CHAPTER 1

Between Damocles and Hydra

Please cut my head off—How by some magic, colors become colors—How to lift weight in Dubai

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HALF OF LIFE HAS NO NAME

You are in the post office about to send a gift, a package full of champagne glasses, to a cousin in Central Siberia. As the package can be damaged during transportation, you would stamp "fragile," "breakable," or "handle with care" on it (in red). Now what is the exact opposite of such situation, the exact opposite of "fragile"?

Almost all people answer that the opposite of "fragile" is "robust," "resilient," "solid," or something of the sort. But the resilient, robust (and company) are items that neither break nor improve, so you would not need to write anything on them—have you ever seen a package with "robust" in thick green letters stamped on it? Logically, the exact opposite of a "fragile" parcel would be a package on which one has written "please mishandle" or "please handle carelessly." Its contents would not just be unbreakable, but would benefit from shocks and a wide array of trauma. The fragile is the package that would be *at best* unharmed, the robust would be *at best* and *at worst* unharmed. And the opposite of fragile is therefore what is *at worst* unharmed.

We gave the appellation "antifragile" to such a package; a neologism was necessary as there is no simple, noncompound word in the *Oxford English Dictionary* that expresses the point of reverse fragility. For the idea of antifragility is not part of our consciousness—but, luckily, it is part of our ancestral behavior, our biological apparatus, and a ubiquitous property of every system that has survived.

FIGURE 1. A package begging for stressors and disorder. Credit: Giotto Enterprise and George Nasr.

To see how alien the concept is to our minds, repeat the experiment and ask around at the next gathering, picnic, or pre-riot congregation what's the antonym of fragile (and

specify insistently that you mean the *exact reverse,* something that has opposite properties and payoff). The likely answers will be, aside from robust: unbreakable, solid, well-built, resilient, strong, something-proof (say, waterproof, windproof, rustproof)—unless they've heard of this book. Wrong—and it is not just individuals but branches of knowledge that are confused by it; this is a mistake made in every dictionary of synonyms and antonyms I've found.

Another way to view it: since the opposite of *positive* is *negative,* not *neutral,* the opposite of positive fragility should be negative fragility (hence my appellation "antifragility"), not neutral, which would just convey robustness, strength, and unbreakability. Indeed, when one writes things down mathematically, antifragility is fragility with a negative sign in front of it.[1]

This blind spot seems universal. There is no word for "antifragility" in the main known languages, modern, ancient, colloquial, or slang. Even Russian (Soviet version) and Standard Brooklyn English don't seem to have a designation for antifragility, conflating it with robustness.[2]

Half of life—the interesting half of life—we don't have a name for.

PLEASE BEHEAD ME

If we have no common name for antifragility, we can find a mythological equivalence, the expression of historical intelligence through potent metaphors. In a Roman recycled version of a Greek myth, the Sicilian tyrant Dionysius II has the fawning courtier Damocles enjoy the luxury of a fancy banquet, but with a sword hanging over his head, tied to the ceiling with a single hair from a horse's tail. A horse's hair is the kind of thing that eventually breaks under pressure, followed by a scene of blood, high-pitched screams, and the equivalent of ancient ambulances. Damocles is fragile—it is only a matter of time before the sword strikes him down.

In another ancient legend, this time the Greek recycling of an ancient Semitic and Egyptian legend, we find Phoenix, the bird with splendid colors. Whenever it is destroyed, it is reborn from it own ashes. It always returns to its initial state. Phoenix happens to be the ancient symbol of Beirut, the city where I grew up. According to legend, Berytus (Beirut's historical name) has been destroyed seven times in its close to five-thousand-year history, and has come back seven times. The story seems cogent, as I myself saw the eighth episode; central Beirut (the ancient part of the city) was completely destroyed for the eighth time during my late childhood, thanks to the brutal civil war. I also saw its eighth rebuilding.

But Beirut was, in its latest version, rebuilt in even better shape than the previous incarnation—and with an interesting irony: the earthquake of A.D. 551 had buried the Roman law school, which was discovered, like a bonus from history, during the reconstruction (with archeologists and real estate developers trading public insults). That's not Phoenix, but something else beyond the robust. Which brings us to the third mythological metaphor: Hydra.

Hydra, in Greek mythology, is a serpent-like creature that dwells in the lake of Lerna, near Argos, and has numerous heads. Each time one is cut off, two grow back. So harm is what it likes. Hydra represents antifragility.

The sword of Damocles represents the side effect of power and success: you cannot rise and rule without facing this continuous danger—someone out there will be actively working to topple you. And like the sword, the danger will be silent, inexorable, and discontinuous. It will fall abruptly after long periods of quiet, perhaps at the very moment one has gotten used to it and forgotten about its existence. Black Swans will be out there to get you as you now have much more to lose, a cost of success (and growth), perhaps an unavoidable penalty of excessive success. At the end, what matters is the strength of the string—not the wealth and power of the dining party. But, luckily, this is an identifiable, measurable, and tractable vulnerability, for those who want to listen. The entire point of the Triad is that in many situations we can measure the strength of the string.

Further, consider how toxic such growth-followed-by-a-fall can be to society, as the fall of the dining guest, in response to the fall of the sword of Damocles, will bring what we now call collateral damage, harming others. For instance, the collapse of a large institution will have effects on society.

Sophistication, a certain brand of sophistication, also brings fragility to Black Swans: as societies gain in complexity, with more and more "cutting edge" sophistication in them, and more and more specialization, they become increasingly vulnerable to collapse. This idea has been brilliantly—and convincingly—adumbrated by the archeologist Joseph Tainter. But it does not have to be so: it is so only for those unwilling to go the extra step and understand the matrix of reality. To counter success, you need a high offsetting dose of robustness, even high doses of antifragility. You want to be Phoenix, or possibly Hydra. Otherwise the sword of Damocles will get you.

On the Necessity of Naming

We know more than we think we do, a lot more than we can articulate. If our formal systems of thought denigrate the natural, and in fact we don't have a name for antifragility, and fight the concept whenever we use our brains, it does not mean that our actions neglect it. Our perceptions and intuitions, as expressed in deeds, can be superior to what we know and tabulate, discuss in words, and teach in a classroom. We will have ample discussions of the point particularly with the potent notion of the *apophatic* (what cannot be explicitly said, or directly described, in our current vocabulary); so for now, take this curious phenomenon.

I n *Through the Language Glass,* the linguist Guy Deutscher reports that many primitive populations, without being color-blind, have verbal designations for only two or three colors. But when given a simple test, they can successfully match strings to their corresponding colors. They are capable of detecting the differences between the various nuances of the rainbow, but they do not express these in their vocabularies. These populations are culturally, though not biologically, color-blind.

Just as we are intellectually, not organically, antifragility-blind. To see the difference just consider that you need the name "blue" for the construction of a narrative, but not when you engage in action.

It is not well known that many colors we take for granted had no name for a long time, and had no names in the central texts in Western culture. Ancient Mediterranean texts, both Greek and Semitic, also had a reduced vocabulary of a small number of colors polarized around the dark and the light—Homer and his contemporaries were limited to about three or four main colors: black, white, and some indeterminate part of the rainbow, often subsumed as red, or yellow.

I contacted Guy Deutscher. He was extremely generous with his help and pointed out

to me that the ancients even lacked words for something as elementary as blue. This absence of the word "blue" in ancient Greek explains the recurring reference by Homer to the "wine-dark sea" (*oinopa ponton*), which has been quite puzzling to readers (including this one).

