The Structure of Operational Revolution

A product of the Center for the Application of Design

A Prolegomena

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The whole formed an immense and disquieting landscape, no title, no specific time, where the shielf half buried in the sand, the medieval helmut splashed with blood, the shadow of an assault rifle falling over a forest wood[en] crosses, the ancient walled city and modern concrete-and-glass towers coexisted less as anachronisms than as evidence.

– Arturo Perez-Reverte, *The Painter of Battles*

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Preface

The Collapse of Operational Consciousness

British philosopher and physicist Sir Karl Popper wrote, "Institutions are like fortresses. They must be well designed *and* properly manned." The essence of design speaks to Popper's imperative, and because institutions are human learning systems, they must be properly led as well. The deep genesis of this paper flows from personal experience gained within two different but related military institutions—one American, the other Israeli. The common referent between the two perspectives was a growing awareness of the erosion of operational thinking in both institutions. Although the loss of operational consciousness was expressed in different historical circumstances, the consequences were much the same in each case—the sapping of the intellectual foundations of the institution. By the end of the Cold War, operational art was declared dead. The process of collapse went essentially unnoticed because no one was competent to articulate a trajectory of decline, which was, in any event, largely intellectual; no one was competent—or interested—in writing—or reading—an intellectual history of the U.S. or the Israeli military. There were limited attempts to counter this prevailing trend with the establishment of learning centers like the U.S. Army School of Advanced Military Studies (SAMS) and the Israeli Operational Theory Research Institute (OTRI). Cooperation between the two centers continued largely unnoticed, although strongly motivated, in the common belief that operational art and operational thinking were far from dead and in fact had broad relevance and application.

During the long intellectual twilight, three events occurred that sparked a reawakening in operational understanding. The 2003 invasion of Iraq and its long, protracted aftermath, and the Israeli attack into southern Lebanon in June 2006, raised serious operational questions that the respective military institutions had difficulty answering. Then in November 2007, the incipient collapse of the global financial system suggested that military,

corporate, and financial failure shared a common intellectual source. This suggested to the present authors that a fundamental reframing of their own, largely military, orientation was in order. A new and much broader synthesis was developed that married Systemic Operational Design (SOD) Theory with Hierarchy Theory.[1] In the paper that follows, the authors try to offer the reader a sense of the larger potential for design beyond its direct military application.

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Introduction

Operational Art as "Tactics with Bigger Arrows"

At the most practical level, OD seeks to overcome the "tactical" orientation that persists in virtually every major field of endeavor. This tactical inclination is so persistent as to constitute an institutional learning impediment or disability. Whether it is the general, the corporate CEO, or the ambassador, all develop professionally with a deeply rooted outlook that creates a particular expectation bias. This bias treats the professionals' expanding world as simply a larger version of their limited and limiting past experience. Thus, operations and campaigns are viewed simply as battles but with bigger arrows; states are merely towns but with greater land and more people; corporations appear as mirror images of the factory. Yet upon reflection, most professionals in the relevant fields would deny such bias. And this is the difficulty; its influence is so subtle and nuanced that it is baffling to express succinctly and perplexing to demonstrate clearly its pervasive effects. We are left, instead, with vestiges and intimations of its presence and influence. Its immediate effect is to produce a kind of "tacticization" of operational art and even strategy. Hints of what we might call the *tactical bias* can be found in at least four areas.

First, there is the way we logically structure the world. We tend to see the world as we *expect* to see it. This appears to us, as we said, more or less as a version of the past. To some extent experience and education helps to overcome this expectation, but a logical fallacy from our early experience becomes a part of the very core of our thinking. This is the *fallacy of composition:* a false belief that says what is true of the part is true of the whole. We assume that what is true of the tree is true of the forest; what is true of the platoon is true of army, etc. We apply this fallacy on a daily basis because the larger world of our more advanced professional experience is beyond the direct privileged view of the familiar world given to us during the novice and apprenticeship days of our vocational life. When

we are overcome by the diversity of our professional challenges, we tend to fill in the unknown segments of the *whole* with the known and familiar remnants of the *part*. Of course, the whole point of systems thinking is to overcome the fallacy of composition—our tendency to structure the whole of the world with "tactical" parts.

Second, there is the way in which we educate. The levels of war are essentially *levels of abstraction* that are uniquely distinct and coherent modes of thought that constitute paradigms in their own right. Other fields, such as the realms of the artisan, the architect, and the sponsor, offer similar planes of abstraction. These levels or planes of abstraction emerge, often quite suddenly and seemingly arbitrarily, out of conceptual necessity. In the military sphere, we train almost exclusively to the tactical level of abstraction; it is easiest to teach and easiest to learn; it is also easiest to engineer. The products of such indoctrinated learning systems are, in the words of Walter Kirn, "sly and flexible, not so much educated as wised-up."[2] An army of "wised-up" tacticians or a corporation of "wised-up" artisans may make great problem solvers, but they make poor critical thinkers. They seldom rise above practical application to the spheres of analysis, synthesis, discernment, appreciation, and judgment. The "wised-up" learner is conceptually blind to other levels of abstraction; the learner cannot see them because he or she lacks the tools of theoretical vision that can only be acquired through serious learning and education. OD seeks to take wised-up tacticians and make them wise operational artists.

Third, there is the way in which we lead human systems. It should come as no surprise that we lead by means of a heroic model of leadership, providing purpose, direction, and motivation through direct physical presence. Heroic leadership is tactical leadership as old as Achilles and the *Iliad,* a necessary consequent of the *tactical bias*. This style persists in any realm where leadership is required and exercised. The vast amount of ink spilled in writing about leadership represents a Manichaean struggle where one side seeks to extol the virtues of the heroic style and the other seeks to expunge it. Our view is that there is a third way that recognizes a need for operational leadership or *command* where men lead by ideas.

Finally, there is the institutional assault on theory. This is expressed in the military through a fairly unabashed anti-intellectualism. In other, mostly corporate, fields, it is more covert. In certain bureaucratic institutions, it becomes a fig leaf for inaction. Theory is central to the development and elaboration of operational design. Arthur Conan Doyle has Sherlock Holmes say, "I have trained myself to notice what I see." OD is about teaching the observer to notice what he sees so he can make critical judgments about the world and act—or not act—with deliberation. As such, OD is a method of education that strives to overcome the *tactical biases* in major institutions. In what follows, we examine the issue from a military theoretical perspective, although we fervently believe there is great crossover potential to other fields of endeavor.

We argue here that the evolution of warfare in the West follows the same process of transformation as human consciousness when the revolution in writing changes the very way in which we think. During this transformation, the *tactical bias* becomes irrevocably and deeply embedded in our thinking. There are, however, certain historical glimmerings where the *tactical bias,* if not fully recognized, is at least challenged and resisted. In the case of warfare, first conceived as a tactical unity, military art soon passes into a bifurcated construction with strategy as *subject* and tactics as *object*. With the Industrial Revolution, a proper military revolution in its own right appears with the emergence of operational art as the mediating, *interjective* synthesis of strategy and tactics. The transformation of design follows the same analogous path as the rise of consciousness and military art. In the beginning designer, creator, and planner are one; with the collapse of the oral tradition, the subjective creator or sponsor and objective planner appear. Even before the Industrial Revolution, the designer begins to emerge as an autonomous cognitive agent during the Renaissance in Italy. Nineteenth century warfare begins to bring the two streams of development to a higher cognitive plane in a new grand synthesis: *the operational artist becomes a synthetic mediator whose campaign design becomes the fundamental referent for the strategist and the tactician*. Effectively, the operational commander plays the role

of strategic "stand-in" for the tactician and tactical "stand-in" for the strategist, while maintaining his functional autonomy by linking strategic purpose (*telos*) and tactical form (*morphos*) with operational structure (*logos*). Paraphrasing Carl von Clausewitz, tactics has its own form but not its own logic. Operational art provides the logic through design. The Truman-MacArthur controversy offers an example when this synthesis breaks down and the *tactical bias* seizes hold—where MacArthur confuses tactical "victory" with strategic success. The Information Revolution has moved the transformation forward until we find ourselves today in the midst of a Digital Revolution and the emerging Fourth Paradigm. We assert that the emergence of operational art in the military realm is as significant as the invention of writing. The theory of Operational Design is the conceptual framework that supports the assertion and offers insight toward its practical application in the present and future security environment.

Throughout this most recent paradigm shift, only one decision-making methodology has been able to keep pace with—and even anticipate—certain emerging existential threats. Here we try to demonstrate that OD offers a multidimensional approach to systemic operational decision-making that has maintained a close affinity and fidelity with its true historical and philosophical roots. Thus, any fundamental understanding of OD must trace the same historical and genealogical trajectory, the same philosophical path that has guided its very transformation. The next section of the study explores that development.

Part I: The Ascent of Operational Art

Design and Quality: The Cognitive Roots

The cognitive structures of design run exceedingly deep. The way our minds have evolved over millions of years of evolution reflects this deep structure. Over the past 15 years, advances in evolutionary biology, cognitive neuroscience, and developmental psychology have shed new light on our cognitive nature.[3] These three disciplines help provide a more comprehensive and advanced understanding of the relationship among design, novelty, and human evolution. The long evolutionary path toward design began when small amoeba-sized creatures began their struggle for survival. The key idea in the struggle for survival is the notion of *homeostasis,* the condition of stability wherein creatures attain some optimal balance of warmth and cold, light and dark, stable nutrition, and flow of information—all of which contribute to their continued existence. Within these conditions, we can postulate a primordial sort of threat environment where, on one hand, some creatures try to extend their existence, and on the other, some creatures try to extinguish that existence for the sake of their own survival. This dynamic predator-prey encounter would determine who would survive over the course of the next two to three billion years.

The key to the struggle was the ability to respond to the dynamic environment in a *conscious* manner. For instance, moving from heat to cold or away from a predator to safety meant some kind of conscious awareness, that is, consciousness, the awareness of ourselves, our environment, and the relationship between the two. Consciousness offered an appropriate response mechanism to changes in the local environment—changes in nutrient concentration, information flows, recognition of friend, foe, and mate, and many other encounters that might enhance or threaten homeostasis. As the environment became more complex, creatures themselves developed more complex responses—or died.

