

FUTURE NEWS

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IN THIS EDITION

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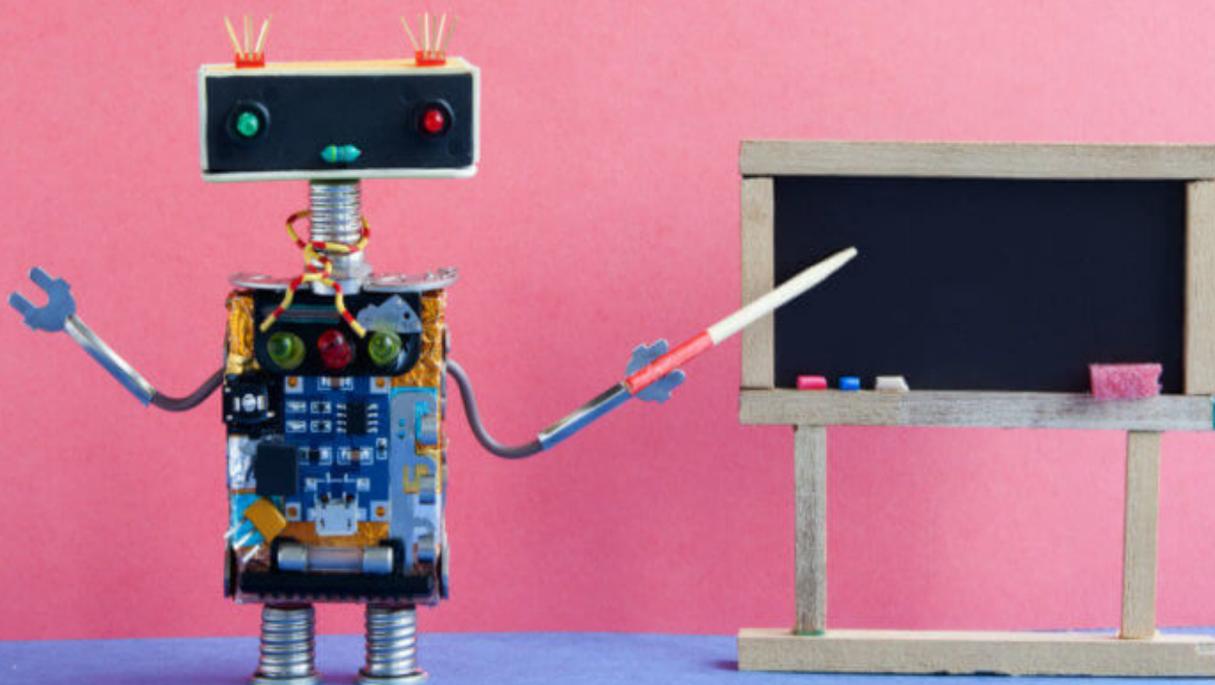
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HOW WE CAN ‘ROBOT-PROOF’ EDUCATION TO BETTER ADAPT TO AUTOMATION

By Raya Bidshahri



Like millions of other individuals in the workforce, you’re probably wondering if you will one day be replaced by a machine. If you’re a student, you’re probably wondering if your chosen profession will even exist by the time you’ve graduated. From driving to legal research, there isn’t much that technology hasn’t already automated (or begun to automate). Many of us will need to adapt to this disruption in the workforce.

But it’s not enough for students and workers to adapt, become lifelong learners, and re-skill themselves. We also need to see innovation and initiative at an institutional and governmental level. According to research by *The Economist*, almost half of all jobs could be automated by computers within the next two decades, and no government in the world is prepared for it.

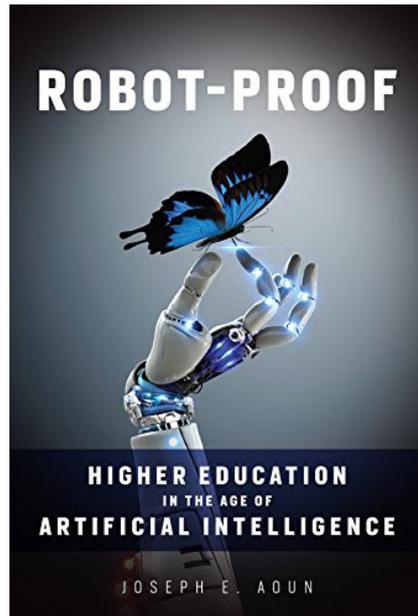


Joseph Aoun

While many see the current trend in automation as a terrifying threat, others see it as an opportunity.

