Forward Resilience: Protecting Society in an Interconnected World
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Forward Resilience in Context

Tomas Ries

Addressing Security Needs

Resilience is one of four ways that humans address their security. They include science, strategy, resilience, and a fourth approach that I call "transcending."

Science is the quest to remove uncertainty through understanding. It does this in two ways. One is creative speculation employing logical reasoning (mathematics) to propose how things might function and thus creating hypotheses. The other is testing the hypotheses empirically for falsification, thereby transforming an hypothesis into a theory, if rigorous testing has not disproved it.

While science indicates that there is no absolute certainty (and the history of science reinforces this) we can achieve a very high level of operational certainty for all practical purposes. Our understanding of how the world around us functions, and the technologies that this has generated, has vastly expanded the domain of certainty around the human condition.

And certainty, in terms of understanding causality, confers tremendous power to manipulate our environment. However despite the advances of science over the last four hundred years, the domains of certainty still remain very small, and beyond them hosts of challenges shrouded in various degrees of uncertainty confront us. This is where strategy and resilience come into play.

Strategy is the attempt to manage uncertainty. It operates outside the tended gardens of science, accepting and engaging uncertainty. As uncertainty still dominates the human condition, it is the most important tool we have at our disposal. It can be divided into two approaches, shaping and dancing.

Shaping is the attempt to manipulate our environment so it accords with our interests as far as possible. This requires conditions where uncertainty is limited and a degree of forecasting is possible. It thus addresses the known-knowns and the known-unknowns. Shaping can be inward-oriented, improving one's own condition, or outward-oriented, shaping the environment. It has dominated much of our strategic thinking since the 19th century. Today, as uncertainty increasingly dominates the human condition, it is being superseded by dancing.

Dancing is needed under conditions of greater uncertainty, when forecasting, planning and shaping are undermined and surprises dominate. Dancing consists of rapidly adjusting to the unexpected, responding to challenges or exploiting opportunities. It addresses the known-

unknowns which may be prepared for to some extent, but which still require flexible adjustments, and the unknown-unknowns, which require a great deal of flexibility.

Shaping and dancing call for two very different mindsets. The first is based on analysis, planning and imposing, and often entails caution and rigidity. The second is based on intuition, agility and accommodating, and requires boldness and flexibility. Yet both depend on limiting uncertainty, permitting a degree of forecasting, and/or conditions in which the inevitable surprises are not too severe. When uncertainty becomes truly rough, both in terms of intensity and severity, resilience is required.

Resilience becomes important when both science and strategy fail, and we are confronted with a shock or pressure that threaten to significantly alter our condition or existence. It thus addresses the unknown-unknowns. It is examined closer below.

Transcending the environment is the quest for positive liberty. It may be the most effective approach, but few are attracted to it, even fewer succeed and it is in any case an individual approach, not available to societies as a whole. This is thus not addressed here.

The Concept of Resilience

Resilience is the response to pressures and shock that take one by complete surprise, or which one may have foreseen but for which one neglected to prepare. These "Black Swans" can sneak up on you, knock you down and leave you surprised and battered, with no forewarning or reaction time. Resilience hurts. It is neither a pleasant nor an easy option. It entails accepting and absorbing the blow (and suffering the strain and pain) and sacrificing important and dearly held things in order to preserve core essentials (and enduring the sacrifice). It does, however, offer the chance of survival.

Resilience is thus a fallback position, the next to last in line before adaptation, which I address in the next section.

Resilience involves no strategic shaping of the environment, little or no dancing, and a correspondingly greater degree of strain and potentially suffering. Under these conditions it is hard to carry out any sort of elaborate strategy. As Mike Tyson puts it: "Everyone has a plan until you punch them in the face, then they don't have a plan."[1]

Whether resilience can be considered part of the "strategic" approach depends upon how one defines it. Along with science it is certainly a crucial method for survival. However, it is not part of strategy understood as shaping and dancing, as it is entirely reactive. There is no pro-active shaping of the incoming energy and very little reactive dancing, apart from absorbing the energy. It is essentially a fallback condition that enables a system to weather completely unexpected challenges to its function and survival. It is that which allows one to survive a completely surprising blow from behind, and then either endure whatever comes, or get back on one's feet and fight back or run. In this respect it is far removed from the strategic approach.

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[1] Mike Tyson, quoted by Jim Messina, in Dan Balz, *Collision 2012: Obama versus Romney and the Future of Elections in America*. As cited in Edward Luce, "Of Comedy and Errors." *Life & Arts - FT Weekend*, August 10/11, 2013: p. 10.