The diversification of living creatures over time led to the development of a more complex form of thought and consciousness that became the foundation for all sorts of learning.

Learning creates the essential conditions for design to flourish. The dynamic world described above pulls consciousness into the future, which is seen as a qualitatively different state than the present. Some philosophers have placed the very source and origin of design within the concept of *quality* and the emergence of diversity in life; indeed, diversity itself is an expression of *quantitative* differences of degree that lead to *qualitative* differences in kind. Design creates the logical path along which qualitative transformation takes place. Thus, "[t]he easiest intellectual analogue of pure Quality that people…can understand is that Quality is the response of the organism to its environment….An amoeba, placed on a plate of water with a drip of dilute sulfuric acid placed nearby, will pull away from the acid….If it could speak the amoeba, without knowing anything about sulfuric acid, could say, 'This environment has poor quality.' If it had a nervous system it would act in a much more complex way to overcome the poor quality of the environment." It would begin to *think:* "It would seek analogues, that is, images and symbols from its previous experience, to define the unpleasant nature of its new environment and thus 'understand' it….But that which causes us to invent the analogues is Quality. Quality is the continuing stimulus which our environment puts upon us to create the world in which we live. All of it. Every last bit of it."[4] The drive of Quality thus became the basic stimulus to *design* the world as conceptual analogues of our own creation.

Cyberneticists have carried the idea of quality in many different directions. One of the fathers of cybernetic theory, W. Ross Ashby, has expanded the notion under his Law of Requisite Variety: only variety (as quality) can defeat variety; organisms must advance in complexity, retrench in some biological niche—or die.[5] In the game of chess, for instance, there is varietal symmetry between the two players at the start of the match; both play with the same pieces on the same board. The decisive factor is the skill of the players. Remove a piece or two and the symmetry is broken,

forcing the disadvantaged player to draw more heavily upon his creative genius and design novel countermoves. Broken symmetry in evolution creates the same dynamic—the struggle to overcome varietal disadvantage in nature through the creation of *new* variety or *novelty*. The advance in variety and novelty creates new quality and new quality creates a new basis for design. Evolution can thus be seen as a kind of game in which one form of novel quality trumps another, only to be trumped in its own turn.

In summary then, we, like all living creatures, enjoy awareness of our surroundings. Awareness is the perception of the quality in the environment in all its variety and novelty and leads to learning. Some creatures—like us—have a rich perception of their surroundings and can carry this perception around in their heads as thought. But creatures not only perceive their surroundings, they can also interact with them. This dynamic interaction leads to more thought, which itself further expresses more novelty and variety through action. Novelty and variety in thought and action drive a process that creates the essential cycle of design expressed as life.

Novelty plays another key role in evolution. William James famously described the world of perception and the senses as "blooming, buzzing confusion" presented by the variety in the environment. But then how does consciousness determine which of all this chaos presents a threat to the creature's survivability? It must be able to discern what it needs to ignore from what it must consider; *it must frame the environment.* Otherwise, it will burn itself out responding to an endless stream of false alarms. It turns out that in nearly "all creatures above a fairly low level of development we find at least an orientation response and frequently full-blown attention mechanisms whose functioning is essential to their survival. *Such mechanisms are geared above all else to the perception of novel stimuli.* Novel stimuli must be detected and assessed as soon as possible, because their appearance indicates a change in the environment, and any change has survivability implications." Here is where learning, experience, and memory play a key role: "In creatures with any degree of complexity, a report of a novel stimulus on any sensory channel is relayed

to an attention device that seeks to extract comparable information from the creature's memory store. There it either succeeds or fails to identify the stimulus with some known category or situation *[pattern]* for which there exists already an appropriate response."[6] This is achieved through a *systemic frame* that facilitates *pattern recognition*, the happy union of learning, experience, and memory. If the stimulus can be pattern matched, an appropriate response is triggered. If no match is found, then the stimulus from the *variety* of the environment itself is truly novel. The creature will go on to monitor the stimulus until "some change in the stimulus allows identification to take place; some change in the stimulus…marks it as potentially dangerous, even if unidentified, in which case escape mechanisms will be activated; the stimulus disappears; [or] the stimulus remains at the same level for some time."[7] But there is another possibility; the organism reacts to the stimulus with its own *novel response.* Pattern recognition is the sieve of design novelty, regulating the passage of information of a particular character and quality. The brain is able "to extract the most currently relevant pieces of information and to act on them single-mindedly."[8] In humans, the mind is also able to turn its attention inward and respond to its own stimuli, especially through the creation of thoughts and ideas. The environment turned inward through self-reflection creates the diversity, variety, and novelty found in creative thought—a seething maelstrom of ideas and imagination that is the firestorm of genius. It is no wonder then that the idea of the *"rival"* plays such a crucial role in the theory of Operational Design.

Today humans are virtually addicted to novelty and variety, yet for millions of years novelty has powered the train of evolution. Even humor seems to have deep evolutionary roots. In his classic study of creativity, Arthur Koestler wrote extensively about humor and remarked how similar the cathartic effect of solving a hard problem or making a scientific discovery was to the catharsis of laughter in a witty joke. Although unaware of the biological origins of humor, Koestler recognized a pattern characterized by an "explosion of tension" when a punch line is understood, a discovery made, or a problem solved, followed by a "catharsis" or slow ebbing

away of emotion. “The dual manifestation of emotions [explosion and catharsis] at the moment of discovery is reflected on a minor trivial scale in our reaction to a clever joke. The pleasant afterglow of admiration and intellectual satisfaction, gradually fading reflects the cathartic reaction; while the self-congratulatory impulse—a faint echo of the Eureka cry—supplies added voltage to the original charge detonated in laughter: that ‘sudden glory’ (as Hobbes has it) ‘arising out of our own eminency.’”[9] We thus have the primordial attention mechanism spotting a potential threat and building tension until the moment of cathartic realization that indeed the danger is approaching and the tension is released in the energy of escape; or in the joyous recognition that the danger has passed, or in the recognition of the novel—whether it is a Red Skelton punch line or a new meal. Today we seem addicted to the catharsis of novelty, ever striving for that authentic primordial rush, all the while pushing our creative genius against encroaching boredom—like T. E. Lawrence in his final wilderness years. The urge to create novelty and to explore novelty flows from the same spring as the urge to survive. The ability to design new patterns of response is at the very core of our ability to survive.

Design and Civilization: The Mythopoeic Roots

The cognitive structure of design offered mankind certain advantages in its historical and cultural transformation that took a particular turn in the rise of the West. The idea that Man himself was the product of a design expressed by a divine Creator offered mankind a powerful spiritual anchor with which to face a lonely hostile world. There are several mythopoeic sources embedded well within in our Western culture. The first has to do with the idea of *fate.*

The notion of fate and destiny has deep Indo-European origins that fostered the concept of design. Indeed, the etymology of the two words *design* and *destiny* share a remarkably close affinity. In virtually every Indo-European culture, the three Fates shape human destiny through a predetermined pattern of design. In the Greek variant *Moirae*, the Fates—the “Apportioners”—”design” a man’s life. *Clotho*, the “Spinner,” spins the

basic fabric of one's life from her distaff onto her spindle; *Lachesis*, the "Allotter," measures the fabric of life with her measuring rod; *Atropos*, the "Unturner," cuts the fabric. Together the three determine the nature and length of a man's life.

The second notion also springs from Indo-European sources. The idea of origin and genesis and a single Creator as the conscious Designer of the Universe offers design its most recognizable analogue. Already by the time of Xenophanes, the belief in a single Creator had taken hold. It is given its fullest expression in the Judeo-Christian concept of God. Design provides the Creator with the mental basis for His creation, with creation the new expression of fate and destiny: *design begets creation, creation begets destiny*. The philosopher Hesiod struggled with the basic question concerning how and from what substance the world arose and how would it end.

Third, *Physis* addressed questions concerning the material and elemental nature of existence and the basis for material design—fire, water, earth, and air. Indirectly it asserted the existence of an objective world and the fundamental idea of *objectivity*. Fourth, *metamorphosis* wrestled with the idea of change, transition, and transformation—how cold becomes hot, how day becomes night, how the present becomes the past—as well as the nature of quality. Fifth, *causality* naturally became a chief consideration as the ancients sought to find the driving forces behind evolution and transformation. Sixth, the idea of *hermeneutics* as the study of knowledge for its own sake also took hold. Finally, the idea of *subjectivity* grapples with the idea of an internal mental world that "for the first time in developmental history is clearly occupied with the psyche as a spiritual arbiter for cognition...."[10] All these ideas were wrapped up in a culture of mythology that first had to be overcome. The great breakout begins with Homer's *Odyssey* where we find history's first expression of a designer-planner relationship when Zeus says Troy would fall "through the designs of Athena."[11] Odysseus would become her planner.

In passing, it is interesting to note that in the Eastern synthesis of Taoism, Confucianism, and Buddhism, the ideas of Genesis, Fate, and many of the others mentioned above play a much-reduced role. For instance, the

idea of the *Tao*, the Way, provides a kind of moral design for the conduct of one's life. In the East, the idea of living life looms more important than understanding life.

Design and Theory: The Conceptual Roots

Theory always follows myth as myth becomes displaced by learning. The theoretical roots of design also run extraordinarily deep. We would have only passing interest in these roots but for fact that in our minds, the very growth of our understanding and knowledge of the world-as-designed has a theoretical component. As human consciousness evolved, the dichotomy between the *objective* outer world of nature and the *subjective* internal world of the mind became more distinct and coherent. Consciousness soon emerged as the arbiter between these two worlds but it lacked a cognitive *mediator*, a synthetic perspective of the *interjective*. In time, that mediator would become *theory.* Within the philosophy of theory, there is a pre-Socratic core that gives it a certain resonant quality that is often overlooked. With this in mind, we turn to the conceptual roots of design theory.

E.J. Hobsbawn wrote that "[w]ords are witnesses which often speak louder than documents."[12] The idea manifests how the word "theory" became a witness to the design process itself because theory is a process of design and construction. "Theory" becomes a kind of semantic Olduvai Gorge that provides insight into the past development and usage of words.

