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FUTURE NEWS

TO CONNECT, TO INFORM AND TO INSPIRE

IN THIS EDITION

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NEW TECHNOLOGIES IMPACTING THE WAY PEOPLE LIVE

by Max Langridge

Providing a dignified elder life means finding ways to do more with less. No wonder people are looking to technology to pick up the slack.

Social interactions are also important – which technology can help with (Credit: Carlos Gil Andreu/Getty Images)

Mechanical mates

The 2018 Smart Ageing prize from UK innovation think tank Nesta, for example, was awarded to the Norwegian Komp, a one-button tablet aimed at elderly users. The stripped-down tablet is modelled on analogue televisions of yesteryear, and offers a simplified way to share photos and make video calls to family and friends.

Komp is a tablet modelled on analogue televisions, offering a simplified way to share photos and video calls (Credit: Estera Kluczenko, No Isolation)

For those in need of more regular contact than the occasional FaceTime, there are no shortage of robots queuing up to be your best friend in your twilight years. There's Pepper, the diminutive android made by Japan's SoftBank Group, which was seen entertaining guests at the Life 90 social club in Prague – "very stupid, but a great deal of fun", according to one of those present.

A cuddly robotic seal pup named Paro is found in care centres the world over, mewing and wriggling as seniors cuddle it. The improbably cute Japanese "carebot" (to charge its batteries, it sucks on a tethered pacifier) is designed to be a therapeutic experience for dementia patients, many of whom are unaware that they are holding a robot and not a live seal pup, bonding with the robot as if it were a real animal.

A robot named Pepper has been designed to interact with elderly people (Credit: Getty Images)

And the EU-funded Enrichme project dispatched Tiago robots built by Spain's Pal Robotics into the homes of elderly people. The large, squinting droids trundled after their charges, reminded them of appointments and medication schedules, ran through fitness routines and sought out mislaid items. But their companionship was rated as highly as their ability to track down lost keys. When the experiment ended, residents mourned the loss of their new friends, with one seen rearranging their furniture to fill in the empty space left by the droid.

Antonio Kung is CEO of Trialogue, an innovation technology company based in France. In 2016, he headed a three-year project to develop robots in conjunction with elderly people. The two models were Buddy, a cutesy "emotional companion" the size of a dog, and Astro, a sturdy walking assistant almost as big as an arcade cabinet.

The project visited care homes and spoke to residents about how the robots could better suit their needs. "We wanted to know, can we capture feedback from the users and provide a system that is closer to what they expect?" says Kung. "Surprisingly enough, there's not much done right now on that."

Kung's research also hinted at the limits of what can be achieved with technology. While feedback on Astro was prosaic – the robot was too big, they said – Buddy was a different matter. "They wanted features that a human has – to understand them better, to be smoother, to have a voice conversation that works well," says Kung. "They wanted it to be more human."

At the end of the day, there is only so much social isolation that a robot can alleviate. These have their place as facilitators, says Kung, but at their core they are still toys, albeit useful ones. In his opinion, the breakthrough robot for elder care will likely arrive as an offshoot of a more mainstream product – one that's good enough that everyone wants one.

The Tiago robot not only can track down lost keys, but provide companionship (Credit: Alamy)

Instead, it is the human connection that lies at the heart of our relationships. "I can say hand on heart that I absolutely love my new job, and it is incredibly rewarding," says Tinkler. "Myself and other Cera Care carers in this area have had neighbours clapping outside of our houses, and we're constantly being stopped on visits by people offering us cups of tea or to say thank you. I hope it inspires others to take up care as a career."

The need for people like Tinkler has never been so acute. The US will need to recruit an estimated 2.3 million care workers by 2025 to keep up with demand, while Australia, will need 100,000. Other developed countries face similar shortfalls.

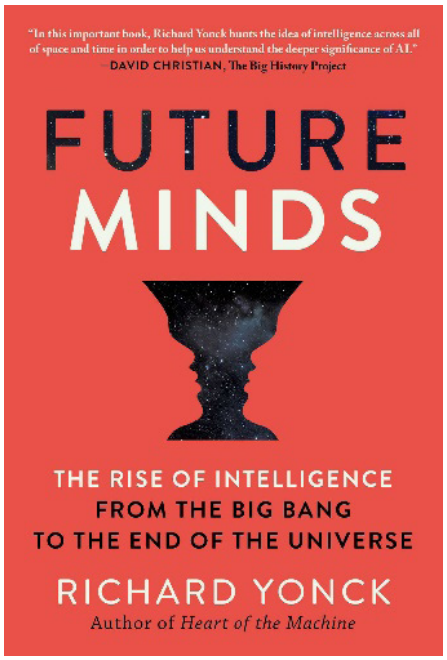
A tech-empowered workforce, trained online and partnered with virtual assistants, tele-present doctors, sensor-equipped homes and dependable companion robots is a future that is fast becoming a reality.