On the other hand, if one is concerned about cataclysmic Black Swans, one may deliberately foster a generic resilience, reinforcing one's capacity to endure unexpected and shocks. Either against totally unimaginable but catastrophic surprise, or else against envisaged but remote possibilities, such as the civil defense programs during the Cold War. In either of these cases the promotion of resilience may be considered a form of strategy, similar to that of an insurance policy. It is certainly a prudent complement to the more active forms of strategy involved in the quest for power. As Zolli and Healy put it,

"If we cannot control the volatile tides of change, we can learn to build better boats. We can design... systems to better absorb disruption, operate under a wider variety of conditions, and shift more fluidly from one circumstance to the next. To do that we need to understand the emerging field of resilience."[2]

Resilience can thus be considered as being partly beyond power. It confers a degree of passive power, if the objective is to avoid being eliminated and if resilience succeeds in avoiding extinction. But it is a very defensive form of power that does not, per se, influence the danger itself other than, perhaps, through exhaustion.

WHAT: Defining Resilience

A preliminary simple definition of resilience is the ability of a system to accommodate dramatic change while retaining its essence and ability to evolve intact.

I will elaborate on this below. Initially it is enough to note that the simple definition above involves three key conceptual components: 'a system'; 'accommodate'; and 'retaining its essence intact'.

'System' implies that the resilient agent is in fact a system, that is to say a collection of dynamically interacting components, which generate a collective function – the essence of the system – which defines their existence, individually and collectively. Every system thus embodies a core function – its essence. If this essence is lost or changed the system ceases to exist. It either evolves into something else, or goes extinct. This essence, in turn, is sustained by a series of vital life systems. These are more open to change, provided they still maintain the essence, or core function of the system. Finally, the system has a variety of physical manifestations -- the branches, leaves and flowers that constitute its contextual shell. These are the most open to change, without affecting the essence.

'Accommodate' is the key operational characteristic of resilience. It implies that resilience does not resist the incoming energy, but receives it, bends to it or accommodates it in some other way, and yet does not break. This is the elastic operational aspect of resilience. Resilience is thus not the same as deterrence, where the stressful energy is pre-empted, or defence, where the stressful energy is resisted. From a Daoist perspective water may exemplify this sort of absorption.[3]

A second key quality of accommodation as used here is the ability to sacrifice the less important in order to preserve the essence. This can be painful and drastic. The need and ability to

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[2] Andrew Zolli and Ann Marie Healy, *Resilience. Why Things Bounce Back*. London: Headline Publishing Group, 2012, p. 323.
[3] See Francois Jullien's chapter on the nature of the energy of water, 'Images d'eau,' in Francois Jullien, *Traité de l'efficacité*. Paris: Grasset, 1996, pp. 261-280.

amputate a gangrenous wound to save the life is one example. The human body's reaction to extreme cold by sacrificing the extremities (nose, ears, hands, feet, etc.) to retain heat for the vital organs is another. In the social dimension, the ability of a society to survive oppressive occupation and recover its essence once liberated is another. In all cases, accommodation to strain can hurt.

'Retaining its essence and ability to evolve intact' is a second operational characteristic of resilience. As Zolli and Healy put it, resilience involves the ability to "maintain its core purpose and integrity in the face of dramatically changed circumstances."[4]

This angle is important since it highlights the crucial issue of essence, or the 'core purpose' of whatever one is considered resilient. It is crucial because it directs all one's efforts. It makes a huge difference if one sees the core purpose of a given society as being to safeguard the lives and health of all its members, or of safeguarding their freedom and independence, or promoting their spiritual values, or their future genetic base, or their ecological base, or whatever. The question matters because in a severe crisis involving resilience we will not be able to offer our citizens all the nice values and services that we have built up in peacetime. We will have to make sacrifices, sometimes brutal.

This implies that even if the outer layers of the target bend to the incoming energy, or even break under its onslaught, the inner core of the system, and the critical vital life systems that sustain it, remain intact and can either continue to function while the stressful pressure is applied, or can hibernate and be revived once the extreme pressure is eased. While resilience may include a degree of superficial adaptation, affecting the system's external layers, it thus does not imply a deep adaptation, transforming its essential function or its key vital life systems. Nor is resilience the same as evolution, which ultimately involves a transformation of the essence (or extinction).

Resilience thus involves external softness and elasticity coupled with internal endurance and tenacity of the core. In this respect it cleaves to the Daoist principle of 'Cotton outside, steel inside. Not the other way around.' It accommodates pressure and surface changes while protecting the essence and its ability to recover (if only partly) at a later time. As such it is a partial transformation, but on a sliding scale towards adaptation, which is similar but deeper, affecting a greater part of the support system and, in extremis, the essence. Evolution is an example of resilience leading to adaptation leading to deep transformation.

