the futures foundation
engaging all Australians in creating a better future...

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FUTURE NEWS

TO CONNECT, TO INFORM AND TO INSPIRE

IN THIS EDITION

THE CIRCULAR ECONOMY

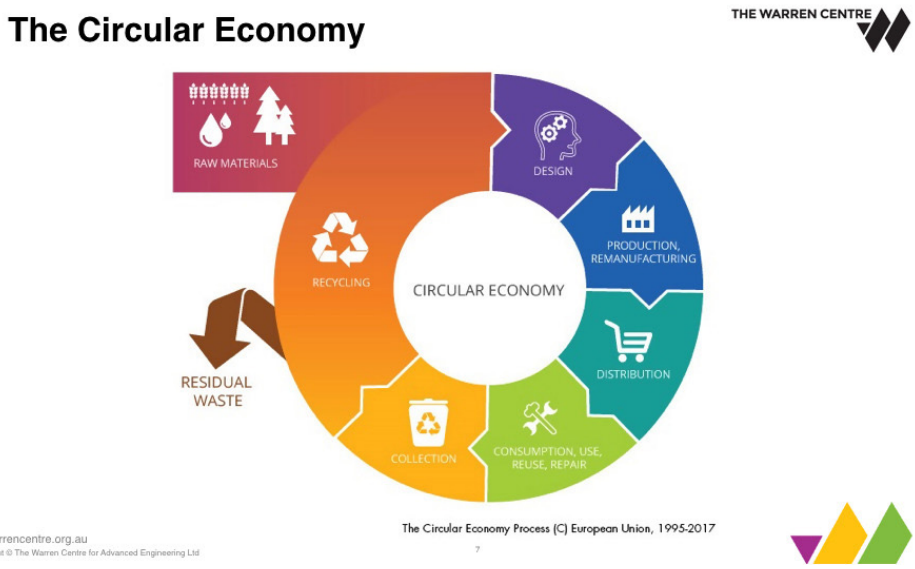
by Ashley Brinson

As a first year chemical engineer, Professor Rousseau taught me the first and most fundamental law of chemical engineering: mass in minus mass out equals accumulation. Chemical engineers and indeed all industrial engineers from the 20th century have created a problem that I call the Accumulation Problem.

We are constantly accumulating waste. Electronic waste accumulates in the laneways behind our offices. The production process is linear as we extract raw materials, build parts, assemble machines, sell to consumers and then landfill obsolescent goods. The profitability equations are also linear such that to increase sales revenue requires more raw material extraction, faster product redesign cycles, and in turn faster product obsolescence. Increased profit is correlated to increased extraction and more landfill waste.

Plastics that were engineered for the remarkable chemical stability of their polymer molecules are accumulating in our oceans and on our beaches. In an often-cited statistic, the rate of plastic accumulation in the oceans will lead to a day in the middle of the century when the mass of all the plastic in the oceans is greater than the mass of the fish. The Accumulation Problem is real.

The Circular Economy is an idea that the linear process should be turned into a cycle of distribution, use, re-use, repair, collection, sorting, and recycling. But this is much more than just recycling. It requires a fundamental re-design of our products and production processes. The concepts are fuzzy and emerging. This diagram is one conception of the Circular Economy.



The Figure Eight diagram below is another conception that imagines a separate biosphere of agriculture, fresh water systems, sanitary waste and fertilisers connected to industrial biosphere of processes that produce energy, use water, produce chemicals and manufacture goods in urban, suburban and industrial land use environments.

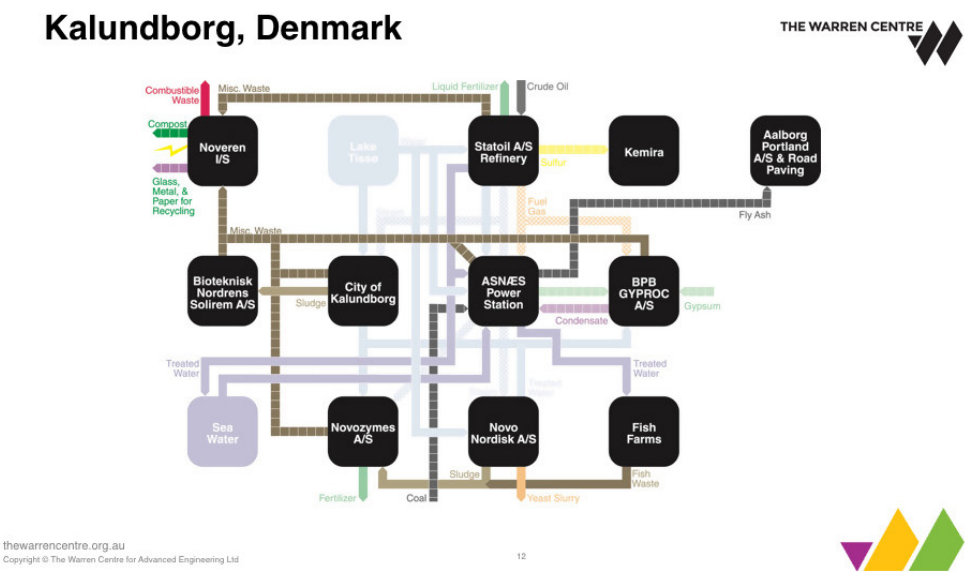
THE WARREN CENTRE

Within these conceptualisations, recurrent themes broadly define the Circular Economy. The Re-Manufacturing Economy refurbishes, upgrades and re-deploys used goods. Instead of owning the Xerox photocopier, hardware is serviced continuously by the copier company. Instead of purchasing consumable ink cartridges, the contract supplies photocopies on demand at a variable cost. Ownership transforms towards a services orientation. New business models of the Share Economy are increasingly relevant and visible in modern cities. Why buy a car when you can call a taxi? Why dedicate capital funds to a yellow-painted taxicab if car owners share their capital with paying users on Uber, Lyft, Ola or if drivers share in Car-Next-Door or GoGet? Reddy Go, oBike, MoBike and Lime use mobile phone apps to enable on-demand use of dockless bicycles and e-bikes. Local manufacturing, local remanufacturing, distributed manufacturing technologies like 3D printing, and local food production are themes within the broader Circular Economy discussion.

