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The Future(s) of Innovation

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INTRODUCTION

Any story about innovation is, at heart, a story about the future of innovation. This as the story of how innovation becomes always involves a forward push, an opening up to the novel, the new, the never-before-seen. Innovation is future-directed activity, focused on making the future real today, if by ever so little. Innovation, in whatever way we try to do it, is an attempt to open up today to the future, if by ever so little. At the same time, the future of anything, including innovation, is unknowable. Had this book been written in the 1980s, it is exceedingly unlikely that it would have predicted the many ways in which the internet affected things such as business model innovation, social innovation, or open innovation. The step from networking technologies to what the internet became would simply have been too enormous to contemplate. Thus,

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any attempt to write about the future of innovation is bound to fail and to be an exercise in futility.

That said, if this book has debated what innovation is right now—for and against, from different perspectives—it would seem a dereliction of duty not to at least attempt a comment on what innovation might become. For even though some of the chapters here have been quite critical of innovation (not least my own previous chapter on image and ideology in the innovation industry—see Rehn, Chap. 5 in this volume), I believe even the more critical commentators (see, e.g., Godin 2015; Godin and Vinck 2017) would agree that we will need innovation in the future. In fact, as we look to how the future seems more and more likely to be defined by a number of "wicked problems" (Rittel and Webber 1973), it becomes clear that there will be a more and more pronounced need for new technologies, new solutions, and new ways of working.

This, however, doesn't mean that innovation won't be forced to change, even in painful ways. Looking to wicked problems such as the ecological crisis, a phenomenon like innovation looks very much like a double-edged sword. On the one hand, innovation has wreaked havoc during the consumption-driven era of late capitalism (cf. Jameson 1991). We have created more and more ways to entertain ourselves, and in so doing also created mountains of waste, and wasted mountains of energy. Bitcoin and other innovations in the field of crypto-currency have been interesting in the way they open up for new ways of understanding the economy, yet at the same time it has been estimated that bitcoin alone uses as much energy as Argentina (with its 45 million inhabitants) and that it thus generates emissions on about the same levels as Greece. Innovative e-commerce firms, in conjunction with advances in manufacturing, have ensured that an astounding amount of products are available to buy for consumers globally, with all of the attendant waste and logistics externalities. In a very real way, innovation created the problem it is now asked to solve, and no one knows where the flywheel stops. On the other, we can view the current state of the world as a *fait accompli* and have little choice but to trust in the capacity of innovation to bring forth novel ways of both keeping the world going and at the same time lessen the impact of contemporary capitalism. Either we start consuming far less, aiming for the politically very challenging project of global degrowth, or we

innovate our way(s) out of the problem. Even in the latter case, it would seem that more and more of our innovation engagements will need to take into account something greater than innovation for the sake of innovation.

Instead, many commentators (see, e.g., Suchek et al. 2021) have noted that one of the core issues for innovation now is how to engage with issues such as the circular economy, and in general addressing the issue of over-exploitation of global raw materials and other resources. Whereas innovators as recently as a decade or so ago could go about creating the new new thing with casual abandon regarding any other issue of sustainability than whether raw materials could be had at a price point where the innovation could be sold at a profit in the market, today innovation is already a different ball-game. Issues such as repairability, recyclability, design for disassembly, material re-use, and sustainable production systems are no longer just an issue for sustainability experts and environmental engineers, they need to be heeded by anyone whose innovation has a material form, and most of those whose do not. The innovation calculation has changed, and while we certainly need to keep innovating, the task may well become one of not innovating *more,* but rather innovating *better.*

To this there will no doubt be innovation evangelists who would point to how the improvement in tools for innovation—*meta-innovation*, if you will—are ushering in yet another golden era for innovation, one where the power of the self-same will be so augmented as to easily deal with pesky issues such as a global ecological crisis. Such a progressivist and solutionist (Morozov 2013) stance is attractive, and answers to a most human need, namely the need for hope. Arguably this has driven our innovation discourse for a very long time, but in our age of techno-optimism, it has taken on an almost religious tone. The new boosters of innovation are not merely stating that innovation is a necessity, but rather that it is *transcendental.*

Consider the entrepreneur-cum-speaker-cum-author Peter Diamandis and his writing partner Steven Kotler. With book titles such as *Abundance: The Future Is Better Than You Think* (Diamandis and Kotler 2012), *Bold: How to Go Big, Create Wealth, and Impact the World* (Diamandis and Kotler 2015), and *The Future Is Faster Than You Think: How Converging*