For a world that's rapidly growing old, such a change can't come quickly enough.

Book Review

by Charles Brass
Chair, Futures Foundation

Future Minds:
The Rise of Intelligence from the Big Bang to the End of the Universe
by Richard Yonck



> *"The most distinctive and universal feature of all intelligence in the cosmos is power over the future.*

Richard Yonck, the author of the new book Future Minds, is a futurist in the deepest sense. Not only does he think about and write extensively on the possibilities of the future, but at the beginning of this book he suggests (using the word "perhaps") that the human capacity to mentally "travel through time," using memory and anticipation, is our "greatest gift," allowing us, most importantly, to build preferable futures. In bringing to center stage right at the start of his book our human ability to imagine, ponder, and create desirable futures he is in resonance with my view that "future consciousness" is our most distinctive and empowering human capacity.

Indeed, as Yonck develops his general theory of intelligence early in his book, he goes way beyond considerations regarding the unique powers of the human mind and he argues that the most distinctive and universal feature of all intelligence in the cosmos is power over the future. As a means to maximize survival, intelligence is adaptability and flexibility regarding what the future may bring.

In attempting to develop a general, non-anthropomorphic theory of intelligence in the cosmos Yonck adopts what he refers to as a "Big History" perspective on intelligence, considering in succession the deep past, back to the "Big Bang" and the origins and evolution of intelligence in the universe; contemporary research on understanding, technologically simulating, and augmenting

> *If we ask, "What is the point or pattern to evolution—what is it all about?" the answer would be increasing intelligence in the universe.*

intelligence (inclusive of the entire twenty-first century); and far future possibilities of how intelligence could further evolve up to the "end of the universe," going roughly 100 trillion years into the future in his speculations at the end of the book. In fact, it would be more correct to say that Yonck adopts a "Big Future" perspective on intelligence, since, although historically informed, the bulk of his book deals with the near and far future. As an enthusiastic and deeply enthralled "time traveler," with an eye toward the potential wonders of the future, Yonck adopts a cosmically expansive temporal perspective on the universe and intelligence, journeying from the beginning to the end of time.

In this temporally expansive perspective on intelligence Yonck is a thoroughgoing evolutionist, describing and explaining the historical development of the cosmos, life, intelligence, culture, and technology in evolutionary terms. As Peter Watson, the historian stated and Yonck seems to agree, "Evolution is the story of us all." For Yonck, intelligence is an evolutionary phenomenon to be explained in terms of evolutionary principles. In fact, one could argue that for Yonck the directionality of cosmic evolution is fundamentally a process of increasing intelligence. If we ask, "What is the point or pattern to evolution—what is it all about?" the answer would be increasing intelligence in the universe. This is a powerful and fascinating hypothesis. Increasing intelligence is integral to the process of evolution, and moreover, the rise of human intelligence is simply a reflection and amplification of this fundamental cosmic process stretching back to the beginning of time. Moreover, for Yonck, the emergence and ongoing evolution of intelligence seems inevitable. Based on a roughly fourteen billion year trend, as Yonck describes it, it is highly reasonable to expect intelligence to continue to evolve to greater and greater heights in the near and far future.

Future Minds is divided into three main sections, each section containing either six or seven chapters. Section one is "Deep Past;" section two is "Twenty-First Century;" and section three is "Deep Future."

In "Deep Past," Yonck traces the evolution of the universe from the Big Bang and the emergence of chemical complexity to the formation of galaxies, stars, life on earth, and the co-evolution of humanity and technology. In this impressively interdisciplinary historical review he attempts to articulate a general definition of intelligence, as it evolved across the great panorama of time, that is not human-centric. Of note, as a topic I return to later, he argues that consciousness is not necessary for intelligence, since we can identify many processes in nature, including unconscious capacities and skills even in humans, that do not seem to involve consciousness. Illustrated through his review and analysis of the evolution of nature, Yonck proposes that the capacity of a natural system to maximize its future freedom of action is the essential defining property of intelligence. Preparedness and competence in coping with possible futures, which subsumes the capacity to achieve goals for the future, is at the core of intelligence.

