms or composing something incoherent. No one knows when a digital Picasso might emerge to wow an audience of Art world cognoscenti. But one thing is for certain: As machines become smarter and more capable, they get closer and closer to achieving true creativity.

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FUTURISTS IN ACTION

HOW TO USE A FUTURIST

by Liz Alexander



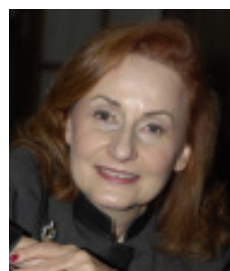
Liz Alexander, consulting futurist and cofounder of Leading Thought LLC has brought together 9 global futurists to explore their experience in engaging clients as futurists.

As one of her collaborators, UNESCO's Chair for Future Studies asks readers to

- realise this process is a learning journey, not a race to the finish
- recognise what is an old, outmoded or 'used future'
- track, understand and accommodate the implications of emerging trends
- explore many alternative futures
- craft a new narrative that energizes all stakeholders
- connect their new narrative and desired future to the reality of the present

THE FUTURISTS WHOSE EXPERIENCES ARE EXPLORED IN THIS BOOK INCLUDE:

Ross Dawson is a futurist, entrepreneur, keynote speaker, strategy adviser and bestselling author. He is the founder or co-founder of six companies, including the Rh7thm and Advanced Human Technologies groups, based in Sydney, Australia.



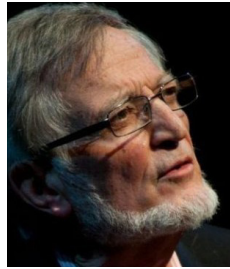
Lynn Curry's firm **CurryCorp** works with clients to discover options, test and articulate preferred futures, design related data collection, and help determine direction. Then to help align governance, management and operations to realize that preferred future.

Sohail Inayatullah is UNESCO Chair for Futures Studies at USIM, Malaysia. Professor, Graduate Institute of Futures Studies at Tamkang University; Melbourne Business School, the University of Melbourne; and the University of the Sunshine Coast.



Dr. Ira Wolfe is President of **Success Performance Solutions**. His latest white paper is about today's VUCA (Volatile, Uncertain, Complex and Ambiguous) world, and is entitled *When The Shift Hits Your Plan*.

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Ruben Nelson is Executive Director of Foresight Canada, Canada's leading practitioners and teachers of the next generation of strategic foresight. Ruben has been honoured by Queen's University and the Queen's Calgary Alumni. He is a Fellow of the World Academy of Art and Science, the World Business Academy and the Meridian Institute on Leadership, Governance, Change and the Future. Ruben is also Vice Chair, the Institute on Religion in an Age of Science.

Rushdi Abdul Rahim is a Senior Vice President at **MIGHT**, a think tank under the purview of Malaysia's Prime Minister's Department. He also serves as the Director of **myForesight®** - the Malaysian Foresight Institute.



Kyle Brown is a global futurist from Toronto, Canada, currently working as a Senior Foresight Strategist at **Idea Couture** – a global strategic innovation and design experience firm. He has previous experience as an adviser and futurist with the **Copenhagen Institute for Futures Studies**.

Leading Thought associate, Mark Tuckwood, is founder and principal at **Insight Gravity**, a global foresight and innovation consultancy. He works predominantly with private sector organizations to curate new value opportunities.



Dr. Robert Burke is a director of Futureware Consulting and associate of Melbourne Business School, the University of Melbourne. Prior, he was CEO of a number of international organisations. He has offered a residential four-day Futures Thinking and Strategy Development Program twice-yearly at Melbourne Business School for over 15 years.

Victor Vahidi Motti is News Editor and Co-Chair of the Youth Council for the World Futures Studies Federation (WFSF). He received the WFSF President's Outstanding Young Futurists Award in 2013 and is an internationally-renowned speaker and consultant on strategic foresight and scenario planning.



Joel Barker was the first person to popularize the concept of paradigm shifts for the corporate world. In addition to being a futurist, he is an author, video maker and inventor.

Tom Cheesewright is a UK futurist who speaks, writes, broadcasts, and **works directly with organisations** to help them see, share and respond to a clearer vision of tomorrow.



Patricia Lustig, CEO of **LASA Insight Ltd.**, is a UK-based practitioner in strategic foresight, strategy development, futures thinking and innovation. She is the author of *Strategic Foresight: Learning from the Future*.