In *Robot-Proof: Higher Education in the Age of Artificial Intelligence*, Northeastern University president Joseph Aoun proposes educating students in a way that will allow them to do the things that machines can’t. He calls for a new paradigm that teaches young minds “to invent, to create, and to discover”—filling the relevant needs of our world that robots simply can’t fill. Aoun proposes a much-needed novel framework that will allow us to “robot-proof” education.

“ Tomorrow’s employees will have to demonstrate a higher order of thought.



LITERACIES AND CORE COGNITIVE CAPACITIES OF THE FUTURE

Aoun lays a framework for a new discipline, humanics, which discusses the important capacities and literacies for emerging education systems. At its core, the framework emphasizes our uniquely human abilities and strengths.

The three key literacies include data literacy (being able to manage and analyze big data), technological literacy (being able to understand exponential technologies and conduct computational thinking), and human literacy (being able to communicate and evaluate social, ethical, and existential impact).

Beyond the literacies, at the heart of Aoun’s framework are four cognitive capacities that are crucial to develop in our students if they are to be resistant to automation: critical thinking, systems thinking, entrepreneurship, and cultural agility.

“These capacities are mindsets rather than bodies of knowledge—mental architecture rather than mental furniture,” he writes. “Going forward, people will still need to know specific bodies of knowledge to be effective in the workplace, but that alone will not be enough when

intelligent machines are doing much of the heavy lifting of information. To succeed, tomorrow’s employees will have to demonstrate a higher order of thought.”

Like many other experts in education, Joseph Aoun emphasizes the importance of critical thinking. This is important not just when it comes to taking a skeptical approach to information, but also being able to logically break down a claim or problem into multiple layers of analysis. We spend so much time teaching students how to answer questions that we often neglect to teach the how to ask questions. Asking questions—and asking good ones—is a foundation of critical thinking. Before you can solve a problem, you must be able to critically analyze and question what is causing it. This is why critical thinking and problem solving are coupled together.

The second capacity, systems thinking, involves being able to think holistically about a problem. The most creative problem-solvers and thinkers are able to take a multidisciplinary perspective and connect the dots between many different fields. According to Aoun, it “involves seeing across areas that machines might be able to comprehend individually but that they cannot analyze in an integrated way, as a whole.” It represents the absolute opposite of how most traditional curricula is structured with emphasis on isolated subjects and content knowledge.

Among the most difficult-to-automate tasks or professions is entrepreneurship.

In fact, some have gone so far as to claim that in the future, everyone will be an entrepreneur. Yet traditionally, initiative has been something students show in spite of or in addition to their schoolwork. For most students, developing a sense

“What we need to see are more moonshots and disruption in the education sector.

of initiative and entrepreneurial skills has often been part of their extracurricular activities. It needs to be at the core of our curricula, not a supplement to it. At its core, teaching entrepreneurship is about teaching our youth to solve complex problems with resilience, to become global leaders, and to solve grand challenges facing our species.

Finally, with an increasingly globalized world, there is a need for more workers with cultural agility, the ability to build amongst different cultural contexts and norms.

One of the major trends today is the rise of the contingent workforce. We are seeing an increasing percentage of full-time employees working on the cloud. Multinational corporations have teams of employees collaborating at different offices across the planet. Collaboration across online networks requires a skillset of its own. As education expert Tony Wagner points out, within these digital contexts, leadership is no longer about commanding with top-down authority, but rather about leading by influence.

AN EMPHASIS ON CREATIVITY

The framework also puts an emphasis on experiential or project-based learning, wherein the heart of the student experience is not lectures or exams but solving real-life problems and learning by doing, creating, and executing. Unsurprisingly, humans continue to outdo machines when it comes to innovating and pushing intellectual, imaginative, and creative boundaries, making jobs involving these skills the hardest to automate.

