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Reflections on Resilience in a “Black Swan” World

DAVID W. ORR

The term “resilience” is defined as the capacity to maintain core functions and values in the face of disturbance, or as a Marine Corps friend of mine puts it, “the capacity to take a gut punch and come back swinging.” However defined, resilience is an elusive concept and is a matter of more or less, not either-or, in the face of changing and often unpredictable circumstances. The long-lasting effects from multiple Black Swan events, like intersecting ocean currents, will create overlapping levels of turbulence and unpredictability.¹ However daunting, the idea that we can improve resilience at varying scales from cities to the entire planet is becoming an important part of policy discussions driven by events ranging from the global economic crisis of 2008 to the devastation of Fukushima and Hurricane Sandy.

The theoretical underpinnings of the concept go back to the writings of C. S. Holling on the resilience of ecological systems and to metaphors drawn from the disciplines of systems theory, mathematics, and engineering. Recently scholars such as Joseph Tainter, Thomas Homer-Dixon, and Jared Diamond have deepened the conversation to include historical experience and anthropological evidence from societies that collapsed for lack of foresight, competence, ecological intelligence, and environmental restraint.²

The concept of resilience is related to that of sustainability, but differs in at least one crucial respect. Sustainability implies an end state that can be achieved once and for all. Resilience, however, is the capacity to make ongoing adjustments to changing political, economic, and eco-

logical conditions. Its hallmarks are redundancy, adaptation, and flexibility, but also the foresight and good judgment to avoid the brawl in the first place.

In the section below I will discuss some of the causes of *brittleness*, the opposite of resilience.³ The subject is large and perplexing but we are predisposed to whittle it down to relatively simple issues of technology. Although better technology is certainly a large part of societal resilience, on reflection, the definition of better is seldom obvious. We do not simply choose to make and deploy single artifacts but rather we select devices as parts of larger systems of technology, power, and wealth.⁴ The plow, for instance, represented the ingenuity of John Deere, but also an agro-industrial paradigm of total human domination of nature with commodity markets; banks; federal crop insurance; grain elevators; long-distance transport; fossil fuel dependence; chemical fertilizers and pesticides; crop subsidies; overproduction; mass obesity; soil erosion; polluted groundwater; loss of biological diversity; dead zones; and the concentrated political power of the farm lobby representing oil companies, equipment manufacturers, chemical and seed companies, the Farm Bureau, commodity markets, giant food companies, advertisers, and so forth. The upshot is a high-output, ecologically destructive, fossil fuel-dependent, unsustainable, and brittle food system. Farmers did not just buy John Deere plows, they bought into a system and the resilience of that system had nothing to do with their choices.

From virtually any perspective there is little in the modern world that is resilient or sustainable. To the contrary, modernity has been about “the affecting of all things possible” as Francis Bacon once proposed in *The New Atlantis*. Progress, that most loaded of words, is defined as increasing power, wealth, velocity, accumulation, and the control of nature, devil take the hindmost. We are not so much Bacon’s intrepid, rational truth seekers but more like very clever apes tinkering in a warehouse filled with the most amazing but inexplicable things. The idea of resilience is largely alien to our cultural DNA and some argue it is not in our biological makeup either. As a result, the drive toward globalization, more economic growth, faster communication, and more interconnectedness has created a global world without firebreaks or even fire departments. As the velocity of change increases we have less and less time to reflect and mull things over. Without anyone intending it we have created an increasingly fragile and frantic house of