Umar Sheraz Sheraz is Senior Research Officer, Center for Policy Studies at the COMSATS Institute of Information Technology in Islamabad, Pakistan.



Jonathan Peck is President of the **Institute for Alternative Futures** and its for-profit subsidiary **Alternative Futures Associates**. IAF/AFA are leaders in the development of “aspirational futures” which integrate vision into scenario development. This has been used by corporations, governments, and non-profit organizations on six continents.

Dr. Jörn Bühring is Research Assistant Professor at the Hong Kong Polytechnic University of Technology’s School of Design, and program leader of the School’s Ignite Innovation Program which fosters industry-university collaboration through tailored initiatives. He has conducted several futures studies in Tourism and Hospitality, Retail, and Financial Services where he practices design-inspired foresight, vision and fiction.



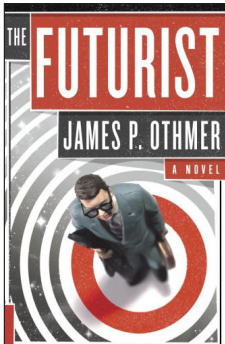
Dr. Lisa Galarneau is a socio-cultural anthropologist and futurist who has been working at the intersection of culture and technology for 25 years.

A copy of the entire e-book is available upon request from the futures foundation.



Book Review

by Charles Brass – Chair, futures foundation



The Futurist: A novel
by James P Othmer



Normal: A Novel
by Warren Ellis

I read “The Futurist” by James P Othmer shortly after it was first published in 2006. It was shortly after now-deceased Jan Lee Martin (the founding Chair of the futures foundation) suggested that futurists would know they had “made it” when comedians created future comedy and novelists wrote books about futurists.

Now having read the second novel (that I know about at least) about futurists “Normal” by Warren Ellis I have read “The Futurist” for a second time.

Othmer’s book is much more a novel. Over 380 pages long it is a sort-of romance novel with a futurist as its lead character. “Normal” is less than half the size but also features a futurist as its main protagonist.

Both are bleak stories. In “Normal” the futurist has been admitted to a high-class mental institution because he has “gazed into the abyss” for too long and mentally gone over the edge. Othmer’s futurist is apparently wealthy and travels the world first-class, but both his professional and personal lives are fraught, to say the least.

Richard Slaughter was so concerned about the number of visions of the future that were bleakly negative that he wrote “Futures beyond Dystopia” in 2004. It seems that these two novel writers at least are still less than positive about the futures facing humanity and not at all convinced that futurists are actually helping all that much.

Othmer’s futurist is a huge success. He once spoke: “on successive days to a leading pesticide manufacture and the Organic Farmers of America and receive(d) standing ovations from both” (p36). He: “once took batting practice with the New York Mets, pretending not to notice the eight-year-old boy with leukaemia from the Make-a-Wish Foundation whom the PR Director let him cut in front of because he had to catch a plane”(p48).

Yet, he doubts his own success: “I’m too inept to be scientific. Too lazy to be original or deep. I don’t have visions” (p82). He says he was: “...never cutting edge or far from the curve. He was often just minutes in front of the pack, a couple of seconds ahead of the global Zeitgeist, or at least the middle American one”(p265).

The novel bounces between these two extremes, but despite the ambiguities of his behaviour and his pronouncements, the futurist’s success seems undiminished.

All this is interspersed with romantic assignations and the death of his father – and makes, for me at least, a mildly interesting but rather unsatisfying story. Ultimately the futurist is chased by extremists in a fictional Middle Eastern country because he is too American. Even this doesn’t seem to affect his reputation (though he does find it hard to keep friends for long).

“Normal” is a much more nuanced story, though I confess its ending rather let me down.

There is a similarity in the premises of both novels. Both are set in worlds where futurists are in demand and considerable amounts of money are able to be made thinking professionally about the future.

Ellis amusingly divides his futurists into two types – foresight strategists and strategic forecasters; both of whom are susceptible to the mental illness that is central to the novel, but each is incarcerated in separate wings of the mental institution (the “Normal Head” of the title), and each of which mutually looks down upon the other.

Foresight strategists are more pragmatic – focused on the practical applications of their prognostications – whereas strategic forecasters are ‘big picture thinkers’ - leaving it up to others to determine the usefulness, or even the meaning, of what they say. Having been at many gatherings of futurists over the years I chuckled at these distinctions – perhaps because they seem too realistic. As a profession futurists have some distance to go in presenting a coherent view of what we do to the world.