In fact, technological trends are giving rise to what many thought leaders refer to as the imagination economy. This is defined as “an economy where intuitive and creative thinking create economic value, after logical and rational thinking have been

outsourced to other economies.” Consequently, we need to develop our students’ creative abilities to ensure their success against machines.

In its simplest form, creativity represents the ability to imagine radical ideas and then go about executing them in reality.

In many ways, we are already living in our creative imaginations. Consider this: every invention or human construct—whether it be the spaceship, an architectural wonder, or a device like an iPhone—once existed as a mere idea, imagined in someone’s mind. The world we have designed and built around us is an extension of our imaginations and is only possible because of our creativity. Creativity has played a powerful role in human progress—now imagine what the outcomes would be if we tapped into every young mind’s creative potential.

THE NEED FOR A RADICAL OVERHAUL

What is clear from the recommendations of Aoun and many other leading thinkers in this space is that an effective 21st-century education system is radically different from the traditional systems we currently have in place. There is a dramatic contrast between these future-oriented frameworks and the way we’ve structured our traditional, industrial-era and cookie-cutter-style education systems.

It’s time for a change, and incremental changes or subtle improvements are no longer enough. What we need to see are more moonshots and disruption in the education sector. In a world of exponential growth and accelerating change, it is never too soon for a much-needed dramatic overhaul.

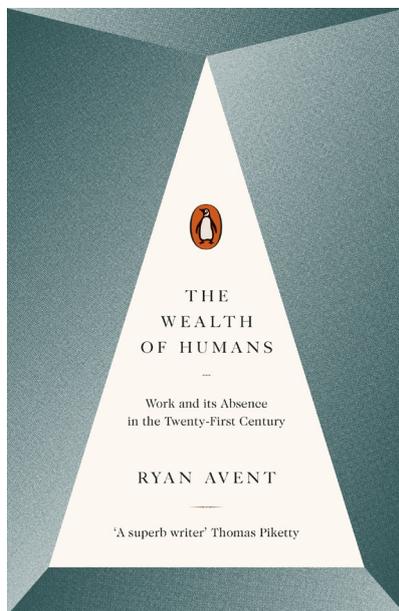
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**The Wealth of Humans:
Work and its Absence
in the Twenty-First Century**
by Ryan Avent

Book Review

by Charles Brass – Chair, futures foundation

“ It is
unfortunate,
but those
groups that
benefit most
from the
changing
economy tend
not to willingly
share their
riches.



People have been writing books about the end of work for a long time. In the 1990s they carried titles like “Job Shift” (William Bridges), “The End of Work” (Jeremy Rifkin) and “ Sleeper’s Wake” (by Australia’s own Barry Jones). In this century the titles are more likely to be “What to do when machines do everything” (Malcolm Frank, Paul Roehring and Ben Pring) or “Humans Need Not Apply” (Jerry Kaplan).

This book agrees with all these authors that the role of jobs in the lives of most people on earth is changing profoundly, and rather more rapidly than most of us are comfortable with. However, unlike many of the above mentioned books, this one argues that the challenges we are facing should be good for us (in the long term at least) and in a couple of hundred pages tries to justify this view and suggest the personal and political mindshifts that might be needed to recognise

the potential opportunities these challenges present. As Avent says in his introduction: “Either society will find ways to shore up work or develop substitutes for it, or workers will use the political system to undermine the forces disrupting their world” (p8).

Further in the introduction he advances this assertion and sets out the challenge he intends this book to address: “...the digital revolution is very much like the industrial revolution. And the experience of the industrial revolution tells us that society must go through a period of wrenching political change before it can agree on a broadly acceptable social system for sharing the fruits of this new technological world. It is unfortunate, but those groups that benefit most from the changing economy tend not to willingly share their riches; social change occurs when losing groups find ways to wield social and political power, to demand a better share. The question we ought to be worried about now is not simply what policies need to be adopted to make life better in this technological future, but how to manage the fierce social battle, only just beginning, that will determine who gets what and by what mechanism” (p16).