cards that hangs by the slenderest of ecological, energetic, social, and economic threads, but whatever else it is, it is no accident.⁵ Rather it is the logical working out of a system of ideas, beliefs, and “pre-analytic assumptions” that are deeply embedded in the Western worldview and perhaps in our genes as well. Although there are some obvious things we can do at the national and international levels to improve resilience, such measures are temporary, stopgap measures that conceal deeper structural flaws rooted in our paradigms and worldviews.⁶ We are prone to tinker at the edges of the status quo and then are puzzled when things do not improve much and even larger disasters occur. My point is if we are serious about designing and building resilience, we will face a long and difficult process of rebuilding not just our hardware and infrastructure, but the ideas and paradigms that underlie our political systems, economy, and education that have undermined resilience in the first place. Perhaps when we come to a fuller understanding of the discipline and restraint that sustainability and resilience will require of us, we may prefer, like Thelma and Louise, to go off the cliff in a blaze of glory. But if we decide otherwise, the conversation about resilience must advance from a focus on the coefficients of change to the structure of larger systems, which is to say from symptoms to root causes. Among other things, this will require revisiting earlier conversations that go back to the likes of Herman Daly, Lewis Mumford, Jane Jacobs, and John Ralston Saul, and further back in time to Frederick Soddy, Karl Marx, John Ruskin, and John Stuart Mill and others who first noticed the cracks in the hard-shell presumptions of the modern project.

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The great economist Nicholas Georgescu-Roegen, once observed that in this world governed by the laws of thermodynamics humans had a choice between a long and dull history and a brief but exciting one. Whether by destiny, accident, or choice we have taken the latter path, but we did not lack for warnings. Marlowe’s *Doctor Faustus*, Mary Shelley’s *Frankenstein*, Melville’s Captain Ahab in *Moby Dick*, Conrad’s *Heart of Darkness*, and science fiction films such as *The Matrix* are cautionary tales about the perils of overreaching, inattention, obsession, irresponsibility, and power run amuck. The sinking of the *Titanic* in 1912 provided the most overused, but dramatic, metaphor for the hubris

that underlies technologically driven society. We have been deaf to such warnings and proceeded in the faith that nature sets no booby traps for unwary societies. But any moderately well informed high school student could make a long list of plausible ways by which the human experiment could be crippled or end badly from the foreseeable consequences of its own actions.

Aside from the permanent threat of nuclear war, rapid climate change resulting from the combustion of fossil fuels is at the top of most such lists. The scientific evidence supporting that fear has grown dramatically in recent years. There is little doubt that if business as usual continues we are heading for a 2°C warming sometime around mid-century. Recent evidence suggests temperature increases of 4–6°C by the year 2100 or even sooner are possible, and perhaps likely.⁷ Somewhere along that trajectory many things come undone, starting with water and food shortages, but eventually—perhaps sooner than later—entire economies and political systems. Nearly everything on earth behaves or works differently at higher temperatures. Ecologies collapse, forests burn, metals expand, concrete runways buckle, rivers dry up, and people curse and kill more easily. Climate deniers, of course, remain unmoved by science and the evidence before their eyes, but they are doomed to occupy roughly the same group status as, say, the Flat Earth Society. More serious problems arise from those who presumably know what lies ahead, but choose not to speak about the harsh realities ahead for fear of alarming the public. As a result of both denial and evasion there is a large chasm separating the science and the public discourse about planetary destabilization now well underway. But whether we face up to it or not, we will have to contend with the remorseless working of large numbers that govern the biosphere. The long emergency ahead is caused by the fact that carbon from the combustion of fossil fuels that will stay in the atmosphere for a very long time. As a result temperatures and sea levels will continue to rise for hundreds or even thousands of years.⁸ The problem is not solvable in any way that we normally use that word. What we can do, and must do, is to head off the worst of what lies ahead by making a rapid transition to energy efficiency and renewable energy. Humans have never faced a more vexing and dire problem. But why have we ignored increasingly urgent and detailed scientific warnings for so long?