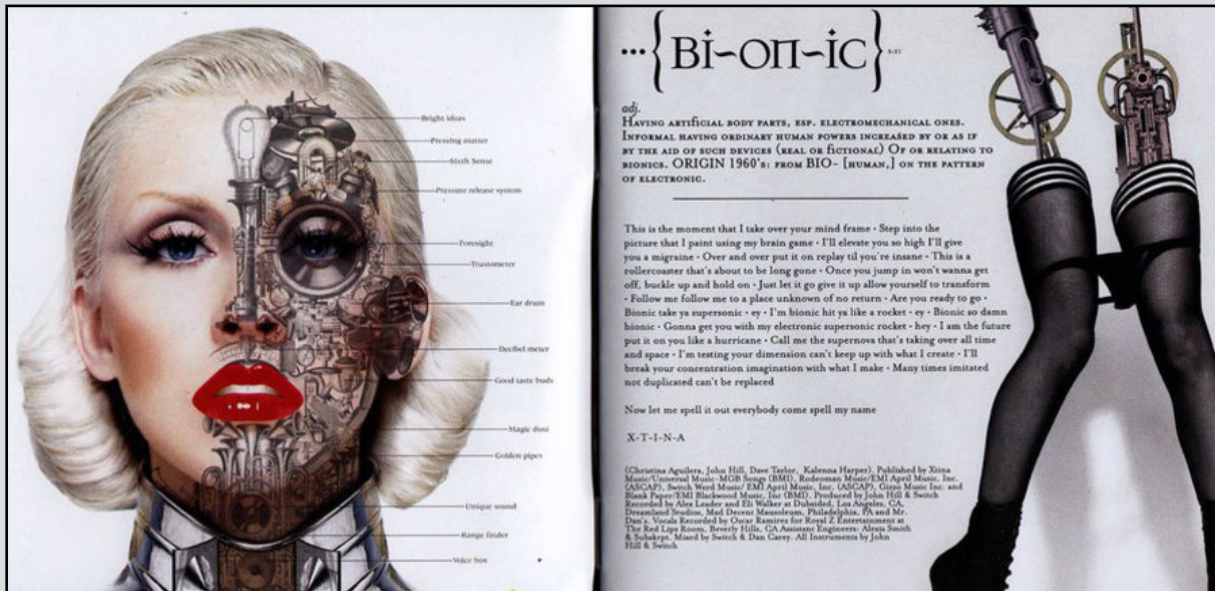
Ellis’ futurist is supposed to be in Normal Head for rest and recovery, but even here he finds conspiracy theories, and ultimately a reason for being sceptical of the directions in which modern technology is supposed to be taking us.

It is not clear to me whether Othmer intends his book to be funny, I didn’t find it so, but Ellis is clearly having a lend of his readers. Perhaps that is why I ultimately found his book more fulfilling.

I am not sure if Jan Lee Martin was right about what needs to happen before futurists become more credible, but if I didn’t know what a futurist was I am not sure either of these novels would encourage me to take the more seriously.

Signals in the Noise

10 HUMAN BODY MODIFICATIONS YOU CAN EXPECT IN THE NEXT DECADE



Elon Musk has called it: you're already a cyborg. Your smartphone enhances your mind, your spectacles enhance your vision, and your pacemaker (if you have one) regulates your heartbeat. Our environment is increasingly wired, sensor-filled, and digitally connected—and so are we! This trend will only continue.

All over the world biohackers, scientists, entrepreneurs and corporations are eagerly pursuing new and marketable applications for advanced technologies. Many of them are being actively designed to help humans fulfill our age-old transcendent longings—to be stronger, smarter, better-looking and more resilient, and to cultivate new abilities that seem like superpowers by the standards of the past.

Here are 10 emerging devices and technologies that could soon enhance you in body and mind.

1. RFID CHIPS

Microchips are not new, but the practice of routinely implanting them in humans is. Already, biohackers are enthusiastically getting chipped, many of them undergoing the DIY surgery in tattoo parlors. With small radio frequency identification (RFID) chips implanted in their hands or wrists these citizen cyborgs can already eliminate many tedious rituals from their daily lives, like carrying a wallet or keys.