Interestingly, it was the British Prime Minister William Gladstone who first made this discovery in the 1850s (and was unfairly and thoughtlessly reviled for it by the usual journalists). Gladstone, quite an erudite, wrote, during his interregnum between political positions, an impressive seventeen-hundred-page treatise on Homer. In the last section, Gladstone announced this limitation of color vocabulary, attributing our modern sensitization to many more nuances of color to a cross-generational training of the eye. But regardless of these variations of color in the culture of the time, people were shown to be able to identify the nuances—unless physically color-blind.

Gladstone was impressive in many respects. Aside from his erudition, force of character, respect for the weak, and high level of energy, four very attractive attributes (respect for the weak being, after intellectual courage, the second most attractive quality to this author), he showed remarkable prescience. He figured out what few in his day dared to propose: that the *Iliad* corresponds to a true story (the city of Troy had not been discovered yet). In addition, even more prescient and of great relevance to this book, he was insistent upon a balanced fiscal budget: fiscal deficits have proven to be a prime source of fragility in social and economic systems.

PROTO-ANTIFRAGILITY

There have been names for two starter-antifragility concepts, with two precursor applications that cover some special cases of it. These are mild aspects of antifragility and limited to the medical field. But they are a good way to start.

According to legend, Mithridates IV, king of Pontus in Asia Minor, while hiding after his father's assassination, got himself some protection against poisoning by ingesting sub-lethal doses of toxic material in progressively larger quantities. He later incorporated the process into a complicated religious ritual. But this immunity got him in trouble a bit later as his attempt to take his own life by poisoning failed, "having fortified himself against the drugs of others." So he had to ask for the services of an ally military commander to give him a blow with a sword.

The method named *Antidotum Mithridatium,* celebrated by Celsus, the ancient world's famous doctor, had to be rather fashionable in Rome, since about a century later it brought some complication to the emperor Nero's attempts at matricide. Nero had been obsessed with the idea of killing his mother, Agrippina, who, to make things more colorful, was Caligula's sister (and, even more colorful, was the alleged lover of the philosopher Seneca, more on whom later). But a mother tends to know her son rather well and predict his actions, particularly when he is her only child—and Agrippina knew something about poison, as she might have used the method to kill at least one of her husbands (I said things were quite colorful). So, suspecting that Nero had a contract on her, she got herself Mithridatized against the poisons that would have been available to her son's underlings. Like Mithridates, Agrippina eventually died by more mechanical methods as her son (supposedly) had assassins slay her, thus providing us with the small but meaningful lesson that one cannot be robust against everything. And, two thousand years later, nobody has found a method for us to get "fortified" against swords.

Let us call Mithridatization the result of an exposure to a small dose of a substance that, over time, makes one immune to additional, larger quantities of it. It is the sort of approach used in vaccination and allergy medicine. It is not quite antifragility, still at the more modest level of robustness, but we are on our way. And we already have a hint that perhaps being deprived of poison makes us fragile and that the road to robustification starts with a modicum of harm.

Now consider a case when the poisonous substance, in some dose, makes you better off overall, one step up from robustness. Hormesis, a word coined by pharmacologists, is when a small dose of a harmful substance is actually beneficial for the organism, acting as medicine. A little bit of an otherwise offending substance, not too much, acts to benefit the organism and make it better overall as it triggers some overreaction. This was not interpreted at the time in the sense of "gains from harm" so much as "harm is

dose dependent" or "medicine is dose dependent." The interest to scientists has been in the nonlinearity of the dose-response.

Hormesis was well known by the ancients (and like the color blue was known but not expressed). But it was only in 1888 that it was first "scientifically" described (though still not given a name) by a German toxicologist, Hugo Schulz, who observed that small doses of poison stimulate the growth of yeast while larger doses cause harm. Some researchers hold that the benefits of vegetables may not be so much in what we call the "vitamins" or some other rationalizing theories (that is, ideas that seem to make sense in narrative form but have not been subjected to rigorous empirical testing), but in the following: plants protect themselves from harm and fend off predators with poisonous substances that, ingested by us in the right quantities, may stimulate our organisms—or so goes the story. Again, limited, low-dose poisoning triggers healthy benefits.

Many claim that caloric restriction (permanent or episodic) activates healthy reactions and switches that, among other benefits, lengthen life expectancy in laboratory animals. We humans live too long for researchers to test if such restriction increases our life expectancy (if the hypothesis is true, then the subjects of the test would outlive the researchers). But it looks like such restriction makes humans healthier (and may also improve their sense of humor). But since abundance would bring the opposite effect, this episodic caloric restriction can be also interpreted as follows: too much regular food is bad for you, and depriving humans of the stressor of hunger may make them live less than their full potential; so all hormesis seems to be doing is reestablishing the natural dosage for food and hunger in humans. In other words, hormesis is the norm, and its absence is what hurts us.

Hormesis lost some scientific respect, interest, and practice after the 1930s because some people mistakenly associated it with homeopathy. The association was unfair, as the mechanisms are extremely different. Homeopathy is based on other principles, such as the one that minute, highly diluted parts of the agents of a disease (so small they can hardly be perceptible, hence cannot cause hormesis) can help cure us of the disease itself. Homeopathy has shown little empirical backing and because of its testing methodologies belongs today to alternative medicine, while hormesis, as a phenomenon, has ample scientific evidence to back it up.

But the larger point is that we can now see that depriving systems of stressors, vital stressors, is not necessarily a good thing, and can be downright harmful.

DOMAIN INDEPENDENCE IS DOMAIN DEPENDENT

This idea that systems may need some stress and agitation has been missed by those who grasp it in one area and not in another. So we can now also see the *domain dependence* of our minds, a "domain" being an area or category of activity. Some people can understand an idea in one domain, say, medicine, and fail to recognize it in another, say, socioeconomic life. Or they get it in the classroom, but not in the more complicated texture of the street. Humans somehow fail to recognize situations outside the contexts in which they usually learn about them.

I had a vivid illustration of domain dependence in the driveway of a hotel in the pseudocity of Dubai. A fellow who looked like a banker had a uniformed porter carry his luggage (I can instantly tell if someone is a certain type of banker with minimal cues as I have physical allergies to them, even affecting my breathing). About fifteen minutes later I saw the banker lifting free weights at the gym, trying to replicate natural exercises using kettlebells as if he were swinging a suitcase. Domain dependence is pervasive.

Further, the problem is not just that Mithridatization and hormesis can be known in (some) medical circles and missed in other applications such as socioeconomic life. Even within medicine, some get it here and miss it there. The same doctor might recommend exercise so you "get tougher," and a few minutes later write a prescription for antibiotics in response to a trivial infection so you "don't get sick."

Another expression of domain dependence: ask a U.S. citizen if some semi-governmental agency with a great deal of independence (and no interference from Congress) should control the price of cars, morning newspapers, and Malbec wine, as its domain of specialty. He would jump in anger, as it appears to violate every principle the country stands for, and call you a Communist post-Soviet mole for even suggesting it. OK. Then ask him if that same government agency should control foreign exchange, mainly the rate of the dollar against the euro and the Mongolian tugrit. Same reaction: this is not France. Then very gently point out to him that the Federal Reserve Bank of the United States is in the business of controlling and managing the price of another good, another price, called the lending rate, the interest rate in the economy (and has proved to be good at it). The libertarian presidential candidate Ron Paul was called a crank for suggesting the abolition of the Federal Reserve, or even restricting its role. But he would also have been called a crank for suggesting the creation of an agency to control other prices.