A simple example of resilience could be bamboo bending to the wind. A good example of a more elaborate and sophisticated form of resilience is the practice of *tuishou* in the Chinese martial art of *Taijiquan*. *Tuishou* is generally translated as 'push hands', but since it in fact is anything but pushy, it might be better translated as 'sticky hands' or, better still, as 'transforming energy'.

Other definitions

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[4] Zolli and Healy, op. cit., p. 7.

To refine the concept of resilience further we may examine some other definitions of the concept.[5] To begin with one loose definition by Carl Folke: "Resilience is the long-term capacity of a system to deal with change and continue to develop."[6]

This definition is valuable in that it notes that the resilient agent is a 'system'. As we shall see below this has important operational implications. Beyond that, however, the definition is too loose to be useful. First, our environment is constantly changing, and all objects and systems in it constantly 'deal with change', and most 'continue to develop'. Folke's definition would thus include almost everything almost all the time. What is missing is the element of dramatic change. It may thus serve as a very general definition of 'functioning', but not resilience. The second reason it is inadequate is because resilience also involves a short-term capacity to deal with change, such as for instance a sudden shock.

One of the best books on resilience has been written by Andrew Zolli and Ann Marie Healy. They offer a better definition which elegantly covers these deficiencies: "we frame resilience in terms borrowed from both ecology and sociology as *the capacity of a system, enterprise, or a person to maintain its core purpose and integrity in the face of dramatically changed circumstances*."[7]

This nicely generic definition includes two key elements missing in the Folke definition. First, the 'dramatically changed circumstances', which specifies that resilience is more than merely dealing with change. It is the capacity to deal with dramatic, or disruptive, change. This is fairly obvious. The second point is deeper. That is the capacity 'to maintain its 'core purpose'. As we shall see, this is crucial, for that is really what resilience is all about. When disruptive change strikes one must generally sacrifice something. What counts is keeping the essence of the system intact, as well as the minimum vital life systems that support it. As we shall see it also has crucial operational implications for any deliberate attempts to promote resilience, since it forces one to focus and prioritize.

Southwick and Charner offer a narrower, context-bound definition of resilience but which largely echoes the core message of Zolli and Healy: "In the physical sciences, materials and objects are termed resilient if they resume their original shape upon being bent or stretched. In people, resilience refers to the ability to 'bounce back' after encountering difficulty. The American Psychological Association (APA) defines it as the 'process of adapting well in the face of adversity, trauma, tragedy, threats and even significant sources of stress - such as family and relationship problems, serious health problems, or workplace and financial stresses'. In his book, *Aging Well*, Harvard University psychologist George Vaillant (2002) describes resilient individuals as resembling 'a twig with a fresh, green living core. When twisted out of shape, such a twig bends, but it does not break; instead, it springs back and continues growing'."[8]

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[5] Like all concepts, resilience is contested. For a short but very good overview of some of the fracture lines see Michael Hanisch, "What is Resilience ? Ambiguities of a Key Term." *Security Policy Working Paper* No. 19/2016. Berlin: Federal Academy for Security Policy, p. 4. Here I will only examine two particularly clear and useful studies of resilience.

[6] Carl Folke, Director of the Stockholm Resilience Centre. SRC webpage 4.4.2011, text accompanying small lecture video.

[7] Zolli and Healy, op. cit., p. 7 *(italics in original)*.

[8] Steven M. Southwick and Dennis S. Charney, *Resilience. The Science of Mastering Life's Greatest Challenges*. Cambridge: Cambridge University Press, 2012, p. 7.

The APA definition mixes resilience with adaptation. Some such as Folke and Zolli/Healy define resilience as the ability to return to a state preceding the shock, which is reconstitution, not adaptation. On the other hand, it all depends on what one considers the 'preceding state' to be. In fact most conditions entail several layers, from the most superficial context-bound to the deep enduring essence. In the face of severe shocks, which make it impossible to restore previous contextual conditions, one must adapt at that level while maintaining or restoring the deeper essential levels. In this sense resilience would include both adaptation to the inevitable at the superficial levels but maintenance or restoration at the core. The twig may bend out of shape, but it still grows and functions as a twig. Ideally, resilience involves full restoration, in which case no adaptation is needed. But when necessary, it involves a mix of adaptation and restoration, provided the essence is restored.