In *The History of Love*, Nicole Krauss describes villagers in Eastern

Europe who ignored warnings of Nazism in these words, “There were rumors of unfathomable things, and because we couldn’t fathom them we failed to believe them, until we had no choice and it was too late.”⁹ Much the same can be said of our own time and our inability to fathom authoritative warnings. Historian Ronald Wright describes our autism as the result of a “progress trap.” “Technology,” he writes, “is addictive. Material progress creates problems that are—or seem to be—soluble only by further progress”¹⁰ It’s an old story. “Many of the great ruins that grace the deserts and jungles of the earth are monuments to progress traps, the headstones of civilizations which fell victim to their own success.”¹¹ The problem, Wright believes, is the inherent “human inability to foresee . . . long-range consequences.”¹²

Foresight is difficult for us. We are preoccupied with the here and now. What lies beyond is confusing and veiled and so we procrastinate. We exist amid the interlocking systems of different temporal and spatial scales and live by often incommensurable and competing value systems that direct our attention to one thing while making us blind to another. The headlines report the fast news from the latest scandal to the daily jiggles of stock market trends. But the brown color of the local river reports the slow movement of topsoil seaward. The former captures most of our attention, but to the alert, soil erosion, literacy rates, and the retreating Arctic ice say much more about our long-term prospects. But as those inexorable slow variables work over decades or centuries, baseline expectations and memories of better things shift downward to a new normal and we forget what once had been. And mesmerized by ever more powerful technology, we fail to notice vulnerabilities silently multiplying and ramifying all around us.

Looking ahead even a few decades, the progress trap will lead to more problematic and unprecedented issues for which we are ill-prepared. Ray Kurzweil, for example, happily forecasts “the singularity,” when carbon-based intelligence (you and I) will merge with silicon-based intelligence (computers) to create something beyond—or below—human. Yet there is almost no inquiry into whether this is, or could be made to be, a desirable future and who has the right to make such decisions, why, and how. We are sleepwalking toward seismic and irrevocable changes in virtually everything we have heretofore regarded as fundamental to our humanity. Bill Joy, founder of Sun Microsystems, has called for a moratorium on the deployment of technologies with the

capability to self-replicate and hence displace human agency, specifically artificial intelligence, nano-technology, and genetic engineering.¹³ But any such moratorium is unlikely. We are unpracticed in foresight, precaution, and the discipline necessary to restrain and redirect our technological drive.¹⁴ The merest suggestion of technological restraint has become the modern version of religious heresy. We now have new and more powerful gods.

A still more fundamental progress trap is inherent in the dynamism of a continually growing, energy- and resource-intensive, consumption-oriented market economy. The market economy has also attained a kind of divine status worshipped, worried over, and appeased with sacrificial offerings (think Detroit). There is good reason to believe that the economy has already exceeded the carrying capacity of earth. But the ideas that there are any limits to growth or differences between quantitative and qualitative growth are still incomprehensible to most economists, corporate chiefs, bankers, financiers, managers of the economy, media talking heads, and all of the nabobs who gather to preen and be seen at the annual *séance* at Davos. Few of these or their acolytes seem to notice the accumulation of ironies piling up all about them. Since the 1950s, for example, economies in developed countries expanded by three- to eightfold, but indicators of happiness did not budge.¹⁵ Beyond some fairly low threshold we are no happier with more stuff than we are with less, but rates of suicide, crime, and mental illness suggest that we are considerably more distraught and distracted. Accumulating wealth is increasingly offset by what John Ruskin once called “illth,” in the form of pollution, climate change, unpaid social costs, and ugliness in its many guises. We are wealthier than ever, but the gap between the super wealthy and all of the rest of us continues to widen and the collateral effects of inequality infiltrate every sector of modern society.¹⁶ Once we confidently presumed that our legacy was an unalloyed stream of benefits to our progeny, but the truth is that we cast a lengthening shadow of biotic impoverishment, deforestation, acidic oceans, toxic pollution, and declining climate stability on our descendants.

What would a sustainable, fair, and resilient economy be? What energy sources will dependably and benignly power it? Given the limits of the earth, what size economy can be sustained? How will we distribute wealth? Who will decide such things? How do we take unusable or stranded assets, including that portion of fossil fuels that cannot be safe-

ly burned, off the ledger? What would it mean to develop an economy for Gross National Happiness? Such questions have been shunted aside in the manic phase of economic expansion, but if not for the well-being of all of the people and all of those to come, what is an economy for?