Technologies Are Transforming Business, Industries, and Our Lives (Diamandis and Kotler 2020), the pair stands as a kind of paragon of innovation triumphalism. In their telling, all we need to do is wait as "exponentially accelerating technologies" do their thing, and accept the abundance that this will bring with it. It is a strange reversal of accelerationism (Noys 2014; see also Loadenthal 2022), which argued that societal collapse might just as well be accelerated so that a new one could be built (a fantasy that the extreme left, the extreme right, and extreme green movements have occasionally indulged in—helter skelter), evangelists such as Diamandis and Kotler are seeing technology accelerating on its own, leaving most of humanity with the task of getting out of the way, waiting for the abundance to come.

This kind of thinking is sometimes coupled with what is known as *longtermism,* a philosophical theory that charges that our decisions today should be driven not only by what is good for the planet and society today, but for these both long into the future (see, e.g., Ord 2020). In one form, this could be used to argue that the economy needs to grow, consume, and innovate less, so as to keep resources free for generations that may not be born for hundreds of years. In another, more radical form, it could be used to argue that the development of technology today can be of such importance to untold generations untold years into the future that e.g. the death of millions or even hundreds of millions of people now starts looking like an acceptable cost. If we can save a hundred billion people in the future, should that affect how we treat a few million people today? Put somewhat differently, some longtermists would say that we need to speed up technological development and innovation now, no matter the cost, as not doing so could pose an existential risk for generations far into the future.

Some, again, would state that all of these notions are in fact built on a very Western outlook on life, and driven by privilege. We want to keep our lifestyle, and to have the innovations that ensure it, but look at it strictly from our own, Western perspective. As, for example, Chaturvedi's chapter in this book shows (Chap. 15 in this volume), this is a very limited way of looking at the world. While there certainly is the possibility that Western countries such as the US and the EU countries will remain strong innovators, it is also clear that innovation in areas such as China,

Southeast Asia, and Africa (without forgetting South America) will become more and more important. China is already an AI powerhouse, and the networked structures for innovation that have developed in Shenzhen (see Hu 2020; Nylander 2017) are showcasing a very different approach to innovation that is normalized in Western views of the same. To all this comes the geopolitics of innovation. While Western corporations may increasingly veer toward more sustainable practices, China as well as many countries in the Global South may well feel that they are entitled to at least some more innovation for innovations sake, referring to a principle of fairness. In other words, the future of innovation might not only be an answer to wicked problems, it might be a wicked ethical problem unto itself.

Lastly, there is the issue that we opened with—the unknowability of the future. The real future of innovation might lie in something that is too weird to contemplate with what we know now. Some discount "weird futures" as being frivolous flights of fancy, but consider the following. Today, if I wonder just how warm it is outside, I start talking to my watch. It can understand simple questions quite well, and can then relay them to a slab of glass and circuits that I have near me at all times, and that can access a global network of information to find the answer. In a timeframe that still seems magical, my wristwatch, speaking in a soft, faux-Irish lilt, gives me the outside temperature and some additional weather info. Utilizing highly sensitive motion sensors, and its innate desire to be helpful, it also sometimes interrupts me mid-lecture or mid-conversation, trying to add to whatever it was I was talking about. Looking back 35 years, to the technology-interested teen I was, such a story would have both stimulated and saddened me. Stimulated, as I wanted to believe, but saddened, as I still was mature enough to know that such marvels would not come during my lifetime. Yet here we are, in a weird future. Discounting the possibility of, for example, synthetic biology, advances in nano-technology, or quantum computing (not to mention technologies we simply do not have terms for yet) to generate far weirder possibilities for the future of innovation than we can imagine today would thus be a mistake.

Taking this as our starting point, we might thus postulate at least four potential scenarios for the future(s) of innovation. These would be:

- *Faster innovation*—a future in which particularly technologies of augmentation make innovation quicker and more explorative.
- *Slower innovation*—a future in which social sustainability issues pushes for more considered, slower (yet possibly more impactful) innovation.
- *Diverse innovation*—a future in which the current, Western innovation logics are challenged, and a new geopolitics of innovation emerges.
- *Weird innovation*—a future of the unknown unknown, in which miracles and magic have to redefined. Also a future in which novel monsters emerge.