Imagine someone gifted in learning languages but unable to transfer concepts from one tongue to another, so he would need to relearn "chair" or "love" or "apple pie" every time he acquires a new language. He would not recognize "house" (English) or "casa" (Spanish) or "byt" (Semitic). We are all, in a way, similarly handicapped,

unable to recognize the same idea when it is presented in a different context. It is as if we are doomed to be deceived by the most superficial part of things, the packaging, the gift wrapping. This is why we don't see antifragility in places that are obvious, too obvious. It is not part of the accepted way of thinking about success, economic growth, or innovation that these may result only from overcompensation against stressors. Nor do we see this overcompensation at work elsewhere. (And domain dependence is also why it has been difficult for many researchers to realize that uncertainty, incomplete understanding, disorder, and volatility are members of the same close family.)

This lack of translation is a mental handicap that comes with being a human; and we will only start to attain wisdom or rationality when we make an effort to overcome and break through it.

Let us get deeper into overcompensation.

[1] Just as concavity is convexity with a negative sign in front of it and is sometimes called anticonvexity.

[2] I checked in addition to Brooklyn English most Indo-European languages, both ancient (Latin, Greek) and modern branches: Romance (Italian, French, Spanish, Portuguese), Slavic (Russian, Polish, Serbian, Croatian), Germanic (German, Dutch, Afrikaans), and Indo-Iranian (Hindi, Urdu, Farsi). It is also absent from non-Indo-European families such as Semitic (Arabic, Hebrew, Aramaic) and Turkic (Turkish).

CHAPTER 2

Overcompensation and Overreaction Everywhere

Is it easy to write on a Heathrow runway?—Try to get the Pope to ban your work—How to beat up an economist (but not too hard, just enough to go to jail)

My own domain dependence was revealed to me one day as I was sitting in the office of David Halpern, a U.K. government advisor and policy maker. He informed me—in response to the idea of antifragility—of a phenomenon called post-traumatic growth, the opposite of post-traumatic stress syndrome, by which people harmed by past events surpass themselves. I had never heard about it before, and, to my great shame, had never made the effort to think of its existence: there is a small literature but it is not advertised outside a narrow discipline. We hear about the more lurid post-traumatic disorder, not post-traumatic growth, in the intellectual and so-called learned vocabulary. But popular culture has an awareness of its equivalent, revealed in the expression "it builds character." So do the ancient Mediterranean classics, along with grandmothers.

Intellectuals tend to focus on negative responses from randomness (fragility) rather than the positive ones (antifragility). This is not just in psychology: it prevails across the board.

How do you innovate? First, try to get in trouble. I mean serious, but not terminal, trouble. I hold—it is beyond speculation, rather a conviction—that innovation and sophistication spark from initial situations of necessity, in ways that go far beyond the satisfaction of such necessity (from the unintended side effects of, say, an initial invention or attempt at invention). Naturally, there are classical thoughts on the subject, with a Latin saying that sophistication is born out of hunger (*artificia docuit fames*). The idea pervades classical literature: in Ovid, difficulty is what wakes up the genius (*ingenium mala saepe movent*), which translates in Brooklyn English into "When life gives you a lemon …"

The excess energy released from overreaction to setbacks is what innovates!

This message from the ancients is vastly deeper than it seems. It contradicts modern methods and ideas of innovation and progress on many levels, as we tend to think that innovation comes from bureaucratic funding, through planning, or by putting people through a Harvard Business School class by one Highly Decorated Professor of Innovation and Entrepreneurship (who never innovated anything) or hiring a consultant

(who never innovated anything). This is a fallacy—note for now the disproportionate contribution of *uneducated* technicians and entrepreneurs to various technological leaps, from the Industrial Revolution to the emergence of Silicon Valley, and you will see what I mean.

Yet in spite of the visibility of the counterevidence, and the wisdom you can pick up free of charge from the ancients (or grandmothers), moderns try today to create inventions from situations of comfort, safety, and predictability instead of accepting the notion that "necessity really is the mother of invention."

Many, like the great Roman statesman Cato the Censor, looked at comfort, almost any form of comfort, as a road to waste.[1] He did not like it when we had it too easy, as he worried about the weakening of the will. And the softening he feared was not just at the personal level: an entire society can fall ill. Consider that as I am writing these lines, we are living in a debt crisis. The world as a whole has never been richer, and it has never been more heavily in debt, living off borrowed money. The record shows that, for society, the richer we become, the harder it gets to live within our means. Abundance is harder for us to handle than scarcity.

Cato would have smiled hearing about the recently observed effect in aeronautics that the automation of airplanes is underchallenging pilots, making flying too comfortable for them, dangerously comfortable. The dulling of the pilot's attention and skills from too *little* challenge is indeed causing deaths from flying accidents. Part of the problem is a Federal Aviation Administration (FAA) regulation that forced the industry to increase its reliance on automated flying. But, thankfully, the same FAA finally figured out the problem; it has recently found that pilots often "abdicate too much responsibility to automated systems."

HOW TO WIN A HORSE RACE

It is said that the best horses lose when they compete with slower ones, and win against better rivals. Undercompensation from the absence of a stressor, inverse hormesis, absence of challenge, degrades the best of the best. In Baudelaire's poem, "The albatross's giant wings prevent him from walking"—many do better in Calculus 103 than Calculus 101.

This mechanism of overcompensation hides in the most unlikely places. If tired after an intercontinental flight, go to the gym for some exertion instead of resting. Also, it is a well-known trick that if you need something urgently done, give the task to the busiest (or second busiest) person in the office. Most humans manage to squander their free time, as free time makes them dysfunctional, lazy, and unmotivated—the busier they get, the more active they are at other tasks. Overcompensation, here again.

I've discovered a trick when giving lectures. I have been told by conference organizers that one needs to be clear, to speak with the fake articulation of TV announcers, maybe even dance on the stage to get the attention of the crowd. Some try sending authors to "speech school"—the first time it was suggested to me I walked out, resolved to change publishers on the spot. I find it better to whisper, not shout. Better to be slightly inaudible, less clear. When I was a pit trader (one of those crazy people who stand in a crowded arena shouting and screaming in a continuous auction), I learned that the noise produced by the person is inverse to the pecking order: as with mafia dons, the most powerful traders were the least audible. One should have enough self-control to make the audience work hard to listen, which causes them to switch into intellectual overdrive. This paradox of attention has been a little bit investigated: there is empirical evidence of the effect of "disfluency." Mental effort moves us into higher gear, activating more vigorous and more analytical brain machinery.[2] The management guru Peter Drucker and the psychoanalyst Jacques Lacan, two persons who mesmerized the crowds the most in their respective areas, were the antithesis of the polished-swanky speaker or the consonant-trained television announcer.

The same or a similar mechanism of overcompensation makes us concentrate better in the presence of a modicum of background random noise, as if the act of countering such noise helps us hone our mental focus. Consider this remarkable ability humans have to filter out noise at happy hour and distinguish the signal among so many other loud conversations. So not only are we made to overcompensate, but we sometimes *need* the noise. Like many writers, I like to sit in cafés, working, as they say, against resistance. Consider our bedtime predilection for the rustle of tree leaves or the sound of the ocean: there are even electric contraptions that produce "white noise"[3] that helps people sleep better. Now these small distractions, like hormetic responses, act up to a point. I haven't tried it yet, but I am certain that it would be hard to write an essay on

the runway of Heathrow airport.

