

**“Resilience and the Unimaginable”  
Technology and Risk: Lessons from Japan**

**Lecture  
by**

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In 2014, the Carnegie Council on Ethics in International Affairs in New York launched a multi-year global research project to celebrate the centennial of Andrew Carnegie’s founding gift in 1914. I am the Centennial Uehiro Chair and hence the leader of the project.

The centennial project has set itself the task of thinking through how different societies face five issues we have in common:

*Citizenship and difference* — how we maintain tolerance amidst diversity, especially in global cities.

*Environment and growth* — how we reconcile stewardship of the earth with economic progress.

*War and reconciliation* — how we rebuild moral ties after conflict.

*Corruption and trust* — how we maintain the integrity of political institutions, especially against the threat of corruption.

*Technology and risk* — how we prevent the harms caused by the use of our technologies.

In investigating these themes, we have made use of the Council’s network of Global Ethics Fellows, and thanks to them we have been able to convene intensive ethical dialogues with citizens and experts around the world—in Brazil, Argentina and Ecuador, the United States, Bosnia, Myanmar and South Africa, and finally here in Japan.

It is this last theme—technology and risk—that brings us together here tonight at the Uehiro Hall in Tokyo. I want to express my gratitude to *Mr. Uehiro*, President of the Foundation and to *Noburu Maruyama* for their unfailing support.

Let me now turn to our theme: technology and risk, learning from the Japanese experience.

Modern technologies empower and enable a global society's ethical dialogues: thanks to cell phones, the Internet, international air travel, and the vast division of labor that links us together, we are able to learn from each other, confront our differences and overcome them through co-operation and dialogue.

If we share technologies, however, we also share their risks: cyber-war, nuclear meltdown, nuclear Armageddon and global terrorism. Just as our technologies bring us together, they can make victims of us all.

In the last fifteen years alone, global society has lived through three moments of unprecedented risk: the terrorist attacks on New York and Washington on September 11, 2001; the global financial crisis of September 2008 and the Fukushima nuclear accident and tsunami of March 2011.

I want to emphasize the technological element these events have in common: in the first, sophisticated screening and intelligence systems failed to prevent a mass casualty attack; in the second, digitized economic modeling and advanced analytical tools failed to warn regulators of the build-up of instability in the global economic system; in the third case, advanced safety technologies failed to prevent a serious nuclear accident in the wake of a tsunami.

We trust technologies to deliver us security, reliability and predictability. When they break down, they pitch us into an unimaginable world.

In this talk, I want to examine what these experiences of the **unimaginable** do to our trust in expertise and institutions and to our confidence in the future of advanced technological society.

Next, I want to ask what we can learn about human **resilience** here, from Japan's experience of tsunami and nuclear accident.

Two words, therefore, are at the heart of my talk tonight: resilience and the unimaginable.

By unimaginable I do not mean unthinkable. They were *not* unknown unknowns. They were thinkable, even predictable but it was impossible to imagine them actually happening.

It was conceivable that terrorists might fly planes into buildings but when it happened it was as if a caesura had opened up in time itself. In Japan, when a fifteen meter tsunami triggered a nuclear accident, the ensuing devastation opened up a similar rupture in time.<sup>1</sup> In the global financial crisis of 2008—the Great Depression provided chapter and verse for what might happen—but when Lehmann Brothers went down and pensions, savings, salaries and life-chances collapsed, we were stunned.

These experiences of the unimaginable deserve to be thought about together. Taken together, they have inflicted a metaphysical blow on our sense of continuity in time, our existential security and our trust in institutions.

Historians—and I was trained as one—will remind us, however, that the unimaginable is how the future *always* arrives. Our anxieties about time are nothing new. The present has always been shapeless, strange and frightening to those who live it. It's only in retrospect, looking backwards that history ceases to be chaotic and assumes, through analysis and reflection, a discernible meaning.

This is reassuring, as far as it goes. Yet it seems to miss what is new about our situation.

First, we are managing man-made risks that have never existed before, nuclear energy, climate change, global terrorism. Second, our technologies—nuclear, chemical and biological—could obliterate all life, so the stakes are higher than before and the price of our failure to take action in time might be human existence itself.

What's historically new also is that while our predictive capacities keep improving, our capacities to act in time do not.