The first step is industrial aggregation. From head to tail, in the bio and techno-spheres, integrated suppliers and consumers co-locate to gain economies of scope and economies of scale in materials and energy efficiency.

Think about this example. In Denmark, The Kalundorg Eco-Industrial Park developed a 1.5GW coal fired power plant which supplies electricity and steam. Statoil Petroleum Refinery supplies natural gas and uses waste steam for its reboilers. Pharmaceutical supplier Novo Nordisk integrates with fresh water fish farms, yeast processing and City of Kalundborg sanitary waste water processing to supply fertiliser sludge to offsite agricultural users.

Gyproc is integrated with the coal fired power station, and fly ash from the power station feeds an Eco Park Portland cement manufacturer. Elements of head-to-tail recycling are being tested in Australia, but the scale of Kalundborg's industrial integration is far beyond domestic Australian industrial co-location and integration.



Professor Ali Abbas at the University of Sydney School of Chemical Engineering has demonstrated a coal fly ash cement technology that incorporates flue gas carbon dioxide into cement carbonates to reduce CO2 emissions yielding cement with compressive strength substantially equivalent to conventional cement kiln products. Last weekend Ali hosted the Australian Circular Economy Conference at Kooindah Waters, Central Coast NSW. Nanyang Technology University Singapore, Tsinghua University, Shanghai Jiaotong University, University of California-Santa Barbara and UTS participated. The NSW Dept of Industry, IChemE and Engineers Australia participated. The World Economic Forum Beijing and from industry Suez, Downer and Dow Chemical participated. Ali shared new insights with me Monday after the conference: “Ashley it’s not just recycling. We’ve got to redesign EVERYTHING. Everything you see around us, it ALL has to be re-designed. The technical discussion in Australia must shift from just recycling to design, Advanced Manufacturing, longevity, re-use and re-purposing.”

It’s not enough just to recycle. Advanced manufacturing processes must be designed and developed to produce customised, high-value components.

In Scotland, MacRebur company is replacing petroleum tars in asphalt with pelletised recycled plastic. It’s not just burying plastic into asphalt material. Recycling is necessary, but not sufficient.

Multiple, successive Five Year Plans by China feature increasing commitment to the Circular Economy. Hu Jintao was an electrical engineer. Xi Jinping is a chemical engineer and lawyer. On matters of industrial development, China’s government is an evidence-based, scientifically driven technocracy– a Twitter-free zone without climate change sceptics. When Shanghai bans free plastic shopping bags, the change is immediate, with high compliance, and no turning back. The speed of industrial reform is fast. Integrated industrial aggregation features prominently in the Suzhou Industrial Park and Tianjin Ziya Economic Area.

In 2017, China’s National Sword Policy prohibited the import of plastic waste starting in 2018. That policy has caused shocks in the US, Japan and Germany. Indeed, it has shocked Australia. Plastics are diverting to Malaysia, Thailand and Vietnam, but hundreds of millions of tonnes of plastic are stranded globally.

Re-design is critical. The economy must be restructured from a linear economy to a Circular Economy as the European Commission Vice President stated in 2015. Mercedes-Benz, and indeed the whole German manufacturing industry, is redesigning products for maintenance, service, refurbishment, re-manufacturing and redeployment driven by Germany's famous DIN industrial standards. Globally, the ISO Standards development are being led by nations adopting the Circular Economy mindset.

The first phase was industrial aggregation. The next two phases are industrial design reform and the transition from product sales towards lease, service and share economy business models. Each year the Warren Centre features a prominent Australian innovator in our Annual Innovation Lecture. Professor Andrew Harris has developed one of the world's largest 3D printers, an invention conceived in Australia and deployed in England to produce mass customised wax forms for concrete acoustic tiles in the London Underground. Andrew stands with one foot in industry, leading Laing O'Rourke's Engineering Excellence playground of new technologies and one foot in academia at the University of Sydney. At our 2017 Innovation Lecture he described how digital design tools yield infinitely and easily customisable production with sensors built into products and infrastructure to allow machine learning and to capitalise on AI efficiencies. The plastic printer car by Local Motors is another example of digital customisation and local manufacturing. Distributed manufacturing and re-manufacturing further enable refurbishment in situ and allow the creation of new share economy and lease business models like photocopier-as-a-service. The Germans believe that jobs displaced by robot factory automation might be supplemented by new labour demand in maintenance and refurbishment.

Apple has a different idea on robotics. On a market capital basis, Apple is the wealthiest company on the planet. When Tim Cook is not chastising Mark Zuckerberg for breaching your data privacy, he's talking up sustainable electronics manufacturing. Apple plans to purchase 100% renewable electricity. Its iPhone XR polymers are 32% bioplastic. In May Apple announced co-financing for a zero-carbon aluminium smelting pilot process with Rio Tinto Alcan. With 2billion iOS devices produced, Apple is part of the e-waste accumulation problem, but it is taking strong actions to implement the Circular Economy. In 2016, Apple demonstrated Liam, a robot that disassembles iPhones to recycle parts. Not only robotic factory assembly, but now product disassembly occurs by robots. Liam's daughter-robot is Daisy, the next generation of iPhone crackers. Daisy is recovering sufficient tin metal that Apple hopes it can close loops and discontinue tin mine extraction in the future.

Presently, the Circular Economy is an idea being formed and promoted for adoption. In the UK, the Ellen MacArthur Foundation catalyses thought leadership in this space. The universities are active here in Sydney, and we observe engagement and aspirations from tech companies like Apple. Ecological cooperation reached an international pinnacle at the 2015 Paris Conference. Perhaps today's Forum "Towards a prosperous yet sustainable Australia – What now for the Lucky Country?" is an indication that aspirations continue to rise. I see a new convergence of thought occurring that is social, political and tech-led within sustainability. Today's technologists are politically active, using digital media platforms to influence social attitudes.