In his excellent chapter on entropy, he explains that following from the second law

> *“Intelligence is not some anomaly or inconsequential feature of the cosmos; it is integral to the evolution of the universe.*

of thermodynamics the overall trend of the universe across time is increasing entropy (homogenization, equilibration, and the breaking down of differences). But many local regions in the universe, including on the earth, have moved in the opposite direction toward greater differentiations and complexity. This increasing localized complexity is evolution, but it is realized by speeding up the overall process of entropy in its surrounding sphere. The evolution of complexity requires the increasing usage of energy which generates increasing entropy. Drawing on the astrophysicist Eric Chaisson’s universal theory of the evolution of complexity—that evolution moves in the direction of increasing energy density rate of usage—Yonck argues that the more complex a system the more the system is capable of generating a “possibility space” for ways to increase entropy. In essence, the localized evolution of complexity, which moves in the opposite direction to entropy, accelerates the overall rate of increasing entropy in the universe as a whole because increasing complexity requires increasing amounts of energy usage. In a great balancing act, increasing complexity generates increasing entropy.

Consistent with the second law of thermodynamics, intelligence emerges as a natural consequence of the evolution of complexity in the universe. Indeed, Yonck states that intelligence allows the universe to equilibrate more efficiently. Moreover, intelligence brings with it the capacity for increasing flexibility and preparedness in coping with the future; intelligence maximizes long-term survival and perpetuates itself, building on itself. Hence, intelligence is not some anomaly or inconsequential feature of the cosmos; it is integral to the evolution of the universe.

Yonck examines the evolution of biological intelligence on the earth and concludes that it is difficult to clearly define when intelligence first emerged. Single-cell non-nucleated living organisms seem to show intelligence. He does note though a recurrent pattern in biology, as well as other natural systems. Parts integrate into greater, more complex wholes generating “emergence,” in which the whole, in unpredictable ways, goes beyond the sum of the parts. One can appropriately say that the evolution of complexity and intelligence is creative emergence. All in all, the evolution of intelligence shows repeated instances of emergence, of the complexities of wholes transcending the complexities of the parts.

When Yonck examines the evolution of human intelligence, he introduces a central theme (or argument) of his book: Biological humans and technology have co-evolved generating a level of complexity and intelligence that greatly exceeds the capacities of biological intelligence alone. Moreover, since the creation of the first primitive tools roughly three million years ago, the ongoing evolution of technology has biologically transformed us. With the introduction of language, abstract cognition (such as thinking), and complex societies layered on top of the human-techno integration, our collective intelligence has skyrocketed, energy usage has correspondingly accelerated, and humans, through technological advances and scientific insights, have begun creating ever-evolving forms of

empowering artificial intelligence, further amplifying this evolutionary process. In essence, the co-evolution of humans and technology fits into the general overall pattern of increasing intelligence in the universe. Technology is not unnatural.

Turning to the "Twenty-First Century," in this section Yonck examines in-depth the accomplishments and challenges, and promises and perils of artificial intelligence research now and into the near future. My impression is that this domain of study and inquiry (and related ones) is Yonck's main area of expertise and he covers in great detail such topics as "chatbots;" the "Turing test;" "virtual personal assistants;" making computer interfaces more human-like and human friendly; defining and programing "common sense" into computers; life-long and "deep learning" in computers; "affective computing" (the issue of emotional communication); computers developing "theories of mind;" ethics and values in computer programs and Asimov's Three Laws of Robotics; technological simulations of the brain; intelligence augmentation and brain-computer interface; cyber-security and hacking human brains and minds; artificial general intelligence and artificial super-intelligence, the emergence of the latter posing a plausible existential risk to humanity; and the "Technological Singularity" and the transhumanist vision of "the rapture of the nerds." This whole section is a very informative, up-to-date review of progress, problems, and promises within this broad domain of technological development, and for Yonck the research and thinking covered in this section represents a key cutting-edge dimension of the ongoing evolution of intelligence on the earth.

Yet, although Yonck includes discussions on human psychology, human intelligence, and the evolution, anatomy, and functioning of the brain (at times drawing enlightening comparisons between the biological and psychological and the construction, architecture, and powers of computers and A.I.), in this second section he emphasizes the "technology of intelligence," much more so than the biology, psychology, and cultural-social dimensions of intelligence. He includes some discussion on the nature of the "mind" and a small amount on consciousness (or conscious intelligence.) But to get a more balanced view of our contemporary understanding of intelligence and the near-term possibilities of the evolution of intelligence, this section could have been significantly expanded to include more psychology, biology, and humanistic-cultural studies.