These are obviously just very simplified scenarios, and the real future of innovation will be plural and is likely to contain elements of all of these. It is still worthwhile to deal with these scenarios as separate entities, in order to tease out the things they may bring to the future of innovation, and to enable the esteemed reader to think through the many possible hybridities that may emerge. Note that I am here not aiming to make a full, academic review of these possibilities, but rather aimed to show how they might play out. As a result, I have not referenced the text with quite the same ardor as I otherwise would, in part as these are all fields where the speed of development—for good or bad—is often so rapid as to make references outdated before this book has a chance to be printed.

FAST, AUGMENTED INNOVATION

Many of the most influential names in technology have stated that what we've thought was the golden age of innovation may be anything but. While innovation skeptics like Tyler Cowen (2011) and myself (Rehn 2019) have suggested that the "low-hanging fruit" (in Cowen's terms) may have been picked, and that any substantial innovation may require substantially more resources than before, people like the aforementioned Diamandis (as well as most of the innovation industry) have steadfastly argued that a number of technological developments are in fact ushering in an era of innovation that might overshadow our own. These technologies come in two flavors, as it were. One, there are potentially radical new technologies that may redefine much of what we think regarding our

global limitations; space mining, hyperloops, and synthetic biology to mention a few. I will not address these here, but they could in their way be fitted under the heading "Weird Innovation" (no insult intended). Two, there are already emerging technologies that would directly enable new forms of product development and innovation. Key among these are machine learning, artificial intelligence (AI), AR/VR/XR (Augmented/Virtual/eXtended Reality), enhanced simulation and automation technologies, and quantum computing. Some of these are already here, others are radically developing, and yet others show tremendous potential as proofs of concept.

I have taken to calling this *augmented innovation,* which while unfortunately sharing the abbreviation AI with a part of itself, describes the potential quite well. What we see here is that these novel technologies will not shift innovation by themselves, but will act as key technologies through which innovators gain novel capabilities and augmented skills with which to explore, experiment, test, and communicate new innovations. Again, I will not reference the theories and books that exist regarding these technologies at the moment of writing, as by the time this book is read, more up to date literature will have been published.

To start, we know that innovation has the potential to be super-charged by *machine learning, AI, and algorithmic logics*. Human beings may still best computers when it comes to issues such as imagination and creativity, but in sheer generation of ideas (and their permutations) computers reign supreme. We have already seen software that have been fed with both basic parameters of certain products and a large dataset of images of the same, and then been asked to generate large amounts of potential new designs. While the current systems have a tendency to generate much that is innately impractical (a system I saw suggested ideas for coffee cups that included handles on the inside and a cup that for all intents and purposes was a plate with a handle), better programming and bigger datasets could quite quickly enable vast improvements, at least in the case of simpler designs. Similarly, a machine learning system can be trained to explore existing patents and suggest possible combinations thereof (e.g., if a patent for mining, possibly combined with one in material sciences, might find use in an adjacent field such as metallurgy). Today, the signal/noise ratio of such systems tends to be less than satisfactory, but every

iteration also tends to bring about improvements, and the speed with which such iterations emerge is increasing. It is not beyond the realm of the possible that the innovator or product development engineer of tomorrow has very powerful systems at their beck and call, enabling very rapid idea generation, idea variations at the touch of a button, and the capacity to run tests *et cetera* on new ideas at speeds that we would see as quite magical. Tomorrow's innovator will not need to do boring archival work, but instead call upon smart algorithms to instantaneously catalogue, for example, all existing designs in a specific category, complete with what parts of these currently enjoy IP protection. Following this, our future innovator might ask an AI to generate novel forms of said design, establishing parameters, filtering out all forms that might have IPR issues. Through three iterations of this, and with a little input from the innovator (beyond the parameters), and a new, innovative design might have been created. In a similar manner, contemporary innovation management often suffers from (a) not being able to capture all the ideas that exist in a corporation, (b) not having sufficient time for filtering ideas to find those that might be interesting to develop further, and (c) having bias play a part in both of the previous instances. While we should be aware that algorithmic systems can show bias as well, running an AI-powered innovation management system in parallel with a traditional one can generate interesting results with new ideas captured and otherwise ignored ideas potentially explored.