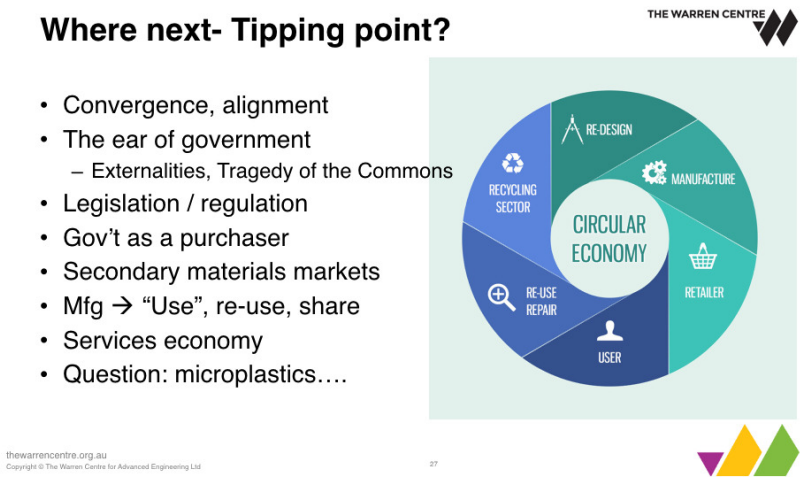
At the University of Sydney, Maryanne Large, Andrew Harris and Ron Johnston developed a program called Invent the Future. PhD candidates from the Science, Engineering, Business and Design Faculties collaborate to imagine a new product or service innovation to commercialise. The Biochite / Carapac team developed the bioplastic film in the image below. Company CEO Michelle Demers hopes to sell this plastic made from polymerised, recycled seafood shells to mushroom farmers to displace petroleum plastics in food packaging. It is uncertain whether this type of compostable plastic will succeed in the market. We don't know if Michelle Demers and her company will succeed at their innovative business venture. But I say strongly that this rising generation carries forward an aspiration to solve the world's so-called wicked problems inherited from the last century.

Based on solid science and the precautionary principle, a significant, influential segment from the professional technical community sees the impact of the accumulation problems of e-waste and plastics. They use the emerging social-political-technology convergence to influence public opinion and business decisions. On June 8 this year, the Thailand Department of Marine and Coastal Resources uploaded photographs of a whale autopsy onto Facebook. Eighty plastic bags were in the belly of the whale. Three weeks before McDonald's USA voted down a proposal to discontinue single-use plastic straws. Four weeks after the incident, Starbucks announced phase out of single use plastics. I call this the David Attenborough effect. Facebook shapes public opinion and business decisions. Mothers and children love whales and that photograph clearly associates plastic bags with death.

The day after that Thai whale incident, my own Facebook feed promoted images of a floating plastic garbage patch at the Dominican Republic in the Carribean. #StrawsSuck began trending. Donald Trump tweets that climate change is a hoax, but a rising generation of young people pushes back in a contest of ideas about the future of the environment.

On November 20, photographs of a 9.5 metre dead whale from Wakatobi National Park in Indonesia were distributed. Six kilograms of plastic from hundreds of plastic cups and plastic bags were in the dead animal's belly. The cause of death is unknown, but the association of death with plastic is irresistible.

Looking forward, this convergence of social-political and tech factors could yield sufficient alignment to trigger a tipping point towards action. This will be obvious when governments begin to use the words of economists to justify legislation and regulation to implement the Circular Economy. It's clear that the economic theories from the last century do not adequately describe the situation we see today and the call for action from the public. Also, governments are massive purchasers in every country's economy. Secondary materials markets needed for Circular Economies are insufficient for recycled materials.



In October, NSW Government released a Circular Economy Policy Statement. There is progress here in NSW. In the meantime, plastics are showing up everywhere, and the images we see in the news and on social media frame spoiled natural beauty, ruination of the ocean, and death to fishes. It is a public relations challenge for the plastics industry, but these materials in macro form are not toxic to humans.

However, eroded microplastics are appearing in the human food chain. Table salt from China, fish, saltwater oysters and fresh water mussels have shown microplastics contamination. Strict curb side waste segregation and recycling in Germany is recovering kitchen vegetable and fruit wastes to municipal composting programs, but plastics are entering that compost and appearing in fertiliser supplied to German farms. The latest story from a few weeks ago was a paper presented at a gastroenterology conference, not yet published in a peer reviewed journal. That work included tests from six European countries plus Japan that showed microplastics in human faeces. We are what we eat, and we are eating plastics. I do not know of published studies showing harm from human ingestion of microplastics, but it has been said that plastics might preferentially absorb low concentration organic pollutants like benzenes in the environment, concentrate them due to lipophilic surface attraction and transfer organic pollutants into human food chains. That is speculative, but it is reported…. Watch this space.

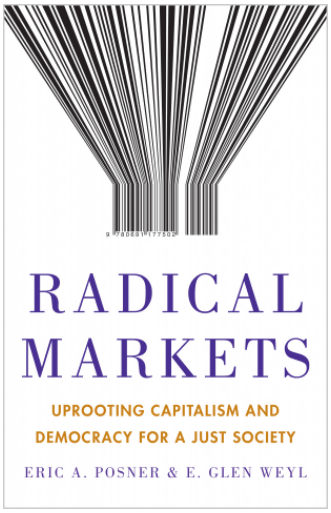
In conclusion, there is plenty of evidence to make the case for re-designing industries and products to align towards the Circular Economy. I foresee increasing public opinion alignment towards these possibilities, especially due to the social-political-digital technology influences. Some leading businesses are already re-engineering themselves to align with the aspirations of a new generation of consumers and customers.

The original article appeared in "The Prototype" from the Warren Centre, and is reproduced with permission.

Radical Markets
Uprooting Capitalism and Democracy for a Just Society
by
Eric Posner and Glen Weyl

Book Review

by Charles Brass – Chair, futures foundation



Books proposing alternative economic structures and systems seem to be proliferating. This one is jointly written by an academic lawyer (Posner) and a research scholar (Weyl) and published in 2018.

Like many of the authors of books in this genre, Posner and Weyl focus heavily on the negative consequences of increasing economic inequality and suggest ways of reducing this – often by recommending abandoning conventional economic marketplaces. Unlike many others, these authors both bring a strong economic and legal background to their analysis and actually recommend strengthening markets, though (as their title suggests) doing so in quite radical ways.