This emphasis on technology (primarily physically embodied technologies) is though consistent with his overall theoretical thrust, since he creates in section one a "physical" theory of the evolution of intelligence, a very impressive and thought-provoking "world-view," but still without really saying much on how consciousness or minds fit into the big scheme of things. One could argue that in order to articulate a theory of intelligence that encompasses everything from atoms and stars to humans and aliens one has to anchor the theory to the physical—as a universal denominator—but cosmic mentalists or idealists might argue that consciousness

> *In essence, intelligence evolves through the act of trying to understand itself and create technological versions of itself.*

or mind is an essential universal substratum as well.

Interestingly, in this section one way in which the psychological is highlighted—in line with Yonck's basic hypothesis that humanity and technology have co-evolved—is Yonck's in-depth and dramatic chronicle of how human thinking, problem solving, creativity, and strategizing have progressed in attempting to understand the nature of intelligence and create convincing and efficient technological simulations of this capacity. Yonck chronicles conscious, purposeful, and evolving human efforts to produce technological intelligence. In an act of ongoing self-reflection, human conscious intelligence is evolving, as a consequence of efforts to understand what intelligence is and how to create it. In essence, intelligence evolves through the act of trying to understand itself and create technological versions of itself.

Using Yonck's own definition of intelligence, one could ask how each of the various intelligent technologies he describes, such as affective computing or brain-computer interfaces, amplifies our collective and individual capacities to be flexible, adaptive, and empowered relative to the possibilities of the future. (In my terminology it would be how do these technologies enhance our future consciousness?) At the very least one can argue that all this technological research and thinking has clearly empowered the human capacity to ponder, speculate, and plan in depth and detail on the future evolution of human-techno intelligence and its potential values and benefits. In what ways can we make our intelligence more powerful and capable with respect to the possibilities and challenges of the future? Again, in an act of self-reflection and purposeful evolution, human intelligence is thinking out how to enhance and technologically augment its powers in the foreseeable future.

Yonck begins the last section, "Deep Future," with a science fiction, futurist scenario set tens of thousands of years in the future, in which he envisions a "virtual mind" creating a "virtual solar system" and then observing that system evolving in complexity and intelligence within "virtual time." One day our descendants may exist as virtual conscious minds living in virtual reality and creating all manner of wondrous things through the coupled power of their minds and super-AI technological systems physically supporting their existence.

Indeed, in this final section, Yonck weaves together his thoughts on entropy and evolution (from section one) and artificial intelligence (the groundwork articulated in section two) with cosmology, space travel and colonization, and the future augmented evolution and transcendence of humanity. His discussions on all these themes and their various interconnections are the stuff that science fiction stories of the future are made of. For example, Yonck covers such futurist-science fiction topics as the science of the brain and the "rewiring of our brains;" gene editing and the biological engineering of life; "cognitive cloning" (making multiple virtual copies of our conscious selves); uploading our conscious minds into computers and realizing relative "digital immortality;" a coming second Cambrian explosion involving a great diversification of types of minds, including a multifarious branching off of "*homo hybridus*" (bio-techno

> *“In the not too distant future, humans are going to dramatically enhance and transform their bodies and minds through various types of technologie*

syntheses); nanotechnological probes and the coming “Awakening of the Universe” (an emergent “intelliverse”) through the progressive infusion of higher forms of intelligence throughout the cosmos; the possibilities of planetary, solar, and galactic level civilizations and the monumentally increasing energy demands of accelerating complexity and intelligence (perhaps we will tap into quasars and black holes are energy sources in the far future); contact or lack of contact with alien intelligence and its implications in each case; Dyson spheres, computronium, and Matrioshka brains that encompass entire solar systems; and the possibility of intelligence grounded purely in energy. As one key general theme through this section, grounded in the idea that there is no one superior all-encompassing, all-purpose kind of intelligence, Yonck foresees a great proliferation and diversification of types of minds and forms of intelligence forming a vast interdependent network of cooperation and competition spreading across the universe, hence the title of his book *Future Minds*.

Acknowledging and discussing the ethical issues, controversies, and existential perils associated the purposeful evolution and augmentation of humanity, Yonck argues that in the not too distant future humans are going to dramatically enhance and transform their bodies and minds through various types of technologies (including computer, biological, and nanotechnological). Indeed, if for no other reason, we need to do this if we are to successfully integrate and deal with ever-advancing artificial super-intelligence, or else we will be left in the dust. In this case human intelligence is anticipating a significant challenge to its future survival. We could argue that the genie was long ago let out of the bottle and for many centuries we have been purposefully evolving and augmenting ourselves, often using various technologies in the process. Still, what Yonck presents in this final section is an array of rapidly advancing sciences and technologies that in the near and far future promise to empower us to radically enhance and transform ourselves, way beyond anything we have accomplished in the past. Although I would say that we have already begun doing this, Yonck proposes that (as far as we know) we are the first minds capable of improving our minds and we should pursue this goal, using science, technology, and sound ethical thinking to guide and empower us.