The chip can be used to make tap-and-go payments and can be programmed to open a home or office door electronically. No more carrying keys down to the beach when going for a swim, and no more joggling with them jangling in your pocket. One Australian biohacker, Meow-Ludo Meow Meow also thinks that chip implants could replace public transport cards.

But that's just the basics. Chipping could soon be used on a national scale for identification and security. Hacking

and identity theft will certainly be a concern, but on the plus side there'll be no more anxiety about losing your passport when you travel! Transhumanist candidate for Governor of California Zoltan Istvan has a chip in his wrist to open his front door. The chips can also be used in the workplace. One Swedish office complex Epicenter has already made chipping a voluntary identification option for tenants and their employees. The Belgian digital marketing firm NewFusion also began offering implants to staff in 2017.

With electronic medical records becoming more pervasive, personal medical data could also be stored on implanted RFID chips. If you arrive in the emergency room and need a blood transfusion you can immediately be scanned for your blood type. Allergic to certain medications? The ER doctors will know this too, as well as who has medical power of attorney, whether or not you're an organ donor, and what your end of life wishes are (e.g. if you have a DNR "do not resuscitate" order).

Signals in the Noise

10 HUMAN BODY MODIFICATIONS YOU CAN EXPECT IN THE NEXT DECADE

2. EXOSKELETONS



Hyundai's "Iron Man" robotic exoskeleton in action. Image credit: Hyundai/
Business Insider

The Terminator was “a cybernetic organism. Living tissue over a metal endoskeleton.” But that was in 1984 and the concept was fictional. Jump ahead to the 2020s and you could be a different kind of cyborg—one that wears a metal exoskeleton over your biological meat sack.

Why would you? If you're in the military, particularly in combat, an exoskeleton can dramatically enhance your strength and endurance and allow you to carry more supplies when moving on foot.

If you're just a regular human then carrying supplies is probably not a big concern. But back pain likely is. Sure, an exoskeleton may not help an office worker much, but it could be a big help to factory workers and manual laborers. In the near future, before the impending robot job-apocalypse, exoskeletons could help laborers to use the correct muscles when lifting and allow them to lift more weight safely.

More profoundly, if you suffer from spinal cord injuries an exoskeleton could help you to walk again. Elderly people with mobility issues could also benefit from the technology.

The transhumanist politician Zoltan Istvan also thinks that exoskeletons could soon transform sport and other forms of recreation by helping us to reach new physical peaks and compete at a different level. He even thinks we'll use them in the bedroom, though it's contentious whether humans will really want to ‘suit up’ as a preamble to getting down and dirty.

3. REAL-TIME LANGUAGE TRANSLATION

Real time language translation applications have been around for a few years though they've had their share of quirks and imperfections. However, recent advances in machine learning have done a lot to improve machine

translation of late—so much so that we are now on the cusp of achieving seamless translation in real time. In late 2016 The New York Times reported that Google's translation “A.I. system had demonstrated overnight improvements roughly equal to the total gains the old one had accrued over its entire lifetime.”

With artificial intelligence facilitating a whole new level of precision in this field, a wave of companies are racing to bring even better products to the market, including Microsoft and Google. The US startup Waverly Labs has crowdsourced over \$4 million and has pre-sold 22,000 prototype earbuds that will translate in real time while canceling ambient noise. At \$299 a pair, you have to wonder whether human translators will be able to earn much of a living from here on out.

4. AUGMENTED VISION

Bionic eyes are a thing! They are currently used to treat hereditary and age-related macular degeneration (AMD) and rely on a camera mounted on glasses feeding inputs to electrodes attached to the retina. This technique is a remarkable, though still imperfect, means of reversing a form of blindness.

Another kind of intraocular bionic lens is being developed by the Ocumetics Technology Corp and is currently being tested in clinical trials. The aim of the product is to restore “clear vision at all distances, without glasses or contact lenses” regardless of the age of the patient. Ideally, “three times better than 20/20 vision” could be achieved and laser eye surgery could eventually be rendered obsolete.

Perfect vision and no glasses would be a massive improvement for many. But why stop there? Theoretical physicist Michio Kaku thinks we should aim for superhuman vision and maintains that we are already well on our way.

Telescopic contact lenses have already been developed, which can enable the user to zoom in and out with a wink. The technology was developed by the US Defense Advanced Research Projects Agency (DARPA) and could soon be marketed to sufferers of AMD. But as the technology improves and gets cheaper it could eventually become the norm to have telescopic vision, as well as other add-ons like night vision.