The origins of theory are shrouded in a cloak of divinity and are reflected in the word "theory" and its Greek cognates. Theory and *theos*, meaning "divine," share the same root. These two words share an association that is especially unique. The cognates related to "theory" mean in a broad sense "to see." The word "theater" has its origin from "theory." *Theasthai*, for example, means "to gape," "to stare," or "to look." The word *thaumazein*, which means "awe" or "wonder," is derived from *theasthai*.[13] For the pre-Socratic Greeks "to see" was "to see the divine" and was reflected in the Greek word theoros.

Theoros came to mean a spectator commissioned by his native city-state to view religious festivals in neighboring towns or to query the Delphic Oracle on some matter of civic importance.[14] The verb *theorein* is derived from *theoros* and came to mean "to look on" or "to contemplate." By the time of Aristotle, the more recognizable word, *theoria*, meant "detached contemplation."[15] Our particular interest, however, is directed at the earlier, pre-Socratic meaning of theory.

"Theory" is associated with a whole group of ancient concepts that reflect the way pre-Socratic man thought about himself and his world. Jürgen Habermas, Martin Heidegger, Bruno Snell, and others have been instrumental in piecing together what amounts to an ancient metaphysics. One expression of this metaphysics can be found among the pre-Socratic Greeks who associated *theoria* with the idea of *cosmos* (world, nature). Through the "eye" of *theoria*, man viewed nature, and at the same time, saw his place within it. By the time of Aristotle, theory had become a mediating "lens" that brought the objective world into the subjective mind.

For the pre-Socratic Greek and his primitive forebears, seeing meant more than the passive observation of concrete objects seized by space and time. It meant a timeless sensing of the world as a unified whole. The association of seeing with the mystical and the divine formed the religious foundation for the pre-Socratic Greeks and most primitive peoples because it was within nature that man saw a reflection of a *divine* design in the structured order of the universe, the *logos*.[16]

The Greek philosopher, Heraclitus, saw the concept of *logos* as that ineffable reflection of the fire or soul of a divine design. This divine spark was common to all by virtue of man's communion with the whole of nature. For Xenophanes and other pre-Socratics, the *logos* of the design was seen as a "comprehensive unity" that must be expressed as a totality—a primitive manifestation of systems theory. Through the fullness of man's experience with nature, he absorbed the essence of the design and the divine Designer.[15] Harkening back to the original meaning of theory, the design and the Designer cannot be known, they can only be "seen," sensed, and experienced. Heraclitus, for instance, said, "I searched into

myself" and the divine was revealed.[17] Over time, the concept of *logos* supplanted the idea of fate and destiny as the guide to an unfolding creation.

In another sense, nature itself became the predominant medium between man and the divine (Designer, design-*logos*). To the extent that pre-Socratic and primitive man possessed knowledge, it was knowledge of the divine. One of the major contributions of philosophy was to show that the primordial idea of theory differed fundamentally from scientific knowledge as it evolved after the time of the Peloponnesian War, underscoring the difference between human knowledge of science and natural theory of the divine. We now know that man underwent a revolution in thought that led to a kind of "alienation" of natural theory. This revolution culminated at Athens with the philosophy of Plato and Aristotle. Its origins are inextricably linked to of rise of human consciousness.

About 2.5 million years ago, primitive man became locked in a sheet of ice. In order to cope with nature's challenge, man accelerated his use of tools, discovered fire, developed speech, and established an extended social order. This all resulted in an extraordinary increase in the size of man's brain. In less than 2.5 million years, the size of man's brain quadrupled. After the Ice Ages, man reverted to his close idyllic association with nature, but he did not lose his tool-making and speaking abilities. In time, man began a turning away from nature. In particular, he sought to control nature through the use of his rapidly developing technology. In this manner, man became "alienated" from nature with the deconstruction of natural theory and its replacement with technical knowledge and know-how.

By the time of Plato and Socrates, there was a clear distinction between scientific knowledge and divine theory. The former was associated with the visible and the concrete; the latter with the invisible and the ineffable. At the same time, the modern meaning of knowledge was formulated, based on a uniquely Attic word, *episteme*. According to Bruno Snell—

> Unlike the Ionian words denoting knowledge and understanding, which refer only to theoretical cognition the Attic term also embraces practical connotations. It signifies both knowledge and ability, and is used more

> particularly to denote experience in manual skills. The direction of Socrates' thinking is, for that reason, given with his language from the first. The nature of his vocabulary enforces a close relation between knowledge and practical interest....[T]he early philosophers, the thinkers of Ionia and Magna Graecia [like Heraclitus], were interested chiefly in a theoretical understanding of the external world.
>
> [Thus] Socrates breaks with the tradition[...and...]restores philosophy from the sky to its place on earth. He rejects myth and fabulation[...and...] attempts to attain to the truth through channels of human understanding. The distinction between human [epistemic] knowledge and divine [theoretic knowledge]...had helped to separate Appearance from Being.... The efforts to reconcile the two domains of divine and human knowledge had produced the rudimentary techniques of induction and deduction. All this was once more subjected to a final change when Socrates in his dialogues tried to rest his own proposals on the authority of human thought, and human speech, *and nothing else* [emphasis added].[18]

Thus, the political execution of Socrates was for the crime of exorcising the divine from man and formally heralding man's alienation from nature as *subject and object*. From now on, where he had found the divine within his own heart, man, forever "homeless in the world," would have to seek it out within the temples of science.

The significance of man's alienation from nature for our purposes is that the very manner in which man thought changed radically and fundamentally. As Western man became more civilized through his technological domination over nature, he began to develop a new modality of thinking. Man developed a *consciousness* that became the basis for reflective, discursive thought. In Julian Jaynes' work, the author presents a psychological formulation of the philosophical work of thinkers like Martin Heidegger and Bruno Snell. Consciousness emerged through man's disassociation from nature.[19] Man no longer saw himself in absolute communion with nature. In setting himself against the world, man developed a subjective ego that allowed him the means to move in the world *independent of nature*.[20] At the same time, associated with the emergent ego was the bifurcation of the world into subject and object. In this relationship, man comes to *know* the world by virtue of the relationship between a detached knowing subject and a known object. Where theory

had been the lens through which man could see the divine in nature, theory becomes the portal through which man sees an objective material world. Man knows the world by virtue of his language and ideas, which now come to reside in the emergent consciousness that persists through learning as a constant reconstruction and redesign. Beginning especially with the post-Socratics, man began to *reason*.

The word comes from the Latin *ratio*. Man established a "ratio" between object and the subjective construction of the object in the mind.[21] Man was able to manipulate these mental objects as ideas with great facility and was also able to *design* and create new ones. At the same time, the idea of truth took on a new meaning. Heidegger discovered that under the theoretic modality of thought, truth meant the "unhiddeness" of nature.[22] Under the epistemic modality, truth came to mean a correspondence—a *ratio*—between object and its subjective construction as idea. The degree to which idea and object corresponded became the ultimate measure of scientific truth.[23]

Historically, post-Socratic philosophy was an attempt in part to exorcise man's lingering communal roots with nature and his creator. Even as late as the time of Homer, man's thoughts were seen as mental echoes of the gods.[24] But civilization provided the impetus for a thorough fragmentation and deconstruction of a holistic, systemic, and unified view of the natural world.

We have already suggested how language and especially technology drove man to view and think about the world as an ensemble of objects. Another factor in the emergence of epistemic thinking was the rise of mathematics and logic. Mathematics provided the means for the enumeration, computation, and calculation of objects. Not only did man develop the mental capacity to conceptualize objects—fragments and bits of nature—he also developed the ability to count and manipulate them mathematically. Most recently, man has reduced mental and physical objects to signs and symbols for *logical* manipulation. This long process of the atomization and reduction of the world has led, especially in the West, to the doctrine of positivism.

The conceptual evolution of design is less explicit but no less fundamental and is best associated with the idea of *understanding*. Our own *understanding* sustains our beliefs. The word "understanding" comes from the Greek *dianoia*. The cognate *dian* means "in between" and suggests a mediating position or interjective location "in between" the world and our ideas about that world. From our earlier discussion about reason (*ratio*), a close relationship between theoretical understanding and reasoning is evident. Any derived proposition about the world has embedded within it a means to reflect our own understanding. A proposition, typically a declarative statement, can be turned into an interrogative statement: the sky is blue is a consequence of the question, Is the sky blue? Our understanding provides the process to answer the question. The adequacy of the answer reflects upon the adequacy of our understanding. All belief, therefore, flows from the interrogatory. In a sense, interrogative knowledge is prior to propositional knowledge. In a more fundamental way, perhaps, understanding is the ability to formulate and answer questions and is a natural legacy forming the foundation of our critical thinking. The mediating *understanding* helps us to *frame* and structure our beliefs, both as knowledge and as theory. In practice, however, much of our belief structure is already given to us—by others.

The final grounding of all belief, whether epistemic or theoretic, is social. This "social justification of belief," as Richard Rorty calls it, virtually defines the intellectual relationship of man to his society.[25] Man tends to believe what he believes because of the authority of another. Social authority is the cohering force in any group, and without it, there can be no common action. It forms the foundation of any community of practice, and any such community is built upon the rock of a *designed understanding*.

The whole course of technology has led to the gradual disembodiment and broad distancing of man from the consequences of his social labor, whether within a security system or in general. Where once production culminated with the accumulation of a tangible surplus, it now continues disembodied in the accumulation of money and capital. The hand-to-hand and eye-to-eye nature of early combat by sword has been

replaced by the disembodied blow of the bullet. Even earlier, the oral transmission of ideas was supplanted by the power and authority of the disembodied—written—word.