Ryan Avent is an economics journalist with *The Economist* and has been writing on the changing world of work for 10 years, and he has come to the conclusion that these changes are best viewed through the lens of wealth – how it is created, and how it is

“ In a way, it would be much easier if the robots were simply taking all the jobs.

distributed? He concludes that the answers that have dominated economic thought for perhaps the past two hundred years are now under serious threat. He acknowledges that changing these traditional answers will be difficult (“It’s hard to imagine society deciding to provide rich lives for able-bodied adults, not because of anything they have done but because a rich livelihood is their right” (p24)), but he argues that models for such a world do exist (families for example) and that humans are imaginative enough to create such societies, once we decide that this is what we need to do.

Avent argues that technological change is actually creating various kinds of abundance which, if only we were properly recognising them, are capable of being provided to everyone.

The book is in four parts. First is 40 odd pages looking at how the digital revolution is creating an abundance of labour. Even this is an inversion of much contemporary thinking which sees technology as creating a shortage of jobs. Avent argues it is, in fact, liberating people to do many new, innovative and creative things.

However, before he gets there later in the book, Avent agrees with many others that we don’t

even yet know what new jobs will be created as technology advances (“the hope is that other industries or occupations will expand to absorb the displaced labour” (p47)). He even notes that “highly skilled workers, such as the engineers who use software to design new automobiles and plant layouts have been made vastly more productive by new technology” (p47), and that “...a massive and growing share of the workforce is left to linger in (a) third category, accepting low pay in order to find employment in low-productivity jobs” (p48). So, he doesn’t ignore any of the issues that all the other authors writing on this subject are quick to point out.

Avent’s second part focuses on scarcity and how it has driven so much conventional economic thought (“Scarcity is one of the fundamental building blocks of economies. Economics matters because people cannot have as much of everything as they want, but must accept trade-offs between one scarce item and another” (p84). Conventional economic wisdom is that scarcity causes prices to rise, and abundance causes them to fall. In these 50 pages Avent explores the various scarcities that focus economists’ attention – land, money, commodities and labour (the conventional sources of capital), and he helps readers think through how the digital economy is affecting these scarcities. He finishes the section by focusing on an often overlooked form of capital – social capital – and how it is changing in the twenty-first century.

Avent’s third section is called “The digital economy goes wrong” and focuses on how technology

is creating hyper-globalisation, enhancing the lives of the 1 per cent and the stagnation that has followed the global financial crisis of 2007.

Finally in his last 60 pages (called “Abundance to Prosperity”) Avent encourages readers to think differently about the challenges technology is presenting us all. He says: “in a way, it would be much easier if the robots were simply taking all the jobs. Solutions might not be any more straightforward to come by, but the millions of robot dog-walkers and sanitation workers strutting through crowds of unemployed humans would at least be clarifying” (p233). Avent doesn’t try and propose specific solutions – he acknowledges that things are too complex and fluid for any one pundit to be able to predict the future – but he does argue powerfully that we are unlikely to move towards viable futures until we begin to think differently.

As he concludes: “We are entering into a great historical unknown. In all probability, humanity will emerge on the other side, some decades hence, in a world in which people are vastly richer and happier than they are now. With some probability, small but positive, we will not make it at all, or we will arrive on the other side poorer and more miserable. That assessment is not optimism or pessimism. It is just the way things are. Face to face with the unknown, it is hard to know what to feel or what to do. It is tempting to be afraid. But, faced with this great, powerful transformative force, we shouldn’t be frightened. We should be generous. We should be as generous as we can be” (p242)

FUTURISTS IN ACTION

HOW DO FUTURISTS SPOT TRENDS THAT SHAPE OUR LIVES?

by Stephanie M. Bucklin

In the U.S., between 500 and 1,000 people are employed as futurists.

No, they can't tell you when you'll meet "the one" or if you'll win the lottery. Futurists look at global trends and make predictions in different spheres, like business and politics. They also work as speakers, authors, consultants, professors and much more, helping people and companies conceptualize possible futures and strategize on how to respond to them.