These questions are first and foremost political, not economic. They have to do with the public processes by which we choose the means to provide food, energy, shelter, materials, healthcare, and livelihood and how we distribute the risks and benefits resulting from those choices. But these large questions are often excluded from democratic control. From the beginning, the deck was stacked and is still heavily weighted to protect wealth, individual rather than collective, rights, and perversely, the rights of corporations as much or more than those of flesh and blood people. Furthermore it gives little or no protection to future generations even when their life, liberty, and property are put at risk because of the actions of the present generation. In short, the system is rigged to protect power and wealth and not to foresee or to forestall obvious risks such as climate disaster looming dead ahead. Our manner of governance seems incapable of reforming itself let alone dealing proactively and constructively with the scale, scope, and duration of the perils ahead. Even at their best, however, it is debatable whether democratic societies are capable of exercising the foresight and precaution necessary to make resilience a priority in difficult circumstances.¹⁷

And here is the nub of the issue. The ideals of America had to do with equality, liberty, and justice, but these have always competed with other values embedded in the American dream, which were mostly about individuals getting rich quick. We were in historian Walter McDougall's view predominantly a nation of hustlers and deal makers, now breathlessly ideologized now as so-called job creators. Pursuit of the American dream often led to the indiscriminate exploitation of land, wildlife, waters, soils, forests, minerals, and people. Our laws, regulations, taxation, and subsidies were designed to accelerate economic expansion and to make it easy for the lucky ones to make lots of money. At the same time we made it much harder than it had to be for minorities, Native Americans, the underprivileged, women, workers, unions, immigrants, the poor and now increasingly the middle class. We have made it still harder to exercise economic and technological restraint, foresight, and precaution even as the scale and scope of risks they incurred became global and irrevocable and resilience declined.

Do we have the right stuff for resilience? No smart gambler would bet on it. It is late in the game; we are seven billion on our way to ten billion, and we have loaded the dice against ourselves by filling the atmosphere with carbon, sharply reducing the biological diversity of earth, acidifying oceans, and spreading our toxics and trash all over the planet. Canadian biologist John Livingstone once described humans as “a rogue primate,” and any reasonably sentient intergalactic tenure review panel for *Homo sapiens* would likely agree.¹⁸ But that is by no means all that we are. In communion with the angels of our better nature we also have the capacity to cultivate foresight, compassion, care, tolerance, ingenuity, creativity, decency, and, I believe, resilience. But time is short, problems are deep rooted, and the challenges are daunting. What’s to be done?

II

“Resilience arises,” in Donella Meadows’s words, “from a rich structure of many feedback loops that can work in different ways to restore a system even after a large perturbation.”¹⁹ Some of the first steps to improve resilience are obvious. The engineering principles and technology for a more resilient electrical grid, for example, are well understood. A resilient power system would be: distributed among many sources and devices, highly efficient, carbon neutral, organized around interlinked smart microgrids that could be isolated in emergencies, and two-way communication between the grid and end users, and sustained by honest, full-cost pricing.²⁰ It would use half or less of the energy we presently use while providing higher quality service.

The principles of resilient urban design are also well known. In Eric Klinenberg’s words, resilient urban areas consist of communities with “sidewalks, stores, restaurants, and organizations that bring people into contact with friends and neighbors.”²¹ Healthy neighborhoods have lots of people watching the streets, as Jane Jacobs once said, and many overlapping connections between churches, businesses, civic organizations, schools, and colleges. More resilient communities are pedestrian and biker friendly with proximity between housing, schools, jobs, theaters, clubs, coffee shops, and health facilities. They have multiple and interconnected layers of so-called social capital—an ugly way to say competent, caring, and engaged citizens who work and play together for the

common good. Urban communities intending to improve their resilience recycle wastes, minimize their carbon footprints, grow by infill, and are stitched together by dependable and affordable light rail systems. Resilient cities will also have a growing percentage of locally owned businesses and community-generated wealth that stays put to create still more prosperity where it can be watched, tended, and nurtured.