Second, the set of technologies today referred to as *the metaverse* holds the potential to have an outsize impact on innovation. While the term is still somewhat contentious and marred by hype, it still seems that various forms of VR and AR will develop to quite an extent in the years to come. Whereas the innovators of yore had to do sketches with a pencil, or mock things up in often cumbersome CAD-programs, the innovator of the future may well don a pair of glasses and get transported to a virtual laboratory where all kinds of digital prototypes can be summoned at the flick of a digital wrist. Imagine being able to think of a new kind of design for an airplane, and then simply describing it to a virtual assistant which uses voice recognition to sketch out a prototype. Imagine then entering your virtual lab, giving additional instructions and seeing your idea take form and develop in real time, as you speak. Want to shrink it down to

palm-size to look at its lines? One voice command. Want to test it in a wind-tunnel? One command. Want the wind-tunnel to mimic a Texas tornado that rips your plane to shreds? One command, and one more to bring the plane back. Combining voice assistants, specialized and general AIs, massive datasets, and the metaverse, we could create virtual product development laboratories that would give a large part of humanity the kind of R&D facilities that today only the richest corporations and countries can afford. Look far enough into the future, and most professionals may be able to afford digital innovation spaces that can mimic entire factories or even ecosystems, democratizing innovation to a degree never-before-seen. Another part of all this, one that will arrive before the house of innovation magic I outline above, is the manner in which several of the aforementioned technologies support an increased use of *digital twins* in innovation work. Already today, corporations experiment with taking an existing product or system and creating digital twins that can be tweaked in order to find new efficiencies or novel functionalities. The metaverse, coupled with AI-supported systems, can boost these capabilities in a tremendous fashion. Today, digital twins tend to be simple systems with a limited amount of parameters, but these new technologies of accelerating innovation could potentially enable making a digital twin of an entire factory or supply chain. Imagine being able to test every possible set of variables in a factory to find its optimal balance between efficiency and sustainability, while running no risk for breaking equipment or shutting the production line down. Today, many of our systems run in a suboptimal fashion simply because we can't afford to test all possibilities for them. Digital twins remove that cost, with great potential to e.g. develop new forms of process innovation.

Lastly, we need to mention the potential inherent in *quantum computing*. While still an early-stage technology, the sheer speed and volume boost this technology might bring have the potential to change what is possible when it comes to computation. In areas such as pharmacology, the kind of computation required to fully model complex systems such as the human body, or to compare large amounts of complex molecules simultaneously, is today outside of what is feasible for any researchers or companies. With quantum computing, it might be both possible and easy to compare millions of molecules and their attendant reactions

simultaneously, something which could speed up drug discovery in a way difficult to imagine today. In a similar fashion, the kind of VR you can engage with today is still cartoonish, as rendering a fully lifelike world would demand far too much from contemporary computer setups. With quantum computing, these limitations are lifted. The plane you conjured up in the example above can now be rendered in exact, lifelike detail. Every rivet will be visible, and you will be able to enter the plane and test the difficulty of overhead lockers, not to mention shifting around seating orders and inhabiting every seat with a perfectly lifelike avatar. That virtual factory? It will now look and act like a real factory, complete with natural-looking oil spills on the floor and sweating workers trying to get a piece of machinery to work.

Taken together, these technologies will not make innovation automatic, but they will augment the power of innovators to work with their ideas to a level that will feel like a set of superpowers. They can also open up brand new vistas for organizations, that can draw upon more of the ideas already existing in them and enable collaboration around innovation on new, and newly empowered, platforms. It also has the potential of creating more democratic innovation, as the costs of exploring ideas and showcasing the same go down in a radical fashion. If everyone in the organization can try out new ways of working, and show their managers why their ideas would work by way of lifelike simulations, a great deal more innovation power can come to the fore.

SUSTAINABILITY AND SLOW INNOVATION

As stated above, there are indications that innovation might accelerate in quite a massive way in the future. That said, we should also consider whether the future of innovation lies in slowing down and becoming more measured and considerate. We should by now all be aware that there are not one but several mega- or gigatrends in connection to this that will affect society as a whole and through this innovation.

The first, and most obvious one, is *global warming* and the many attendant phenomena this has or will give rise to. If we are to survive, as a species and in something akin to the civilization we have established,

radical change is needed. We have for too long lived with the unspoken assumption that any kind of innovation is good innovation, and this has led us to waste money, material resources, and cognitive power that could have been used elsewhere. As an example, consider the attempts by several startups and corporations to create a laundry-folding robot. In one case, that of the Laundroid (see Rehn 2020a), more than 100 million USD was invested in a startup that in the end failed to even deliver on the promise of easing our laundry-folding woes. This can be inquired into from several perspectives. Does the world, in the state it is in, need to solve this "problem" technologically? Was there nothing more important that the amount of money and expertise that went into the Laundroid could have been used for? The champions of innovation might here point out that innovation trajectories can often be complex, and that there is a chance that, for example, some innovation discovered in the creation of the Laundroid might later bloom into something far more impactful, and this is a fair comment. Yet this does not take away from the fact that as global warming is turning into an existential crisis for humanity, we may not be in a position to gamble quite so freely with our limited resources as we have done up until now, and in the studies I have done about the Laundroid there seems to be little if anything in the way of positive externalities. Hope may spring eternal, but hope alone cannot save the planet.