The ascent of war follows the trail of the written word. Historically, improvements in agriculture led to a surplus in resources and a consequent rise in population. Control of the surplus led to a hiving-off of a ruling class with its own particular political agenda. This agenda was dispensed socially by specialists in ritual and doctrine. The specialization of ritual and doctrine eventually fell under the centralized control of a "clerisy" in both a secular and religious form.[26] At this stage, a crucial event occurred as man became literate. The Homeric cycle was the last gasp of the oral tradition in the West. The sudden rise of Greece out of its own Dark Age came about with the collapse of the oral tradition and the rise of writing. According to Gellner, "Earliest deployments of writing...occur in administration, tax-gathering and similar spheres: but the mysterious power of writing in recording, transmitting and freezing affirmations and commands soon endows it with an awe-inspiring prestige, and causes it to be fused with the authority of ritual specialists. The priest takes over writing from the accountant. Just as literacy facilitates bureaucratic, administrative centralization, it also makes possible the codification and logical centralization of doctrine."[27]

The clerisy soon finds itself in an extraordinarily powerful position. Not only can it shape society through ritual and written indoctrination, it can design the very substance of culture through the creation, authorization, and dispensation of ideas. In the intellectual capacity of dispensers of ideas, the pen plays a powerful role:

> The significant thing about writing is that it makes possible the detachment of affirmation from the speaker. Without writing, all speech is context-bound: in such conditions, the only way in which an affirmation can be endowed with special solemnity is by ritual emphasis, by an unusual and deliberately solemnized context, by a prescribed rigidity of manner. *But once writing is available, an affirmation can be detached from context*. The fact that it is so detached in turn constitutes a very special context of a radically new kind.

> In a sense, the transcendent [*as mediation*] is born at this point, for meaning now lives with the speaker or listener. It also makes possible solemnity without emphasis, and respect for content rather than for context....Cognitive and moral egalitarianism is made feasible. This is of utmost importance for the later history of mankind. Semantic content acquires a life of its own. It can dispense with artificial animation by ritual solemnity [emphasis added].[28]

A number of points may be made about Gellner's passage. The first concerns his insight that with writing, "an affirmation can be detached from context." Gellner means that the truth of an assertion can no longer be *verified* in relation to the reality: that reality is the context. This is precisely the problem that confronts the historian; the truthfulness of any historical document can never be verified, it can only be corroborated. The whole project of Leopold von Ranke's philosophy of history was to establish the ground of historical truth within historical context. In this way, von Ranke believed historical interpretation and synthesis based on documents and records could at least be bounded in some objective manner.

A second point concerns the issue of "[c]ognitive and moral egalitarianism." All written statements now stand equal before the reader in the sense that they are all contextually groundless and, therefore, the objective truth of one statement is no greater nor lesser than any other statement—all statements that spring forth disembodied from context are equally false, equally true, or equally ambiguous. Thus, the social force of any idea must rest on grounds other than its truth or accuracy. The social force of an idea will then necessarily rest on at least five factors: its social utility, the authority of those expressing the idea, the rigor of the method that gave rise to the idea, the logical coherence of the idea, and the force and coherence of argument with which the idea is presented. These five factors do nothing more than fix belief in the individual; they provide a pragmatic justification for his beliefs.[29] The social force of any idea exists only to the extent that an individual will believe in it.

A third aspect more directly relates to an issue that will be addressed in the ***Prolegomena***, namely the role of doctrine in fixing beliefs and shaping communities of practice:

> Writing makes possible the codification and systematization of assertion, and hence the birth of *doctrine*. A clerisy, a set of specialists who provide ritual, legitimation, consolation, therapy, will in due course, like any subsection of society, have a tendency to define its boundaries so as to restrict entry, and to attain monopoly. Adam Smith's famous remark about businessmen is liable to apply equally to Shamans: when they get together, they will automatically try to impose a closed shop and establish a monopoly. The solemnity of ritual was the only way, really, in which they could do this in pre-literate days. But who can enforce similarity and the limits of ritual over a dispersed area. With writing, the situation changes. Standardization and conceptual quality control become possible.[30]

Any system of ideas "is designed to serve primarily *one* purpose, the provision of a unified charter of a social order and of its vision. This trumps any secondary services it may perform on the side....[Before the emergence of society] [a]ll men thought, and thought compulsively, but they did not all share the same compulsions. Now, concepts came to be written out in doctrine, available equally to all readers and binding for all, and a single set of them claimed authority over all men, independently of community."[31]

Finally, and most important, was the role that writing played in transforming consciousness. Eric. A. Havelock has studied this at length, continuing the work of Snell and others examining the transformation of an oral tradition to one based on writing:

> Havelock describes this process *as a movement from ear to eye*, which on a mental plane may be sketched out as follows: Orality is based on the retrospective memorization of laws and customs, a form of knowledge upon which didactic memorizing is based, something, however, that at the same time ties the intellect down in a sort of encyclopedic conservatism....
>
> Only when something is written down do we have the opportunity to reflect upon it, to discuss it and distinguish it from the person responsible for the written proposition. This is clearly different from an oral presentation in which speech and message merge and allow no opportunity for reflection, as we cannot go back and reflect on what has been said.

Whereas in the oral tradition the speaker is the *subject* and the listener the *object*, the written word becomes the mediating source of *interjection* with the writer as the *subject* and the reader as the *object*. As a consequence,

"for the first time, we witness a human being thinking discursively—that is to say separating action from awareness, internal and external, which until then had been a unity."[33] The written word becomes the synthetic vehicle for self-reflection and critical thinking.

The authority of doctrine, however, created a new player in society—the *heretic*. The heretic could share his own beliefs, but these beliefs were socially subversive; they were at variance with the common cultural bias of society and thus dis-unifying. Traditionally, societies have rooted out subversive heresies by destroying the heretic. In times of war and strife, when social unity becomes especially critical, the heretic is not only a social pariah, he becomes a military liability.

But the heretic brought something else—a new *design*. All ideas that challenge existing beliefs and doctrines must be a novel expression of some kind of conceptual design—a new understanding that shatters existing modes of thought and worldviews. The heretic offers a novel logic that becomes the basis for a new paradigm.

Paradigms Lost: The Heretical Roots of Design

The story is told that shortly after the capture of Aqaba in July 1917, a British colonel from Cairo General Headquarters (GHQ) came to visit T.E. Lawrence, who was none too fond of rear echelon visitors and disdained interruptions to his normal routine. Upon arrival, the colonel eventually found newly promoted Major Lawrence feeding his camels near the shoreline. The colonel sidled up to Lawrence to better observe the feeding. At length he asked, "I say, Lawrence, what *do* you give these beasts for lunch?" Without entirely acknowledging his intrusive guest, yet with exquisite timing, Lawrence thought a moment and said, "Half an hour, same as the donkeys."

Thomas Kuhn sought to emphasize the personal significance and magnitude of a paradigm shift. He wrote, "The transfer of allegiance from one paradigm to another is a *conversion experience* that cannot be forced" [our emphasis]. Whether or not the unnamed colonel realized he had been the brunt of one of Lawrence's many jokes is unrecorded.

We can see, however, that different assumptions, presumptions, and perspectives can lead to humor and irony as well as serious misunderstanding. This idea of hidden assumptions, beliefs, and habits of mind is exactly what came to constitute the core notion underpinning Kuhn's idea of a *paradigm*. The development of operational art is a culmination of change that leads to a new paradigm.

In 1947, young Professor Kuhn was asked to prepare a set of lectures for a Harvard class on the origins of 17th century physics. In preparation, he began with Aristotle's *Physics*. As he read, the more he was struck by the seeming ignorance and naiveté of the great philosopher's understanding of the physical world. How could Aristotle, for instance, possibly confuse the spatial *motion* of an object with the idea of qualitative *change*, as when an object *changes* from hot to cold? Or how could Aristotle possibly conceive of matter itself as entirely dispensable in his physics and believe that the real substance of the world was the quality of an object: its "wetness," shape, "hotness," "heaviness," and/or color? Kuhn was puzzled.

Then one day while working through *Physics* for the umpteenth time, he set aside his four-color pencil and gazed out the window of his office:

> Suddenly the fragments in my head sorted themselves out in a new way, and fell into place together. My jaw dropped, for all at once Aristotle seemed a very good physicist indeed, but of a sort I'd never dreamed possible. Now I could understand why he had said what he'd said, and what his authority had been. Statements that had previously seemed egregious mistakes, now seemed at worst near misses within a powerful and generally successful tradition. That sort of experience—the pieces suddenly sorting themselves out and coming together in a new way [as I looked out the window]—is the first general characteristic of revolutionary change….Though scientific revolutions leave much piecemeal mopping up to do, the central change cannot be experienced piecemeal, one step at a time. Instead, it involves some relatively sudden and unstructured transformation in which some part of the flux of experience sorts itself out differently and displays patterns that were not visible before.[34]

Kuhn's epiphany was precisely the same sort of "transformation" that commanders like U.S. Grant and T.E. Lawrence would undergo in their confrontation with operational art.

The experience led Kuhn to postulate that every scientist labors within a characteristic paradigm, a kind of *designed* lens through which nature and the world is conceptually structured and perceived. In 1962, Kuhn published his ideas in perhaps the most influential book written in the last 65 years: *the Structure of Scientific Revolutions*. He argued that scientists, just like any other social group, carry out their quotidian affairs within a common shared framework of assumptions and habits of mind concerning the world—what constitutes a problem, a solution to the problem, and a methodology with which to solve the problem. Such a framework of shared presuppositions constitutes a paradigm. At any particular time, a given scientific community will hold a prevailing paradigm that structures and directs work in a given field. Of course, in a broader sense, scientists are like any other community of practitioners. Military commanders are also practitioners within a professional community and operate inside a distinctive strategic paradigm.

Metaphorically, a paradigm can be conceived of as a kind of *map*. John Casti elaborates on this essential metaphor:

> Let's imagine…knowledge of the world as being the *terra incognita* of the ancient geographers and map makers. In this context, a paradigm can be thought of as a crude sort of map in which territories are outlined but not too accurately, with only major landmarks like large rivers, prominent mountains, and the like appearing. From time to time, explorers venture into this ill-defined territory and come back with accounts of native villages, desert regions, minor rivers, and so on, which are dutifully entered on the map. Often such new information is inconsistent with what was reported from earlier expeditions so it's periodically necessary to redraw the map totally in accordance with the current best estimate of how things stand in the unknown territory. Furthermore, there is not just one map maker but many, each with a different set of sources and data on the lie [sic] of the land. As a result there are a number of competing maps on the same region, and the adventurous explorer has to make a choice of which map he will believe before embarking upon an expedition to the "New World." *Generally, the explorer will choose the old, reliable firm of map makers*, at least until gossip and reports from the "Explorers Society" show too many discrepancies between the standard maps and what has actually been observed. As these discrepancies accumulate, eventually the explorers shift their allegiance to a new firm of map makers

> whose pictures of the territory seem more in line with the reports of the returning adventurers [emphasis added].[35]

In Casti's metaphor, commanders are both explorers *and* map makers. When the old map is torn up and a new one produced, a paradigm shift has occurred.