Now given Yonck’s argument first presented in section one that the evolution of intelligence seems inevitable in the universe, stating that we should pursue this end using science and technology seems beside the point. What choice do we have? But Yonck points out the future is uncertain. Perhaps humanity will be a dead end or an unsuccessful evolutionary branching in this overall cosmic process. There is no cosmic guarantee that humanity may not go extinct in the future. So it is better to thoughtfully embrace and self-consciously pursue this overall universal trajectory, maximizing our chances for being a fully realized expression of this universal evolutionary rise of intelligence. Based on an argument from the biologist Julian Huxley, I have stated that since we are guiding the

> *“Of course, we want increasing intelligence, but we should aspire toward wise intelligence (within ourselves, our machines, and our hybrid syntheses)*

process of evolution, whether we acknowledge it or like it, we should face this fundamental reality about our existence and make the best of it. It would be an existential tragedy to falter or fail given this great opportunity.

In the final chapter of the book, “Life at the End of the Universe,” Yonck envisions a scenario at a “bar” *Beyondfar* (again science fiction in its feel and ambience) 100 trillion years in the future. Only massive black holes remain in the cosmos, which provide advanced “energy intelligences” with colossal amounts of energy. The universe continues to expand, and even though this envisioned scene is trillions of years ahead in time, the universe is far from spent, for it will continue to expand for a google years into the future relative to our now. (A trillion is a one followed by twelve zeros; a google is a one followed by a hundred zeros.) Intelligences of this era create multiple virtual universes and observe and study in accelerated time the evolution of such universes. In the context of this envisioned far future Yonck proposes as a central moral imperative (which presumably advanced future beings follow) the ongoing creation of universes, forms of life, and types of intelligence. In the end, he asks what is humanity’s (and our descendant’s) special purpose and value in all of this evolution and universe creating, and he proposes we give meaning and value to the whole cosmic process, bearing witness to creation and the ongoing evolution of a multiverse filled with intelligence.

In closing, in order to balance Yonck’s techno-optimism, I can ask whether technology always empowers us and makes us more intelligent. More to the point, does technology make us better persons? As numerous techno-critics have pointed out, “smart technologies” often seem to make us dumber, more dependent, more mentally fragmented, and more present-focused (See my book *The Pursuit of Virtue*). Perhaps our motives and goals, indeed the substance and drivers of our consciousness, that are behind the creation and use of such technologies are shallow, profit-driven, ego-centric, and sensationalistic. What should be our over-arching values, ethical standards, and purposes in guiding our future human-techno evolution? To a degree Yonck does address this issue, but I would suggest that this normative and deeply humanistic question needs to be brought to center stage, and the sooner the better. I have proposed that we should aspire toward evolving as “wise cyborgs” in a wise techno-empowered society that guides the evolutionary journey of ourselves and our technologies. Of course, we want increasing intelligence, but we should aspire toward wise intelligence (within ourselves, our machines, and our hybrid syntheses). If our machines are our evolutionary children—a distinct possibility—then we should bequeath to them a mindset emphasizing wisdom at the core of their advanced intelligence. And here again is where consciousness comes into the picture, for it is within our conscious minds that we need to determine the set of psychological qualities, emotional, ethical, personal, and cognitive, that constitute wisdom. If we are to be “god-like,” recreating ourselves and populating the cosmos with multiple universes and forms of life and mind, then we need to be, above all else, wise gods in doing this.

FUTURISTS IN ACTION

EDUCATOR AS FUTURIST

Moving beyond "Preparing for the future" to "Shaping the future"

by Laura McBain and Lisa Kay Solomon

We shape the future and the future shapes us. Educators shape the mindsets, behaviors, and skills their students will carry with them into the future. And while this has always been true, the global pandemic, nationwide public attention to social justice, and the need to dismantle historically inequitable systems have heightened our collective sense of urgency to design more equitable and abundant futures with — and for — our students.