Antifragile Responses as Redundancy

Something flashed when I heard "post-traumatic" during that London visit. It hit me right there and then that these antifragile hormetic responses were just a form of redundancy, and all the ideas of Mother Nature converged in my mind. It is all about redundancy. Nature likes to overinsure itself.

Layers of redundancy are the central risk management property of natural systems. We humans have two kidneys (this may even include accountants), extra spare parts, and extra capacity in many, many things (say, lungs, neural system, arterial apparatus), while human design tends to be spare and inversely redundant, so to speak—we have a historical track record of engaging in debt, which is the opposite of redundancy (fifty thousand in extra cash in the bank or, better, under the mattress, is redundancy; owing the bank an equivalent amount, that is, debt, is the opposite of redundancy). Redundancy is ambiguous because it seems like a waste if nothing unusual happens. Except that something unusual happens—usually.

Further, redundancy is not necessarily wussy; it can be extremely aggressive. For instance, if you have extra inventory of, say, fertilizers in the warehouse, just to be safe, and there happens to be a shortage because of disruptions in China, you can sell the excess inventory at a huge premium. Or if you have extra oil reserves, you may sell them at a large profit during a squeeze.

Now, it turns out, the same, very same logic applies to overcompensation: it is just a form of redundancy. An additional head for Hydra is no different from an extra—that is, seemingly redundant—kidney for humans, and no different from the additional capacity to withstand an extra stressor. If you ingest, say, fifteen milligrams of a poisonous substance, your body may prepare for twenty or more, and as a side effect will get stronger overall. These extra five milligrams of poison that you can withstand are no different from additional stockpiles of vital or necessary goods, say extra cash in the bank or more food in the basement. And to return to the drivers of innovation: the additional *quantities* of motivation and willpower, so to speak, stemming from setbacks can be also seen as extra capacity, no different from extra boxes of victuals.

A system that overcompensates is necessarily in overshooting mode, building extra capacity and strength in anticipation of a worse outcome and in response to information about the possibility of a hazard. And of course such extra capacity or strength may become useful by itself, opportunistically. We saw that redundancy is opportunistic, so such extra strength can be used to some benefit even in the absence of the hazard. Tell the next MBA analyst or business school professor you run into that redundancy is not defensive; it is more like investment than insurance. And tell them that what they call

"inefficient" is often very efficient.

Indeed, our bodies discover probabilities in a very sophisticated manner and assess risks much better than our intellects do. To take one example, risk management professionals look in the past for information on the so-called *worst-case scenario* and use it to estimate future risks—this method is called "stress testing." They take the worst historical recession, the worst war, the worst historical move in interest rates, or the worst point in unemployment as an exact estimate for the worst future outcome. But they never notice the following inconsistency: this so-called worst-case event, when it happened, exceeded the worst case at the time.

I have called this mental defect *the Lucretius problem,* after the Latin poetic philosopher who wrote that the fool believes that the tallest mountain in the world will be equal to the tallest one he has observed. We consider the biggest object of any kind that we have seen in our lives or hear about as the largest item that can possibly exist. And we have been doing this for millennia. In Pharaonic Egypt, which happens to be the first complete top-down nation-state managed by bureaucrats, scribes tracked the high-water mark of the Nile and used it as an estimate for a future worst-case scenario.

The same can be seen in the Fukushima nuclear reactor, which experienced a catastrophic failure in 2011 when a tsunami struck. It had been built to withstand the worst past historical earthquake, with the builders not imagining much worse—and not thinking that the worst past event had to be a surprise, as it had no precedent. Likewise, the former chairman of the Federal Reserve, Fragilista Doctor Alan Greenspan, in his apology to Congress offered the classic "It never happened before." Well, nature, unlike Fragilista Greenspan, prepares for what has not happened before, *assuming worse harm is possible*.[4]

If humans fight the last war, nature fights the next one. Your body is more imaginative about the future than you are. Consider how people train in weightlifting: the body overshoots in response to exposures and overprepares (up to the point of biological limit, of course). This is how bodies get stronger.

In the aftermath of the banking crisis, I received all manner of threats, and *The Wall Street Journal* suggested that I "stock up on bodyguards." I tried to tell myself no worries, stay calm, these threats were coming from disgruntled bankers; anyway, people get whacked first, then you read about it in the newspapers, not in the reverse sequence. But the argument did not register in my mind, and, when in New York or London, I could not relax, even after chamomile tea. I started feeling paranoia in public places, scrutinizing people to ascertain that I was not being followed. I started taking the bodyguard suggestion seriously, and I found it more appealing (and considerably more economical) to become one, or, better, to look like one. I found Lenny "Cake," a trainer, weighing around two hundred and eighty pounds (one hundred and thirty kilograms), who moonlighted as a security person. His nickname and weight both came

from his predilection for cakes. Lenny Cake was the most physically intimidating person within five zip codes, and he was sixty. So, rather than taking lessons, I watched him train. He was into the "maximum lifts" type of training and swore by it, as he found it the most effective and least time-consuming. This method consisted of short episodes in the gym in which one focused solely on improving one's past maximum in a single lift, the heaviest weight one could haul, sort of the high-water mark. The workout was limited to trying to exceed that mark once or twice, rather than spending time on un-entertaining time-consuming repetitions. The exercise got me into a naturalistic form of weightlifting, and one that accords with the evidence-based literature: work on the maximum, spend the rest of the time resting and splurging on mafia-sized steaks. I have been trying to push my limit for four years now; it is amazing to see how something in my biology anticipates a higher level than the past maximum—until it reaches its ceiling. When I deadlift (i.e., mimic lifting a stone to waist level) using a bar with three hundred and thirty pounds, then rest, I can safely expect that I will build a certain amount of additional strength as my body *predicts* that next time I may need to lift three hundred and thirty-five pounds. The benefits, beyond the fading of my paranoia and my newfound calm in public places, includes small unexpected conveniences. When I am harassed by limo drivers in the arrival hall at Kennedy airport insistently offering me a ride and I calmly tell them to "f*** off," they go away immediately. But there are severe drawbacks: some of the readers I meet at conferences have a rough time dealing with an intellectual who has the appearance of a bodyguard—intellectuals can be svelte or flabby and out of shape (when they wear a tweed jacket), but they are not supposed to look like butchers.

Something that will give the Darwinists some work, an observation made to me by the risk analyst, my favorite intellectual opponent (and personal friend) Aaron Brown: the term "fitness" itself may be quite imprecise and even ambiguous, which is why the notion of antifragility as something exceeding mere fitness can elucidate the confusion. What does "fitness" mean? Being exactly tuned to a given past history of a specific environment, or extrapolating to an environment with stressors of higher intensity? Many seem to point to the first kind of adaptation, missing the notion of antifragility. But if one were to write down mathematically a standard model of selection, one would get overcompensation rather than mere "fitness."[5]

Even the psychologists who studied the antifragile response of post-traumatic growth, and show the data for it, don't quite get the full concept, as they lapse, when using words, into the concept of "resilience."

ON THE ANTIFRAGILITY OF RIOTS, LOVE, AND OTHER UNEXPECTED BENEFICIARIES OF STRESS

Once one makes an effort to overcome domain dependence, the phenomenon of overcompensation appears ubiquitous.