It's not for lack of trying.<sup>2</sup> We used to leave future prediction in the hands of amateurs--religious zealots and political visionaries—but 21<sup>st</sup> century societies have turned the future over to professionals. There are risk managers everywhere, deploying lessons learned from disasters large and small, and employing probabilistic algorithms to make the banking systems we use, the buildings we work in, the airplanes we travel in more secure. Banks and investors consult 'country risk' professionals before placing their financial bets; architects and engineers consult with seismologists to ensure that their 'design basis' anticipates future ground motion; the engineers who build levees and seawalls consult with meteorologists about extreme weather events; actuaries price every conceivable type of risk for insurance companies. In the political domain, every foreign ministry of any size has a policy-planning unit whose job is to sketch 'over-the-horizon scenarios' for decision makers. Every country's intelligence agency tries to

detect the signal in the midst of the noise, the gathering crescendo of impending attack.<sup>3</sup>

These professionals must be doing something right, because so many risks are successfully averted. For example, there has not been a mass casualty attack on the US 'homeland' since 9/11. Thanks to good risk management, there are plenty of dogs that haven't barked.

Still the paradox remains: despite the increasing sophistication of our predictive techniques, the future keeps arriving in unanticipated form.

What does it do to us, I want to ask, when risk management keeps failing to prevent the grand catastrophes of our time: the cataclysmic terrorist attack, the nuclear meltdown, the global financial crash? What does it do to our trust in institutions, our faith in technology, more broadly, our faith in the future?

To ask these questions is to answer them: we trust government less, suspect experts more and have less faith that the future will turn out well.

In the broadest sense, the battering we have received at the hands of the unimaginable makes us more fearful, more pessimistic about the world's chances of survival and more fixated on ourselves alone, saving what we can for us and our children.

A 'risk society', as the German sociologist Ulrich Beck was the first to call it in the 1980's, is one whose political ambitions are reduced to preventing the worst.<sup>4</sup> A risk-averse political horizon promises security at a price: not only more surveillance, but also a loss of confident daring.

Risk societies are not hopeful one. Opinion polls tell us that the global middle class public—now numbering in the billions-- is less optimistic about the future than at any time in history.<sup>5</sup> We may be living longer and there may be more of us enjoying prosperity,<sup>6</sup> but we do not feel more confident about the future. Thanks to the unimaginable, a moral tone of anxious disbelief ripples through our politics and public life. We live in a faithless moral environment: deluged by alarming information but without the faith in science and politics to believe that public authority can prevent the worst.

Societies that do not trust their governments, their experts or their sciences of risk have a greater chance of becoming unstable than those that keep faith in public reason. Frightened and disoriented people may be tempted to succumb to prophets of doom or false purveyors of salvation; if people are sufficiently frightened by the times they live in, they may be tempted to embrace authoritarian solutions; their leaders may seek conquest or aggression as an outlet for frustration. People that have lost faith in the capacity of deliberative public reason to avert the unimaginable may wall themselves

away from a runaway public world and allow the social fabric to decay. Societies that lose faith in their collective capacity to solve their most pressing problems are societies that run the risk of collapse.

## II

I have laid the gloom on thick for a reason. Pessimism is not a prediction it's a heuristic. We need to spell out worst so that we can avoid it. There are alternatives, better ways to anticipate the unimaginable *together*—let me stress the word—and help us to be more resilient when, despite our best efforts, the unimaginable does occur.

Japan has valuable lessons to teach us about resilience. Since 1945, it has recovered from apocalyptic military defeat, the detonation of two nuclear weapons, a mass casualty terrorist attack in a subway, and four years ago, a tsunami that killed 20,000 people and triggered a major nuclear accident.

The catastrophe of 2011 unleashed a heart searching discussion in Japanese society: a spate of official reports, discussion in the press about why Japanese institutions were taken unawares, searching inquiries about Japanese character and its political system. This debate is ongoing but it offers real insights for outsiders.

The first lesson—evident in the magnificently angry and eloquent commission report, authored by a team led by Professor Kiyoshi Kurokawa—is that the very phrase—the 'unimaginable'—is a moral excuse. When spokesmen for Japan's 'nuclear village'—the collusive tribe of regulators and operators who created Japan's nuclear industry—said the nuclear accident was '**soteigai**'—unthinkable—the beleaguered Japanese public reacted with fury.