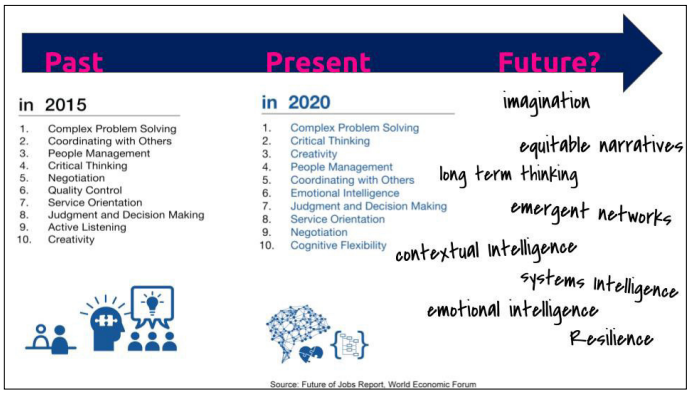
This moment has made us realize that we cannot just prepare students for the future, we must help them develop the imagination, agency, and will to shape the future. As educators, we spend an inordinate amount of time preparing students for the future as if we know how the future will unfold for them. But in an ever accelerating moment of uncertainty and ambiguity — merely being 'prepared' feels insufficient. In a world filled with more unknowns than knowns — how do we help our students not just be "prepared" but capable of envisioning and building the futures they want to bring to life?

Educators have a responsibility to our collective futures.

We need educators to be futurists.

To be an education futurist means weaving the practices of futures thinking and design into our learning experiences with leaders and students. In a rapidly changing world, futures thinking helps us imagine a wider range of the possible, plausible, probable futures in which we will be learning and living. Design helps us build toward more preferred futures by giving form to ideas, rapidly experimenting, and learning through iterative processes and feedback. Through these lenses, we see the world not just as it is, but how it could be if we took a more empathetic and human-centered approach to uncover and solve complex challenges in the hopes of creating a more equitable, humane, and anti-racist future. We believe educators have the capacity to enable these capabilities at scale by co-designing experiences with students that provide opportunities for intentional practice, and a protective space to develop them.

Embracing the mindset of an educational futurist requires a foundational shift that will challenge our vision of why, how, and where we implement learning. In K-12 schools we are comfortable teaching the past; but not the future. There are plentiful lesson plans, teacher training, multiple-choice options, and even essay prompts on how to examine what already exists in the world. But there is no teacher preparation program that prepared us to teach about how to intentionally shape the futures we want to bring to life.



The World Economic Forum skills list and our capabilities for an Education Futurist

We have to help students understand their context and capabilities in more holistic, interdisciplinary ways than ever before. We have to teach our students to become adept time travelers — to make sense of the past in order to envision new futures; to be sense makers of disparate types of information — moving seamlessly between what's known and unknown; to flex their imagination in expansive and applied ways, and to become critical and contextual thinkers. We need them to understand the equitable and ethical considerations of policy, technology, and power dynamics of systems and structures. And, all capabilities must integrate emotional intelligence and mental wellbeing into our curriculum as a core investment in the future health and resilience of our students.

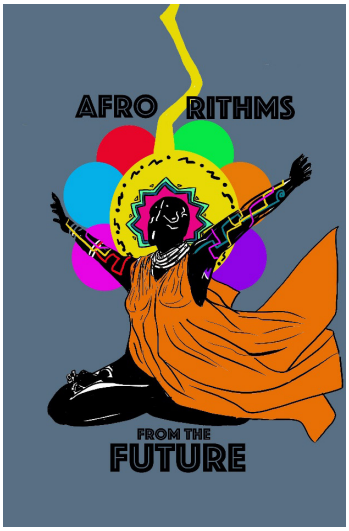
Provocations from the K12 Lab Futures Fest. Image by Patrick Beaudouin

Over the last couple of years, we've been co-creating new practices and approaches with school leaders, educators, and students to develop these new capacities and behaviors to shape more expansive and equitable futures. The K12 Lab's Futures Fest in January 2020 brought together educators from around the country to showcase some of their and our newest prototypes and to highlight how some educators, in varying formats, are creating programs that enable their students to shape the trajectory of their communities. The last seven months have accelerated the urgency of this work.


Our school scenario planning tools

This summer we worked with 36 school-based design teams to help them envision and co-create prototypes for the various scenarios unfolding this year in schools. Using scenario planning tools and design processes, teams went from thinking about the fall as a singular plan they needed to create, to adopting an emergent design approach that adapts to their community's unfolding needs.

And, more recently, we've begun to help school leaders build their adaptive capabilities and mindsets through an emergent posture that enables them to become navigators of their shifting context. Moving beyond linear strategic plans, our work equips them with sense making skills to help them better understand their own ecosystems and co-construct new strategic intents for their communities. This new work requires leaders to move from uncertainty paralysis to embracing ambiguity and to really see this moment as an expansive opportunity to co-design with students and communities who have been historically marginalized and underinvested within our educational system.



Alan Clark: a talented local artist in Oakland and author of the graphic novel series, *In Search of the Black Panther Party*: https://phantomelectrik.com

We are committed to learning more. Right now, we are learning with and from others like Lonny Avi Brooks from CSU East Bay who is the leading voice in AfroFuturism 2.0, the co-producer with Ahmed Best of the Afrofuturist Podcast and Afro-Rithms — a game aimed at democratizing futures that represent a multiplicity of voices and identities which was developed in collaboration game designer, Eli Kosminsky.

