

AFTER THE PANDEMIC: CYBERNETIC SYSTEMS AND AN APPROACH TO THE FUTURE

THE SIR ROBERT GARRAN ORATION

Delivered by Professor Genevieve Bell – Australian National University – at the 2021 IPAA National Conference held in Brisbane (and online) on November 29th 2021.

Future: a period of time following the moment of speaking or writing; time regarded as still to come. Oxford English Dictionary

Futurist: one who studies and predicts the future especially based on current trends. Oxford English Dictionary

It is an uneasy feeling to take up the mantle of the Garran Oration. Unlike many who have delivered this Oration in the past, I did not know Robert Garran. He died long before I was born. And yet he has shaped much of my world. I am a citizen of the Commonwealth he helped architect; I live, as I did as a child, in the city he helped build; and I work at a university he helped imagine and then see established. (I did once briefly work in the Public Service that he helped create but I was younger then and should be forgiven that trespass). And of course, my predecessors in this Oration span the highest levels of Australian politics, government, industry, and the judiciary, and all of them had something weighty to say about the future, and about the unique role that the public service has to play in delivering it.

In this, the 2021 Garran Oration, I too want to talk about the future and how we might approach it, as citizens and as public servants. But to be clear, although I am sometimes called a futurist, this is not a series of predictions or assertions about particular futures. Rather this Oration is a meditation on the shape of the future, and the tools and approaches we might need to cultivate in order to succeed in it. It is safe to say, my take on the future owes much to my training as an anthropologist, and to the time I have spent in and around large multinational technology companies in America's Silicon Valley. For all its many faults, including a sometimes-wilful denial of the past, I have come to appreciate the American orientation to the future, as a space of reinvention and possibility. However, I have also come to believe that this space of possibility must be approached deliberately and with purpose. I have come to think that approaching the future requires two simultaneous actions.¹ Firstly, one must seek to tell stories about the future, stories that motivate and inspire and challenge, stories connected to the present and the past, while offering a different path forward; and at the same time, one must actively disrupt the present to make those futures more than just stories. Put another way, we have to invest in the tools and conversations of the present as much as we do in those of the future."

In the final months of the second year of a global Pandemic, we stand in a curious moment. There is hope, certainly, about life after COVID-19, and often wishful thinking. But sometimes it can just feel

¹ Bell, G. (2021). Touching the Future. In A. Hay (Ed.), *Griffith Review 71: Remaking the Balance*. Griffith Review. pp. 251–263

like the future is on hold— out of focus, distant. After all, during the Pandemic, the passage of time has not followed familiar lines: seasons have unfolded and still, for many, it has felt like the same day has repeated over and over again.² That said, COVID-19 is no longer entirely unknowable or unknown; it has touched all of us, and shaped and reshaped our bodies, our homes, our families, our daily lives, our communities, our schools, our companies, our cities and even our governments. It has impacted our ideas about data, privacy, borders, danger, vaccinations, regulations, and even public health officials. And whilst the headlines might be the same, the lived experiences of COVID-19 globally are multiple and varied.

Here in Australia, we have endured a patchwork of lockdowns, restrictions, and border closures, as well as a protracted period of virus suppression, sustained social and economic safety nets, and even now, as we report belated but enviable vaccination rates, not everyone here feels safe or unencumbered. Exactly how things will unfold in the months and years to come are harder to ascertain notwithstanding our assertions of a post-COVID new normal.

We have done much in our various presents to ensure that there is a post COVID-19 future. We have invested in vaccines, health care workers, civic society, social systems, and government policy. And the lessons we could draw from this period might help inform public policy, regulation, and standards, as well as future state, national and private investments in everything from infrastructure to training. Yet despite the rhetoric from politicians and businesses alike, there remains a lack of clarity about what a post-Pandemic future could or should be. Or perhaps more precisely, there is an unwillingness to contemplate a different future than the one we were headed towards before the Pandemic. In my mind, we have the opportunity in this particular moment, to do more. To get beyond the catchy taglines and predictions about our future and instead to develop a coherent point of view about the future and how we might want to approach it.

The future of work. The future of the office. The home of the future. The city of the future. Future thinking. Future state. Future generations. Future directions. Speculative futures. Dystopian futures. Prospective futures. Future risk. Future shock. Future challenges. Future-proof. A better future. An uncertain future. Securing the future. Back to the future. Facing the future. Jobs of the future. Save our future. In the future. The future. Our future.