This simple yet powerful metaphor conceals the profoundly complex cognitive processes at work during paradigm creation and destruction. Man subjectively constructs the real world in his head. The "map" not only represents the real world, it also tells him how it works. Thus, in reality, our construction of the world is both map *and* blueprint that allows us *to see* the world as it is and how it *works*; it tells us what *is* and what *happens*. And because it is a *construction*, a paradigm is also a *design*.

The foundation of our subjective construction of the world rests on a whole network and constellation of beliefs—judgments about facts and opinions. Not all judgments are true, and in fact, many are simply false, based on hearsay, superstition, ideology, and base ignorance. Furthermore, much of our mental map of the world reflects this ignorance, just as the ancient maps reflected ignorance through the superposition of fierce dragons and other imaginary creatures in the regions of *terra incognita*. Our cognitive maps thus represent a danger to explorers because they are always incomplete and based on unchallenged and willful ignorance. They can be dangerous in another way—our maps create biases of expectation as the underlying beliefs coalesce and solidify into habits of mind.

In another sense, a paradigm is like a restaurant menu, a map or *window* into the back kitchen that tells us what the cook is creating. We come into the restaurant expecting to be served what we have ordered. Suppose that over time, the chef is fired, a new owner emerges, and the cuisine is transformed from Mexican to Italian fare. In Casti's map metaphor, the underlying reality, the terrain, is invariant—unchanging. All the laws of physics are the same throughout time, from beginning to end. It becomes a matter of continuously exploring the underlying unchanging terrain of a

natural world. In the menu metaphor, we add mankind to the underlying terrain, and we have a complex social reality that is in a constant state of flux. The map must be updated and restructured constantly.

It is important to point out the difference between a physical paradigm fabricated by the natural sciences and a social paradigm constructed by the human sciences. Commanders like Grant were challenging an underlying paradigm developed from military science and history, although one should realize that military science in their day was in the early stages of development. They did most of the "science" in their heads. Thus, the difference between the paradigm construction of a regular and stable natural world and the complex ever-changing man-crafted world is extreme, and the intellectual achievement of some military commanders must be seen accordingly. Indeed, it is no exaggeration to assert that some 19th century and early 20th century commanders' re-imagination and reframing of warfare was a greater intellectual achievement than, for instance, the revolution in astronomy that overturned the Earth-centered Ptolemaic universe and replaced it with the heliocentric paradigm developed by Copernicus, Galileo, and Kepler.

The menu analogy demonstrates another aspect of the power of expectation biases and habits of mind. Suppose we haven't been to the newly reestablished Italian restaurant in some months; the last time we dined there, it was still serving Mexican dishes. We arrive and our expectation biases cloud our view of the new changes—we expect to dine in an Italian restaurant, so we do so in our imagination. The principle, "I'll believe it when I see it" is overturned to say: "I'll see it when I believe it." As studies have amply demonstrated, our bias-shaped beliefs effectively inhibit us from seeing the real world—we have eaten the menu. Without critical theory and reflection we will continue to "eat the menu."

When leaders went off to war in 1914, virtually every serving officer believed that the war would be short, swift, and decisive; after all, the dead hand of Napoleon and the paradigm of annihilation had so promised. Four years later, it was evident that the promise had betrayed everyone, although only a few rare and gifted individuals like T.E. Lawrence would

eventually see beyond Napoleon's influence and recognize that a revolution in the art of war had truly occurred.

A paradigm is like a conceptual window into the real world: like a map that allows us to see the underlying terrain; like a menu that allows us to see into the back kitchen of a restaurant. A paradigm has an immensely practical function—you *use* the paradigm, as Casti says, "Like a pair of spectacles….Occasionally a paradigm shift takes place when the spectacles get smashed, and [you] then put on a new pair that transforms everything into new shapes, sizes, and colors. Once this shift takes place, a new generation…is brought up wearing new glasses and accepting the new vision of 'truth.' Through these new glasses, [you] see a whole new set of puzzles to be solved…." Paradigms are theories that aid us in reflecting critically on our profession. In military art, a paradigm reflects some underlying theory of war. The verisimilitude of a military theory, the degree to which it represents some underlying objective reality, is less important than its *reliability*—its ability to guide dependably toward solutions to real-world military problems.

In Kuhn's writings, he makes a further point about the state of a profession. In his studies a community of scientists, after a paradigm shift occurs and before it is fully infused throughout the community of practitioners, is operating in a state of confusion. It is as though the community is using two different lenses, seeing and operating in two different worlds; one group uses the old paradigm but a smaller group begins using the new one. Kuhn uses the term *incommensurability* for this sort of conceptual bifurcation. It creates a crisis in the community because the two-world view makes it virtually impossible for the community as a whole to communicate with itself. This crisis is fundamentally a *social* crisis that precipitates a broader revolution within the very discipline. The practitioners must be brought back into the same world with a common worldview to be effective in their profession; they must recalibrate their conceptual lenses.

Employing Kuhn's conceptual framework, we now go on to examine the ascent of warfare toward operational art. As an organizing frame, we

use pivotal revolutionary waypoints in the development of civilization to establish the historical context for transformation from one qualitatively different paradigm to the next. We also try to show in this hierarchical development how design emerges as a necessary consequence of historical transformation. Thus, the emergence of the Classical Paradigm can best be explained within the broader context of the Agricultural Revolution, the Industrial Paradigm by the Industrial Revolution, the Cybernetic Paradigm by the Information Revolution, and the Ecological Paradigm by the Digital Revolution. Ultimately, every conceptual framework is arbitrary based on decisions by the relevant observer. The only criterion of merit is the explanatory power of the frame chosen. We believe that the framework offered here meets that condition and also offers the best explanatory argument to help decision makers move from theory to practical application.

The Classical Paradigm: A Quest for Annihilation

The two Homeric epics, *The Iliad* and *The Odyssey*, establish in literary form four fundamental milestones in human history: first, the transformation of the bicameral mind—consciousness dominated by a god-inspired imagination—to a discursive mind—consciousness determined by an autonomous and critical outlook of subject and object; second, the movement away from an oral, aural listening tradition to a visual, ocular culture of seeing and observing, which provides the intrinsic metaphor for theory; third, the emergence of the mediating role of writing; and finally, a passage from raiding and retribution to organized war. These milestones together now provide man with the cognitive space to create a military art with a strategic subject and a tactical object linked together by an increasingly more sophisticated planning architecture.

In the *Iliad,* the dominating characters are Achilles and Hector. They represent a heroic mode of warfare that had persisted for centuries. The heroic leader leads an army on raids of plunder and retribution. Armies are dominated by a military and oral tradition in which fighting exists for its own sake. Within the oral tradition, the hero drives the entire stock of narratives. The Odyssey marks a qualitative transformation when fighting

takes on a purpose other than its own and moves beyond narrative to history. *Fighting, now configured as a tactical battle, can serve the new and autonomous purpose of strategic intent.* Because strategic intent is posed as some desired object off in the future, a new cognitive requirement emerges—the need for planning. In the *Odyssey,* Odysseus is expressly showcased for his ability to plan, and the "myth of the Wooden Horse, which, as Odysseus's invention, becomes the embodiment of his special intellectual abilities" that go beyond sheer heroic power.[36]

The emergence of strategy now creates a subjective exterior plane of reference from which to examine and question critically the objective role of the tactical battle in relation to its contribution to the war as a whole. In a metaphorical sense, one is reminded of the tale of Baron Munchausen who escapes from a swamp by pulling himself out by his own hair (or bootstraps). Odysseus pulls himself out of the cognitive "swamp" of heroic warfare to create a binary conception of military art conceived as strategy and tactics. Now, for the first time, tactics becomes objectified and the object of theoretical examination.

Throughout the classical period the nature of battle, to the extent that it supported the intent of strategy, was bent on the annihilation of the enemy. The whole point of massing in the first place served that purpose. It was also possible for a weaker opponent to defeat a stronger force through maneuver, but the hallmark of a great strategist was success in the battle of annihilation and represented the persistent Homeric specter of the heroic leader.

Strategy, on the other hand, was still obscured from theoretical reflection. In its essential sense, strategy means "the art of the general," or more directly "generalship." The term was used in both these senses at least as early as the first century A.D. by the Roman writer Frontinus, who used the Greek term, *Strategikon*, is his Latin writings. The first formal discussion on strategy appeared about 600 A.D. Entitled *Strategy*, the work is generally attributed to the Byzantine emperor Maurice. Two things strike the modern reader upon reading Maurice's book. First, there is an inordinate amount of discussion concerning what today would be regarded as the domain of

tactics—the blessing of battle flags, using speeches to motivate troops, watering the horses, carrying rations in saddle bags, stripping corpses during combat. Second, there is a recurring argument, almost trivial by modern lights, that wars are not necessarily decided by raw courage and numbers, but rather by strategy and tactics. This is the first hint of a modern understanding of the attainment of military advantage through the design and planning of campaigns and battles. A slightly earlier piece, written anonymously about 550 by a retired Byzantine combat engineer, defined strategy as "the means by which a commander may defend his own lands and defeat his enemies." Like the work of Maurice, this treatise focuses on many of the more mundane aspects of generalship. A very different view of strategy, however, is found in Sun Tzu's *Art of War* written about 450 B.C.

Although written a thousand years before the Byzantine treatises, the Chinese work is much more sophisticated. For Sun Tzu, there is no need to argue against winning war through appeal to the gods, reliance on large numbers, or raw courage. Instead, Sun Tzu readily accepts the primacy of planning. He defines strategy as the "art of defeating the enemy's plans." The central concept in Sun Tzu's treatise is the idea of "strategic advantage." The Chinese equivalent, *shih*, is a complex of meanings that include "aspect," "outward shape," "momentum," and "force." This notion of strategy, as the art of achieving military advantage, is a notion slow to develop in the West. Thanks to a period of profound intellectual, social, and economic decline known as the Dark Ages, interest in military art virtually disappeared. This was all swept away, however, with the coming of the Renaissance in the 16th century.