There had been plenty of warning after all, that Japan's seismic volatility put their nuclear systems at risk. The Kobe earthquake of 1995 and the East Asian tsunami of 2004 should have made risk managers review every feature of a nuclear plant built at the water's edge, with its back up generators at sea level. The 'design basis' of Fukushima Daiichi did not anticipate a tsunami measuring fifteen meters. Tepco, the operator and the government regulator failed to ask obvious 'what if' questions and did not move back-up power generators and control equipment to higher ground. When the tsunami hit, the most devastating—but also the most easily anticipated—consequence was 'station blackout', the loss of all electrical power.<sup>7</sup>

If the unimaginable is an alibi, the right response is to attribute responsibility. A succession of official reports has done just that: condemning 'regulatory capture' and a collusive 'mindset' among operators, regulators and politicians. If this was a disaster 'made in Japan', it surely isn't the only society where the pathological intertwining of political and economic power has harmed the public interest.

The same conclusions—reject the unimaginable as an excuse, allocate responsibility for mistakes and get rid of the negligent and collusive—ought to have been applied after 9/11, Hurricane Katrina and the financial crisis of 2008—but they have not been.

In all of these cases, a failure of imagination amounted to a failure of moral, political and legal responsibility. No matter how diffuse the chain of responsibility in the divisions of labor that characterize advanced societies like ours, we need competitive and competent institutions—courts, regulators and free media--capable of establishing liability, exposing negligence and punishing it, down to the individual level.

What are the lessons to be learned? In Kiyoshi Kurokawa's words, we can't be safe with high risk technologies unless we have:<sup>8</sup>

“. . . the muscles of a vibrant civil society: diligent regulators, honest bureaucrats serving for the people. . . activist prosecutors, alert legislators, courageous whistleblowers, relentless journalists, independent academics, thriving NGO's, and above all, ordinary people who vote.”

A second lesson from the Japanese experience is that risk expertise has to be democratized; it can't be delegated to experts alone. If risk is not binary, i.e. if there is no red line between safe and unsafe, only gradations on a scale, then security is in the eyes of the citizens in whose name risk prevention is exercised. They have a right to the knowledge they need to figure out whether they are being told the truth. Democratic accountability and public disclosure may not be perfect antidotes to corrupt and collusive indifference by regulators and operators, but they are the only effective tools we have.

As disasters always do, Fukushima has legitimated counter-experts, skeptics and activists who were dismissed as amateurs by the 'nuclear village', but whose self-taught researches into seismology, nuclear design and tsunamis sometimes proved more reliable than the experts. These 'counter-experts' have earned standing--the right to be listened to—about the future of energy policy and nuclear power in Japan.<sup>9</sup>

Right now, these 'counter-experts' have won temporary injunctions to prevent the start-up of local reactors and leaders of the campaign have made no secret of their ultimate strategy: to use legal challenges to delay the return to nuclear for long enough—a decade perhaps—to force Japan's big companies to move away from nuclear into renewables.

The counter-experts point out that Japan is now producing base load power entirely without nuclear, and they hope that the days of nuclear are numbered. They are hoping that the more open the debate, the more public the discussion, the less likely Japan will decide to remain on the nuclear road. An accident like Fukushima has cost the nuclear

industry standing and nuclear opponents have gained some leverage over the public agenda.<sup>10</sup>

Under public pressure, Japan has moved to create regulators independent of politicians and operators alike; mandatory re-design of nuclear facilities to guarantee that loss of power can never happen again; a public commitment to smart grids, a break-up of regional energy monopolies and a more balanced energy portfolio, with less nuclear and more renewables.<sup>11</sup>

Japan's 'nuclear village' still dominates the economy and politics of Japan, yet the village now confronts a society deeply uncertain about whether the risks of nuclear can still be run.

The ultimate outcome of the Japanese struggle between the nuclear village and the counter-activists will have a global impact. There are 440 nuclear plants in operation worldwide, with seventy more under construction. After Three Mile Island, Chernobyl and now Fukushima, after three unimaginable accidents, global energy systems still remain committed to nuclear.<sup>12</sup>

China is pressing ahead with nuclear, driven in part by the pollution costs of coal-fired electricity. Germany, on the other hand, is transitioning out of nuclear but is finding the going hard. Coal fired electricity generation has driven up Germany's carbon emissions and consumers have been hit with the costs of converting to renewable power. As a result, it is uncertain whether Germany will persevere or whether other advanced economies will follow Germany's example.