Zolli and Healy also make a number of important distinctions concerning resilience. One is that resilience is not always the same as robustness: "resiliency is not *robustness*, which is typically achieved by hardening the assets of a system. The Pyramids... are remarkably robust structures... but knock them over and they won't put themselves back together."[9]

Another is that resilience is not redundancy: "The same holds true for *redundancy*… Highly resilient systems are frequently *also* highly redundant systems. But backups are costly… Worse still, these backups may become of little or no use when circumstances change dramatically."[10]

This is a particularly apt observation for our present condition. In an age of austerity, most states do not have the money to subsidize agriculture (providing a partial domestic source of food) nor maintain large stocks of oil and grain, or huge shelters for the population. And yet all these could still be needed.

Finally, they note that resilience does not imply returning to an identical state: "resilience does not always equate with the recovery of a system to its initial state. ... In their purest expression, resilient systems may have no baseline to return to – they may reconfigure themselves continuously and fluidly to adapt to ever changing circumstances, while continuing to fulfill their purpose."[11]

The question is whether such fluidity permits any significant transformative core purpose. If one only reacts, then any shaping of the surroundings would be very limited and shallow. There is a price to be paid for such a degree of resilience. Thus there is probably an optimal equilibrium between stasis and fluidity that permits one both to shape the external environment and adapt to it (an enduring core and adapting surfaces). Go too far either way and one either ends up either as the Pyramids or as a virus.

The nature of that which can be resilient

To get an even better grasp of resilience it helps also to understand the nature of that which is resilient. Whether it is a virus, or a global ecosystem, it can be described as a system with three core abilities. The first is the ability to survive a sudden shock to its normal condition. This could include the ability to protect the vital core of the system while sacrificing system peripherals. The second is the ability to return towards its original state after the shock. The third is the ability to adjust itself to new conditions if they do not permit a return to the original

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[9] Zolli and Healy, op. cit., p. p. 13 *(italics in original).*
[10] Ibid.
[11] Ibid.

state, but without losing its essence and vitality. This third feature distinguishes a resilient ecosystem from an elastic rubber band. Elasticity is a crucial component of resilience, but it is not enough. A resilient system must also be able to alter itself if survival so demands, yet without losing its essence.

These three abilities are, in a sense, the physiology of resilience. They imply that the resilient must be a fairly complex dynamic system, close to a living organism in the sense that it has a dynamic function, seeks the survival of that function (in other words, of itself), and has an ability to make complex adjustments in that effort. This description thus considers ecosystems, states, societies or cities as living beings, alongside such obviously living organisms such as viruses, plants and animals. One day it could include machines imbued with artificial intelligence, if indeed we could still call such things 'machines'.

In addition to the physiology of resilience, we may also describe the morphology of resilience. From this perspective a resilient system can be divided into three functional parts. The first is the essence, or its core function: that which makes the system what it is, animates it and gives it an evolutionary purpose, even if this is not a conscious purpose. The second encompasses the vital life systems that sustain the essence. The third consists of the outer trappings, including all sorts of more or less redundant or replaceable supporting elements. These are important under normal circumstances, but may be sacrificed in a catastrophe.

Both the physiology and morphology of resilience have implications for how resilience works. We may thus turn to a short outline of how resilience may occur.

HOW: Promoting Resilience

The definition of resilience includes the three core functions outlined above: surviving the initial shock (preserving the essence) even as peripheral components are buffeted; recovering sufficient vital life systems to sustain the essence, while the storm rages; and finally adjusting external trappings and vital life systems, if necessary, to sustain the core essence. This last element implies that a resilient system may look very different superficially after being subjected to trauma, but that its essence remains largely the same. If the essence is no longer the same, then the victim will either have become extinct or been transformed into something radically different.

To survive the initial shock, resiliency needs at least three overlapping qualities.

First is the ability to absorb incoming energy. The key quality here is redundancy, whether in terms of space and time, or reserves and alternatives. It needs all those things a hyper-efficient system weeds out. They offer hyper-efficiency, and thus better everything, under normal conditions. But hyper-efficient systems become fatal as soon as conditions become abnormal. Under these conditions we need fat and we need slack, because they permit us to absorb shock. Of course a fine balance is necessary here. Too much slack and fat and the system will not survive the initial blow. Too little slack and fat and it will not have enough reserves to sustain the initial blow.

Nevertheless, one of the key lessons from a resilient perspective is that hyper-efficiency is the enemy of resilience. It makes it, and our entire system, frighteningly vulnerable. We need to get back some fat. The problem for societies living in the age of austerity is that systemic fat costs money. We can no longer subsidize national agriculture to maintain a degree of nutritional

self-sufficiency, we can no longer afford the luxury of extra manpower or goods stored in warehouses.