There are lots of ways the future is evoked – in government, politics, business, movies, and even music. What are we actually talking about when we talk about the future? Is it a place? A promise or prediction? A warning? A moment in time? An aspiration? A hope deferred or a promise made and never fulfilled? And who gets to talk about the future anyway, to predict its path, advocate for its particular unfolding or plan for its arrival?

In Western Europe, at least, the idea of the future as a point in time, not yet arrived at, dates back to the Middle Ages. Then it was closely aligned to the notion of transformation, of an individual becoming anew, in an almost ecclesiastical sense. The idea of the future as a destination, a changed state, or an active way of being is a much more recent adaptation. This latter orientation, especially as it implicates whole groups or societies, appears to emerge in the twentieth century. Some have argued that this sort of future is a product of the modern age, and its fascination with speed, change and reinvention.³ Or more bleakly, as one Australian futurist put it: “The future becomes an arena of economic conquest

² Bell, G. (2021). #COVIDTIMES: Social experiments, liminality and the COVID-19 Pandemic. *Journal & Proceedings of the Royal Society of New South Wales* 154 (Part 1). pp. 60-68.

³ Wajcman, J. (2015). *Pressed for time: the acceleration of life in digital capitalism*. Chicago: The University of Chicago Press.

and time becomes the most recent dimension to colonise, institutionalise and domesticate”.⁴ For some, the future is less a space of conquest, and more a promise that never needs to be delivered upon. I have written elsewhere about this notion of a proximate future: “the proximate future is a future infinitely postponed; when we are continually about to enter a new age, when we are continually anticipating what happens next, and when our attention is continually directed over the horizon”, and away from the seemingly unsolvable challenges of the present to a better future.⁵ This is a far cry from the ways in which Australia’s First Nations people might talk about and conceptualise the future: ‘always was, always will be’ offers a through line from past to present to future and makes clear both persistence and responsibility.

Of course, there are others who worry less about how to conceive of the future and occupy themselves with working out how to own the future. In this formulation, the future waits for the person with the best story to unlock its value or be better prepared for its unfolding. Indeed, we have always had people who told stories about the future in attempts to lay claim to it. Sometimes they charted the flights of birds to foretell specific events. Sometimes they divined meaning in the entrails of animals or the ripples in a bowl of water or the fall of tea leaves. Sometimes they published models of capital markets or populations. Sometimes they predicted coming trends in colours, food and music. Sometimes they stood on stages and delivered expansive visions of new products. Sometimes they spoke of revolution, or change. Sometimes they demanded constancy and a return to older orders. And sometimes, they wrote novels and screenplays about the future that would, recursively, haunt our imaginations and shape the way we approached that same future.

William Gibson lives in that last category. Gibson writes speculative fiction and over the years he has helped frame the ways in which we encounter new digital technologies. His works – *Burning Chrome*⁶ and *Neuromancer*⁷ – are widely credited with firmly lodging the term “cyberspace” in our collective consciousness. However, for me, it is an interview that he gave in 2003 that reverberates in my head. He was being interviewed by *The Economist* about the future, and rather than simply offer a set of predictions about new and novel technologies, Gibson said: “the future is already here, it’s just unevenly distributed”.⁸ I like to think he was not ducking the question per se, so much as offering a different way in. Gibson’s provocation suggests that the future is not a destination or an event yet to transpire, but rather is a collection of activities, encounters and even things that we can see, if we so choose. In this way, the future is knowable, even observable in our present, if we pay the right attention.

Of course, long before Gibson gave that interview, in the very places that his work was most constantly referenced, yet another attitude to the future was often on display. It was given voice by Alan Kay, an American computer scientist, at a XEROX PARC event in 1971 with the maxim: “The best way to predict the future is to invent it”.⁹ This understanding of the future has an orientation to action. The future is not waiting to be imagined, discovered, or avoided; it is being built in the present. This embodies a

⁴ Inayatullah, S. (2013). Futures Studies: Theories and Methods. In *There’s a Future: Visions for a Better World*. BBVA. p. 41

⁵ Dourish, P. and Bell, G. (2011) *Divining a Digital Future: Mess and Mythology in Ubiquitous Computing*. Cambridge, Massachusetts: The MIT Press. p. 25. Also Bell, G. and Dourish, P. (2007). Yesterday’s tomorrows: notes on ubiquitous computing’s dominant vision. *Personal and Ubiquitous Computing* 11(2). pp. 133–143.