Those who understand bacterial resistance in the biological domain completely fail to grasp the dictum by Seneca in *De clemencia* about the inverse effect of punishments. He wrote: "Repeated punishment, while it crushes the hatred of a few, stirs the hatred of all … just as trees that have been trimmed throw out again countless branches." For revolutions feed on repression, growing heads faster and faster as one *literally* cuts a few off by killing demonstrators. There is an Irish revolutionary song that encapsulates the effect:

The higher you build your barricades, the stronger we become.

The crowds, at some point, mutate, blinded by anger and a sense of outrage, fueled by the heroism of a few willing to sacrifice their lives for the cause (although they don't quite see it as sacrifice) and hungry for the privilege to become martyrs. It is that political movements and rebellions can be highly antifragile, and the sucker game is to try to repress them using brute force rather than manipulate them, give in, or find more astute ruses, as Heracles did with Hydra.

If antifragility is what wakes up and overreacts and overcompensates to stressors and damage, then one of the most antifragile things you will find outside economic life is a certain brand of refractory love (or hate), one that seems to overreact and overcompensate for impediments such as distance, family incompatibilities, and every conscious attempt to kill it. Literature is rife with characters trapped in a form of antifragile passion, seemingly against their will. In Proust's long novel *La recherche,* Swann, a socially sophisticated Jewish art dealer, falls for Odette, a demimondaine, a "kept" woman of sorts, a semi- or perhaps just a quarter-prostitute; she treats him badly. Her elusive behavior fuels his obsession, causing him to demean himself for the reward of a bit more time with her. He exhibits overt clinginess, follows her on her trysts with other men, hiding shamelessly in staircases, which of course causes her to treat him even more elusively. Supposedly, the story was a fictionalization of Proust's own entanglement with his (male) driver. Or take Dino Buzzati's semiautobiographical novel *Un amore,* the story of a middle-aged Milanese man who falls—accidentally, of course—for a dancer at the Scala who moonlights as a prostitute. She of course mistreats him, exploits him, takes advantage of him, milks him; and the more she mistreats him, the more he exposes himself to abuse to satisfy the antifragile thirst of a

few moments with her. But some form of happy ending there: from his biography, Buzzati himself ended up marrying, at sixty, a twenty-five year old, Almerina, a former dancer, seemingly the character of the story; when he died shortly after that, she became a good caretaker of his literary legacy.

Even when authors such as Lucretius (the same of the high mountains earlier in this chapter) rant against the dependence, imprisonment, and alienation of love, treating it as a (preventable) disease, they end up lying to us or themselves. Legend perhaps: Lucretius the priest of anti-romance might have been himself involved in uncontrollable —antifragile—infatuation.

Like tormenting love, some thoughts are so antifragile that you feed them by trying to get rid of them, turning them into obsessions. Psychologists have shown the irony of the process of thought control: the more energy you put into trying to control your ideas and what you think about, the more your ideas end up controlling you.

Please Ban My Book: The Antifragility of Information

Information is antifragile; it feeds more on attempts to harm it than it does on efforts to promote it. For instance, many wreck their reputations merely by trying to defend it.

The wily Venetians knew how to spread information by disguising it as a secret. Try it out with the following experiment in spreading gossip: tell someone a secret and qualify it by insisting that it is a secret, begging your listener "not to tell anyone"; the more you insist that it remain a secret, the more it will spread.

We all learn early on in life that books and ideas are antifragile and get nourishment from attacks—to borrow from the Roman emperor Marcus Aurelius (one of the doer-Stoic authors), "fire feeds on obstacles." There is the attraction of banned books, their antifragility to interdicts. The first book I read, during my childhood, of Graham Greene's was *The Power and the Glory,* selected for no other reason than its having been put on the *Index* (that is, banned) by the Vatican. Likewise, as a teenager, I gorged on the books of the American expatriate Henry Miller—his major book sold a million copies in one year thanks to having been banned in twenty-three states. The same with *Madame Bovary* or *Lady Chatterley's Lover.*

Criticism, for a book, is a truthful, unfaked badge of attention, signaling that it is not boring; and boring is the only very bad thing for a book. Consider the Ayn Rand phenomenon: her books *Atlas Shrugged* and *The Fountainhead* have been read for more than half a century by millions of people, in spite of, or most likely thanks to, brutally nasty reviews and attempts to discredit her. The first-order information is the intensity: what matters is the effort the critic puts into trying to prevent others from reading the book, or, more generally in life, it is the effort in badmouthing someone that matters, not so much what is said. So if you really want people to read a book, tell them

it is "overrated," with a sense of outrage (and use the attribute "underrated" for the opposite effect).

Balzac recounts how actresses paid journalists (often in kind) to write favorable accounts—but the wiliest got them to write unfavorable comments, knowing that it made them more interesting.

I have just bought Tom Holland's book on the rise of Islam for the sole reason that he was attacked by Glen Bowersock, considered to be the most prominent living scholar on the Roman Levant. Until then I had thought that Tom Holland was just a popularizer, and I would not have taken him seriously otherwise. I didn't even attempt to read Bowersock's review. So here is a simple rule of thumb (a heuristic): to estimate the quality of research, take the caliber of the highest detractor, or the caliber of the lowest detractor whom the author answers in print—whichever is lower.

Criticism itself can be antifragile to repression, when the fault finder wants to be attacked in return in order to get some validation. Jean Fréron, said to be a very envious thinker, with the mediocrity of envious thinkers, managed to play a role in intellectual history solely by irritating the otherwise brilliant Voltaire to the point of bringing him to write satirical poems against him. Voltaire, himself a gadfly and expert at ticking off people to benefit from their reactions, forgot how things worked when it came to himself. Perhaps Voltaire's charm was in that he did not know how to save his wit. So the same hidden antifragilities apply to attacks on our ideas and persons: we fear them and dislike negative publicity, but smear campaigns, if you can survive them, help enormously, conditional on the person appearing to be extremely motivated and adequately angry—just as when you hear a woman badmouthing another in front of a man (or vice versa). There is a visible selection bias: why did he attack *you* instead of someone else, one of the millions of persons deserving but not worthy of attack? It is his energy in attacking or badmouthing that will, antifragile style, put you on the map.

My great-grandfather Nicolas Ghosn was a wily politician who managed to stay permanently in power and hold government positions in spite of his numerous enemies (most notably his archenemy, my great-great-grandfather on the Taleb side of the family). As my grandfather, his eldest son, was starting his administrative and hopefully political career, his father summoned him to his deathbed. "My son, I am very disappointed in you," he said. "I never hear anything wrong said about you. You have proven yourself incapable of generating envy."

Get Another Job

As we saw with the Voltaire story, it is not possible to stamp out criticism; if it harms you, get out. It is easier to change jobs than control your reputation or public

perception.

Some jobs and professions are fragile to reputational harm, something that in the age of the Internet cannot possibly be controlled—these jobs aren't worth having. You do not want to "control" your reputation; you won't be able to do it by controlling information flow. Instead, focus on altering your exposure, say, by putting yourself in a position impervious to reputational damage. Or even put yourself in a situation to benefit from the antifragility of information. In that sense, a writer is antifragile, but we will see later most modernistic professions are usually not.