The second quality is the ability to adjust to the incoming pressure, both in terms of avoiding meeting the incoming force head-on, and in terms of modifying its own normal way of functioning. The key quality here is agility and flexibility, dodging the blow and improvising its response. Here too there is a fine balance between giving way so much that one is crushed, and resisting a force that one cannot defeat.

The third quality is the ability to protect its essence even as it its external trappings, and even some vital life systems, bend and crack under the pressure. This calls for an ability to conceal, shield or even remove the vital essence from the incoming force. Here there is no fine equilibrium. All else may be modified or sacrificed, but the core essence must be preserved at all costs, lest one go extinct.

To endure and recover the ability to sustain the essence over time, resiliency requires at least three overlapping qualities:
- First, the ability to endure external pressures by reducing them. This can be done by deflecting them, by returning them against their sources, or by absorbing them.
- Second, the ability to adjust sufficiently to permit survival. This can be done by compromising on non-essential functions, or even discarding them, as for instance in an amputation.
- Third, the ability to sustain essence over time and under the new pressures. This requires ensuring that the minimum of vital life systems needed for the survival of the essence remain functional. Under extreme stress this may be complemented by shutting down the active functioning of the essence, but retaining the minimum needed to allow it to be reanimated at a later time when conditions are more clement. Examples are hibernation or going comatose.

These qualities are in turn facilitated by a degree of measured creative destruction. Thus:

> "Regular, modest failures are actually *essential* to many forms of resilience – they allow a system to release and then reorganize some of its resources. Moderate forest fires, for example, redistribute nutrients and create opportunities for new growth without destroying the system as a whole. …
> More broadly, resilient systems fail gracefully – they employ strategies for avoiding dangerous circumstances, detecting intrusions, minimizing and isolating component damage, diversifying the resources they consume, operating in a reduced state if necessary, and self-organizing to heal in the wake of a breach. No such system is ever perfect, indeed just the opposite: A seemingly perfect system is often the most fragile, while a dynamic system, subject to occasional failure, can be the most robust. Resilience is, like life itself, messy, imperfect, and inefficient. But it survives."[12]

The interesting point here is that what may appear to be ideal conditions to postindustrial humans – safety and security, hyper-efficiency, constant smooth functioning and comfort – reduce resilience. The more just-in-time delivery, the less resilience. From this perspective, a degree of slack, redundancy and fat are good. Cars made in the 1960s are highly resilient. Today's cars are wonderful but offer extremely low resilience.

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[12] Zolli and Healy, op. cit., pp. 13-14.

More operationally, Zolli and Healy identify five ways to promote resilience: "...sufficient reserves available to any given system; or diversifying its inputs; or collecting better, real-time data about its operations and performance; or enabling greater autonomy for its constituent parts; or designing firebreaks so that a disturbance in one part does not disrupt the whole..."[13]

They miss out on one crucial element to which they refer later on in their book: allowing smaller sustainable disruptions to take place, which both strengthen the system itself and help reduce the likelihood of big cataclysmic disruptions. A typical example (to which they refer) would be regular but small forest fires as opposed to rare but massively destructive forest fires. Another example would be allowing children to learn from small experiences (hammer on the thumb) rather than shielding them from all harm, leaving them unprepared to deal with the world. In fact the difference lies in accepting flow and realizing that excessive safety and comfort is as damaging as excessive danger and hardship. The balance is crucial.[14]

Finally there are 'recipes' for resilience. The psychologists Southwick and Charney identify ten coping mechanisms that have proved effective for dealing with stress and trauma, which they refer to as 'Resilience Factors': All resilient individuals they interviewed:

1.	Face reality	Confront their fears
2.	Maintain energy	Maintain an optimistic but realistic outlook
3.	Are open to support	Seek and accept social support
4.	Have guides	Imitate sturdy role models
5.	Manage themselves	Accept responsibility for their own emotional well-being

Most also:

6.	Have an anchor	Rely on an inner moral compass
7.	Find an anchorage	Turn to religious or spiritual practices
8.	Are stoic	Find a way to accept that which they could not change
9.	Are robust	Are active problem-solvers who look for meaning and opportunity in the midst of adversity and even find humor in the darkness.