⁶ Gibson, W. (1982). *Burning Chrome*. Omni.

⁷ Gibson, W. (1984). *Neuromancer*. ACE.

⁸ Gibson, W. (2003). The future is already here – it’s just not evenly distributed. *The Economist* 4(2). p. 152.

⁹ Gillies, J. M. and Cailliau, R. (2000). *How the Web Was Born: The Story of the World Wide Web*. Oxford University Press. p, 187.

distinctive American cultural trait – the future is a project, more closely linked to ideas of progress and technological advancement. In this way of thinking, the future is a promised land, and the present and the past are encumbrances that can be readily shed or erased. Notwithstanding the remarkable hubris encoded in Kay’s utterance, and the daily consequences of that attitude we still manage today in our dealings with and through digital worlds, there is something about the act of making the future that feels generative.

How should we be thinking about the future here in Australia, in 2021? Perhaps we should take a page out of Gibson’s book and take a moment to look around. If we did that, what pieces of the future might we find, already here, and what could we do with that knowledge? I have been thinking about this question a lot recently; looking around and hoping to catch a glimpse of a future that might help us navigate the COVID-19 present and what comes after it. And it strikes me that one of the inescapable pieces of the future already unevenly distributed in the present is not a technology per se, or a behaviour, or a demographic pattern, rather it is the inescapability of complicated systems as foundational aspects of our daily routines.

Over the arc of the Pandemic, we have seen systems as they have failed, in some way or another. We have acted together and communally to help keep those systems working; we have created new systems purpose built for the moment; and we have held our breaths, collectively, hoping that they might succeed. All the while, their interdependencies have become clearer and clearer, and so did their various fragilities and break points. Where once we just saw pieces, and rarely wondered at the connections, now the whole is on display; and we should not look away.

Ordinarily, most systems remain invisible to the general public. Prior to the Pandemic, for instance, most of us didn’t spend a lot of time pondering global supply chains, or the complex dance of delivery services, or the interconnections of state and federal regulatory frameworks. But here in Australia, over the last two years, we have seen many systems rendered in plain sight, and implicated in our everyday lives. In part, the failure of these systems is what made them visible to the public: systems that delivered food to our grocery stores, systems that delivered educational content to our children, systems that made sense of viral loads and population epidemiology; systems to obtain, certify and distribute vaccines; systems that shut down our borders; systems that spread factual news; even the systems of electricity, telephony and the internet. We saw these systems because they stopped working. For me at least, this sudden knowledge of systems sits atop other knowledge that we gained in the bushfire season of 2019-2020. That season made unforgettably visible a different set of systems – fire, water, rain, wind, smoke, fire fighters and fire safety apps, and of course climate and climate change.

If this is a bit of our future on display in the present, how should we make sense of it all? What can we say about the systems we have seen – as a category, not in their specifics. First, systems are always and already a collection of things, be they procedures, principles or objects. Second, systems implicate people, as well as technology. Third, systems are ever present and important to daily life. Fourth, systems are frequently invisible and resist easy comprehension or legibility as they are often deeply complex and complicated. Fifth, systems can and do span geographic, cultural, political, and regulatory borders.

Taken this way, it becomes easier to see that systems have been at the core of the work of the Australian public service for more than a century. Garran himself clearly understood the importance of systems and their functioning, from the Australian Constitution to the public service. Indeed,

government has both been a system, and been responsible for building, regulating, administering, securing and sometimes decommissioning all manner of systems. Of course, over the decades, the government has developed increasingly specialised functions and portfolios, even as systems were becoming increasingly dynamic, adaptive, open, interconnected, and built on and with sophisticated technologies. Furthermore, the Pandemic has been a series of society-wide experiments in reconfiguring and adjusting systems, and in having to respond quickly to changing circumstances, and in contradistinction to conventional wisdoms. There is much we should reflect on from this period. And as we look to a future rich with ever more such systems, we might need to imagine new models of engagement and governance, new kinds of critical thinking and critical doing, and new sorts of training. How do we teach ourselves to see these systems all the time, not just when they are broken?