The ultimate outcome of the debate in Japan is still unclear, but what is gone—forever—is the public's blind faith in the safety of nuclear technology. What Fukushima teaches, surely, are that there simply is no such thing as a 100 per cent safe nuclear reactor.

What human beings create is bound, sooner or later, to go wrong. As Charles Perrow argued thirty years ago, accidents are not unimaginable contingencies. They are 'normal' occurrences in any advanced technological system.<sup>13</sup>

The unimaginable, therefore, remains permanently on the human horizon. This is not a counsel of despair, just a call to vigilance.

The most interesting aspect of the Japanese reflection on Fukushima is precisely the honest admission of the limits of regulatory reform, engineering re-design, risk management, safety training—i.e. all the public policy responses to the crisis. These limits are epistemological.

In all the Japanese reports on Fukushima, there has been a recurrent focus on “the mindset” that prevented regulators and operators from foretelling risk; the “conceptual wall” that separated those in the routine present from an apocalyptic possibility;<sup>1</sup> the ‘collusive’ mental atmosphere of mutually enforcing self-delusion in the ‘nuclear village’; the stove-piping of professional specialization that prevented experts in seismology from grasping warnings from experts in tsunamis; the deep reluctance to ask ‘what if’ questions, and then take preventive actions when the answers proved disturbing; the rigidly binary fashion in which regulator and operator understood risk, according to which, plants were either safe or they were not, and since no could admit, in this binary scenario, that there might be degrees of safety, both regulator and operator persuaded themselves, and then the public, that the plants were a hundred percent safe.

In his concluding thoughts, Yokara Hatamura, Chairman of one of the Investigative Committee’s observed with haiku-like concision:<sup>14</sup>

“Possible phenomena occur. Phenomena that are considered impossible also occur.”

“You cannot see things you do not wish to see. You can see what you wish to see.”

The bad news here is that there is no good reason to suppose these epistemological barriers can ever be overcome.

We know, from the cognitive psychologists, Daniel Kahneman and Amos Tversky, that<sup>15</sup> we are error-making machines, constitutionally disposed to misprice risk, to nod off when we should be paying attention, to hope for the best, when we should be planning for the worst. Our ‘risk management’ protocols are there to counter-act these weaknesses. On complex technological platforms like aircraft carriers, for example, naval commanders build in redundancy: since individual crew-members may forget a crucial check on a flight deck, several are tasked with the same job, to ensure that it is done right, every time.<sup>16</sup> The same principle is copied in safety systems in aircraft, nuclear power stations and other technological systems that cannot be allowed to fail: there are back-ups for back-ups, and human monitors perform the same checks over and over, to protect against the inattentiveness of any individual.

It is likely that robots will take over many of these supervisory functions, since they never get bored and never nod off. They can be programmed to adapt to foreseeable contingency, but only human beings know how to improvise when the rule-book is gone, procedures no longer work, technologies longer respond to instrumentation, systems fail to re-boot, when, in other words, the unimaginable hits us in all its dumb-founding force.



This is another lesson from Fukushima, particularly evident in the conduct of the operating crew on duty at the plant the day the tsunami hit. The Japanese journalist, Ryusho Kadota's marvelous book focuses on Masao Yoshida, site superintendent at Fukushima Daiichi and the way he marshaled his team to respond after the earthquake and tsunami swept away the world he knew.<sup>17</sup> In darkness, with no electric power, cut off from their families and the rest of the world, with no functioning instrumentation, the core operating staff of eleven men had to figure out what was wrong with three reactors, each with its own separate system failures. They had little or nothing to go on: the manuals had been washed away. They made sense of an absolutely senseless situation, drawing on decades of work in the plant, team loyalty, and a capacity to improvise. They pored through thousands of pages of blue-prints and wiring diagrams in order to find a way to restore power, using batteries they ripped out of overturned cars and buses left in the station parking lot.<sup>18</sup> They managed to hook up a rudimentary pumping system, using a fire-truck, to pour water onto exposed fuel rods, thus preventing an even worse catastrophe. To get the water onto the fuel rods, they had to enter the containment building and expose themselves to radiation, in order to open critical valves by hand. They sent older men, who'd already had their children, in to face the higher levels of radiation, protecting the younger ones from potentially cancer bearing doses. When one measure failed, they tried another; when hydrogen explosions brought roof paneling onto their heads, they kept working, for forty-eight hours without a break. When they received ill-conceived orders from the Prime Minister's Office in Tokyo to stop sluicing seawater over the fuel rods, the plant superintendent pretended to comply, but ordered his men to continue anyway. They made mistakes, but they did not panic, they did not desert their posts; they worked as a team, they did not quarrel, they improvised solutions as best they could and in the opinion of most experts, they prevented a massive radiation leak that would have jeopardized the lives and health of their fellow citizens.