Many:

10.	Generate robustness	Attend to their health and well-being and train intensively to stay physically fit, mentally sharp and emotionally strong.[15]

Zolli and Healy again identify seven core qualities that promote resilience on a more generic level:

> "…virtually all resilient systems employ tight *feedback mechanisms* to determine when an abrupt change or critical threshold is nearing.
> …
> When such sensors suggest a critical threshold is nearing or breached, a truly resilient system is able to ensure continuity by *dynamically reorganizing* both the way in which it serves its purpose and the scale at which it operates. Many resilient systems achieve this with embedded counter mechanisms, which lie dormant until a crisis occurs.
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[13] Ibid, p. 6.

[14] For a useful take on this see Greg Ip, *Foolproof. Why Safety Can Be Dangerous and How Danger Makes Us Safe*. London: Headline Publishing Group, 2015, p. 326.

[15]Southwick and Charney, op. cit., p. 13.

Another way to bolster a system's resilience is to *de-intensify* or *decouple* the system from its underlying material requirements or to diversify the resources that can be used to accomplish a given task.

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This…is made feasible by certain structural features of resilient systems. While these… may appear outwardly complex, they often have a simpler internal *modular structure* with components that plug into one another…This modularity allows a system to be reconfigured on the fly when disruption strikes, prevents failures in one part of the system from cascading through the larger whole, and ensures that the system can scale up or scale down when the time is right.

…

To encourage this modularity, many resilient systems are *diverse at their edges* but *simple at their core*.

…

This modularity, simplicity, and interoperability enable the components of many resilient systems to *flock* or *swarm*… and to break into islands when under duress.

…

Yet this… is only part of the story. Paradoxically, resilience is often also enhanced by the right kind of *clustering* – bringing resources into close proximity with one another. But it's a special kind of clustering, one whose hallmarks is density and diversity – of talent, resources, tools, models, and ideas."[16]

Finally they also make the important point that resilience is always uncertain, and must be nourished.

"Resilience is always, perhaps maddeningly, provisional, and its insistence towards holism, longer-term thinking, and less-than-peak efficiency represent real political challenges.… Resilience must continuously be refreshed and recommitted to. Every effort at resilience buys us not certainty, but another day, another chance."[17]

WHEN – Conditions Under Which Resilience Comes into Play

Zolli and Healy provide a good summary of the conditions in which resilience comes into play:

"…sudden and serious disruptions…cause you to be 'flipped' over the threshold separating your present context and a new one....Unfortunately, many of these thresholds may be crossed only in one direction. Once forces have compelled you into a new circumstance it may be impossible for you to return to your prior environment. You'll have entered a new normal.

To improve your resilience is to enhance your ability to resist being pushed from your preferred valley, while expanding the range of alternatives that you can embrace if you need to. That is what resilience researchers call *preserving adaptive capacity* – the ability to adapt to changed circumstances while fulfilling one's core purpose – and it's an essential skill in an age of unforeseeable disruption and volatility.

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Enhancing the resilience of an ecosystem, an economy, or a community may be achieved in two ways: by improving its ability to resist being pushed past these kinds of critical, sometimes permanently damaging thresholds, and by preserving and expanding the range of niches to which a system can healthily adapt if it is pushed past such thresholds."[18]

One might ask if the first solution actually is resilience. Resisting being pushed into a new valley is not resilience but resistance. However the second part gets to the core of resilience: preserving the essence while adjusting to a new context. There is a nuanced difference from

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[16] Zolli and Healy, op. cit., pp. 12-14 (*italics* in original).
[17] Ibid, p. 276.
[18] Ibid., pp. 7-9.

adapting, in which case the degree of adjustment is far greater. The difference is one of degree, both resilience and adapting involve degrees of submitting to the environment by changing oneself while preserving one's essence, but adaptation as defined here involves a greater degree of self-change. On the other hand one might say that adaptation requires a degree of resilience as the alternative would be to either to resist any significant change, or to snap and break under the forces of change.

Under such conditions of great and sustained pressure the resilient may need to adapt deeply, by changing its trappings and even its vital life systems in order to retain its essence. In this case the first step towards evolutionary change is underway. If successful the system may continue in another form, including a shift of essence. If unsuccessful it will go extinct.

Key Terms

The essence of resilience consists of three core functions: survive, endure and return.
- Survival is the capacity of a system to avoid total collapse when subjected to abnormal and existential pressure or shock.
- Enduring is the ability of a system to maintain its vital core (core function and those vital life systems that sustain it) alive should abnormal conditions prevail and prevent the full functioning of the system.
- Returning is the ability of the dormant system to reanimate itself once conditions permit, either fully or partially.

A partial reanimation always involves adaptation and may include mutation. Both of these are part of evolution. Adaptation implies that the system evolves partially by degrees, mutation involves much deeper change and evolution by transformation. If a system is unable to survive, endure and return from pressure or shock it goes extinct.