And building on Kay's injunction, how would we approach thinking about systems, making sense of them, designing, building, securing, and stopping them again? How would we build future systems? What tools do we need? What skills? What conversations do we need to have and where would we have them? What would the role of government be in the creation, management, regulation, and security of such systems? How would we need to train, organise, and manage our workforces, and our organisations? Where would the citizen, the community, the corporation fit into our thinking?

Cybernetic Systems – a tool for the future?

Whilst it might not seem obvious, I think one of the places we might find answers is in the past. In a not dissimilar moment of upheaval and change, an approach to systems as a building block of the future emerged. That approach was called Cybernetics.

As a form of systems thinking, Cybernetics dates to the 1940s, and is strongly linked to the rise of the computer. Now for some of you, I suspect, Cybernetics is but a faintly familiar thing; this thing that you think you know, but you cannot quite place. It is a familiar stranger, or an echo of an earlier conversation. It starts in the aftermath of World War II, when the conversations were about what to do with all that computing power and data; and about what this would mean for how the world could – and should – be. It was a time when governments, universities and companies were all competing to take advantage of recent innovations. Everyone worried about the future, but also, they wondered about it. Every month, it seemed, brought new technological breakthroughs. Things that had been theoretical were suddenly possible.

Against this backdrop of febrile activity, and in lingering shadows of the destructive power unleashed during the war, Cybernetics would articulate a whole new area of study and a whole new way of looking at the world: “to develop a language and techniques that will enable us indeed to attack the problem of control and communication” brought about by the rise of new computational machines.¹⁰ For Norbert Wiener, one of the early founders of Cybernetics, computers raised unique challenges; he wondered how we might understand these new technologies and communicate with and through them. Wiener drew inspiration from the Greek word for helmsman, *kybernetes*, illustrating his belief that the science of Cybernetics would be the science of steering, or control, broadly defined.

Cybernetics was Wiener's framework for mediating the relationship between people and the new machines, and for processing the technical and other kinds of knowledge this relationship would bring forth.¹¹ For him the notion of control was especially important given the rhetoric surrounding ‘thinking

¹⁰ Wiener, N. (1948). *Cybernetics: Or Control and Communication in the Animal and the Machine*. MIT Press. p. 9.

¹¹ Wiener (1948); Wiener, N. (1950). *The Human Use of Human Beings: Cybernetics and Society*. Houghton Mifflin; Wiener, N. (1964). *God and Golem Inc: A Comment on Certain Points Where Cybernetics Impinges on Religion*. MIT Press.

machines' and the ways that early computing had already been used by the military. For Wiener, the world would become a whole new kind of feedback loop of ecological, technical, and human systems. Cybernetics argued persuasively that one had to think about the relationship between humans, computing and the biological as a holistic system. It wasn't just about theory either, it was about actively building systems, and thus building the future.

Cybernetics may owe some of its intellectual roots to Wiener, but there were others in the conversation including Claude Shannon, J.C.R. Licklider, John von Neumann, Gregory Bateson, Margaret Mead, and Jerome Wiesner. These names recall the earliest days of computing, information science, ecology, applied anthropology and technological innovation, as well as such organisations as Bell Labs, MIT, DARPA, the Institute for Advanced Studies, and the Wenner-Gren and National Science Foundations.¹² And that is just the American branch. Ultimately there would be events, all over the world, and through the years, to discuss, to debate and to iteratively evolve Cybernetics in a myriad of different ways.¹³

I find myself interested in those ways that Cybernetics remade itself and the things that it influenced and shaped – it was a point of view about the future and how to build it, never a prediction of what the future might be. It is quite possible to argue that Artificial Intelligence as a research agenda in the 1960s is a direct and immediate product of Cybernetics – it is surely in dialogue with it, even as it seeks to erase it.¹⁴ In the 1960s, DARPA was funding work that also built on Cybernetics and again pulled together many of the same players, or their intellectual descendants. That lineage brought us the internet, the space program and contemporary robotics.