At the national level resilient economies have diversity, redundant supply chains, and the good sense to place strict controls on the scale of enterprises and monopoly.²² In the realm of national policy, resilience will require a larger definition of security than heretofore. We have spent trillions for defense against often exaggerated external military and terrorist threats while ignoring self-generated dangers that jeopardize access to food, energy, clean water, shelter, physical safety, health care, and economic livelihood. Policy analyst Patrick Doherty proposes a “grand strategy” that connects policy and market demand for smarter growth with strategic investments that build resilient energy infrastructure and agricultural systems.²³ Mark Mykleby and Wayne Porter, former staff members at the Joint Chiefs of Staff, propose a “national strategic narrative,” making sustainability the new standard for national and foreign policy and reconnect our political conversations with our highest values.²⁴

In short we do not lack for ideas and proposals to improve the resilience of our infrastructure and our capacity to adapt and foresee. All of these and many others are sensible and necessary steps toward the elusive goal of resilience, but they are only necessary first steps, not sufficient long-term responses. In Andrew Zolli’s words, “none of these is a permanent solution, and none roots out the underlying problems they address.”²⁵ Moreover, our increasingly complex technical “solutions” may often cause more problems than they solve. Financial risk analyst Nicholas Taleb puts it this way:

Man-made complex systems tend to develop cascades and runaway chains of reactions that decrease, even eliminate, predictability and cause outsized events. So the modern world may be increasing in technological knowledge, but, paradoxically, it is making things a lot more unpredictable. . . . [W]e are victims to a new disease . . . neomania, that makes us [call] Black Swan-vulnerable systems—“progress.”²⁶

In Taleb's view, we are increasingly vulnerable to more and more severe Black Swan events as a result of increasing complexity, interdependence, and globalization.²⁷

III

In essays such as this it is incumbent on the writer to conclude by proposing one miracle cure or another. I have no panaceas, only four observations. The first is that it is not possible to make an unsustainable system resilient. Its design is its destiny. In other words, if we intend to improve resilience, we will have to remedy the systemic flaws that have rendered our future increasingly precarious.

Second, the challenge of improving resilience must begin by reforming structures of governance and political processes by which we decide issues of war and peace, taxation, education, research and development, healthcare, economy, environmental quality, and the basic issues of fairness. The reformation must begin in the United States. In Al Gore's words, "the decline of US democracy has degraded its capacity for clear collective thinking, led to a series of remarkably poor policy decisions on crucially significant issues, and left the global community rudderless."²⁸ Corporations and markets do many good things, but seldom without rules, structures, oversight, enforcement, and the countervailing power of government. Our inaction in the face of climate destabilization and virtually every Black Swan event and virtually every source of ecological, social, and economic fragility is rooted in failures of regulation, politics, foresight, and leadership that are attributable to the corrupting power of money that infects governments and the political process at every level. As a result, a small group of well-funded interest groups hold our common future hostage.

There are deeper structural issues as well. In Nicolas Berggruen's words, "the faster, wealthier, more connected, and more complex our scientific and technological civilization, the less intelligent our governance of it has become."²⁹ His solution is "intelligent governance," which "devolves power and meaningfully involves citizens in matters of their competence while fostering legitimacy and consent for delegated authority at higher levels of complexity."³⁰ The path toward resilience, in other words, will require a substantial upgrading of our collective capacities of foresight, coordination, and enforcement while also im-

proving fairness within and among countries and entire generations. In Berggruen's view the key to good governance requires constraints on consumerism and "institutionalized feedback arrangements that favor the long-term and counter the ethos of immediate gratification."³¹ Policy expert Leon Fuerth proposes starting with reforms in the Executive Office of the President to build "anticipatory governance . . . a systems-based approach for enabling governance to cope with accelerating, complex forms of change."³² This requires no heroic leaps, only the development of rational procedures of planning and policy development.