The book is dedicated to W.S. Vickery, whoseinfluential economic theories saw him declared Nobel Laureate in Economics in 1996 (though much of his influential work was published in the 1960s). Vickery's research focused on the power of auctions to solve major social problems and address some of the failings of modern economic marketplaces. For example, "Vickery's insights about urban planning and congestion pricing are slowly changing the face of cities, and they play an important role in the pricing policies of ride-hailing apps like Uber and Lyft" (pxxi).

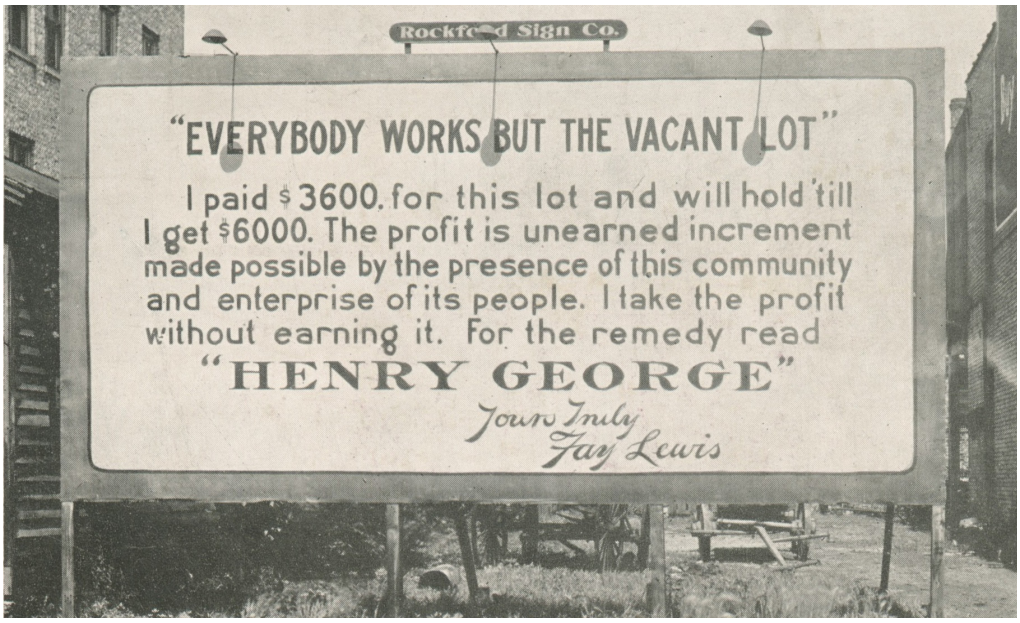
Posner and Weyl propose four radical, auction-based methods of improving efficiency in property ownership and distribution, elections and public policy, global labour markets and the ownership of personal data. Each of these is relatively easy to explain (as I will try to do for two of them below), but each seriously challenges some common preconceptions about how efficient and effective economic systems operate.

The 20 page introduction sets out the rationale for conceiving their radical markets proposals, and is a succinct summary of the challenges facing modern so-called liberal democracies. I don't think there is any need to elaborate here on this summary. Anyone who believes all is well in the economic world won't be interested in reading this book and those who accept that the current system is failing don't need to hear the specific details Posner and Weyl's critique.

Having established that "long –held assumptions are being overturned" (p29), the authors then take 200 or so pages to describe their four radical proposals.

The first chapter is entitled "Property is Monopoly" and focuses on new ways of acquiring, taxing and distributing property. It begins (as did Vickery) with land, and the ideas of Henry George, who in 1879 wrote "Progress and Poverty". George was one of many early economists who noted that land was a monopoly product (once someone owned it they could do what they liked with it), and that it was in short supply. George's critique of this observation is nicely summarized in this postcard that appeared in New York in the 1800s (and is reproduced on page 44 of this book):

Posner and Weyl detail George's thinking over many pages (essentially, he proposed to tax the "unearned"



profits on land), but then conclude that his remedies are inadequate, and go on to build on Vickery's work to suggest auction based solutions, not just for land but potentially for all privately owned property.

Essentially, their idea is that those who own the property would declare what they believe it to be worth. Having made that declaration, there would be two consequences: the owner would be levied a tax (the authors call this a common ownership self-assessed tax, or COST) based on the value they proposed (so, the higher one values, say, the land they own, the greater the tax they would pay) and the owner would need to be prepared to sell the property to anyone who offered that price.

The tax discourages individuals from valuing their property too highly, and the need to accept any offer at the declared price discourages too low a valuation. This is pretty well the standard economic definition of efficiency.

Clearly, this proposal raises many questions: exactly what types of property are included, how are the records kept and distributed, how the tax rates are determined (probably different arrangements for different types of property), how to deal with property that is jointly owned, how to manage depreciation; and these and other issues fill out this chapter (and much of the last chapter where some of the future consequences are explored).

Having challenged conventional notions of property ownership, Posner and Weyl then move on to challenging modern thinking about democracy and elections. Here they introduce a concept they call Quadratic Voting designed to be "a much-needed cure to the pathologies of the traditional voting systems used in democracies" (p82).

They point out that this is by no means a big leap, since much political action is involved in deciding how public goods (such as clean air, access to infrastructure such as roads etc) should be funded and distributed, and "rather than being allocated to the single individual who values them most, the overall level of public goods must be determined to maximize the total good of all members of society" (p98). Many philosophers (principally Jeremy Bentham, who proposed the maxim "the greatest good for the greatest number") have noted that "every

citizen's voice must be heard *in proportion* to how important that good is to that citizen" (p98) (emphasis in original). One vote, one value systems do not accomplish this.

The authors devote perhaps 10 pages to explaining the chequered history of the one person, one vote system that dominates modern democratic voting, noting that it fails to protect minority rights, creates a tyranny of the majority, produces paradoxical victories for bad candidates, and ignores, or at least downplays, the views of the very knowledgeable.

They propose a system through which every citizen is given a budget of vote credits every year, which they can spend by voting or can save for the future. To convert these credits into votes "a voter can dip into his budget and spend as much of the balance as he wants to buy votes – but the cost of a number of votes is its square in credits…One vote costs one credit, but two votes cost four credits, three votes cost nine credits" (p106) and so on. "This system enables people to cast votes that reflect the strength of their preferences" (p106). Hence, "a passionate minority can outvote an indifferent majority…and the outcome of the vote should maximize the well-being of the entire group, not the well-being of one subset at the expense of that of another" (p106).