And, of course, there are other descendants and other echoes. For instance, Cybernetics would travel with Gregory Bateson to California, and touch many of the founders of today's Silicon Valley.¹⁵ This next Cybernetic wave would continue to engage with the future of computing and of humanity, and it would also focus increasing attention on the broader ecological dimensions. Here it would find form with Stewart Brand and the *Whole Earth Catalog*, and also Douglas Engelbart and the internet and the

¹² These are some of the core intellectual histories of Cybernetics. Heims, S. J. (1993). *Constructing a social science for postwar America: The cybernetics group, 1946-1953*. MIT Press; Kline, R. R. (2015). *The Cybernetics Moment: Or Why We Call Our Age the Information Age*. Johns Hopkins University Press; Malapi-Nelson, A. (2017). *The Nature of the Machine and the Collapse of Cybernetics*. Springer International Publishing; Pias, C. (Ed) (2016). *Cybernetics: The Macy Conferences 1946-1953: The Complete Transactions*. University of Chicago Press; Pickering, A. (2010). *The Cybernetic Brain: Sketches of Another Future*. University of Chicago Press; Rid, T. (2016). *Rise of the Machines: The Lost History of Cybernetics*. Scribe Press.

¹³ There are a range of useful accounts of cybernetics, by the practitioners themselves and also as a series of intellectual histories. This is a relevant cross-section of the material. Ashby, W. R. (1956). *An Introduction to Cybernetics*. London: Chapman & Hall; Beer, S. (1959). *Cybernetics and Management*. London: English Universities Press; Bowker, G. C. (1993). How to be universal: Some cybernetic strategies, 1943-1970. *Social Studies of Science* 23, pp. 107–127; Elias, P. (1997). The rise and fall of cybernetics in the US and the USSR. In *Proceedings of Symposia in Pure Mathematics* 60. American Mathematical Society. pp. 21-30.; Foster, S. G. and Varghese, M. M. (2009). The planners. In: *The Making of The Australian National University. 1946-1996*. ANU Press. pp. 3–19; Gerovitch, S. (2002). *From Newspeak to Cyberspeak: A History of Soviet Cybernetics*. MIT Press; Hayles, N. K. (1999). *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. University of Chicago Press; Hilton, A. M. (1963). *Logic, computing machines, and automation*. Washington: Spartan Books; Medina, E. (2011). *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile*. MIT Press; Mindell, D. A. (2004). *Between Human and Machine: feedback, control and computing before cybernetics*. Johns Hopkins University Press; Pask, G. (1961). *An Approach to Cybernetics*. London: Hutchinson; Swann, T. (2018). Towards an anarchist cybernetics: Stafford Beer, self-organisation and radical social movements. *Ephemera* 18 (3), pp. 427–456; Vickers, M. (2015). *On the wings of light: Reflections on Cybernetics, Africa and the Wider World*. Pan African University Press.

¹⁴ Bell, G. (2021b). Talking to AI: An anthropological encounter with artificial intelligence. In L. Pedersen & L. Cliggett (Eds.), *The SAGE Handbook of Cultural Anthropology*. SAGE Inc. pp. 428–443

¹⁵ Bateson, G. (1972). *Steps to an Ecology of Mind*. New York: Ballantine Books; Brand, S. (1974). *Two Cybernetic Frontiers*. New York: Random House.

personal computer, and of course design thinking and Stanford University.¹⁶ And then there is the way Cybernetics travels through Gordon Pask and Jasia Reichardt and MIT's Media Lab to shape design, computer graphics and digital art.¹⁷ In fact, Cybernetics has been an intellectual wellspring for the twentieth century. Scratch the surface and somewhere there will be a link to Cybernetics. It was more than just an approach to the future, it was also inspiration for a multiplicity of different futures, and a toolkit to get you there.

One of the key concepts in Cybernetics that has persisted is the idea of feedback – where the output of a system is also its future input. This is a devastatingly simple insight. Whilst it predates Cybernetics, it is a concept that found new audiences through Cybernetics, as feedback grew especially important with the advent of computers and data as we know them today. Feedback was married with circular causality, which focused on reciprocal relationships between the ecological, human and technical pieces of the system. In a future rich in dynamic and adaptive systems, we will need to pay particular attention to feedback, feedback loops and reciprocities – to the ways that they are constituted and constitutive. We will need to see each system and its dynamics; not just its pieces but the ways in which they are assembled, and by whom. We will need to remember and be reminded that every system has a history and set of reasons it came to be that way. Knowing how to ask about the boundaries of a system, its interdependencies and affordances are critical skills; as is being able to determine who is erased or rendered mute or invisible in a system.