I was in Milan trying to explain antifragility to Luca Formenton, my Italian publisher (with great aid from body language and hand gestures). I was there partly for the Moscato dessert wines, partly for a convention in which the other main speaker was a famous fragilista economist. So, suddenly remembering that I was an author, I presented Luca with the following thought experiment: if I beat up the economist publicly, what would happen to me (other than a publicized trial causing great interest in the new notions of *fragilita* and *antifragilita*)? You know, this economist had what is called a *tête à baffe,* a face that invites you to slap it, just like a cannoli invites you to bite into it. Luca thought for a second … well, it's not like he would like me to do it, but, you know, it wouldn't hurt book sales. Nothing I can do as an author that makes it to the front page of *Corriere della Sera* would be detrimental for my book. Almost no scandal would hurt an artist or writer.[6]

Now let's say I were a midlevel executive employee of some corporation listed on the London Stock Exchange, the sort who never take chances by dressing down, always wearing a suit and tie (even on the beach). What would happen to me if I attack the fragilista? My firing and arrest record would plague me forever. I would be the total victim of informational antifragility. But someone earning close to minimum wage, say, a construction worker or a taxi driver, does not overly depend on his reputation and is free to have his own opinions. He would be merely robust compared to the artist, who is antifragile. A midlevel bank employee with a mortgage would be fragile to the extreme. In fact he would be completely a prisoner of the value system that invites him to be corrupt to the core—because of his dependence on the annual vacation in Barbados. The same with a civil servant in Washington. Take this easy-to-use heuristic (which is, to repeat the definition, a simple compressed rule of thumb) to detect the independence and robustness of someone's reputation. With few exceptions, those who dress outrageously are robust or even antifragile in reputation; those clean-shaven types who dress in suits and ties are fragile to information about them.

Large corporations and governments do not seem to understand this rebound power of information and its ability to control those who try to control it. When you hear a corporation or a debt-laden government trying to "reinstill confidence" you know they are fragile, hence doomed. Information is merciless: one press conference "to tranquilize" and the investors will run away, causing a death spiral or a run on the

bank. Which explains why I have an obsessive stance against government indebtedness, as a staunch proponent of what is called fiscal conservatism. When you don't have debt you don't care about your reputation in economics circles—and somehow it is only when you don't care about your reputation that you tend to have a good one. Just as in matters of seduction, people lend the most to those who need them the least.

And we are blind to this antifragility of information in even more domains. If I physically beat up a rival in an ancestral environment, I injure him, weaken him, perhaps eliminate him forever—and get some exercise in the process. If I use the mob to put a contract on his head, he is gone. But if I stage a barrage of informational attacks on websites and in journals, I may be just helping him and hurting myself.

So I end this section with a thought. It is quite perplexing that those from whom we have benefited the most aren't those who have tried to help us (say with "advice") but rather those who have actively tried—but eventually failed—to harm us.

Next we turn to a central distinction between the things that like stress and other things that don't.

[1] Cato was the statesman who, three books ago (*Fooled by Randomness*), expelled all philosophers from Rome.

[2] This little bit of effort seems to activate the switch between two distinct mental systems, one intuitive and the other analytical, what psychologists call "system 1" and "system 2."

[3] There is nothing particularly "white" in white noise; it is simply random noise that follows a Normal Distribution.

[4] The obvious has not been tested empirically: Can the occurrence of extreme events be predicted from past history? Alas, according to a simple test: no, sorry.

[5] Set a simple filtering rule: all members of a species need to have a neck forty centimeters long in order to survive. After a few generations, the surviving population would have, on average, a neck *longer* than forty centimeters. (More technically, a stochastic process subjected to an absorbing barrier will have an observed mean higher than the barrier.)

[6] The French have a long series of authors who owe part of their status to their criminal record—which includes the poet Ronsard, the writer Jean Genet, and many others.

CHAPTER 3

The Cat and the Washing Machine

Stress is knowledge (and knowledge is stress)—The organic and the mechanical—No translator needed, for now—Waking up the animal in us, after two hundred years of modernity

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The bold conjecture made here is that everything that has life in it is to some extent antifragile (but not the reverse). It looks like the secret of life is antifragility.

Typically, the natural—the biological—is both antifragile and fragile, depending on the source (and the range) of variation. A human body can benefit from stressors (to get stronger), but only to a point. For instance, your bones will get denser when episodic stress is applied to them, a mechanism formalized under the name Wolff's Law after an 1892 article by a German surgeon. But a dish, a car, an inanimate object will not—these may be robust but cannot be intrinsically antifragile.

Inanimate—that is, nonliving—material, typically, when subjected to stress, either undergoes material fatigue or breaks. One of the rare exceptions I've seen is in the report of a 2011 experiment by Brent Carey, a graduate student, in which he shows that composite material of carbon nanotubes arranged in a certain manner produces a self-strengthening response previously unseen in synthetic materials, "similar to the localized self-strengthening that occurs in biological structures." This crosses the boundary between the living and the inanimate, as it can lead to the development of adaptable load-bearing material.

We can use the distinction as a marker between living and nonliving. The fact that the artificial needs to be antifragile for us to be able to use it as tissue is quite a telling difference between the biological and the synthetic. Your house, your food processor, and your computer desk eventually wear down and don't self-repair. They may look better with age (when artisanal), just as your jeans will look more fashionable with use, but eventually time will catch up with them and the hardest material will end up looking like Roman ruins. Your jeans may look improved and more fashionable when worn out, but their material did not get stronger, nor do they self-repair. But think of a material that would make them stronger, self-heal, and improve with time.[1]

True, while humans self-repair, they eventually wear out (hopefully leaving their genes, books, or some other information behind—another discussion). But the phenomenon of aging is misunderstood, largely fraught with mental biases and logical flaws. We observe old people and see them age, so we associate aging with their loss of muscle mass, bone weakness, loss of mental function, taste for Frank Sinatra music,

and similar degenerative effects. But these failures to self-repair come largely from maladjustment—either too few stressors or too little time for recovery between them—and maladjustment for this author is the mismatch between one's design and the structure of the randomness of the environment (what I call more technically its "distributional or statistical properties"). What we observe in "aging" is a combination of maladjustment and senescence, and it appears that the two are separable—senescence might not be avoidable, and should not be avoided (it would contradict the logic of life, as we will see in the next chapter); maladjustment is avoidable. Much of aging comes from a misunderstanding of the effect of comfort—a disease of civilization: make life longer and longer, while people are more and more sick. In a natural environment, people die without aging—or after a very short period of aging. For instance, some markers, such as blood pressure, that tend to worsen over time for moderns do not change over the life of hunter-gatherers until the very end.

And this artificial aging comes from stifling internal antifragility.

The Complex

This organic-mechanical dichotomy is a good starter distinction to build intuitions about the difference between two kinds of phenomena, but we can do better. Many things such as society, economic activities and markets, and cultural behavior are apparently man-made but grow on their own to reach some kind of self-organization. They may not be strictly biological, but they resemble the biological in that, in a way, they multiply and replicate—think of rumors, ideas, technologies, and businesses. They are closer to the cat than to the washing machine but tend to be mistaken for washing machines. Accordingly we can generalize our distinction beyond the biological-nonbiological. More effective is the distinction between noncomplex and complex systems.

Artificial, man-made mechanical and engineering contraptions with simple responses are complicated, but not "complex," as they don't have interdependencies. You push a button, say, a light switch, and get an exact response, with no possible ambiguity in the consequences, even in Russia. But with complex systems, interdependencies are severe. You need to think in terms of ecology: if you remove a specific animal you disrupt a food chain: its predators will starve and its prey will grow unchecked, causing complications and series of cascading side effects. Lions are exterminated by the Canaanites, Phoenicians, Romans, and later inhabitants of Mount Lebanon, leading to the proliferation of goats who crave tree roots, contributing to the deforestation of mountain areas, consequences that were hard to see ahead of time. Likewise, if you shut down a bank in New York, it will cause ripple effects from Iceland to Mongolia.