The authors recognize that this is a seriously radical proposal, and they spend many pages both explaining it, and providing examples of research experiments where it has been trialled (they even point out how it might improve the reputation systems used by websites such as Airbnb and Uber) – and improve decision making in Body Corporates and other smaller scale social enterprises).

In their conclusion Posner and Weyl say that these are the two most significant proposals in this book, so this review will stop describing their proposals in any detail (the other two proposals in the book propose similar auction type systems to change immigration rules, and to control the corporate or government use of personal data).

It is worth, however, commenting on some of the conclusions the authors draw. They are unabashed advocates for the power of marketplaces to set prices and to distribute goods – but they are just as clear that this does not mean that marketplaces should be entirely free. They are clear that unregulated markets retard productivity, increase inequality and depress employment. Hence, they propose these radical changes to the way markets operate. They are not, however, blind to the potential downsides of their proposals. As they say: "Our proposals are grounded in economic theory and in the history of ideas, but human nature has a way of defeating the best thought-out schemes, both through stubbornness and through its occasional extreme malleability" (p273), and they devote 20 pages to considering both ways in which these proposals might be trialled as well as ways they may be abused. As a futurist I was particularly excited to read this sentence: "The proper level of complexity is a design question that can only be answered with experience" (p275). They even devote an appendix to postulating on how market fundamentals might change in the long-term if these proposals were implemented.

The final two sentences in the book sum up its origin, and its thesis: "If we aspire to prosperity and progress, we must be willing to question old truths, to get at the root of the matter and to experiment with new ideas. this is what we have tried to do" (p276). And their attempts resonated at least with this reviewer.

FUTURISTS IN ACTION

WELCOME TO THE FUTUREPOD PODCAST SERIES

We belong to a broad and diverse international community which remains mysterious to many, and is rich and interesting with abundant wisdom to share, deep history and potentials for finding new and creative ways forward. At a time in our history when wise perspectives and new ideas are needed, we have found another way to let these voices shine.

To say what brought our small FuturePod team together is an intriguing and impossible task. Rebecca Mijat, Peter Hayward, Mendy Urie and Ana Tiquia, all members of the Melbourne, Australian foresight community, began exploratory meetings in early 2018 to find out what a project could look like, built around collecting and collating many of the eminent, individual voices of the futures and foresight community.

We would start in Australia, using a small professional recording studio for live interviews and build to include remote interview recordings of interstate and international professionals and practitioners.

Our vision, we discovered was to build a project, which would contribute to creating humane and better futures for all, through the Foresight community, with the three-fold aims of:

- recognising and honouring those people who came before us and who played a major role in establishing the futures and foresight field;
- supporting and promoting those in the community who are establishing themselves and furthering the contributions of our field; and
- providing a place that can offer inspiration to those who wish to join us by listening to those conversations and then going out and creating their own pathway.

The team does this by combining old technologies (conversation and storytelling) and new technology (podcasting and social media) in a not-for-profit venture for the community, supported by the community.

Peter, Rebecca and Mendy are grateful for the early contributions of Ana Tiquia for her energy, experience and ideas in building the FuturePod project. A special mention also goes to our music creator, Doctor Turtle, for the song It Looks Like The Future, But It Feels Like The Past

EPISODES SO FAR PRODUCED ARE:

Waking Up and My Inquiry into Depth - Richard Slaughter

In part 1 of his interview Richard discusses his beginnings, his inspirations, his mentors and his journey into the foresight community. He also discusses his favourite methods and concepts.

Against the Global Narrative and Rediscovering our Options - Richard Slaughter

In part 2 of his interview Richard discusses the emerging futures, how he explains foresight to people and closes with his advice on how to live in a world that is on the edge of disaster.

WELCOME TO THE FUTUREPOD PODCAST SERIES

Alternative Thinking About Today and Tomorrow - Richard Hames

As an international powerhouse, hear a small sliver of Richard's wisdom in this podcast, and how alternative thinking about today and tomorrow is at the core of his practice.

Hope, Agency and Being a Pathway Agnostic - Rowena Morrow

Rowena taught foresight for many years and so listen to her teach you about Hope Theory, consultancy and performing organisational roles.

A Life of Teaching the Future - Peter Bishop

Peter shows how he starts with how people have learned faulty thinking about the future through science and history and shows them how contingent thinking is a better way to think about the future.

Better Decision-Making Through Creative Conversations - Susan Oliver

Susan is a leader amongst Australia's futures community. An innovator and champion of diversity hear how Susan practiced her craft and how she worked on company boards to make them thought leaders and to make better decisions.

A Macrohistorian's Design for Better Futures - Michael McAllum

As a macrohistorian, Mike works at many levels, from local through to Global to support much-needed radical new thinking and new systems in an emerging networked and collaborative society.

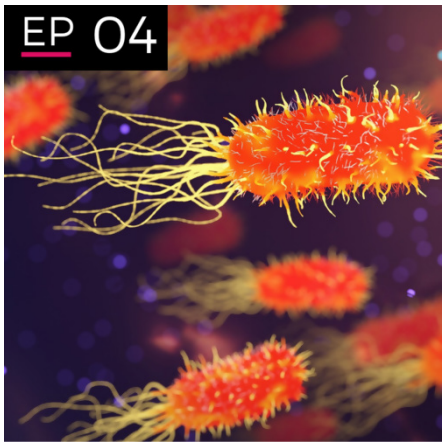
The Foresight Switch - Maree Conway

Maree explains how the 'Foresight Switch' is turned on in people through doing foresight processes and how to be open to the future and to look for diversity of perspectives.

WELCOME TO THE FUTUREPOD PODCAST SERIES

Limits to Growth - Josh Floyd

Josh speaks about his early appreciation of the bio-physical context of the world and his 20 year journey of enquiry into discovering new thinking tools and new habits to look at and make sense of the world.



Experimentation and Mutant Futures - Jose Ramos

Jose is the living example of a mutant futurist who believes we live as communities of faith around our shared and emerging futures and who practices experimental futures.

Preaching to the Choir - Paul Higgins

Paul explains his pragmatic approach to working with the people and organisations that want to make a difference.