Because of its proximity to World War II and the shared knowledge of how technology in general, and computers in particular, had been utilised, Cybernetics was built on the idea that systems would require deliberate and concerted “steerage” in Wiener’s words. The debate inside the Cybernetics community was very much about how to ensure that new systems did not create further destruction. The debate would later expand to include a critique of automation, labor, universal basic income, and even capitalism. Put another way, Cybernetics had a politic, which is to say, it brought a distinctive point of view to the way it thought systems should be built. Our responsibility then is to ensure that as we contemplate future systems, we do so alive to the fact that they will embody a politic, and conscious of the fact that we can shape that self-same point of view. We should not adhere to the notion that technology is neutral and should instead encourage debate about the values in technology and the systems that would encompass them. This is as true for a regulatory framework managing electronic vehicle charging stations as it is for the next generation NBN network, or telehealth rebate schemes, among many, many other things. We will need to actively create spaces for such conversations and equip ourselves to have them.

If Cybernetics is a way of making sense of systems, and if those systems always and already include relationships between the human, technology and the ecological, then our understanding of future systems needs to be informed by those three things and the relationships between them, and Cybernetics could indeed help us approach our systems-rich future. As such Cybernetics offers a perspective that could inform a range of different practices and practitioners. Standing in 2021, the ideas of Cybernetics – of steering a technological object, of the idea of humans in the loop, and of the environment – feels hopeful and a generative approach to the future.

In this Oration, I do not propose to lay out a detailed Cybernetic systems approach for government, though I would like to extend an invitation for government to consider how such an approach could

¹⁶ Pesce, M. and Bell, G. (2018). 1968: The Year the World Began. *Next Billion Seconds*. Available at: <https://nextbillionseconds.com/2018/11/23/1968-when-the-world-began-part-one-the-pivot/>

¹⁷ *Ibid*; Reichardt, J. (Ed) (1968). *Cybernetic serendipity: The computer and the arts* (Studio International Special Issue 905). Studio International.

be useful, and complementary to the practices already at work. What I can offer instead is a perspective on the attributes of organisations that build good and successful Cybernetic systems. Which is to say, the characteristics of a healthy, vibrant cybernetic organisation.

Building a Cybernetically-informed organisation

When we launched a new School of Cybernetics here at the Australian National University in January of 2021, it felt like a tall order. This is the first new School created at the ANU in more than 30 years. It is also the first school of Cybernetics in Australia, and the first new school of Cybernetics globally in two generations. And whilst much has been written about the theory of Cybernetics, far less has been written about the organisations that do it well. So, we have been finding our way.

Our School of Cybernetics builds on the work of the Autonomy, Agency, and Assurance Innovation Institute (3Ai) inside the College of Engineering and Computer Science (CECS). I created the 3Ai in September 2017 as an experimental space in which to attempt to establish a new branch of engineering to take Artificial Intelligence (AI) safely, sustainably, and responsibly to scale. Little did I know it would become a school so quickly.

In building the 3Ai, and in launching the new School, we have learnt a great deal about how to critically think and critically do Cybernetics. We have also learnt a great deal about doing Cybernetics in this place, on Ngunnawal and Ngambri land, informed by 60,000 years of Indigenous ways of knowing, many of which are profoundly cybernetic. In steeping ourselves in the intellectual history of Cybernetics and its practitioners, there are things that seem to be especially relevant as we train our students to approach systems as building blocks of our future. In particular, there are three threads that have revealed themselves and that I want to share with you. I tend to think of them as hallmarks of organisations that will build successful systems, cybernetic systems. Let me unpack them in turn:

1. *Iterative communications.* In the 1940s and 1950s, the conversations about Cybernetics unfolded not in hours, but over days, weeks and years. Ideas were iterated. The line of inquiry wasn't always direct. In tackling the future of computing, participants discussed and debated the consciousness of octopuses and childhood development in Bali as much as linguistics and the future of calculations. Ideas flowed, accumulated and grew. In so doing, people built a body of distinctive and new knowledge, and they also built a community.

I know that sometimes feels impossible, but there is reason to believe that we need to work on iteration; to allow the space in which the right answer isn't always the first we happen upon. In the School of Cybernetics, we try to create space for the arc of a conversation to change over time and evolve. It is about making sure we have room for ideas to accumulate, cross-propagate and change form.