The second crisis that innovation needs to address is the evermore problematic issue of *resource depletion*. Our current global system is such that we are overusing most planetary resources, and in many cases do not at current have feasible ways of switching these out. The resources most discussed today tend to be fossil fuels, pointing to the critical issue of energy. Here, again, innovation is something of a double-edged sword. Many forms of innovation are energy-intensive, but innovation can also aid in the conservation of energy, and this discussion has already been quite robust in innovation research (see, e.g., Adams et al. 2016; Suchek et al. 2021), and we are already seeing impressive progress in a transition toward green energy. A far less discussed resource-issue is that of materials that tend to be understood as mundane and plentiful. We may seldom discuss the connection between innovation and water, but the fact remains that without potable water, most other conversations are pointless. With massive urbanization has come critical issues regarding how we

can keep up water infrastructures, and ensure continued life on our planet. Twenty-one of the 37 biggest aquifers on the planet were already in 2015 past their "sustainable tipping point," i.e. drying out (Richey et al. 2015), with obvious ramifications for the global food system. Another, possibly more surprising depletion event is occurring in sand. While it to a layman might seem impossible that there could be such a thing as a sand shortage, with deserts and beaches seen as endless reserves, the fact of the matter is that sand shortage, with sand being the planet's second-most used resource after water, is becoming a crisis event. The issue lies in the fact that much of what we normally call sand cannot be used for the purposes it today is: construction, glass manufacture, and the production of, for example, silicon chips. Desert sand, for instance, is not coarse enough to be used in making cement and other critical infrastructure, making a radical shift toward a circular economy needed, in particular when it comes to the built environment (cf. Torres et al. 2021). The issue doesn't become rosier when we consider less common raw materials. Rare-earth minerals, with lithium as the best known of these, are as their name indicates rare. They are used in basically all electronics, their mining is often highly non-sustainable, and they are very difficult to replace. Something similar could be said about helium, which has been called the world's only completely non-renewable resource, and one that we are wasting at alarming rates. To most people, this might seem like a non-issue, as helium is famous for balloons and little else, but in reality it is a critical resource for our modern world. It can act as a super-coolant, and is important for things such as medical apparatuses such as MRI machines as well as the aforementioned quantum computers, which all rely on liquid helium-cooled superconductors.

A third crisis refers more to social sustainability, but is also linked to the two above. The issue of *social inequality* may at first glance seem somewhat further removed from the above-mentioned innovation issues, but I would contend that such an assumption would be mistaken. There has been a long tradition in innovation thinking of assuming "trickle-down" effects, so that an innovation initially is only used by the wealthiest, most novelty-seeking individuals or organizations, and in many cases this has held. Computers, the car, electric light, the television, and refrigeration are all cases where the early models were expensive luxuries, but

today seen as necessities. That said, there are no guarantees that this is a process that will always occur, and in addition we have over the last decades seen that despite what some in the innovation industry have referred to as a golden age (by any other name) of innovation, many have not seen their socio-economic standing change in anything like a positive way. On the contrary, a number of commentators (see, e.g., Klein 2020; Piketty 2014, 2020) have remarked on an increased polarization even in affluent Western countries, where the middle class is being hollowed out and where structures of privilege have ensured that innovation increasingly benefits the few, rather than the many. Contemporary innovation has been a boon to the urban elite I myself represent, where I by pressing a few buttons on my iPhone can get people to deliver an ever-expanding universe of goods to my door, yet done little to ease the life of, for example, poor pensioners, who may not even be able to afford the smartphone that I see as an utter necessity. With some of the latest business model innovations acting as a way to establish digital serfdom, this trend looks unlikely to end anytime soon. Here it should also be noted that despite a tremendous amount of the innovation conversation focusing in particular on the younger demographic, the main aging trend is not a question of more and more young people crowding the economy, but rather the general graying of society. Here, again, innovation literature has been achingly slow to respond to a clear trend that has been evident for several decades, and where costs for care and often insufficient pension systems are setting many societies up for very challenging decades to come.