Deep Inquiry and Dealing with Complexity - Peter Hayward

Peter speaks about solving problems through deep enquiry, and the power of scenarios as a conversation tool for discussing and exploring futures.

Re-thinking Business and Education - Simon Dehne

Simon has successfully developed a professional business.

All episodes can be freely accessed here: https://www.futurepod.org/episodes/
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Signals in the Noise

25 EXPERT PREDICTIONS ABOUT THE FUTURE THAT WILL EXCITE YOU

by Alex Daniel

The future looks pretty cool. Sure, long-term worries about climate change and the ever-increasing encroach of robotic intelligence might give the average person pause. But there are still plenty of reasons to look toward the future with great expectations. And that's not just an opinion: research conducted by futurists and reports produced by some of the world's smartest think tanks indicate that, on the whole, the future is nothing but bright. Here are 25 reasons why.

1 POOR COUNTRIES WON'T EXIST

Seems far-fetched, but that's a prediction made by none other than Bill Gates, who stated that, "By 2035, there will be no more poor countries." Though the recent swing toward nationalism and protectionist policies by rich nations across the globe might make this seem like an unlikely scenario, the larger trends have been a steady improvement in the average quality of life around the world and a steady eradication of extreme poverty that looks likely to continue. The World Bank, for what it's worth, expects the number of people living in extreme poverty to dwindle to less than 3 percent of the population by 2030.

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2 WE CAN LIVE ON AS COMPUTER BRAINS

Like an episode of *Black Mirror*, some researchers predict that we will some day be able to load our brains into a computerized form where they will be able to outlive our bodies. Neuroscientist Randal Koene is studying a way to do this, "mapping the brain, reducing its activity to computations, and reproducing those computations in code," according to *Popular Science*, which he expects to be able to do by 2045.

3 BUSINESS WILL GET MORE HUMAN

"The cracks in 20th century leadership models becoming more apparent by the day," say Rohit Talwar, Steve Wells, and Alexandra Whittington, leaders of Fast Future, a professional foresight firm specializing in delivering keynote speeches, executive education, research, and consulting on the emerging future and the impacts of change for global clients. They give the example of retail bosses who resist experimenting with new approaches in the face of digital competition or authoritarian politicians. "In the face of these toxic and outdated strategies, we could see emergence of new leadership models that focus on promotion of continuous learning, encouraging the expression of alternative of views, and increasing engagement of a more informed workforce and population in debate and decision making about the way ahead."

Signals in the Noise

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4 LEAPS AHEAD IN TRANSPORTATION

The acceleration adoption of electric cars and autonomous vehicles will transform the world of transportation, according to the Fast Future team. “Major towns and city centers are already becoming cleaner and quieter as a result of the rise in electric and autonomous transport,” they say. “With the banning of manually driven vehicles (except for the emergency and security services) from major cities, road traffic accidents and therefore injury and death involving road vehicles could reduce to almost zero.” They add that there could also be a dramatic change in ownership of vehicles, with the sight of packed residential streets and difficulty finding parking spots becoming a thing of the past. Though, if you think flying cars are gonna take you to the skies, sorry: that’s one of the 20 Long-Predicted Technologies That Are Never Going to Happen.

5 RENEWABLE ENERGY WILL BE CHEAPER AND EVEN MORE RELIABLE

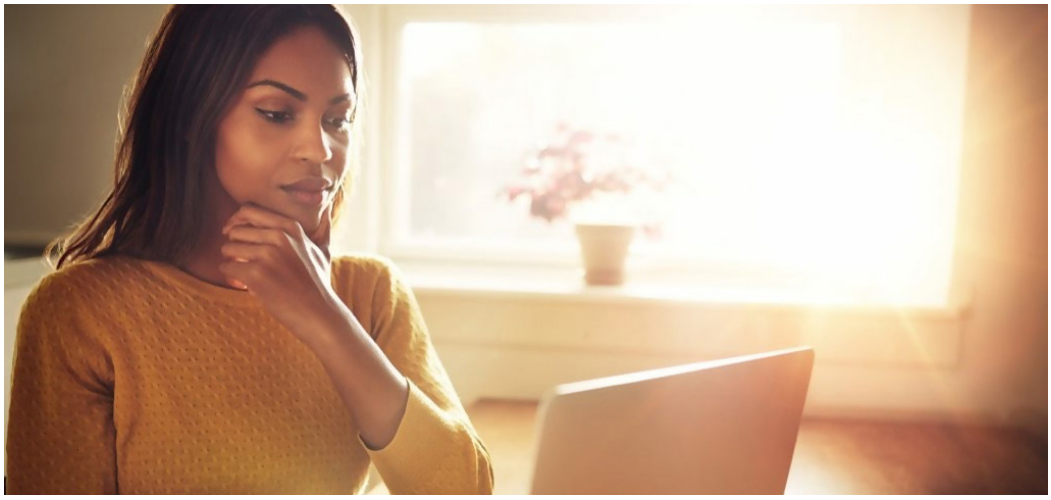
Despite pushback from some quarters, solar and other types of renewable energy continue to march forward, becoming increasingly cheap and ubiquitous. As a World Wildlife Fund report predicts: It is “technically feasible to supply everyone on the planet in 2050 with the energy they need, with 95 percent of this energy coming from renewable sources.”

Signals in the Noise

25 EXPERT PREDICTIONS ABOUT THE FUTURE THAT WILL EXCITE YOU

6 GENDER EQUALITY WILL BE (AS LEAST CLOSE TO) A REALITY

According to a report from the Copenhagen Consensus on Human Challenges, while the exclusion of women from work led to the loss of 17 percent of global GDP in the year 1900, this will be reduced to just 4 percent by the year 2050, thanks to, "[R]ising wages and rising female participation in the labor force rise hand-in-hand, implying that there are gains to the society from women's movement into the paid work sector at these times." An Oxford University study also predicted that, by the same year, women and men throughout the developed world would largely do an equal share of housework and caring for children, with greater equality between the genders as the years go on.