2. *Productive Discomfort.* As a field, Cybernetics fused maths, engineering, and philosophy with biology, psychology, and anthropology, among many others. The diversity of voices in any given room was startling. Participants in the conversations and debates came from all over the world, as well as all over the disciplinary map. They were at different points in their careers, and they had different lived experiences. It was robustly interdisciplinary before that term was in common currency. In the various accounts of the early days of Cybernetics, all make mention of just how hard it was to find common ground and even a common

vocabulary. They also make clear mention of the ways these conversations were like nothing else any of them had or would again experience.

As we look to a world rich in systems, we will need to value a diversity of voices for the productive discomforts that they generate. Building on the idea of iterative communication and community, we will also need to cultivate and recognise new kinds of leaders and new kinds of organisations. In the School of Cybernetics, we have worked hard to hold communities of diverse voices in generative conversations. It requires real work, considerable attention, and a capacity to tolerate dissonance and disagreement and to see them as sites of production. It will always be a work in progress.

3. *Strength and Grace.* The last important lesson in the Cybernetic canon is, for me at least, an unexpected one, and perhaps one that is only visible with considerable distance. One read of Cybernetics is that it failed to frame the world along its preferred lines; another read is that Cybernetics has, in fact, shaped and shape-shifted through multiple generations, and interpretations. Its impact might not have been straight forward, but its legacies are everywhere. What if the reason Cybernetics persisted is because it was a framework not a prescription, an approach not a prediction?

In a very early conversation about the work we needed to do at the ANU, one of my staff said: we should focus less on problem solving and more on question asking. These days, I think we would say we need to focus less on problem solving and more on the broad context; we should learn to ask better questions and expect better answers from ourselves and others. In our work in the School of Cybernetics, we try build approaches that we can share and that will be generative and propel others forward. We work to make space for others to carry our work forward and to change it as they go.

Our futures seem to require different models of leadership, critical thinking and critical doing, and different kinds of training experiences than those currently at hand. We need to fill this gap. We need to help citizens and organisations approach future systems, and to critically frame the role of government, industry, and civic and civil society in the creation, management, regulation, and security of such systems. I know that much like the cybernetic conversations of the 1940s, we need as many voices and points of view as we can gather together. In the School of Cybernetics, I like to believe we are doing some of that work. I hope others will join us. This is a moment for government to step in and step up.

Cybernetics is an important approach to the systems-full future, and it strikes me that there is an opportunity to reappraise and refit it for a world of twenty-first century dynamic, complex systems, and for the people who will regulate them. For the Public Service, this is an invitation and a challenge. Cybernetics is an articulation of a system with dynamic feedback loops that brings together humans, increasingly smart computing, and the broader ecological world. It is also as an approach to building such complex systems that favours many voices, unfolding conversations, and the necessity to build new knowledge.

And, much like Garran himself understood more than a century ago, I believe that whatever we build will need to move, grow and adapt. Our ideas will always end up in someone else's hands and, when they do, we need to hope we gave them enough grace and enough shape to hold the future.

Thank you.

Acknowledgements: This work builds on earlier collaborations and partnerships, and I remain grateful for those conversations, especially to Paul Dourish, and my many colleagues at Intel and in the expanding Intel diaspora. Recently, my work has centred on how to create critical thinkers and doers who are equipped to design, manage, regulate, and resist, where necessary, AI-powered systems, and I am grateful to every single one of them. This work would not have been possible without the ongoing engagement, trust and shared sense of purpose of the students and staff, past and present, of the 3Ai and the School of Cybernetics. I also need to acknowledge Stewart Brand, Rodney Brooks, Paul Pangaro, and Mark Pesce and my many other cybernetic ancestors, who live on my bookshelves and sometimes in my Twitter stream, and who are always alive in my imagination. And last but not least, my appreciation and affection for Jochen Trumpf who answered an early question on the subject of Cybernetics and has been stuck listening to it unfold with me ever since; for the remarkable trio of women, I am lucky enough to call friends and have as colleagues: Alex Zafiroglu, Maia Gould and Gabrielle Vannithone, who helped make the room for this work to come into existence in the first place; and Pat Connors who didn't get to hear this one.