Third, there are no purely national solutions to systemic problems of fragility. In an interdependent world we will have to evolve institutions, laws, procedures, and habits of heart that make resilience the default at both the local and regional scales and evolve formal institutions, non-governmental organizations, and networks at the global scale. In fact an efflorescence of civic capacity is emerging in diverse ways from so-called slow movements (food, money, cities) to organizations tracking carbon emissions of corporations, to women planting trees in Kenya, to transition towns, to the growing role of elders in tempering our adolescent enthusiasms.

Finally, we tend to equate solutions with technology without expecting or requiring any particular improvement in our behavior or institutions. As important as better technology is to a more resilient future, real solutions will also require the rediscovery of old ideas, traditions, techniques, design strategies, and even those quaint and mostly forgotten qualities of wisdom and humility in an age much enamored of self and surfaces. We are caught in a trap of our own making. If we are to escape the worst of it we will have to disenthral ourselves from our own unleavened cleverness and wean ourselves from the faith that even more of the same will somehow work differently this time.

Postscript: Conferences on the subject of resilience might best held in places like Detroit or Easter Island where there are ruins and reminders of human fallibility. Perhaps they might begin with a reading—something like Shelley's sonnet "Ozymandias." Alas, they are almost always convened in fairyland places like Aspen or Davos, or expensive hotels in Washington DC amid the trappings of power, wealth, and aggrandizement. Discussion is thereby skewed to the familiar and toward the comforting faith that tinkering at the margin of the status quo will

suffice—a slight policy adjustment here and a better technology there, responses that are neither robust nor resilient.

NOTES

1. Taleb, *The Black Swan* and *Antifragile*. In the latter Taleb writes, “[T]he modern world may be increasing in technological knowledge, but, paradoxically, it is making things a lot more unpredictable. Now for reasons that have to do with the increase of the artificial, the move away from ancestral and natural models, and the loss in robustness owing to complications in the design of everything, the role of Black Swans is increasing” (7).

2. Walker and Salt, *Resilience Thinking*.

3. Lovins and Lovins, *Brittle Power*.

4. Ellul, *The Technological Society* and *The Technology System*.

5. World Economic Forum, *Global Risks 2013*; Rees, “Denial of Catastrophic Risks,” 1123.

6. The National Academies, *Disaster Resilience: A National Imperative*.

7. National Climate Assessment.

8. Archer, *The Long Thaw*.

9. Krauss, *The History of Love*, 8.

10. Wright, *A Short History of Progress*, 7; see also Costanza, “Social Traps”; and Taleb, *Antifragile*.

11. Wright, *A Short History of Progress*, 8.

12. Wright, *A Short History of Progress*, 108.

13. Joy, “Why the Future Doesn’t Need Us.”

14. Sunstein, *Worst-Case Scenarios*.

15. Pretty, “The Consumption of a Finite Planet.”

16. Wilkinson and Pickett, *The Spirit Level*.

17. Burnell, *Climate Change and Democratization*; see also Kurlantzick, *Democracy in Retreat*.

18. Livingston, *Rogue Primate*.

19. Meadows, *Thinking in Systems*, 76.

20. Fox-Penner, *Smart Power*.

21. Klinenberg, “Adaptation,” 35.

22. Lynn, “Built to Break.”

23. Doherty, “A New U.S. Grand Strategy.”

24. Mr. Y, *A National Strategic Narrative*.

25. Zolli, “Learning to Bounce Back.”

26. Taleb, *Antifragile*, 7.

27. Taleb, *Antifragile*, 285.

28. Gore, *The Future*, xxv.

29. Berggruen, *Intelligent Governance for the 21st Century*, 182.

30. Berggruen, *Intelligent Governance for the 21st Century*, 13.
31. Berggruen, *Intelligent Governance for the 21st Century*, 34.
32. Fuerth, *Anticipatory Governance: Practical Upgrades*, 1.

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