But every futurist's career is extremely varied. Rewire spoke with four top futurists to discover more about this unusual path:

Brian David Johnson



Futurist in residence at Arizona State University, Futurist and fellow at Frost & Sullivan

What is a futurist?

Futurism has been around for quite some time. What futurists were in the beginning were artists. They were embracing progress and machines back in the '20s and '30s. Coming out of World War II, specifically out of the U.S. military and the Rand Corporation, you begin to have futurists who were doing planning—not only nuclear scenarios, but supply chain scenarios in this new Cold War we were in. The practice of it started there.

The futurists you see today are a bit different. I am an applied futurist, which means I work with organizations to not only model the future, but go about making that future happen. I really only work 10 years out, and I

work with people to model both positive and negative futures.

Then I work backwards and see what that organization needs to do to make that future happen. What are the things that are in their control that they can start to do to move towards that positive future and move away from that negative future? What are the things that could happen not in their power that could affect the future?

What does a typical workday look like for you?

I have about three typical workdays. One of them would be out lecturing on a stage in front of about 1,000 (to) 14,000 people, talking about the future to people who are building it. In past months, I have spoken (during) the Arizona State of the State in front of legislatures, companies and developers, to a university audience, to a large trade association in San Francisco, and to—which is my favorite—a middle school. They're the ones that matter, the ones who ultimately are going to build the future.

A second typical day would be me working with a company specifically onsite and modeling the future with them. I go on-site and we work together to model the future. I walk them through the future-casting session where we model positive and negative futures. I do an analysis of that raw data and come back to them with a report that says, these are the futures, and here's what you need to get done eight years from now, four years from, and here's what you need to start doing on Monday.

My third typical day would be myself in my library researching and writing.

What do you wish you had known before embarking on this career?

How awesome it would be. I really mean that. As an integral part of my futurecasting and backcasting process, as well as my threatcasting work at ASU, I use science fiction. I use science fiction stories based on science fiction facts to model possible futures. Because science fiction gives you a language to talk about the future.

All good stories are about a person and a place with a problem. A science fiction story actually allows you to look at the effects of the future you are modeling. I'm a total nerd, so I've always read science fiction comic books and movies, and I'm a science fiction writer. I've always used that as a part of my work as a futurist.

What are some of the unique challenges of this job?

What I tell my students is that modeling the future is actually not the hardest part. The hardest part is working with organizations, whether that be companies or schools, to actually go about changing the future.

What advice would you have for people interested in becoming a futurist?

Do it. You need a diverse set of viewpoints because that will make the futures you're modeling far more robust. You also need to be curious when you don't agree with or like people. You need to ask yourself, why am I having an allergic reaction to this person's idea?

Faith Popcorn



Founder and CEO of Faith Popcorn's BrainReserve

What is a futurist?

A conduit to tomorrow—a person who can

show you where the future is leaking into the present, where we are heading, and what we should do about it right now.

How did you first come to work as a futurist?

This career didn't exist when I embarked on it. I was working in advertising—I started as a copywriter—and felt, "Why is everyone at the agency so focused on today? Why aren't they thinking and worrying about tomorrow because that's the future of their business?" So I left and that's how my company Faith Popcorn's BrainReserve began.

What does a typical workday look like for you?

It's often a mix of client meetings, a BrainJam (brainstorm) session with my team as we work on a consulting project; talking with TalentBankers—members of our global network of future thinkers—and TrendTrekking. That's our term for exploring signals from the future. It could be going to a wearable tech incubator, or talking with someone who's pioneering a new kind of cannabis-infused beverage.

What advice would you give someone interested in becoming a futurist?

Read voraciously. Explore things you are not naturally interested in—off-the-beaten-path restaurants, talks, galleries, concerts, products. Meet-ups of people who are passionate about something that sounds odd to you. And connect with those who are also interested in futurism and innovation—there are more and more and more of them. Then when you think about what you've heard, read and learned, look for patterns and—equally important—look for outliers.

Dr. Nilda Perez



Futurist, business foresight strategist, speaker and author

What do you wish you had known before embarking on your career?