As a consequence of advances in Euclidean geometry, it became possible for the first time to visualize the movement of the mass of an army in space and time. Rendering objects *in perspective* was the first artistic method anywhere that had the capacity to map point by point and *to scale* the edges, surfaces, and relative distances apart from the actual physical object. In the military sphere, this led to the genesis of ballistics and the birth of military science. For the tactician, the flight of cannon balls could

now be visually displayed with great precision. Concurrent advances in the science of measurement meant a similar development in strategy. For the first time, strategists could have maps that were as useful as they were reliable because they were *drawn to a known scale*. While maps existed prior to the Renaissance—the period of the Scientific Revolution—these maps did not have a scale. Without a linear scale, there was no way to convert spatial distance into time, and without this time-space relationship, there was no way to plan major movements, let alone design a detailed plan of campaign. No wonder that the Swiss theorist, A. H. Jomini, would define strategy as "the art of making war on a map."

During the same period, innovations in clock-making forged a new link between space and time. Generals operating with maps of the same scale and with clocks of the same time could now *synchronize* (*syn+chronos* = [bring] *together in time*) the movement of separate military formations. Furthermore, advances in mathematics and printing made it possible to develop relatively sophisticated planning tables. (Imagine developing a march table on a wax tablet with Roman numerals....)

The Renaissance at last provided the strategist with the intellectual planning tools with which to bridge the gap between worldly perception and mental conception. This new conception was nothing less than the "geometrization" of military space and time. *It meant that a common military "chessboard" would define the conduct of military operations.* Equally significant was that now for the first time the vague, largely idiosyncratic Chinese notions of "strategic advantage" could be defined more precisely. The physics of Sir Isaac Newton would set the strategic chessboard into motion.

Newtonian physics was a direct consequence of the three-dimensional worldview wrought by the Renaissance. Newton's three laws of mechanics provided military strategy with a powerful metaphor with which to plan campaigns. The metaphor was the idea of mechanical force. Once having grasped the nature of mechanical force, it became only a matter of time before the practical aspects of the idea would surface. Napoleon, an artilleryman, with a solid background in mathematics and physics, was one

of the first classical strategists to recognize that to use force effectively you had to *concentrate* it.

In an analogous fashion, Napoleon and others recognized that it was more effective to mass the combat force of an army on a *single point*. But the effect of concentration was played out on the tactical battlefield. The attainment and applications of torque became the paramount concern of classical strategy. Indeed, Soviet military theorist G. S. Isserson uses it as the chief characteristic of the classical paradigm: "strategy of a single point."

Thanks to the greater precision in thinking brought about by advances in physics, it became possible to redefine the oriental notion of strategy in more precise way. During Napoleon's time, strategy came to be understood as the art of achieving l*everaged, positional* advantage through *maneuver*. In practice, this meant a couple of things. First, in order to achieve leverage, forces had to mass. Second, leverage had to be denied to the enemy. Finally, leverage had to be applied at some *decisive* point with a positional advantage. In all cases, maneuver became the working dynamic of classical strategy. As an example, the Ulm Campaign of 1805 shows how Napoleon was able to achieve leveraged, positional advantage by maneuvering upon the rear of General Karl Mack's Austrian Army.

The scope for planning was as great as it ever was. Images of Napoleon crawling over huge map sheets with a protractor planning his next campaign are literally true. Design as we understand it here in its operational and systemic dimensions had no range for expression, limited as it was to a single chessboard. This would soon change, however, with the rise of the Industrial Revolution, when commanders would have to work with multiple chessboards extended in space and time. *These multiple operational "frames" would demand, for the first time, design of a logical structure in order to provide new coherence to this emerging framework.*

The Industrial Paradigm: Non-strategies of Exhaustion

"The Industrial Revolution," writes Eric Hobsbawm, "marks the most fundamental transformation of human life in the history of the world

recorded in written documents....No change in human life since the invention of agriculture, metallurgy and towns in the New Stone Age has been so profound as the coming of industrialization."[37] The Industrial Revolution set in motion a profound reframing of the West and ultimately of the world. It transformed the way we thought, the way we wrought, and the way we fought. Cognitively subjective man no longer was the passive "mirror of nature" whose mind *reflected* the objective material world; instead, he actively *constructed* the world from an interjective, mediating perspective. Now an active and synthetic observer, he was able to process new information and knowledge—and learn—at an extraordinary pace. Industrialization created new ways in which man could reconstruct the world on a massive, heretofore unimagined, scale. The Industrial Revolution created machine warfare and ceaseless engines of mechanized death.

The collapse of the Roman Empire led to a collapse of warfare in the West. Where gains in military art had been made up to that point, only the Eastern Roman and Byzantine Empires were able to preserve them. The West trudged into a Dark Age of crisis and response, losing the advantages of strategic thought so painfully developed since the Trojan War. By the 15th and 16th centuries in Italy and elsewhere, a rebirth began that led to a long recovery known as the Renaissance, setting the stage for industrialization. It was during this rebirth that design as a distinct creative activity arose.

Design, often used synonymously with *plan*, is something quite different. In etymological origin *plan* is older, derived from the Indo-European root **pele-**[1] meaning "to flatten," "to spread," "to spread out," "to wander," "*to mold." Design* evolved from the word *designate* with the root **sekw-**[1] meaning "to follow," "coming next," "object which one follows." One of its Latin cognates, *sequester*, means "follower," "trustee," "depositary," or *"mediator."* As we saw previously, planning marks a decisive break with the Homeric tradition with *boule*, the Greek for "plan" or "scheme," used quite often in reference to Odysseus in the *Odyssey*; it is rare—cited once or twice—in the *Iliad.* In ancient Greek, there is no word for *design* in our modern sense. This can be explained for several reasons. First,

there was relatively little in the way of novel creation in the ancient world. Most "designs" were imitations of existing forms of nature, or variations of those forms. A common example is the myth of Icarus and Daedalus. Daedalus was a master artisan who tried to design a flying machine based on natural imitation. Obviously, the device failed and history would have to wait for aeronautical system designers to complete the project. Second, design serves form and function. In the classical period, design, where it might be said to exist at all, served primarily form, especially form as appearance, particularly where religious motifs were required—which was often. Third, although there may have been brief fulminations of what we might call *aesthetic design*—for instance, under Themistocles and Augustus—there were no cases of multifunctional, complex *systemic design*. Finally, systemic design could not flourish because there was no way to ensure the principle of *unity of design*. In the classical period, design—such as it was—was expressed as a "tree-house" approach to construction: an existing form was simply modified and extended over time like a tree-house: there was no joint or unified conception with regard to size, location, function, form, material or quality.

Increasingly the functional dimension of design began to compete with aesthetics during the long recovery after the Middle Ages out of human necessity. The scientific revolution brought massive innovations in the area of design. Creative designers like Da Vinci and Michelangelo rejected the blind imitation of nature for their source of inspiration. Instead, they embarked on a bold path of novelty and invention. However, a great impediment to design was the need for a material conception *in scale* of the original idea: a mediating sketch that linked idea to realization. Sixteenth century designers solved the problem by creating exquisite sketches drawn to scale. The invention of *orthographic scale projection* was the technological breakthrough that opened up the West to practical design. The marrying of sketching with design was crucial and carried forward the legacy of writing. As Michael French notes: "Design and drawing are very close—indeed, the word dessin means 'drawing' in French. Most designers, most of the time, will think in images rather than

words, and many great designers have also been great draughtsmen—Leonardo Da Vinci is an outstanding case."[38] Italy also presented designers with its first great challenge.

For well into the 18th century, the greatest design achievement—and challenge—known to man was the three-masted sailing ship. It was also the first manmade, multifunctional device we would recognize today as a *system* and, thus, the first effort in systemic design. The complexity of the design also created a new relationship between systemic design and theory. The design of systems created serious practical engineering considerations expressed in two key questions: "(1) How can failure occur? (2) What design feature can obviate that failure mode without introducing another?"[39] The first systemic design theorist to address these questions was Galileo Galilei.

In 1638, past the age of 70, he published his seminal work *Dialogues Concerning Two New Sciences.* Through a series of discourses, Galileo sought to unravel some of the main challenges to shipbuilding and other design issues. Rather than trying to find a single solution to a design problem, he was the first to recognize the importance of understanding the *potential within the entire system for failure*: "Every solution of every design problem begins, no matter how tacitly, with a conception of *how to obviate failure in all its possible and potential manifestations*."[40]

The Renaissance also created a fundamentally new social role for the designer by placing him in a *mediating* position between the patron or sponsor and the craftsman. The dramatic increase in the wealth of the merchant city states in Italy and in the Netherlands created a new class of entrepreneurs with vast financial resources.[41] Families like the Medicis sponsored extraordinary works of cultural, artistic, and technological innovation. The family of Cosimo de Medici sponsored great designers like Da Vinci, Galileo, Michelangelo, Brunelleschi, Botticelli, Raphael, and Donatello. Here the design sketch played a key role in the process of sponsorship. The design sketch, in its role as a *common mediating referent,* became instrumental in the highly competitive process of achieving sponsorship in the first place. Only an effective design proposal

could withstand the scrutiny of sponsors risking great amounts of money on a design that had never existed before.

By now, design, and designing, sought to uncover the *potential* within systemic activity; indeed, *the essential medium of design is potential,* and in the operational context, this becomes strategic potential. With the advent of the Industrial Revolution, militaries not only were able to exploit existing strategic potential, but they were able to generate completely new varieties as well. By the end of World War II, for instance, design created the ultimate manifestation of strategic potential with development of nuclear weapons. Paradoxically, the nuclear revolution became the very abnegation of design by threatening its very existence—as it still does today.

Passing from engineered systems like the sailing ship, the Renaissance cleared a path for the design of human systems in the Industrial Revolution. The first great multifunctional creation of industry was the *factory system, which* sprung out of an organized *division of labor*. Again, there were certain design impediments that had to be overcome. These related to the question of *unity of design*. Any system, because of its multifunctional nature, must have a singular and holistic design. Prior to the Industrial Revolution, a guild system militated against such a division of labor because of commercial and parochial trade interests. In Great Britain, however, social forces essentially destroyed the guild structure. The workers were reorganized, first in the textile industry, into a designed system of multifunctional shops and workstations. Factory organization ensured unity of design. Social systemic design brought the next great system on line with the development of the railroad system: the first-born son of the Industrial Revolution and the father of operational art.