5. SMART CONTACT LENSES

But wait, the eye stuff gets even cooler! Both Sony and Samsung have patented smart contact lens technology that can record video by blinking. The augmented reality company Magic Leap is also working on a smart contact lens, in tandem with its much anticipated new augmented reality headset. Both products will be able to overlay computer generated images onto the real world.

Signals in the Noise

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But augmented reality tech isn't just for fun. Another application of smart contact lenses being developed at the X lab (formerly Google X) is the capability to detect blood glucose levels in tears and alert diabetics when their blood sugar is too low.

How could this change your life in the next decade? Leading transhumanists and tech gurus Peter Diamandis and Kevin Kelly think that in the near future these kinds of innovations will hail the end of PCs, smartphones and screens-as-we-know-them. Soon you could walk around with the equivalent of your smartphone inside you, while the screen could be both everywhere and nowhere. Classic miniaturization and dematerialization in action!

6. 3D PRINTED BODY PARTS



Lab-grown bladders and functional vaginas have already been successfully implanted in patients. But even more exciting is the promise of 3D printing and implanting vital organs like hearts, lungs and kidneys.

Professor Martin Birchall, a surgeon at University College London, believes that this will come and that important stepping stones will arrive very soon. He told the BBC in 2016: "I think it will be less than a decade before surgeons like me are trialling customized printed organs and tissues. I can't wait!"

The Economist is even more optimistic, predicting that the first implantable livers and kidneys could be 3D printed as early as 2023.

7. SMARTER DRUGS

Let's be honest, humans love drugs. Some age-old faves include alcohol, caffeine and sugar. But when it comes to both medicinal treatment and recreational or performance-enhancing drugs (think Prozac for depression and anxiety, or caffeine and amphetamines for alertness and concentration) today's drugs are pretty darn primitive. Why? Because they're a one-size-fits-all solution that can't be well tailored to the individual. Benefits are also very hard to decouple from side effects.

The good news is that soon we could have a new generation of better, smarter drugs. Already, artificial intelligence and cheap genomic sequencing are accelerating the drug discovery process and facilitating an increase in effective personalized medicine. Unsurprisingly, pharmaceutical companies, governments and tech corporations are eagerly getting in on this medical big data game.

The Human Longevity Inc., which was run until early 2017 by the pioneering geneticist Craig Venter (of Human Genome Project fame) is on track to complete an ambitious plan to sequence 1 million human genomes by 2020. The company hopes to mine this enormous database of genetic, and phenotypic (lifestyle) data and rapidly accelerate the innovation of personalized drugs and treatment plans.

Personalized cancer treatments are already increasingly common and effective. Soon, as former US President Bill Clinton once said, we could "know the term cancer only as a constellation of stars."

8. BRAIN-COMPUTER INTERFACES

Humans can already control wheelchairs, advanced neuroprosthetic limbs and drones with their minds. Brain-computer interfaces (BCI) have also been used to communicate with patients suffering from the rare affliction of locked-in syndrome. Soon we could be using technology like this all the time, not just to correct for disabilities, but to enhance communication and sensory connection. Perhaps we could even connect telepathically?

Mark Zuckerberg certainly thinks so. He famously proclaimed in 2015 that in the future (though more than a decade away):

"You're going to just be able to capture a thought, what you're thinking or feeling in kind of its ideal and perfect form in your head, and be able to share that with the world in a format where they can get that."

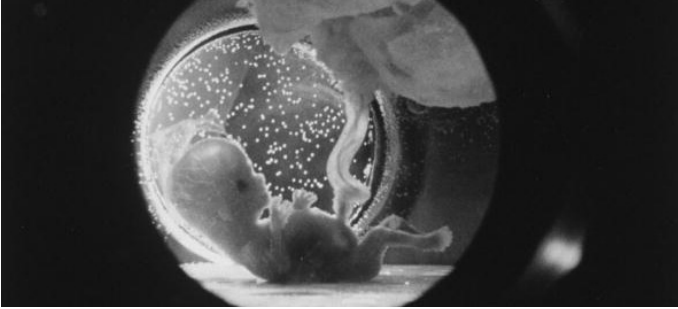
Zuckerberg is not the only tech kingpin thinking about this stuff. In 2016 Elon Musk famously spruiked the idea of a "neural lace," effectively an advanced BCI in which biological brains seamlessly mesh with non-biological computing. Rumbblings on Twitter and hints from Musk himself suggest he is actually planning to work on his own lace design.