I kind of fell into this career. I was interested in learning about global business and this strategic foresight course offered a deeper look into the future of business and organizations. I immediately fell in love with futuring and all of the possibilities it offered.

What are some common misconceptions about futurists?

That we read palms or tarot cards or that we are kooky because no one can really read the future. Which is true but futurists can read trends past, present, and can scan future trends that will assist in finding those opportunities or threats to someone's business or an entire industry.

What advice would you give someone interested in becoming a futurist?

It is a fascinating career path. You are continuously scanning the future and you see things happening that most are oblivious to.

Alisha Bhagat



Senior strategist at Forum for the Future

What does a typical workday look like for you?

I start my day by doing a scan of industry journals and general news. I'll check twitter to see what

is trending and read a little bit of current research in the areas I'm working on.

After scanning, I'll dig into some project work. This could mean one-on-one work with a company on their strategy or using futures tools to problem solve around an issue. I've worked on topics such as the future of sustainable fashion, the Argentine tea industry and the food system in the U.S.

What does a futures project entail?

Working on futures projects involves three main components. First, the subject matter knowledge that is gained through research and interviews. Futurists need to be generalists who can pick up subject matter knowledge easily. This could mean deep research into a particular industry, a series of interviews with experts, or visiting a farm or factory.

Second, there is the process component of utilizing futures tools to help analyze the current situation, look at trends impacting the future, and creating possible and desired visions of the

future. Futurists use a pretty extensive toolkit to create the right process for the situation. Finally, thinking about the future is not effective if the process lacks ownership and purpose. A major part of the work I do is to help groups think about positive and sustainable futures in which their business as well as the planet can flourish. To do that, visions of the future need to be shared by the people in the organization and they need to be an integral part of the process.

To do this we create artifacts from the future, write immersive scenarios, and find fun and creative ways to engage with people to make the futures real. The next step is helping people to think about their part in it.

What do you wish you had known before embarking on this career?

I started this career having only worked in the world of government and policy. I now spend most of my time working with companies. I wish I had spent more time working for some large companies I now consult with so I could have better understood their operations and internal decision-making early in my career.

What advice would you give someone interested in becoming a futurist?

It is good to be an interdisciplinary thinker and a generalist. It is a very niche career so you have to think about what unique skills you can bring to the table. You simultaneously need to be a rigorous researcher and a creative visionary.

My advice would be to check out the wealth of information out there: foresight programs at universities, books on futures studies, groups such as the Association of Professional Futurists, and see if the job of futurist is interesting to you. Reach out and talk to people in the field to see what path is right for you. I wouldn't be where I am today without many mentors to help me along.

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Signals in the Noise

15 TOP THINKERS ON INNOVATIONS THAT WILL MOST CHANGE OUR LIVES BY 2050

Thirty years ago, Stephen Hawking published *A Brief History of Time*, Steve Jobs unveiled the NeXT Computer, and *Die Hard* hit cinemas for the first time. The World Wide Web had not yet been invented.

A lot can change in a few short decades, whether guided by advances in science and technology or by changing ideas and politics. Ahead of the 2018 Hay Festival, we asked 15 leading writers and thinkers to answer one question: Which innovation will most change the way we live by 2050?

Below are their responses - which range from driverless cars to neural implants, plus a rather unexpected bet on the return of snail mail.



Nigel Shadbolt, co-author (with Roger Hampson) of *The Digital Ape: How to Live (in Peace) with Smart Machines*

Personalised digital companions.

They won't need to be self-aware to be a real presence in our lives. From cradle to grave, our AI-powered chums will play with us, be our teachers and tutors, help us remember, shop and bargain for us, console and cajole us. They will be in every aspect of our lives, become trusted sources of information, knowledge and perhaps even wisdom. They will, after all, have the power of the future web to draw on, as well as the social networks they and we engage with. All of this with no one at home in their digital circuits, but it won't feel like that as we share every aspect of our lives with them.



Hannah Critchlow, scientist and author of *Consciousness: A Ladybird Expert Book*

Optogenetics.