The mediating role of the Renaissance designer finally finds its analogue in the military realm with the rise of the industrial, systemic state. Industrialization moved the Westphalian state to unprecedented levels of complexity as it became a true bureaucratic system.[42] The complexity of the state pulled the head of state to a new location of permanent governance and bureaucratic oversight, eliminating forever the dual role of soldier-king fighting on the battlefield. The new division of labor meant

that the political function of the king would increasingly become associated with the economy, financial, and commercial direction and the integration of an increasingly vital civilian workforce. The new division of labor and the demilitarization of the soldier-king also shattered the basic symmetry of military art—the bifurcation between strategy and tactics—that had existed since ancient times. When the head of state migrated permanently to his new political setting, the responsibility for providing strategic direction migrated with him as did the label "strategy." *This created a serious functional and semantic void*. Under the old symmetry, the soldier-king directed the campaign and fought the battle; the war and the campaign were seen as essentially synonymous and coterminous. Industrialization made the *conduct of war* a separate skill set that the civilian head of state had to acquire and exercise. Abraham Lincoln and David Lloyd George were perhaps the first successful industrial strategists. The functional void now revealed the campaign in a completely new light. Industrialization created a new functional requirement for a permanent campaign commander who could *mediate* between the civilian strategists and the military tacticians. Industrialization demanded that campaigns be conducted as a *system of operations,* which created the natural necessity for a systemic design approach—the move from one chessboard and single frame to multiple chessboards with many frames. The campaign commander soon surfaced as a new mediating authority between strategist and tactician ensuring unity of design. The campaign design emerged as the common mediating referent for decision making, planning, and unity of effort. The transformation of the conduct of the campaign gave birth to operational art: the art of employing operations for the purposes of strategy.

With the advent of the Industrial Revolution, the whole physical (ontological) and cognitive (epistemological) structure of warfare changes. The idea of *annihilation* through the physics of torque or leverage was supplanted by *pressure,* taking the metaphor of steam from industrialization to the theater of operations. Instead of concentrating military force at a single point to achieve conditions of torque, the application of military force under the new operational conditions was distributed over a broad area.

The latter describes Pressure as Force distributed over a two-dimensional space or Area: P=F/A. Physically the principles of solid mechanics under the classical paradigm were replaced by those of fluid mechanics. More fundamentally, under these new conditions, the armies in a theater of operations began to *liquefy*.

Operational art, a term first given currency by Soviet military theorists in the 1920s emerged because a new style of conducting campaigns demanded a new name and helped to fill the semantic void.[43] The new pattern in the way military forces came to be used created a fundamental revolution in the design and conduct of campaigns. From an aesthetic standpoint, the changing pattern of warfare engendered a new creative milieu that transformed military art. The significance of this change in military artistic thinking can be grasped best if we see it as an analogy, where classical strategy is to painting as operational art is to sculpting. For the military artist, the most important consideration is the changing nature of his medium of expression—his opponent. Unlike the painter, or the sculptor, or the cook whose media are changeless, the military artist confronts an enemy who evolves new technologies and so reconstitutes and redesigns his very own essence. The Industrial Revolution created fundamentally just such a new creative quality.

The American philosopher John Dewey wrote, that "art is a process of production in which natural materials are *re-shaped*." The Industrial Revolution brought about a further "re-shaping" and re-framing through a profound transformation of the "natural materials." This process of revolutionary transformation occurred at two levels. At the tactical level, six innovations changed the way battles were fought. First, the rifled musket dramatically increased the lethality and accuracy of firearms. Second, a reliable breech-loading mechanism reduced by 80 percent the vulnerability of the rifleman by allowing him to fire effectively from a prone position. Third, a workable magazine system made possible a greater rate of fire. This enabled fewer troops to control the same amount of frontage while further reducing troop vulnerability. Fourth, the use of barbed wire after 1873, along with the older use of entrenchments, induced a greater linear

extension and depth of the battlefield than under classical conditions. Fifth, the innovation of smokeless powder not only greatly improved the interior ballistics—and ultimately lethality—of direct and indirect fire weapons, the new smokeless ammunition rendered the rifleman "invisible" by eliminating the telltale cloud of black smoke. Finally, a system of indirect fire meant that the power artillery could range across the deep battlefield. This all rendered the defense, the strongest form of war, even stronger, making battles last for days, weeks and even months. It meant tactically that battles could seldom be decided through a penetration of the enemy's center, followed by a rapid pursuit. Instead, decision had to be found through maneuver off the battlefield. *Most significantly, the extended operation replaced the battle as the chief mode of tactical action.*

At the operational level of war, the Industrial Revolution wrought three further innovations that completed the revolutionary new paradigm in warfare. First, the railroad provided a means to mobilize and rapidly deploy the huge armies that began to be employed after the French Revolution in 1789. Because of the nature of railroad nets, these deployments were distributed along a nation's frontier. Second, the telegraph provided a means to control the massive, distributed armies as they maneuvered from their areas of deployment. Under classical conditions, armies that maneuvered in a distributed fashion typically lost the direction and control of the commander. The concentric movement of Napoleon's corps was regarded as a necessary evil. Control was regained once the armies had concentrated for combat on a dense battlefield. The employment of multiple field armies in a single theater of operations was extremely rare under pre-industrial conditions. The later development of reliable clocks and watches added a further element of precision to command and control. Third, the Industrial Revolution created what can be termed a modern market infrastructure. With the rise of factories, the city, as opposed to town and country, became the engine of national activity. Cities became linked through a new system of market interdependence, all facilitated by the development of railroads and instantaneous communications like the telegraph. Improvements in road and bridge

building also contributed to the transformation of warfare. Armies themselves now had to distribute themselves in order to secure and to defend adequately the new industrial infrastructure.

From a creative standpoint, the Industrial Revolution dramatically changed the relationship among space, time, and mass, which *in turn* transformed the nature of military force and its creative application. This is suggested in the analogy presented earlier: classical strategy is to painting as operational art is to sculpture.

In terms of mass, the deployment of armies proceeded in a distributed fashion. The use of operational reserves added greater depth to this deployment. This distributed pattern of deployment became fixed because nations had to accommodate the defense of the newly emerging market infrastructure that was itself distributed. The distributed deployment and maneuvers of the armies led to an expansion of space within a theater of operations. The domination of the defense caused campaigns and battles to become protracted. This increase in time imposed another constraint on military planners that further ensured a distributed deployment. If wars were continuous, protracted affairs, then a nation's resource base—which had to sustain a potentially long war—had to be defended and the enemies destroyed. Because a nation's resource areas are distributed in space, it only followed that both attacker and defender would have to deploy and maneuver his forces in the same distributed—and protective—manner.

The campaign became the primary element of operational art—the creative employment of distributed operations for the purpose of strategy with an operation consisting of battles and maneuvers defined by a subordinate campaign objective. These battles and maneuvers tended to seek and to exploit *freedom of action*, while at the same time denying freedom of action to the enemy. Typically, under conditions of contemporary warfare a modern campaign consists of a series of operations; *campaign design transforms them into a system of operations*. The key to understanding operational art is to recognize that modern campaigns are composed of a mosaic of clearly defined actions that have their own logical structure and

articulation, spatial depth, and lateral extension. Several characteristics of operational art clearly differentiate it from classical strategy. In its fullest expression, operational art displays several chief characteristics. First, operational art dramatically improves lethality well beyond the bow and arrow, the smoothbore musket, and artillery stage. Without this, operations do not achieve sufficient extension, depth, and duration to induce distributed maneuver.

Second, operational art employs continuous logistics. Under operational conditions, logistics has evolved to support protracted operations. Without a continuous logistical system, military formations do not possess sufficient endurance to conduct deep, distributed operations. The railroad was the first innovation to provide the means of continuous logistical support. By the 20th century, mechanization and motorization supplemented the railroad by creating a true operational rear logistical area.

Third, the operational artist uses instantaneous, distributed communications to control the extended operations. The telegraph was the initial device that sustained such communications. Later, the radio supplanted the telegraph. Reliable watches created the means to *synchronize* the control of the distributed formations.

Fourth, the operational artist uses military formations that are operationally durable. These formations must be able to conduct a succession of operations—battles and deep maneuvers—indefinitely. Without this proper force structure, extended formations lack sufficient endurance and resonance to conduct successive, distributed operations.

Fifth, the commander and his staff must possess operational vision. The command structure must be technologically competent and "perceptually quick." Leaders must be able to envision creatively all actions in a theater of operations as a whole and a coherent pattern of activity, extended through space and time but unified by a common aim. Without this creative unifying ability, operations appear simply as an ensemble of unconnected events. Operational command fundamentally creates an intense learning environment.

Sixth, contending armies must be fairly symmetric in their force structure, theory, and doctrine. Furthermore, these armies must be fielded by industrialized nations with advanced economic and social infrastructures. Without this aspect of symmetry or "self-reflection," the whole aesthetic aspect of operational art is subverted; tremendous ambiguity and confusion will likely ensue because the requisite medium of expression does not exist. The war in Vietnam is an example of the collision of two asymmetric military systems. Essentially through the predominant use of guerrilla warfare, the enemy denied U.S. forces the proper medium and form upon which to "work" their operational art, as if sculpting before an empty pedestal.

Seventh, nations must have an extended capacity to wage war. Prior to the Industrial Revolution, a nation's capacity to wage war resided with its army. With the emergence of modern war, the nation's capacity to wage war became greatly extended. The whole idea of total war was forged in the furnaces of the Industrial Revolution. This meant that a modern nation waged war not only with its armed forces, but also with its production capacity, workers, national leadership and bureaucracy, resources and extraction base, and economic infrastructure. Military art evolved to take these new conditions into account. Today when we speak of annihilation, we no longer mean, in the Napoleonic sense, the destruction of the enemy's army. Instead, we mean the destruction of the enemy's capacity to wage war, that is, destruction throughout the strategic depth of the enemy, including not only his armed forces but also his economic infrastructure, his production capacity, and his social cohesion.

Finally, distributed campaigns must be sustained strategically by a system of *continuous mobilization*. Without the continuity of strategic mobilization, all protracted operational activity in a theater of operations will quickly shut down. The theory of continuous mobilization is significant for two reasons. First, it suggests, for the first time, a link forged between the civilian rear and the military front, a characteristic of total war. Second, it suggests a joint service approach to the conduct of war.