We are also experimenting with futurists Aisha Bain and Meredith Hutchinson from Resistance Communications who use immersive reflective community practices to reclaim stolen histories and to envision equitable futures for young women. Moving forward, we are building on our own expertise and networks in futures, design, and equity to create a fellowship for education leaders who are ready to cultivate their futures and design capabilities and mindsets as they actively engage their communities in shaping equitable futures together. And we're committed to sharing our learning along the way so this work can be owned by everyone.

This is inherently new territory, and we are committed to discovering and shaping this emergent work through co-creation, network building, rapid experiments with networks, administrators, school leaders, teachers, and, most importantly, students.

This isn't just another fad. This is an inflection point.

We are being shaped by this moment, and outcomes of the choices we make will shape us for years to come. Educators and students are the futurists we need today.

Signals in the Noise

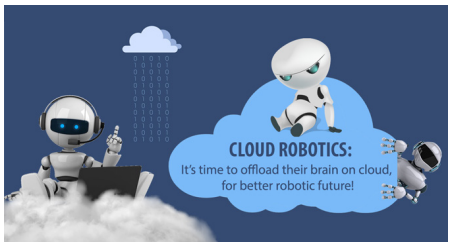
6 AUTOMATION TECHNOLOGIES THAT WILL COMPLETELY TRANSFORM THE WORLD FROM NOW TO 2030

by Harish Shah

The 2010s saw an advent of a degree of automation all around us, in all aspects of life, that was thought only to be the stuff for fiction in the 2000s. As the exponential evolution of technology continues into the 2020s, despite the hindrance brought about by a new major pandemic, by 2030, the human experience, as well as expectations, will be very different by 2030, compared to that in 2021.

As of 2021, the concepts of the Internet of Things, Robotic Process Automation and Artificial Intelligence are widely known and understood - something that would have been too much to expect out of most people in just 2016. However, nothing happens in a silo. Things converge, and so do technologies. Evolution does not stop, and it is non-linear. Out of the chaotic convergences and cross-impacts, 6 technologies are gradually, subtly, making their way into common application in the world around us, to completely transform it, within 10 years.

CLOUD ROBOTICS



Don't imagine. Know. That someday, robots will be instructed remotely through distances, and they will perform complex tasks, with "intentionality", intelligently, without intervention or supervision beyond the initial instruction, drawing on streaming real-time dynamic data. In fact, this is already happening, in the case of Google's self-driving cars, hospital robots, early stage domestic robot butlers, and in factory and warehouse operations at companies that are early adopters. What will different 10 years from now, is that more average individuals will be utilizing cloud robotics resources, on a routine basis, than most folks will imagine in 2021.

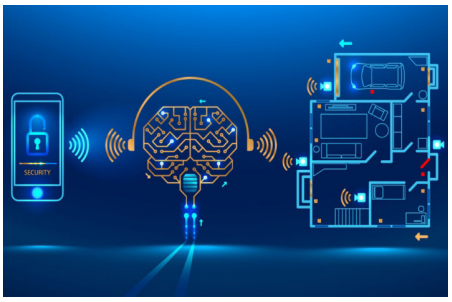
INTERNET OF ROBOTIC THINGS

The key difference between Cloud Robotics and the Internet of Robotic Things, is the original source location of the data that the robotic object responds to. While Cloud Robotics is a concept where the machine responds primarily to data at the heart of the cloud (or flowing through it), in the Internet of Robotic Things concept, the machine responds to data originating at the parameter edge of the cloud or internet network to which it is connected - meaning in simple terms, to data generated where a sensor is, which may quite possibly be on the robot itself. The distinctive added value of this, is the greater degree of the robot's "ability" to interact, collaborate and respond, dynamically, with human beneficiary of its very purpose. In a way, the robot becomes an intelligent, autonomous, contributor, for a flow of data, including instructions, to the network, and other objects connected to the network. This sets up a situation, for a network of connected objects to make "decisions", independently of human beings, to some degree, to solve problems, perform tasks or execute functions.

Signals in the Noise

6 AUTOMATION TECHNOLOGIES THAT WILL COMPLETELY TRANSFORM THE WORLD FROM NOW TO 2030

ARTIFICIAL INTELLIGENCE OF THINGS



Since 2013, when I began my career as a Professional Futurist, I have consistently been iterating on a routine basis: Nothing happens in a silo. There are always domino effects, reactions, cross-impacts and convergences. The Artificial Intelligence of Things is just the sort of thing why I have been doing that, to the point, that I have become known for "nothing happens in a silo" being my tagline.