Born in the first decade of the 21st century, optogenetics is one of the most revolutionary innovations – so much so that I'm willing to wager the inventors will win a Nobel Prize for it. The technique allows researchers to instantaneously and precisely switch on, or off, discrete pathways in the brain. This single technique has revealed how complex behaviours from love to social anxiety or addiction are directed in our brains simply by the flick of a switch – by lighting up, or dimming down, the activity in a specific circuit in our brains. It uses genetic tricks to convert light energy into electrical activity in the nervous system. The way it has opened up our understanding of psychiatric conditions is unprecedented and it's exactly this that spurred one of its creators, psychiatrist Karl Deisseroth at Stanford University, to invent it.



Sue Black, author of *All That Remains*

A national identity database.

I suspect that by 2050 we will have lost physical money and plastic debit and credit cards. Our biometrics will instigate every one of our transactions via the digital world and internet of things. The interaction will occur at different levels of security using our fingerprints, retinal scans, facial recognition, voice and DNA. Some of these will be captured at birth – and the birth certificate will be a thing of the past, replaced by a biometric chip. By stealth we will have introduced a national identity database.

Signals in the Noise

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Carlos Fonseca, author and contributor to the new Hay Festival Bogota 39 anthology

Data wars.

I think the greatest innovation in the coming decades will revolve around our renewed understanding of the fragile frontier between the sphere of the public and that of the private. This, in turn, will be part of a broader revolution regarding our understanding of what information is and how it can affect our lives. We have already started to see it happen – from Cambridge Analytica’s scandal to Trump’s Twitter presidency – but I can only imagine that it will become more accentuated. Data will become the new oil, the priced commodity over which wars are fought.



Lucy van de Wiel, sociologist and researcher at the University of Cambridge

Intersectional feminism.

The magnitude of current academic, state and private investments in innovation will inevitably result in many advances in biotechnologies, data technologies and nanotechnologies. Their effects on how we live our lives is, however, not inherent in these new technologies but dependent on how we distribute resources and oppressions in 2050. In order to use these technological advances for the greater good, we cannot leave their implementation to unregulated market forces. Rather, we need an innovation of a sociopolitical kind that is modeled on intersectional feminism, which puts countering inequalities and systems of oppression (sexism, racism, classism, environmental exploitation) at the heart of the introduction, production and regulation of new technologies. This is particularly pertinent given the intensified ecological and social effects of climate change and increasing scarcity of resources we will experience by 2050.



Jaideep Prabhu, professor at Judge Business School, University of Cambridge

Driverless vehicles.

It is expected that by 2030 all vehicles will be fully connected and autonomous: that is, they will be able to perform all lateral and longitudinal driving tasks in all situations during entire journeys. This innovation will have a profound impact on how we live, both good and bad. On the up side, it will mean dramatically fewer vehicles on our roads, reducing congestion and pollution. City spaces now taken up by parking will be freed for housing, pedestrians and beautification. Car accidents, a major source of fatalities on the roads, mostly because of human error, will be dramatically reduced. Those who are unable to drive will have mobility. On the downside, large numbers of people are currently employed as drivers of taxis and trucks. These jobs will have to be replaced by others, but we don’t yet know what these new jobs will be or how this change will happen.



Linda Yueh, author of *The Great Economists: How Their Ideas Can Help Us Today*

Driverless cars.

One of the “Great Economists” that I have been writing about, Joseph Schumpeter, would say that every innovation and the firms that produce them are “threatened and put on the defensive as soon as it comes into existence.” So, the innovations of today may be unlikely to exist, at least their present form, in 2050. But one clue as to which innovation might be the one that most changes the way we live would be

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to look at those that have the most imitators. That is the essence of creative destruction, when incumbents fall as challengers improve their inventions/ products and the best ideas survive. Given the number of companies developing driverless cars, that might be one to watch.



AC Grayling, philosopher

Robot taxis.

Available 24 hours a day and quickly summonable by an app on a mobile phone, robot taxis will make traffic flow more efficient, thus shortening journey times, reducing the clutter of 'street furniture' in the form of traffic lights, signs, road markings, etc, and drastically reducing or nearly eliminating private car ownership. These changes will make huge savings both to public authorities and private individuals, redirecting resources to better things; and because robot taxis will be electric, urban air quality will improve, traffic noise will reduce, and walking and cycling will be much safer. Hasten the day!