Similar displays of astonishing human improvisation were on display on September 11, 2001 and at Memorial Hospital in New Orleans when Hurricane Katrina struck.<sup>19</sup>

In all of these cases, the improvisations were not random: they were framed by vocabularies and procedures learned over many decades of routine training. All the same, there is a crucial gap between what can be trained for, in normal circumstances, and what must be learned, instantly, when the unimaginable strikes.

We need to understand why people in these extreme situations do not panic, desert their posts, betray their colleagues, abandon the suffering and seek to do their best in impossible situations. We need to understand this because, if I am right, there are ultimately no fail-safe systems, regulatory oversight, robotic substitutes, no procedures that can prevent the unimaginable, and if so, when all else fails, we are left with a human quality best identified as resilience.

### III

Resilience is a like a coin rubbed bare by overuse. It will denote any denomination you care to give it. So we need to do some work to recover meanings we can actually use. The English dictionary lists two: “the ability to recover quickly from illness, change or misfortune”, then it adds the idea of ‘buoyancy’, the capacity to bob to the surface after being submerged. In the language of metallurgy and materials science, resilience refers to “the property of a material that enables it to resume its original shape or position after being bent, stretched or compressed.”

The key feature of a resilient material is elasticity. The most resilient materials are alloys, combinations of elements acting together, rather than elements acting alone. New ‘memory alloys’, developed in Germany, for example, can be bent and resume their shape millions of times.

The metaphorical implications for human conduct are obvious: we are more resilient when we act together, as a forged unit, a combination of skills under single leadership, than when we try to act alone.<sup>20</sup>

The metallurgical metaphors, however, do not always point moral meaning in the direction of solidarity. The metaphors also identify a resilient person as a pliable, shape-shifting individualist. Normally, we don’t think of such people as morally praiseworthy. They are, to use Charles Dickens’ memorable phrase, life’s ‘artful dodgers’. In this meaning, resilience may actually be an anti-heroic disposition, a capacity bend without breaking, springing back after being knocked down. Unlike defiance or resolution in the face of adversity, resilience submits to *force majeure*.

We know that human beings will do almost anything to survive, and that includes sacrificing other people in order to make it through. The Fukushima plant operators were exceptional in that they did not betray each other, but many forms of resilience are distinctly equivocal.

After World War II, some survivors of the saturation bombings in Germany and Japan made a living in the ruins as prostitutes, pimps and black market entrepreneurs. They displayed amazing resilience and we celebrate their vitality, but they may not have been all that virtuous.<sup>21</sup>

Resilience in other words, is not necessarily a moral virtue in itself. It is merely a disposition, neither worthy of praise nor blame. Indeed, we should say of those victims who fail to display resilience, who succumb to the unimaginable, and lie down and give up, that they deserve pity rather than blame.

What do we know about those who don’t give up? Child psychologists tell us that the best predictor of whether a person will develop resilience in adulthood is whether they

have benefited from a reliable, long-term, enduring relationship with an adult in early childhood. It appears that children who grow up without an ongoing, frame-creating adult presence are less resilient: major setbacks or misfortunes unravel their capacity to cope.<sup>22</sup>

Child psychology can tell us where resilience comes from in our backgrounds, but it can't predict who actually will display it when the unimaginable strikes. Those who have proved resilient in disaster often say that they were surprised, nonplussed by their own reactions.

This suggests that there is no technique or training that can make people reliably resilient in the face of the unimaginable.