The convergence of Artificial Intelligence and the Internet of Things enables technology to do independently of human involvement what for long has been dismissed as impossible outside of fiction - by bringing the network to "life". With an "intentionality", the whole network "senses" for information, through its "nodes" or "limbs" or "parts of anatomy" formed by the devices. The network then starts "behaving" like a "conscious" entity, to respond to information whether auditory, visual, etc, that it picks up.

For example, the Artificial Intelligence of Things becomes pretty useful, in crime fighting, by detecting facial features through cameras, to identify instantly, information about suspects through the network, and alert other articles of technology to respond, to facilitate apprehension of the suspect. It can be used to identify, monitor and analyze consumer behavior of shoppers in a physical retail environment, to enable machines on the ground to dynamically interact with the shoppers to assist them or to pitch products or promotional offers. You can imagine, that this would mean, technology will surpass the human salesperson's competency, in executing the retail task.

For almost a decade, a strong valid argument for not automating in the service sector, has been the merit of the "personal touch". With the Artificial Intelligence of Things, technology can now enable a degree of personalization not possible for a human worker.

INDUSTRIAL INTERNET OF THINGS

Most people today are familiar with the Internet of Things, because their smartphones now "speak" to them, in response to what they pick up around them, such as a sales promotion at a sporting goods store they are walking past. Most people are unaware that there are many different types and avatars of the Internet of Things, which do much more, and the Industrial Internet of Things is just that, rapidly transforming factories and manufacturing facilities around the world. This has been ongoing for sometime now, and the Industrial Internet of Things is hardly something that is actually new. Just because something is not widely known, does not mean, that it hasn't been around.

What the Industrial Internet of Things specifically does, is enable machines to communicate each other for coordination, with the human in the loop, to efficiently and safely execute industrial tasks, often complex, sensitive or highly hazardous, cutting the need for direct physical presence of the human employee.

My own forecast, is that the Industrial Internet of Things will enable companies, to fully bring about lights-out automation to their entire logistical and manufacturing processes, from start to finish, by 2030. Being a Professional Futurist, I am in the business of saying, "I told you so." When 2030 arrives, that is exactly what I will be saying.

UNMANNED VEHICLES

In Singapore, unmanned vehicles are being trialed as of 2021, to deliver groceries, to the doorsteps of consumers.

Unmanned vehicles will be the most visible manifestation of automation for a long time to come, even beyond the 2020s.

Most road accidents result from human error, and this is an important case for accelerating the unmanned vehicle adoption and deployment. For safety alone, apart from other gains, such as efficiency in traffic management, route planning, punctuality, etc, it is important that our taxicabs, buses, delivery vehicles and even personal vehicles are driven by autonomous technology, rather than by human drivers.

Unmanned vehicles mean that eventually, persons will no longer be able to make a living as drivers and delivery-persons, but consumers will get time-efficient services and the disappearance of the low-skill laborious jobs will mean greater appreciation and pursuit of education, greater enterprise, innovation and industry. It is the sort of hi-tech evolution necessary, to nudge the human to perform more and better.

AUGMENTED ANALYTICS

It is not just technological evolution that is accelerating. Changes to business, industry and consumerism, are happening rather rapidly, relatively to the past. Changes are happening on a far more frequent basis with each passing year. It is not just information that is important. Fast information is becoming increasing critical for enterprise survival.

To the rescue comes Augmented Analytics, the machine learning enabled data acquisition, storage, retrieval, processing, analysis and relay cycle. Long term implication, to be concise and precise, is that your standard analyst roles, or white collar jobs mostly occupied by graduates within the first two years of their corporate careers today, will no longer exist, because much of the data, information, analysis, decision making "leg work" will be fully automated, widely, for instantaneous level speed, high accuracy and cost savings.

It is not conclusive, but here is a conclusion.

No, it is not the "blue collar" worker that is endangered. It is the worker who is neither a Knowledge Worker, nor a Wisdom Worker, that is at risk of redundancy.

There are many other technologies driving the advent of unprecedented degrees of automation all around us. There is a very long list of them, omitted herein. For example, the Internet of Mobile Things and the Autonomous Internet of Things, to mention drops out of a lake. What I have included herein though, are the 6, that will affect the most direct and visible changes to the human experience and condition, in a variety of ways, over the next decade.

Nothing happens in a silo, and this must be constantly repeated. None of the technologies mentioned herein, or omitted from herein, cause as much of an impact on their own, as they do, in convergence with each other.

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