Philippe Sands, author of *East West Street*

Global citizenship.

Our ability to apply for a passport that makes every living human being a Citizen of the World, with equal minimum rights for all.



Daniel Davis, author of *The Beautiful Cure*

Cancer Cures.

Science has improved our lives in countless ways, but I think the greatest success of science has been, and will be for some time to come, in curing diseases. Our understanding of the human immune system is one discipline that is right now leading us to all sorts of new ideas for medicine. By 2050, cancer and many other diseases will be treatable much more commonly than they are today. This will have huge ramifications for society: We need better care of the elderly and we need to ensure that inequalities in access to medicine, between rich and poor across the globe, don't worsen.



Clive Wilkins (artist in residence) & Nicky Clayton (professor of comparative cognition), University of Cambridge

AI.

We live in a digital age and there is no doubt that the latest advances in AI will fundamentally alter the ways in which we inhabit our worlds, both spatially and temporally. So the answer to the question posed seems obvious – but what will change and why? We speak with our vocal organs but converse with our entire bodies. Likewise, the subjective experience of thinking is both mental and physical. When these protagonists are at odds, the conundrum they present provides a sounding board that enables the questioning of passing realities. These themes are central to our book *The Moustachio Quartet*.



Peter Florence, director of Hay Festival

Neural implants.

The advance of automation and digital capability will create greater value for the less replicable human skills of humour, dancing, sex, cooking, conversation and storytelling. When the implants are hooked to our brains, we're going to get our fingertips back – and our sensual lives will be richer. Imagination will, as it ever has, surpass our mechanical reality.

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15 TOP THINKERS ON INNOVATIONS THAT WILL MOST CHANGE OUR LIVES BY 2050



**Terri Apter, author of *Passing Judgment*
Probability programmes.**

By 2050, there will be a widely-used programme that gives a probability for every publicly-accessible prediction. For example, the likelihood of a statement such as “This Head of State will be a master negotiator” will be assigned a probability. The underlying calculations and explanation of method will also be available. Related programmes will log the consistency (and inconsistency) of publicly-accessible statements by any individual, and some headway will have been made towards registering the truth value of any statement. Widely used, such programmes will transform both individual accountability and public response.



**Juliet Davenport, CEO and founder, Good Energy
Clean energy.**

Virtually all of the technology of the future relies on electricity — everything from artificial intelligence to smart homes. Electricity will become even more foundational to the way we live, but how we generate it must become cleaner and greener if that future stands a chance of looking the way we want it to. This will make electricity more tangible to us, as smaller-scale renewable generation, battery storage and a decentralised electric grid replace much of the “big generator” to “end consumer” model. Then this will circle back around to AI, as every battery-powered smart home will be managed and made more efficient with intelligent algorithms.



**Luke Harding, author of *Collusion*
The letter.**

By 2050, the electronic world was bankrupt. Facebook – so compromised, so noughties! – was a distant memory. The idea that the internet might empower communities and make governments honest a laughable conceit. For a while, a range of apps offered the illusion that our private correspondence was safe. WhatsApp, Signal, Telegram: they were encrypted, weren't they? Eventually, it became clear that our online messages and identities were no longer secure. First, it was the Russians, stealing secrets, hacking elections, leaking data. Then medium-sized nations were able to do the same thing. After that, large corporations and then small ones could suck up our emails. The death of online privacy was officially proclaimed in the 2040s. It was around this period that someone had the bright idea of going back generations in search of an answer. First hipsters, and then pretty much everyone started making marks on pieces of paper and sending them to one another. Broke governments didn't have the man-woman-or-robot power to open each missive. These communications were wrapped in something called an “envelope”. Without design or fanfare, the letter came back. It was like the return of vinyl, but better. A Victorian innovation became the great rediscovery of the mid-21st century. We returned to the gentler world of our inked selves; each letter a harbinger of something new.

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