In the complex world, the notion of "cause" itself is suspect; it is either nearly

impossible to detect or not really defined—another reason to ignore newspapers, with their constant supply of causes for things.

STRESSORS ARE INFORMATION

Now the crux of complex systems, those with interacting parts, is that they convey information to these component parts through stressors, or thanks to these stressors: your body gets information about the environment not through your logical apparatus, your intelligence and ability to reason, compute, and calculate, but through stress, via hormones or other messengers we haven't discovered yet. As we saw, your bones will get stronger when subjected to gravity, say, after your (short) employment with a piano moving company. They will become weaker after you spend the next Christmas vacation in a space station with zero gravity or (as few people realize) if you spend a lot of time riding a bicycle. The skin on the palms of your hands will get calloused if you spend a summer on a Soviet-style cooperative farm. Your skin lightens in the winter and tans in the summer (especially if you have Mediterranean origins, less so if you are of Irish or African descent or from other places with more uniform weather throughout the year).

Further, errors and their consequences are information; for small children, pain is the only risk management information, as their logical faculties are not very developed. For complex systems are, well, all about information. And there are many more conveyors of information around us than meet the eye. This is what we will call *causal opacity:* it is hard to see the arrow from cause to consequence, making much of conventional methods of analysis, in addition to standard logic, inapplicable. As I said, the predictability of specific events is low, and it is such opacity that makes it low. Not only that, but because of nonlinearities, one needs higher visibility than with regular systems—instead what we have is opacity.

FIGURE 2. This illustrates why I have a thing for bones. You see identical situations of head-loading water or grain in traditional societies in India, Africa, and the Americas. There is even a Levantine love song about an attractive woman with an amphora on her head. The health benefits could beat bone density medication—but such forms of therapy would not benefit pharma's bottom line. Credit: Creative Commons

Let us consider bones again. I have a thing for bones, and the idea I will discuss next made me focus on lifting heavy objects rather than using gym machines. This obsession with the skeleton got started when I found a paper published in the journal *Nature* in 2003 by Gerard Karsenty and colleagues. The tradition has been to think that aging *causes* bone weakness (bones lose density, become more brittle), as if there was a one-way relationship possibly brought about by hormones (females start experiencing osteoporosis after menopause). It turns out, as shown by Karsenty and others who have since embarked on the line of research, that the reverse is also largely true: loss of bone density and degradation of the health of the bones also *causes* aging, diabetes, and, for males, loss of fertility and sexual function. We just cannot isolate any causal relationship in a complex system. Further, the story of the bones and the associated misunderstanding of interconnectedness illustrates how lack of stress (here, bones under a weight-bearing load) can cause aging, and how depriving stress-hungry antifragile systems of stressors brings a great deal of fragility which we will transport to political systems in Book II. Lenny's exercise method, the one I watched and tried to imitate in the last chapter, seemed to be as much about stressing and strengthening the bones as it was about strengthening the muscles—he didn't know much about the mechanism but had discovered, heuristically, that weight bearing did something to his system. The lady in Figure 2, thanks to a lifetime of head-loading water jugs, has

outstanding health and excellent posture.

Our antifragilities have conditions. The frequency of stressors matters a bit. Humans tend to do better with acute than with chronic stressors, particularly when the former are followed by ample time for recovery, which allows the stressors to do their jobs as messengers. For instance, having an intense emotional shock from seeing a snake coming out of my keyboard or a vampire entering my room, followed by a period of soothing safety (with chamomile tea and baroque music) long enough for me to regain control of my emotions, would be beneficial for my health, provided of course that I manage to overcome the snake or vampire after an arduous, hopefully heroic fight and have a picture taken next to the dead predator. Such a stressor would be certainly better than the mild but continuous stress of a boss, mortgage, tax problems, guilt over procrastinating with one's tax return, exam pressures, chores, emails to answer, forms to complete, daily commutes—things that make you feel trapped in life. In other words, the pressures brought about by civilization. In fact, neurobiologists show that the former type of stressor is necessary, the second harmful, for one's health. For an idea of how harmful a low-level stressor without recovery can be, consider the so-called Chinese water torture: a drop continuously hitting the same spot on your head, never letting you recover.

Indeed, the way Heracles managed to control Hydra was by cauterizing the wounds on the stumps of the heads that he had just severed. He thus prevented the regrowth of the heads and the exercise of antifragility. In other words, he disrupted the recovery.

Table 2 shows the difference between the two types. Note that there may be intermediate steps between engineered and organic, though things tend to cluster in one bucket or the other.

The reader can get a hint of the central problem we face with top-down tampering with political systems (or similar complex systems), the subject of Book II. The fragilista mistakes the economy for a washing machine that needs monthly maintenance, or misconstrues the properties of your body for those of a compact disc player. Adam Smith himself made the analogy of the economy as a watch or a clock that once set in motion continues on its own. But I am certain that he did not quite think of matters in these terms, that he looked at the economy in terms of organisms but lacked a framework to express it. For Smith understood the opacity of complex systems as well as the interdependencies, since he developed the notion of the "invisible hand."

Click here for a larger image of this table.

TABLE 2 • THE MECHANICAL AND THE ORGANIC (BIOLOGICAL OR NONBIOLOGICAL)

THE MECHANICAL, NONCOMPLEX	*THE ORGANIC, COMPLEX*
Needs continuous repair and maintenance	Self-healing
Hates randomness	Loves randomness (small variations)
No need for recovery	Needs recovery between stressors
No or little interdependence	High degree of interdependence
Stressors cause material fatigue	Absence of stressors cause atrophy
Age with use (wear and tear)	Age with disuse*
Undercompensates from shocks	Overcompensates from shocks
Time brings only senescence	Time brings aging and senescence

* Frano Barović reading this chapter wrote to me: "Machines: use it and lose it; organisms: use it or lose it." Also note that everything alive needs stressors, but not all machines need to be left alone—a point we will visit in our discussion of annealing.

But alas, unlike Adam Smith, Plato did not quite get it. Promoting the well-known metaphor of the *ship of state,* he likens a state to a naval vessel, which, of course, requires the monitoring of a captain. He ultimately argues that the only men fit to be captain of this ship are philosopher kings, benevolent men with absolute power who have access to the Form of the Good. And once in a while one hears shouts of "who is governing us?" as if the world needs someone to govern it.

Equilibrium, Not Again

Social scientists use the term "equilibrium" to describe balance between opposing forces, say, supply and demand, so small disturbances or deviations in one direction, like those of a pendulum, would be countered with an adjustment in the opposite direction that would bring things back to stability. In short, this is thought to be the goal for an economy.

Looking deeper into what these social scientists want us to get into, such a goal can be death. For the complexity theorist Stuart Kaufman uses the idea of equilibrium to separate the two different worlds of Table 2. *For the nonorganic, noncomplex, say, an object on the table, equilibrium* (as traditionally defined) *happens in a state of inertia. So for something organic, equilibrium* (in that sense) *only happens with death.* Consider an example used by Kaufman: in your bathtub, a vortex starts forming

and will keep going after that. Such type of situation is permanently "far from equilibrium"—and it looks like organisms and dynamic systems exist in such a state.[2] For them, a state of normalcy requires a certain degree of volatility, randomness, the continuous swapping of information, and stress, which explains the harm they may be subjected to when deprived of volatility.