The components of the above conceptual scaffold are outlined below.

System: Every living thing, from an amoeba to the global ecosystem, is in fact a dynamic system of systems of interacting energies serving a particular core function. A system thus consists of a core function, the vital life systems that compose and sustain that core function, and a host of peripheral components and dynamics that serve the system. The more complex a system is, the more vital life systems and peripherals it has. When considering security we must always take into account that that which we are trying to protect is in fact a system. Thus we must also be able to distinguish between the core function and vital life systems that are central to the survival of the system, and the peripherals which may be sacrificed when the system is subjected to existential stress.

Total collapse: Under ideal conditions we seek total protection. Under extreme conditions we can no longer do so, but must focus on preserving core functions and their vital life systems, while sacrificing whatever is needed to do so.

Abnormal: An event that either is totally unforeseen (a Black Swan which takes a system totally by surprise and for which it is entirely unprepared), or an event that is foreseen but is considered so unlikely that one invests little or nothing to prepare for it specifically, or an event for which one is only partially prepared.

Existential: An event that may lead to systemic collapse. Systemic collapse is when the vital core (see below) of a system is destroyed, leading to total systemic collapse, as opposed to secondary threats, which only challenge the peripheral parts of a system. Systemic collapse is the same as extinction. Peripheral damage can be survived. (See also 'vital core' below.)

Avoiding extinction and retaining the ability for continued adaptation is the highest priority of any system engaged in evolution. The default setting of all natural systems, from plants to the human body to the global ecosystem, is to protect the vital core by sacrificing the peripherals when necessary. Human intent combined with power may interfere with this default setting temporarily (for instance political decisions) but if the pressure is intense enough the core principle always kicks in and wins out. A perfect example is the reaction of the Swedish government and society to the flood of asylum seekers in the fall of 2015.

Pressure or shock: Pressure and shock differ in degree but both can present existential threats. They are a function of three variables: surprise, speed and severity. If an event comes as a total surprise (unknown unknowns), at great speed, and with great intensity (extreme systemic challenge) then it is a shock. If the severity is high but if there are warning signs (known unknowns), the evolution is gradual

Vital core: Essence, consisting of core function and the minimum vital life systems needed to sustain it. Examples are seeds that can survive forest fires

One may thus distinguish between a vital core that is essential for the survival of a system, and its individual and/or peripheral components and attributes, which are generated by the core and which play complementary roles in the full system, but are not essential for the survival of the system as a whole.

The distinction is crucial both for the security analyst and the leadership. Under normal conditions, when all is going well, we tend to take the functioning of our vital life systems for granted and focus on peripheral attributes, such as saving human lives, protecting property, respecting laws and regulations, etc. However in a catastrophe one may have to sacrifice one or more of these in order to safeguard the vital core upon which society as a whole depends for its very survival. This means that in a catastrophe we will have to make sacrifices, and sometimes extremely severe sacrifices for which a political leadership and state institutions used to operating only under normal circumstances will be totally unprepared.

It is also crucial to note that one of the fundamental principles of ecosecurity (the ways in which ecosystems safeguard their security) is that the individual component counts for nothing, the collective vitality counts for all. Thus individual components are constantly sacrificed for the system as a whole to flourish. And to flourish means to evolve, which always involves change. From this perspective the Daoist worldview and perspectives on security are a crucial complement to our Aristotelian worldview, and absolutely essential for any attempt to understand and develop resilience. Colin Gray has hinted at the importance of the Daoist perspective,[19] but the one Western author who has truly examined this in depth is the French philosopher Francois Jullien. His books on this topic are brilliant.[20] He is required reading for anyone interested in strategy in general and in resilience in particular.

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[19] Colin S. Gray, *Strategy and Defence Planning. Meeting the Challenge of Uncertainty*. Oxford: Oxford University Press, 2014, p. 325.

[20] For a deep, original and important analysis of the essence of strategy, see Francois Jullien, *A Treatise on Efficacy* (Translated by Janet Lloyd). Honolulu: University of Hawaii Press, 2004.

Developing Forward (Networked) Resilience

'Forward resilience' is crucial in a world dominated by and depending upon global flows. The concept of forward resilience applies mainly to the functional security dimension, i.e. the global networks and nodes upon which our economies and technical infrastructure depend.[21] But in such a world there is actually no 'forward'. With all nodes and flows interlinked, they all become critical to varying degrees. Thus a better term would be 'functional Resilience', or 'networked Resilience', though I will continue to use forward resilience here.