Seeing resilience as a capability that is triggered by the unimaginable is helpful, but it may miss a crucial element of moral orientation towards self, community and the future.

Let us see what the Japanese language can tell us about this dimension. I am not a native-speaker and so I am taking my life in my hands in front of a Japanese audience when I venture into this terrain, but I do so for a reason: ethics are coded in language and the Japanese language has an especially resonant vocabulary of resilience.

In Japanese, as I understand it, one word is frequently used after disaster: **Ganbaru**. After the Kobe earthquake, **Ganbaru Kobe**, became a slogan of the recovery. In the dictionaries, I learn that **ganbaru** means 'working with perseverance' 'toughing it out'.

A related term, derived from Zen Buddhism, is **Gaman** meaning "enduring the seemingly unbearable with patience and dignity." A related term **gamanzuyoi** means "suffering the unbearable". Linked to this idea is the word **shoganai**, acceptance of your fate.

From this we learn that resilience is both active and passive.

The passive meaning of resilience may be the older one, the one we have inherited from Buddhist, Jewish and Christian traditions, the ones that tell us to submit to God's will.

Modern resilience, by contrast, is active, springing back into shape like an industrial alloy.

When we praise civilian survivors after Fukushima, we usually praise the active variety. Yet who are we to judge? Why are we so sure that activity is better than passivity? Doesn't it depend on circumstance? And how do we know whether someone who has been passive at one moment, may spring into action later, when we have moved on and are no longer looking?

Is it possible to combine the passive and active meanings of resilience, i.e. to bring together the acceptance of *force majeure* together with determined will to overcome?

Again the Japanese language is helpful. The literal translation of resilience is, apparently, ***Kaifuku-ryoku***. ***Kaifuku*** means returning to the original condition and ***ryoku*** is the word for power.

A Japanese student suggested to me that ***Kaifuku-ryoku*** does not capture the idea that those who are resilient possess ‘an iron core’. So for her, the right translation in Japanese is ***Orenai-Kokoro***, which means an unbroken heart.

This a beautiful possibility, but how do we square the idea of ‘the unbroken heart’ with what we said earlier?

Earlier we suggested that resilience can take both individualistic and solidaristic forms; it can be either active or passive; it can be thought of as an unconscious disposition or as an active virtue. Even when thought of as a moral choice, resilience can be expressed in defiance towards fate or shape-shifting fluidity in the face of it.

In the light of this, we need to take care when we use the word. When we praise someone for resilience, we may not actually know what we are saying.

We may not realize what a negative impact our praise of survivors’ resilience can have. Volunteers who went north to assist survivors in Tohoku region after the earthquake and tsunami quickly learned never to use the word ***ganbare***, because, in essence, it amounted to telling already burdened people to work harder.<sup>23</sup>

Once outsiders began to praise resilience, those not praised began to feel that they were being condemned. Worst of all, those who were praised felt they were being tacitly told: you’re doing fine, you’re on your own.

Resilience is a category that individualizes responsibility for survival, puts it all onto the shoulders of survivors, and can have the effect of absolving those in safety from further responsibility for those in danger. People outside the disaster zone praised the people of the Tohoku region for their resilience; invoked the farming and fishing traditions of the region, with their long-standing endurance of foul weather, blizzards and storms at sea. In an insidious, if unintended way, praise for resilience did not bring zones of safety and zones of danger together: moral approbation was an unacknowledged strategy to wash your hands of further implication. The fact that some of the civilian survivors of Fukushima were irradiated has deepened their isolation from the rest of Japanese society. They are praised for resilience, but they are also denominated ***hibakushe***, the irradiated people.

Our moral praise of individuals carries the unstated implication that those who did not survive lacked the necessary resilience. Praise for resilience, in other words, can become an exercise in moral cruelty. In fact, whether you survive a catastrophe or not usually depends not on resilience, but on chance, good luck, on where you happened to be when disaster struck. Praising resilience and identifying it as the critical survival

value also ignores the fact that survival afterwards depends, not just on personal qualities, though these obviously matter, but on public choice: how community leaders and government officials responded, whether they performed their designated responsibilities. Resilience is not the same as public responsibility and is no substitute for it.