All three of these cases, which deal not with great future potential but actual and increasing limitations, may force the hand of future innovation, in various ways. It is self-evident that the carefree innovation for the sake of just creating more stuff cannot be sustained. Innovators will need to pay far more attention to what the environmental impact of their innovations are, and societies need to develop robust conversations about what kinds of innovation should be encouraged and supported. Whereas the augmented innovator of the future might have a virtual lab with unending possibilities, they will also need to think long and hard about whether and how their creations can be produced in a world with limited resources, and be quite sure about the ways in which these resources can be re-utilized at, for example, a product's end-of-life. Further, innovators

will need to understand that the socio-political context innovations are introduced in, and consider whether there might be more deserving audiences and more pressing problems than those that the urban elites face.

All this will require *slow innovation.* Not in the sense that innovation processes *per se* need to be slowed down, but so that our innovation thinking becomes more considered and capable of thinking beyond the moment of commercialization. Life in the Anthropocene forces us to think not in the weeks it takes to prototype, or the months that it might take to create an innovation, but in decades and generations. Life in a complex world also makes it an imperative to think about true diversity and inclusivity, rather than about how one best can sell yet another gadget or service to a middle-aged, white professor in central Copenhagen. This might sound like the pessimistic cries of yet another Cassandra, but this would be a most mistaken reading. This kind of slowing down, this kind of focus on greater care and consideration might be exactly what innovation needs in order to be something more than the rote production of novelties. This might be what breaks a flawed innovation ideology and enables us to transcend simplistic models of the economy and innovation.

DIVERSE INNOVATION REGIMES AND THE GEOPOLITICS OF INNOVATION

For much of its history, innovation has been a story of white men inventing and commercializing novel technologies and ways of doing business, with other white men being the assumed primary users and consumers. This state of affairs has been supported by Western nations, Western ecosystems, Western innovation agencies, Western entrepreneurial finance, and Western media, to just mention a few. Yet, as, for example, Abhinav Chaturvedi's chapter (Chap. 15 in this volume) shows (and, in a somewhat different way, the chapter by Sine N. Just and Sara Dahlman, Chap. 14 in this volume), much innovation occurs outside of these Western networks of privilege. In fact, as Martin (2016) has remarked, one of the key challenges for innovation studies is to break with the sclerotic

tendencies of the field and start seeing both the innovation that happens in the "dark" parts of the world (here not seen as a colonial term, but as that which has been overshadowed by the focus on Western innovation orders) and to make the field truly global.

This, however, is challenging in several respects. Not only are most successful and popular innovation scholars situated in the West, the very ontology of the field has a bias that marginalizes alternative innovation regimes. Much of what is written about innovation carries with it a set of assumptions regarding the necessary structure thereof—triple-helix structures (Leydesdorff and Etzkowitz 1998), Western notions of entrepreneurial finance, diffusion models with wealthy early users (Rogers 1962), and so on. What this has created is a field where alternatives to the simplistic view of the market economy have been systematically silenced. One possibility for the future of innovation might thus be the emergence and ascendance of one or several alternative innovation regimes challenging the hegemony of contemporary innovation thinking. Such challenges aren't necessarily just geographically driven, but might also be defined by alternative ideological world-views, or simply novel experiments in the ways of creation.

The first emergence might be that of *new innovation geographies.* This clumsy phrase is meant to draw our attention to the fact that the future might not be built in Palo Alto, no matter what the innovation bros (cf. Chang 2019) think. For too long, the notion that innovation will only flourish in advanced Western economies, or localities that mimic these, has plagued the conversation about innovation. What this has led to is a classic case of colonization—we might as well coin the phrase "innovation colonization" here—where many actors have either an investment in or confusion about what innovation needs to look like. For too long, the notion of Silicon Valley (and the numerous clumsy attempts to copy this unique setting) has loomed over innovation thinking as the one right setting for innovation. Looking at the new, global world of innovation, several things stand out. One, not all structures will be as driven by hard capitalist logics. Looking to the Nordic countries, which always do very well when indexes about innovation are tallied, we can see that a more collaborative, social logic can work just as well. In the Nordics, systems such as social security, free healthcare and education, and strong

innovation support from the government have created an innovation landscape that actually outperforms more capitalist systems such as those in the US and the UK. It turns out that when people do not have to worry about affording basic necessities such as health- and childcare, their creative faculties can have freer reign. Companies such as LEGO and IKEA can keep innovating, drawing part of their innovation capabilities from the supportive social structures of their native countries.