This view of security is important because our societies no longer function as national islands and cannot do so in future. We all depend entirely on complex transnational technical and economic flows. Hence forward resilience, understood as ensuring that nodes and flows beyond national and regional borders can function under pressure, is crucial both for sheer survival and as the optimal remedy against disruptions.

Forward resilience is thus understood here as two things: first, networked resilience across borders, or transnational resilience; and second, resilience in the domain of functional security, or functional resilience.

The functional dimension is one of three security dimensions on which humanity depends. The foundation, on which all else rests, is the ecological dimension. When healthy, it offers a livable habitat and natural resources. Resting on this is the functional dimension, consisting of science, technology and economic activity. It provides the practical understanding, tools and products that humanity needs and enjoys. Finally, at the very top, is the social dimension, consisting of human societies and their governance. This is the domain of politics, or the distribution of goods and the quest for influence that goes with it. Their functioning, and their interaction, determine humanity's security.

The functional dimension of security is crucial in its own right. It contains a host of specific threats from within this dimension, such as design (Y2K), management (2008 financial crisis), maintenance (national infrastructure), etc. However today it is also becoming increasingly vulnerable to extra-dimensional factors. These include ecological dimension challenges such as pandemics, storms and so forth, and antagonistic challenges from the social dimension, emanating from global organized crime, transnational revolutionary movements, and hostile state actors. The last are a particular challenge since they have the resources to deliver truly existential blows against another state's functional survival. We also see continuous signs of preparations to disrupt our functional systems.

We also know from Russian official documents and actions that Russian grand strategy emphasizes waging what we could call 'functional war' against our functional life systems, in order to prepare for, support or even replace military warfare. This is nothing new, it is a clear continuation of the Soviet 'correlation of forces' concept, but it is now being prepared intensively. There are also indications that Russia believes that the West is engaging in a similar sort of warfare against the Russian Federation.

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[21] The concept of functional security was first encapsulated by Bengt Sundelius, "Functional Security," in *Functional Security*. Stockholm: Swedish National Defence College - Acta B30, 2004, pp. 17-22.

To develop forward resilience two things are necessary. The first is mapping and understanding the challenge. The second is establishing the capabilities needed to strengthen our resilience.

Understanding and Mapping

Our knowledge and understanding of the problem is limited. We must start to understand four areas:
- our transnational functional vital life systems;
- their vulnerabilities and gaps;
- activities and preparations undertaken by others, whether state or non-state actors, to disrupt our systems; and
- how we may develop a networked resilience that can reduce our vulnerabilities.

This is essentially a research task that can be carried out by a policy-oriented central tasking group that could outsource research to clusters of expertise from government, the private sector, academia and civil society. See for instance the the Development, Concepts and Doctrine Centre (DCDC) of the British Ministry of Defense.

Implementing

With a clearer idea of the terrain and requirements, we can begin implementing measures for networked resilience. This task is essentially the same as NATO's military role, but focused on functional security rather than military defense, and hence at a lower level of political intensity. The operational principles and requirements, however, are the same.

For this we need an agency that can promote transnational functional resilience. Whether this would act under the aegis of NATO, the EU, or another entity entirely is a minefield I will not enter here. Such an agency would need to carry out three core functions:

- **Act as a forum for political decisions** needed implement networked resilience. This is in essence similar to NATO's civil-political role, but less politically charged than defense, though highly relevant for economic and technological interests and the private sector.

- **Carry out studies of the overall situation and specific challenges**, providing expert support for the political forum on measures to enhance networked resilience. This includes at least three tasks:
    - overview scanning of the state and evolution of the functional landscape (including the functional networks, their vulnerabilities and related Russian activities;
    - suggesting to the political forum how networked resilience may be enhanced;
    - overseeing the civil-military overlap.

- **Implement or oversee measures agreed upon in the political forum** to enhance networked resilience. This includes interacting with at least four types of overlapping tasks.
    - First, to engage major actors involved in global and theatre networks and flows (governments and business), in order to enable global resilience, in this case linked to NATO requirements;

- o Second, linking government and private sectors in order to promote public-private partnership for resilience;
- o Third, engaging the recipients of resilience measures, to enable the implementation of such measures;
- o Fourth, engaging donors to enable the provision of resilience measures.

Implementing this sort of agency would be a first step towards protecting our functional security not only nationally but also transnationally. This can only be done multinationally and through public–private partnerships.

Developing this sort of 'forward resilience' is crucial and highly overdue. A major challenge will be to bridge the gap between two contrasting interests: the focus on cost-efficiency, which favors vulnerable hyper-efficiency; and the need for redundancy and slack, which ca promote resilience, especially against the unforeseen.