7 YOU'LL BE ABLE TO PURCHASE EMOTIONS ONLINE

With the progress made in psychiatric medication, it's just a step further to imagine this scenario, described by Alex Ayad, head of Imperial College London's Tech Foresight Practice: "Recently, techniques for direct brain stimulation, like optogenetics, have made it possible to not only read but also write information into single neurons," he tells *The Telegraph*. But while data-transfer rates have been slow, that's changing fast. "One could foresee a new and extraordinary world where there is a virtual marketplace for trading high quality emotions—where artists looking for a particularly high strength brew of melancholy, or actors needing to channel regret or compassion for their next play, could purchase emotions online," he says.

Signals in the Noise

25 EXPERT PREDICTIONS ABOUT THE FUTURE THAT WILL EXCITE YOU

8 BUILDINGS WILL POWER THEMSELVES

According to Tamar Kasriel, founder and managing director of Futureal, buildings will become energy efficient and self-sustaining. "A powerful mix of sense and/or fear will have continued the momentum behind increasing the efficiency and reducing the cost of alternative power sources," he tells *The Telegraph*, adding in a reference to *Back to the Future.* "Solar panels will be built into lots of different building materials, so the whole of Hill Valley can quietly and cleanly power itself."

9 HUMANS WILL UPGRADE THEMSELVES

Kasriel adds that he expects medical and technological advances to allow individuals to modify and improve themselves more conveniently and affordably, with "prosthetic add-ons and improvements [moving] further into the realm of the possible and everyday." He expects that "just the right cocktail of food/medication to be the very best that they can be for the day ahead, based on micro performance analysis of the day just gone."

10 WE'LL HAVE LIVING CITIES

While "smart cities" that adapt to data about and the behavior of its citizens have become a reality (or at least close to it), Ayad suggests that we are not too far from buildings and infrastructure itself responding to the behavior of residents. "Entirely new synthetic life forms, or biological machines, made of engineered living cells from bacteria, fungi and algae will grow and evolve with the changing needs of a building's inhabitants," he predicts, with living materials blending seamlessly with manmade architecture to create an urban experience that is healthier and more tuned in to nature.

11 AND MORE HUMAN CITIES

The Fast Future team sees a similar evolution in cities, but with a result that technology helps create better connections and sense of community among the citizens. "As the nature of work, jobs, and shopping change radically, we could see an accelerated pace in the repurposing of major city center buildings from business and retail to residential and leisure," they predict. "The very technologies that helped to change our work and shopping habits (the Internet, increasingly powerful mobile and wearable devices, AI, robotics, IoT, drones, and autonomous vehicles) also provided the technological solutions for planning, converting, and living effectively in buildings previously used as offices and stores. We could see the emergence of a model where communities of people have taken back the cities and are able to live harmoniously with enabling technologies in a truly connected way."

Signals in the Noise

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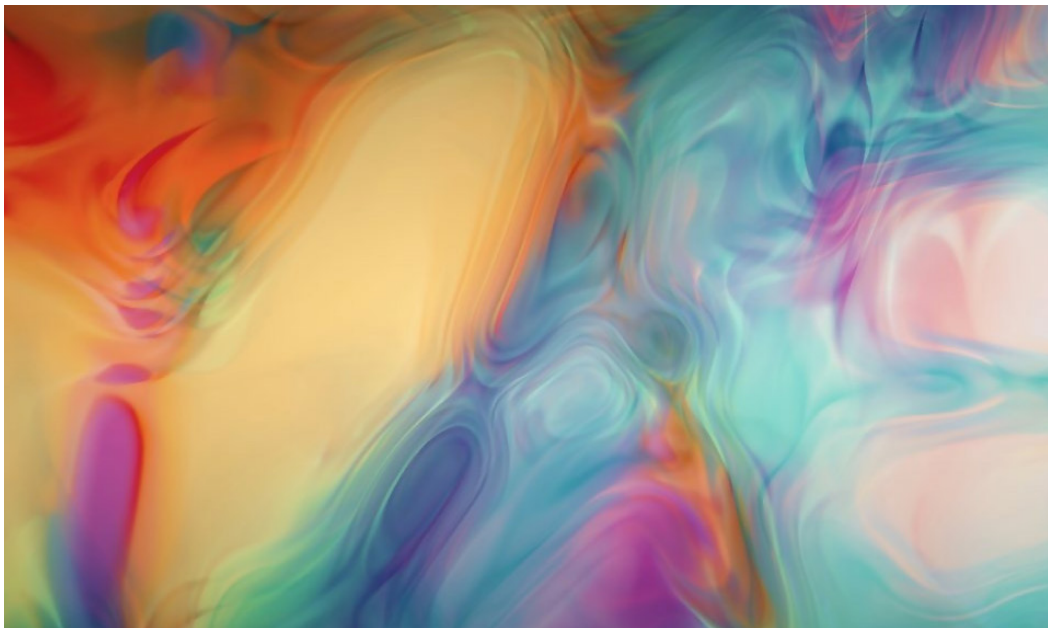

12 INVISIBILITY CLOAKS WILL BE A THING

It won't just be the stuff of *Harry Potter*: Ayer points to developments already happening in nanotechnology engineering, which have enabled scientists to "cloak" objects through by bending and refracting light. "They may be used in everything from novelty gimmicks to making unsightly construction sites and power stations seemingly 'disappear,'" Ayer predicts.

13 OUR CLOTHES WILL BE HIGH-TECH

Futurist Ray Kurzweil describes in his book *The Singularity Is Near* how our clothing will get more technologically sophisticated, and better allow us to function in a high-tech world. He predicts that "computers will disappear as distinct physical objects, with displays built in our eyeglasses, and electronics woven in our clothing."

Signals in the Noise

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14 MOVING AWAY FROM CHEMICALS

The Fast Future team expects to see a fuller embrace of natural dyes to meet the needs of the mass market for clothing and textiles, and a broader move away from chemicals over the long run. "The idea that the future could see the use of less harmful chemicals is good for the planet and the consumer alike," they say, pointing to a recent *Fast Company* article on the topic.

15 SMART TECHNOLOGY WILL EXTEND TO MOODS

If you think voice activation is cool, what do you think about *mood* activation? Richard Watson, futurist and founder of the online magazine *What's Next*, expects that machines will develop to the point that they can read their users' moods and respond accordingly. "This can be done by 'harvesting' facial expressions, body language, heart rate, voice, and so on," he predicts. "If you are typing text into a computer, the computer might consider the speed you are typing, decide you are stressed, and conclude that this isn't the best time to allow you to read negative emails."