The leaders of Stanford University's NeuroTechnology Initiative also believe that in years to come "brain-machine interfaces will transform medicine, technology and society" and that "future devices will likely not only restore, but also augment, human capacities."

Signals in the Noise

10 HUMAN BODY MODIFICATIONS YOU CAN EXPECT IN THE NEXT DECADE

9. DESIGNER BABIES



In 2016 the first 3-parent baby was born. The nucleus from one of the mother's eggs was transplanted into a donor egg with the nucleus removed. The donor egg was then fertilized with the father's sperm, a process undertaken to avoid a fatal condition called Leigh syndrome, which is carried in the mother's mitochondrial DNA.

With gene editing becoming a more precise science, thanks to new techniques like CRISPR-Cas9, it will not be long before they are utilized en masse to prevent most heritable diseases. Why would you roll the genetic dice when you could actively intervene to ensure that your child will be healthy? Especially if you've had your genome sequenced and know you are a carrier of deleterious genes, like the BRCA1 and BRCA2 mutations, which strongly predispose those with the mutations to breast and ovarian cancer.

Pre-natal screening already affects the proportion of certain genetic traits in the population—a high percentage (most recently estimated at 67%) of fetuses identified as having Down syndrome are aborted. While statistics like this have sparked widespread ethical debates, they also indicate that humans tend to be willing to make use of technologies that give them more choice over their reproductive outcomes. IVF is another obvious example.

The ultimate potential of gene-editing technology is profound and could be species changing. It's uncertain how far we'll progress (or indeed allow the technology to progress) in the next few years. But you'll definitely see movement in this space over the next decade.

10. ENHANCED SEXUAL ORGANS

Almost 300,000 Americans underwent breast augmentation surgery in 2016, a 4% increase on the previous year and a 37% increase since 2000. But it's not just boobs, almost all cosmetic procedures are on the rise. Clearly Americans have embraced this mode of human enhancement with gusto.

But who wouldn't want to achieve the same goals without sticking bags of silicon inside their body? There might just be a better way.

Transgender transhumanist Valkyrie Ice McGill predicted in 2014 that by 2024 a total functional gender

transformation will be possible. The same technology that could enable a complete gender reassignment could also allow patients to achieve breast, buttock, and penis enlargements with more natural results. She stated:

"A decade from now, a plastic surgeon is likely to use body modeling software developed by MMOs and VR to enable you to decide precisely how you want to look, and then supervise the da Vinci autosurgeon as it uses your own body fat and skin cells to produce a stock of programmable stem cells, and then performs hundreds or even thousands of minimally invasive microsurgeries to place those programmed cells throughout your body, where they will become extra muscle mass, larger breasts, repair damaged internal organs, etc., allowing your future self the option of "resculpting" your personal appearance."

Holy crap! A bigger butt grown from your own stem cells. Kinda cool, if a little predictable. But then we idealize curvy women and muscular men because it's been an historical ideal with a strong biological impetus. Our tastes don't spring from nowhere.

Yet when it comes to sex, humanity as a species has big aspirations and vivid imaginations. There will always be those who want to create completely new ideals of beauty and sexuality and who hope to transcend the limits and values of the present day.

The transhumanist George Dvorsky is one such human. He has playfully outlined out a speculative ideal for "the penis of the future." Notably, it's not the same old thing but bigger. Among other traits, Dvorsky hopes that a future penis could be bacteria resistant and WiFi enabled. Another eager biohacker and transhumanist Rich Lee has a different vision. He thinks vibrating penis implants will be the way of the future.

Some other fascinating predictions can be found in the 2016 Future of Sex report. The authors believe that dating in virtual reality will be common by 2022, and that by 2027 we'll have brain interfaces that allow us to literally turn on our partners via their most powerful sexual organ: their mind.

While the fullest realization of many of these technologies will likely be felt over several decades, it is realistic to imagine we will see these kinds of innovations improving fast and becoming more widely tested and adopted in the decade to come. Sure, you might not have a vibrating penis in 10 years time, but you will certainly have met someone with a chip implant by 2027 and there's a very good chance you'll have one yourself. The same goes for much of the rest. Very exciting stuff!

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