CRIMES AGAINST CHILDREN

Not only are we averse to stressors, and don't understand them, but we are committing crimes against life, the living, science, and wisdom, for the sake of eliminating volatility and variation.

I feel anger and frustration when I think that one in ten Americans beyond the age of high school is on some kind of antidepressant, such as Prozac. Indeed, when you go through mood swings, you now have to justify why you *are not* on some medication. There may be a few good reasons to be on medication, in severely pathological cases, but my mood, my sadness, my bouts of anxiety, are a second source of intelligence—perhaps even the first source. I get mellow and lose physical energy when it rains, become more meditative, and tend to write more and more slowly then, with the raindrops hitting the window, what Verlaine called autumnal "sobs" (*sanglots*). Some days I enter poetic melancholic states, what the Portuguese call *saudade* or the Turks *hüzün* (from the Arabic word for sadness). Other days I am more aggressive, have more energy—and will write less, walk more, do other things, argue with researchers, answer emails, draw graphs on blackboards. Should I be turned into a vegetable or a happy imbecile?

Had Prozac been available last century, Baudelaire's "spleen," Edgar Allan Poe's moods, the poetry of Sylvia Plath, the lamentations of so many other poets, everything with a soul would have been silenced.…

If large pharmaceutical companies were able to eliminate the seasons, they would probably do so—for a profit, of course.

There is another danger: in addition to harming children, we are harming society and our future. Measures that aim at reducing variability and swings in the lives of children are also reducing variability and differences within our said to be Great Culturally Globalized Society.

Punished by Translation

Another forgotten property of stressors is in language acquisition—I don't know anyone who ever learned to speak his mother tongue in a textbook, starting with grammar and, checked by biquarterly exams, systematically fitting words to the acquired rules. You pick up a language best thanks to situational difficulty, from error to error, when you need to communicate under more or less straining circumstances, particularly to express urgent needs (say, physical ones, such those arising in the aftermath of dinner in a tropical location).

One learns new words without making a nerd-effort, but rather another type of effort: to communicate, mostly by being forced to read the mind of the other person—suspending one's fear of making mistakes. Success, wealth, and technology, alas, make this mode of acquisition much more difficult. A few years ago, when I was of no interest to anyone, foreign conference organizers did not assign to me the fawning "travel assistant" fluent in Facebook English, so I used to be forced to fend for myself, hence picking up vocabulary by finger pointing and trial and error (just as children do)—no handheld devices, no dictionary, nothing. Now I am punished by privilege and comfort—and I can't resist comfort. The punishment is in the form of a person, fluent in English, greeting me by displaying my misspelled name at the airport, no stress, no ambiguity, and no exposure to Russian, Turkish, Croatian, or Polish outside of ugly (and organized) textbooks. What is worse, the person is unctuous; obsequious verbosity is something rather painful under the condition of jet lag.

Yet the best way to learn a language may be an episode of jail in a foreign country. My friend Chad Garcia improved his Russian thanks to an involuntary stay in the quarantine section of a hospital in Moscow for an imagined disease. It was a cunning brand of medical kidnapping, as during the mess after the end of the Soviet rule, hospitals were able to extort travelers with forced hospital stays unless they paid large sums of money to have their papers cleared. Chad, then barely fluent in the language, was forced to read Tolstoy in the original, and picked up quite a bit of vocabulary.

Touristification

My friend Chad benefited from the kind of disorder that is less and less prevalent thanks to the modern disease of *touristification*. This is my term for an aspect of modern life that treats humans as washing machines, with simplified mechanical responses—and a detailed user's manual. It is the systematic removal of uncertainty and randomness from things, trying to make matters highly predictable in their smallest details. All that for the sake of comfort, convenience, and efficiency.

What a tourist is in relation to an adventurer, or a flâneur, touristification is to life; it consists in converting activities, and not just travel, into the equivalent of a script like those followed by actors. We will see how touristification castrates systems and organisms that like uncertainty by sucking randomness out of them to the last drop—while providing them with the illusion of benefit. The guilty parties are the education system, planning the funding of teleological scientific research, the French baccalaureate, gym machines, etc.

And the electronic calendar.

But the worse touristification is the life we moderns have to lead in captivity, during our leisure hours: Friday night opera, scheduled parties, scheduled laughs. Again,

golden jail.

This "goal-driven" attitude hurts deeply inside my existential self.

The Secret Thirst for Chance

Which brings us to the existential aspect of randomness. If you are not a washing machine or a cuckoo clock—in other words, if you are alive—something deep in your soul likes a certain measure of randomness and disorder.

There is a titillating feeling associated with randomness. We like the moderate (and highly domesticated) world of games, from spectator sports to having our breathing suspended between crap shoots during the next visit to Las Vegas. I myself, while writing these lines, try to avoid the tyranny of a precise and explicit plan, drawing from an opaque source inside me that gives me surprises. Writing is only worth it when it provides us with the tingling effect of adventure, which is why I enjoy the composition of books and dislike the straitjacket of the 750-word op-ed, which, even without the philistinism of the editor, bores me to tears. And, remarkably, what the author is bored writing bores the reader.

If I could predict what my day would exactly look like, I would feel a little bit dead.

Further, this randomness is necessary for true life. Consider that all the wealth of the world can't buy a liquid more pleasurable than water after intense thirst. Few objects bring more thrill than a recovered wallet (or laptop) lost on a train. Further, in an ancestral habitat we humans were prompted by natural stimuli—fear, hunger, desire—that made us work out and become fit for our environment. Consider how easy it is to find the energy to lift a car if a crying child is under it, or to run for your life if you see a wild animal crossing the street. Compare this to the heaviness of the obligation to visit the gym at the planned 6 P.M. and be bullied there by some personal trainer—unless of course you are under the imperative to look like a bodyguard. Also consider how easy it is to skip a meal when the randomness in the environment causes us to do so, because of lack of food—as compared to the "discipline" of sticking to some eighteen-day diet plan.

There exist the kind of people for whom life is some kind of project. After talking to them, you stop feeling good for a few hours; life starts tasting like food cooked without salt. I, a thrill-seeking human, have a b***t detector that seems to match my boredom detector, as if we were equipped with a naturalistic filter, dullness-aversion. Ancestral life had no homework, no boss, no civil servants, no academic grades, no conversation with the dean, no consultant with an MBA, no table of procedure, no application form, no trip to New Jersey, no grammatical stickler, no conversation with someone boring you: all life was random stimuli and nothing, good or bad, ever felt like work.[3]

Dangerous, yes, but boring, never.

Finally, an environment with variability (hence randomness) does not expose us to chronic stress injury, unlike human-designed systems. If you walk on uneven, not man-made terrain, no two steps will ever be identical—compare that to the randomness-free gym machine offering the exact opposite: forcing you into endless repetitions of the very same movement.

Much of modern life is preventable chronic stress injury.

Next, let us examine a wrinkle of evolution, that great expert on antifragility.

[1] Another way to see it: machines are harmed by low-level stressors (material fatigue), organisms are harmed by the *absence* of low-level stressors (hormesis).

[2] These are the so-called dissipative structures, after the works of the physicist Ilya Prigogine, that have a quite different status from simple equilibrium structures: they are formed and maintained through the effect of exchange of energy and matter in permanent nonequilibrium conditions.

[3] Neither Rousseau nor Hobbes. True, life then was perhaps "brutal and short," but it is a severe logical mistake to present a tradeoff, to use unsavory aspects of early humanity as a necessary cost of avoiding modern tortures. There is no reason to not want advantages from both eras.