To value resilience in the face of the unimaginable is also to say that the unimaginable *will* happen. It is to say that despite our best efforts, risk management will fail. For many experts, this praise of resilience amounts to a confession of failure, and at worst, becomes a kind of alibi to cover preventable mistakes. Praise for resilience, followed by training programs to make people more resilient, propels us, these authors argue, “onto a slippery slope towards learning to live with risks that are actually intolerable.”<sup>24</sup>

We don't have to endure the unimaginable. We can avert it. We no longer have to think of low probability-high impact events as 'black swans'.<sup>25</sup> We can prepare for them, price their risk, budget for their eventuality. What was unimaginable today may be fully preventable tomorrow. The levees that broke in New Orleans have been rebuilt to a higher standard; the back-up power of nuclear reactors, everywhere, has been moved to higher ground. In the words of the US General Accounting Office, all of the world's nuclear regulatory bodies have taken some steps to focus on “previously unimagined accident scenarios”, particularly the loss of electric power.<sup>26</sup> In the wake of the 2008 financial meltdown, banks have been banned from risk-taking that might damage the global economic system. We can learn from our mistakes. We are not condemned to repeat.

When asked whether Japanese regulators and operators have adopted his recommendations for a vigilant safety culture, Kiyoshi Kurokawa shrugged his shoulders and said with a faint smile, “It will take time.”<sup>27</sup> It is easy to hear this as a confession of failure, but paradoxically it is also an expression of confidence: in the capacity of his own society to learn and one day master its own future.

#### IV

What have we learned from the Japanese experience that might apply more generally? The unimaginable is a fact of life, but it is also an alibi. Resilience takes many moral forms, from the 'artful dodgers' to the inspired teamwork of a group under pressure. It can be active, passive, selfish and selfless; it can be learned but it cannot be taught.

Resilience rises to virtue when it expresses itself as responsibility for others. The responsibility that matters is not to your individual survival, though that counts, but responsibility for the survival of others in your community. If we become capable of this virtue, I would argue, it is because we retain hope in the future of such a community.

My claim would be that resilience is never only an individual capability, but always depends on some shared belief in a collective future worth fighting for. If there was no

such hope, I would argue, what would the point of resilience be? What would you want to survive for? No one wants to survive alone: that, surely, was the lesson of Robinson Crusoe.

There are varieties of hope, from 'hoping for the best' to 'hope against hope,' to 'radical hope' the capacity to believe in a future when all hope seems gone.<sup>28</sup> There are so many examples of this in the 20<sup>th</sup> century—from Primo Levi to Nadezdha Mandelstam and Nelson Mandela—we have plenty of evidence that human beings can cling to hope and survive in even the darkest circumstances.<sup>29</sup>

The connection between hope and resilience is easily mocked, and no one did a more loving job of mockery than Charles Dickens, in his depiction of the eternally foolish, but eternally optimistic Wilkins Micawber, the character in *David Copperfield*, who whenever faced with difficulty, liked to say "Something will turn up." Micawberish is still the word we use to deride any form of hope that seems mere hopefulness, a hope without reasonable grounds beyond wishing for the best.

The hope I am talking about is different and quite complex: it is free of hubris, and so it takes for granted, that we will not always be able to avoid the worst. At the same time, it is not misanthropic: it prepares for the worst, but does not think the worst of human beings or doubt their capacity to rise to the occasion. It is anti-utopian: while it believes that over time we can become more just and less violent, it does not have any faith that we can fundamentally change who we are as a species; it is rationalist but questions that History, with a capital H, is knowable. But it affirms that we do learn from our mistakes and that we are not condemned to repeat. This complex hope is, I believe, what underpins human resilience. It is more than a disposition, more than an inheritance from our upbringing and more than an attitude of responsibility towards others. It is also a metaphysical commitment, deep inside, usually left spoken, to the future continuity of human life itself, no matter what, a commitment best expressed by the belief that we will not only survive but prevail.<sup>30</sup> The operators at Fukushima Daiichi who saved their country from nuclear fallout and radiation did so, it seems to me, out of a deeply ingrained loyalty to their society, their community, their locale, their families and hence to the continuity of these communities through time. Thanks to this set of loyalties, they knew whom they were responsible to and for. They were quite conscious who they were working for: their people and future they hoped to open up for their loved ones, on the other side of the unimaginable. It is this hope that kept them going—and it is their example that gives us reason to keep faith ourselves with this common future we create together.

## References

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