In quite a different way, countries such as China and India are showing not one but several pathways toward the innovation of the future. Whereas the dominant innovation logic of the Western countries has been one of competition "red in tooth and claw" (as depicted by Tennyson and Marx), we are increasingly seeing more collaborative and supportive structures emerging in countries less Western. While the dream of ubuntu innovation (from the Nguni Bantu term) might not yet have made its ascendance in Africa, we can already see that China is developing innovation regimes that are markedly different from those we have been familiar with by the Western innovation discourse. Consider the aforementioned Shenzhen (Hu 2020; Nylander 2017). Here, companies are spitting out endless varieties of whatever the market seems to be keen on, in neither direct competition nor strict collaboration with others. Rather, we can in the region see something akin to an organic response to environmental demands, a kind of accelerated evolution which accepts that much of what is produced will fail and be wasteful expenditure (cf. Bataille [1949]1988), yet this is seen as part of the cost of doing business. A teeming, roiling innovation Petri dish, less occupied with SEO and marketing strategies than simply spitting out what might be desired down the line. Both China and India are examples of innovation ecosystems that care far less about stability (a most Western preoccupation) than about whether they are working fast enough, generating novel varieties at the speed demanded by the market. China is reacting to the Western impulse of more, now, but at the same time India is showcasing another innovation regime, one far more attuned to the market as it is, where it is. In 2005, C. K. Prahalad took his experience from being born and growing up in India and wrote *The Fortune at the Bottom of the Pyramid* (Prahalad 2005). Here he argued that the economic dynamism that existed in even those with the least wealth could actually be corralled for innovation and novel

wealth-creation. In India, there is a tremendous amount of "dark innovation" (Martin 2016) that may well redefine how we view successful innovation in the future, particularly as India is consistently showing that their own, local approach to innovation (including forms of *jugaad*, as discussed by Chaturvedi in this volume) can engender impactful change.

A second, possibly more speculative scenario is that of *norm-breaking innovation regimes*. Here, I am thinking in particular about more community-driven innovation logics, as well as the potential in alternative organizational forms such as anarchism in innovation (cf. Parker et al. 2008; Rehn 2020b). For quite a long time, the field of innovation studies has been aware of alternative innovation structures, such as networks and innovation (Benkler 2007) or open innovation structures (Chesbrough 2003). What has been lacking, though, is a more consistent thinking regarding these which would see them not as local aberrations but as regimes unto themselves. Referring to remarks made earlier, it is not beyond the realm of the possible that innovation might become radically democratized by technology, not entirely unlike the way in which the internet allowed for freer dissemination of information, for better and/or worse. With the technological wherewithal being accessible to evermore increasing audiences, the current corporate stranglehold on innovation might not so easy to uphold. We are also seeing how the potential in digital economies has created possibilities for new kinds of criminal gangs, engaging in high-tech thefts and ransomware attacks. While these often non-Western gangs aren't today engaging in much beyond criminal innovation, over time such engagements might spark new startups and technologies.

We should also be aware of the possibility that *a new geopolitics of innovation* might emerge. The rise of the innovation regime we have at current was to a great degree driven by globalization and friction-free supply chains. As I am writing this, several things have emerged to challenge this. The coronavirus pandemic of 2020–2022 showed the fragility of our globalized system and created global disturbances in transportation as well as shortages in several critical supply chains. Geopolitical disturbances such as Brexit, isolationist policies in general, and Russia's war of aggression in Ukraine has exacerbated these issues, with the full global consequences being quite difficult to predict. While the geopolitics of

innovation for a long time has been one of increasing openness and collaboration, it is not beyond the realm of the possible that we may see more and more walls between, for example, national innovation systems—with the attendant challenges this might bring.

We thus need to learn to think about innovation in a manner that is less Eurocentric, less attached to the innovation systems we are used to, and more open to novel forms of innovation as well as new forms of innovation barriers. While a new geopolitics of innovation might bring with it various kinds of creative destruction, some of which might hit our current, Western economies, there is much to be said for rise of new innovation economies. Innovation thrives on diversity, and our current innovation context is still sorely lacking in diversity, equality, and inclusivity. Maybe new, norm-breaking innovation systems, from countries we today write less about in innovation journals, are exactly the kind of disruption that we need.