16 WARFARE WILL PLUMMET

At a time when international tensions seem to just keep ratcheting up, this might seem optimistic, at best. But experts believe that, by the year 2050, the number of countries involved in internal war will drop by more than 50 percent, according to a report published in *International Studies Quarterly*. Matt Ridley, author of *The Rational Optimist*, agreed that the future would bring a drop in armed conflict, telling the World Future Society that "I do expect the decline of violence and war to continue. War will be rare but not absent."

17 LITERACY WILL INCREASE

Like war and famine and poverty, illiteracy has been steadily declining for decades, and the Copenhagen Consensus Center predicts that illiteracy (currently at above 20 percent) will drop to 12 percent by 2050.

18 BABY-MAKING WILL BE SMARTER

Fertility techniques have evolved by leaps and bounds in the past several decades and loop poised to develop further soon. From freezing a woman's healthy ovarian tissue (which can then be re-implanted when she's ready to have a baby later in life) to creating sperm and eggs from human stem cells, the options for bringing life into the world are about to expand.

19 BABY GENIUSES WILL BE REAL

There are plenty of ethical difficulties to work out in the fears of "designer babies" in which parents can manipulate their children's genetics before they are even born (replacing diseased genes or making the baby healthier—and in the distant future, potentially boosting a child's IQ). But setting aside the ethics for a minute, being able to create a super-smart baby would be kind of cool.

Signals in the Noise

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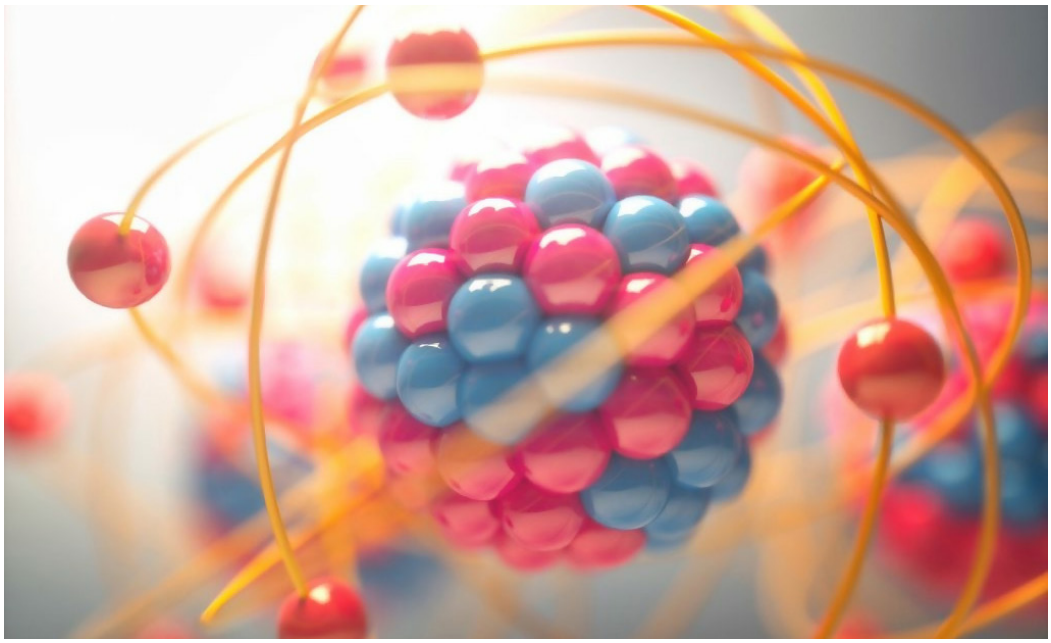
20 COMPUTERS WILL STRENGTHEN OUR BRAINS

Futurist Ian Pearson expects that it's just a matter of time before our brains are wired to computers in order to help our brains work more quickly. "We can expect this as soon as 2050 for many people," he tells BBC. "By 2075 most people in the developed world will use machine augmentation of some sort for their brains and, by the end of the century, pretty much everyone will. If someone else does this you will have to compete."

21 WE'LL BE ABLE TO SPEAK MANY LANGUAGES

Thanks to enhanced apps, special goggles or other similar devices, simultaneous translation will allow us to speak a wide range of languages without pulling out a translation dictionary. As *The Economist* explains, "A series of announcements over the past few months from sources as varied as mighty Microsoft and string-and-sealing-wax private inventors suggest that workable, if not yet perfect, simultaneous-translation devices are now close at hand."



22 WE'LL HAVE FIGURED OUT NUCLEAR FUSION

This combining of multiple atomic nuclei has challenged scientists since the 1940s, but that will eventually change, according to Pearson. He maintains that nuclear fusion "is likely [achieved] by 2045 or 2050 and almost certain by 2100. It's widely predicted that we will achieve this." But he adds that, "What difference it makes will depend on what other energy technologies we have. We might also see a growth in shale gas or massive solar energy facilities. I don't think that wind power will be around."

23 ORGAN SHORTAGES WILL END

While many people still die because they are unable to get an organ transplant in time, developments in creating artificial body parts have paved the way for lab-grown organs that will reduce and potentially eliminate the need for other people to offer up their hearts, lungs, and kidneys.

24 WE'LL LIVE IN FLOATING CITIES

While the devastating results of climate change are beginning to show, engineers have been at work creating a workaround to the flooding likely to happen as a result of man's activities: floating cities. For example, Belgian architect Vincent Callebaut has mocked up a self-sustaining "Lilypad" capable of holding 50,000 inhabitants, which would not only ensure humanity's survival, but look pretty cool, too. And if you doubt such a project could come to pass, just look at the progress of Jag Mandir (pictured), in Lake Pichola, India, to see that aquatically isolated communities can indeed be sustainable.

25 TWO WORDS: SPACE ELEVATORS

"[S]pace elevators will certainly be around, and although 'cheap' is a relative term, it will certainly be a lot cheaper than conventional space development," says Pearson. "It will create a strong acceleration in space development and tourism will be one important area, but I doubt the costs will be low enough for most people to try".

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