WEIRD INNOVATION: THE NEW NEW THINGS

As I indicated at the very beginning of this chapter, the future is unknowable and it would behoove us to remain very humble in the face of the same. I have so far indicated various possibilities, all of which I see has having a high probability to have a big impact on innovation in the future, but I am more than aware that I may be completely wrong. The triumphalist notions of augmented innovation I outline above might be scuppered by unforeseen technological problems, or by repressive politics, or a toxic mixture of both, or something else entirely. The idea of a slower, more measured innovation I lay out as a possible scenario may be made completely redundant by sudden and surprising developments in technology that ensure endless free energy and resources for all. It might even come to pass that the Western hegemony over innovation continues, and that there is no great diversification, just more of the same. I see none of these possibilities as particularly likely, but it would take a far more arrogant man than me (even though I am a full professor, and thus know a fair bit about arrogance) to completely deny these possibilities.

We should also be aware of the fact that even if the scenarios I've outlined here would be relatively close to the actual state of the future, that doesn't mean that everything pans out as predicted. I have in the above not discussed the many kinds of externalities that these futures also might engender, and which might complicate the innovation situation. Take, for instance, the way in which augmented innovation may shape the future. In the future I envisioned above, technologies such as AI and the metaverse were presented as enabling better innovation in the future, giving us superpowers. That is only one side of the story. I have recently started to talk about the phenomenon of "long bias" in algorithmic innovation logics, by which I mean the capacity, for example, AI-powered systems to create long-term skews in innovation trajectories. Much of what today is written about biases in AI deals with errors that can be detected in the here and now—faulty categorizations, erroneous exclusions, and so on. When it comes to innovation, the actual results of a biased decision (e.g., to fund one research project and not another) might not be detectable in years, and in some cases will remain speculative. Consider, for instance, the decision to fund the initial ARPANET, which directly led to the development of the internet. Had that decision not been made, we might still have gotten networked computers, but the trajectory could have looked very different (and developed a lot slower). As we move toward more and more innovation being affected by algorithmic logics, we may thus be blackboxing (Latour 1999) a lot of potential developments, and not even be aware that we are missing out, or stuck in algorithmically generated suboptimal path dependencies and dominant designs (cf. Anderson and Tushman 1990).

Something similar lies as a potential in what I above called slow innovation. While the idea of a more measured and considered innovation might seem sensible and even necessary, we should be aware that there here lies a risk of what we might call "seriosity bias." The term might sound strange, as we normally work with the assumption that we should aim for being serious rather than frivolous. In innovation, however, this simple logic might be misleading. Seriousness is a culturally and therefore historically defined category, and therefore tricky to use with regard to emergent phenomena. Consider video games. The first video game was hacked together by an enthusiast and played on what was supposed to be

a machine for research (the PDP-1). For a long time, these games were considered a frivolity, a silly and childish marginal phenomenon. Today, video games represent a 200 billion USD market and have led to various other business developments such as gamification. In a similar manner, the first steam engines were considered toys for idle gentlemen to experiment with, and were long considered frivolous technology without serious applications. In fact, innovation often seems to follow a path where it starts out as a non-serious experiment, developing into something akin to a toy, and only slowly progresses to actual serious use. A mindset that only aims to innovate in the "serious" realm might thus sabotage many innovation trajectories by not allowing sufficient frivolity.

This is a complex way of saying that we simply do not know. The future, even when we can guess at some of its probable paths, is exceedingly likely to surprise us. In fact, the one thing we do know about the future is that it will look different from how we think it will, as this has always been the case. With innovation, the case is weirder still. Here, we can only look to the genius of Arthur C. Clarke, who used science fiction to peer into the future. We sometimes speak of his three "laws," cobbled together from various of his pronouncements, and they represent a guide as good as any for the weirdness of innovation's future:

> *Clarke's First Law:* "When a distinguished but elderly scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong."
>
> *Clarke's Second Law:* "The only way of discovering the limits of the possible is to venture a little way past them into the impossible."
>
> *Clarke's Third Law:* "Any sufficiently advanced technology is indistinguishable from magic."

So, for a vision regarding the space mining, hyper loops, and synthetic biology that I mentioned before, do visit your local bookstore and buy new releases in science fiction, as well as some of the classics. Never hurts.

THE MANY FUTURES OF INNOVATION

So will there be innovation in the future? Most certainly. Great and small, fast and slow, serious and frivolous. Rather than speaking of a singular future, we should think in multiples and pluralities, and cherish the unknowability of the future. What I have suggested here should only be seen as food for thought, some preliminary trajectories into the great unknown of innovations yet to come… It's going to be a wild ride.

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