The foregoing factors transformed the art of conducting campaigns. The intellectual structures that had guided military commanders previous to the Industrial Revolution were no longer valid and could be even dangerous. In the words of C. Wright Mills, battles like "Waterloo still belonged essentially with the wars of Alexander or Caesar, just as Trafalgar belonged essentially with those of the Roman Trireme or the Spanish Armada." Yet, even after 50 years of living in the new Industrial era, armies in World War I marched to war peering through a Napoleonic lens. Consequences of the intellectual failure of the contending armies to recognize the new revolution in warfare are still with us today. Indeed, to some extent, the dead hand of Napoleon still rests upon the shoulders of many military leaders throughout the world.

Operational art transformed classical strategy and the hand of man. It opened up the "fist" of annihilation into the more sophisticated and designed articulation of distributed force in depth. U.S. Grant was the first modern campaign commander to achieve and demonstrate the new efficacy of *operational systemic design*. When the American Civil War ended, "the federal budget had soared to over $1.2 billion, and the Union fielded an army over one million men—the largest, best equipped, best fed and most powerful war machine ever assembled in the history of the world to that date. In proportion to the base from which it began, it was the largest mobilization in American history." As for the new strategic role of conducting war: "Behind both Army and bureaucracy stood a radically transformed presidency wielding authoritarian power over almost every aspect of Union life."[44]

If the Civil War made the Union Army the best in the world, Grant's operational generalship made it the best led. His campaign design of 1864 was the first *system of operations* ever conceived. Grant conceived something far more subtle than Napoleon could ever imagine. Thanks to the railroad and the telegraph, the design linked and integrated five separate armies conducting five different campaigns in five separate theaters of operations into one synthetic campaign design. Like the

fingers of a hand, he set five Union armies into motion from the Gulf of Mexico to the Rapidan River, across distances covering thousands miles. In the west, Nathaniel Banks, commanding the Department of the Gulf with 40,000 men, would head from New Orleans toward Mobile and northeast toward Atlanta. William T. Sherman, commanding the Division of the Mississippi—a quasi-army group consisting of Thomas's Army of the Cumberland, Schofield's Army of the Ohio, and McPherson's Army of the Tennessee—with 100,000 soldiers at Chattanooga, would concurrently head southeast to Atlanta and then into the Confederate heartland. They would thereby smash the Confederate Army of Tennessee under the command of Joseph E. Johnston and seize Atlanta. Simultaneously in the east, Grant would assume command of another quasi-army group consisting of Benjamin Butler, commanding the Army of the James with 35,000 men at Norfolk, which would proceed up the James River, a high-speed avenue of approach northwest to Richmond. Meanwhile, Franz Sigel and his army of West Virginia with 26,000 men would move down the Shenandoah Valley, cutting railroads linking Richmond and razing the breadbasket of the Confederacy. Finally, George A. Meade's Army of the Potomac would fix Lee's Army of Virginia and prevent any reinforcements flowing west to Johnston in Georgia. All the while, naval forces supported Grant's every move. Grant's exceptional role as Lincoln's operational mediator determined that strategic *telos* (intent) was translated into operational *logos* (logic) and tactical *morphos* (shape). The campaign lasted more than a year and all the while, the systemic design ensured that a constant flux of learning, reflection, and understanding permeated Grant's forces.

The Cybernetic Paradigm: Modes of Disintegration

The Classical and Industrial paradigms gave rise to two military design motifs: the *clockwork*, based on a monolithic, mechanically articulated army; and the *framework* recalling Joseph Schumpeter's "steel frame" of the modern state and the railroad that helped shape the distributed deployment patterns of mass industrial armies.[45] Another transformation occurred hard on the heels of the Industrial Revolution—the Information

Revolution. Where the steam locomotive and the telegraph had helped frame the last paradigm, the internal combustion engine and the wireless radio would give rise to the *network:* integrated, operational systems of land, air, and naval forces. The new network highlighted for the first time the importance of information and the vulnerability of networked systems to disintegration and *cybershock*.

Arthur C. Clarke, the science fiction writer, once asserted that any sufficiently advanced technology is indistinguishable from magic.[46] Clarke's observation may seem quaint but his point bears directly on the development of the Cybernetic Paradigm. Much of the discussion concerning new and future military technology is long on description and short on explanation.[47] The explanations offered have a sleight of hand quality that underscores Clarke's observation. This is most evident in the promised magic of information warfare.[48] The magical quality of information warfare stems from a vague and imprecise understanding of the very nature of information itself. In reality, the development of new networked systems created another significant transformation in warfare that has yet to be fully understood. A closer look at information helps clarify two questions central to that transformation: How do information technologies create a revolution in the means and methods of waging war? What objective criteria can help measure this revolutionary change?

Once the new mechanized armies lost their telegraphic umbilical and became networks, information and control became a crucial factor in operational design. Although the two are two sides of the same coin, discussion of information invariably neglects the control relationship. Control is regulating influence directed toward some predetermined goal. Control thus consists of two key elements: the regulating *influence* of one agent or actor over another in that the former induces change in the behavior of the latter; and *purpose* in that influence is guided toward same prior objective set by the controlling agent.[49] Because leadership provides purpose, direction, and motivation, it is easy to see the important role the military commander plays in the control and regulation of his forces.

The idea of control exists at all levels of human activity and forms the basis of society. Man's primordial urge to dominate and regulate nature and his environment to his own purposes places control at the center of human evolution. Domination and control over nature was realized thorough technology, which placed man on a path that led from the stone axe to the supercomputer. Man's early ability to produce and use tools like the axe changed human thought itself. The "axe-making ability to do things in the proper order is one of the brain's many natural talents." Indeed, it eventually became a foundation for planning and problem-solving. "[I]n our ancient past the axe-maker talent for performing the precise, sequential process that shaped axes would later give rise to the precise, sequential thought that would eventually generate language and logic and rules which would formalize and discipline thinking itself. The newly dominant sequential talent of the mind was able to use the 'cut-up-nature-and-control-it' capability to extract more knowledge from the world and then use that knowledge to cause further change. Thanks to the axe-makers' talents and their gifts, things literally would never, at any time, be the same."[50]

The domination of nature through all aspects of technology brought change and difference to the forefront of control. The idea of difference and diversity was already mentioned in an opening section. The idea that two things are recognizably different or that a thing changes over time is central to the theory of control—*cybernetics*.[51] This is seen in the etymology of the word control, which derives from the medieval Latin verb *contrarotulare*, "to compare something 'against the rolls,' the cylinders of paper that served as official records in ancient times."[52] The notion that difference and change could be determined through comparison creates the inseparable link between control and information. Control creates information in two reciprocal ways. First, because control is goal directed, there must be a continuous comparison between the current state and the future intended state. This continuous comparison generates *feedback* information to the controlling agent. Second, the controller generates his own information in the form of adjustment instructions that *feed-forward* to the controlled agent.

In warfare, armies seek to dominate and control their opponents ultimately through the destruction of will. This struggle for control generates feedback information because the status of the armies is in constant flux. Staffs continuously process the information and assess the situation in relation to the overall mission objectives. Commanders feed-forward information as "fragos" (fragmentary orders) or other forms of instruction. The feedback of information as intelligence about self and the enemy and the feed-forward of information as instruction complete the reciprocal cycle of military control. It is only through the process of control that information has any meaning or, indeed, any objective existence.[53] *Fundamentally, then, the object of cybernetic shock is to destroy the enemy's ability to process information to control himself while protecting one's own capability*.

Recognition of the intimate relationship between control and information provides a new perspective from which to view the Cybernetic Paradigm and the theory of design. According to James Beniger, the natural evolution of living systems like armies creates a crisis in control. The control crisis is resolved only after a sudden transformation in information processing and communication—an information revolution. The first crisis occurred 4 billion years ago when the problem of controlling the replication of life arose. The emergence of DNA was the first Information Revolution and resolved the crisis. The complex macromolecule deoxyribonucleic acid contains a programming, decision, and control apparatus for the creation and replication of life. DNA "organizes matter and energy at the most fundamental level of control [and is] not only the most basic of all control technologies…but also one whose capabilities are unlikely to be rivaled by technologies of our own making for many generations to come."[54] DNA is the basic building block for all genetic material and is the first example of the *logic of design*. A 1 inch strand of genetic material contains the information equivalent of 12,000 typed manuscript pages or roughly twenty 500-page books. The nucleus of a single human cell contains 5 feet of genetic code, the equivalent of 2,000 such books.[55] The DNA information is structured in a program that provides feed-forward executive control in the replication and development of life. The DNA information *in-forms*, i.e., puts

form into, shapes, organizes life in the movement from *design through logos to morphos*. In the military sphere, the soldier comprises the basic genetic material in a combat organization. Education, training, and doctrine is the military DNA that *in-forms* the troops and thereby shapes the armed forces.

The second control crisis emerged 600 million years ago when life developed the ability to move through space and time. The crisis was resolved by an information revolution that led to the evolutionary design and development of the brain and central nervous system. For nearly 4 billion years, chemistry dominated life processes; then suddenly "primitive electronics [began] to assume importance as soon as we have a creature that moves around....The first electronic systems possessed by primitive animals were essentially guidance systems, analogous logically to sonar or radar."[56] The brain and nervous system offered two distinct advantages. First, the brain provided an executive control function that could feed-forward information in a dynamic lethal environment. The brain also lent a staff control function that could rapidly assess feedback information from the outside world. Second, the electronic-based nervous system provided a complete feed-forward-feedback cybernetic loop that was swift, unambiguous, and reliable, giving the organism the ability to *reframe*. Every organizational command and staff process is essentially a poor model of the brain and nervous system. The rapid evolution of the brain led to the development of modern war and human society, thus creating a third control crisis.

Genetic control through DNA design and programming does have one shortcoming—the genetic blueprint is virtually fixed forever. The encoded information cannot be reprogrammed, and the design cannot be redesigned or reframed, but about 120,000 years ago, man began to redesign and reframe himself through the use of learning and technology. Beginning with the rapid development of simple tools, man was able to extend his natural capabilities and circumvent his hardwired genetic code. By 10,000 B.C., the swift development of tools led to a crisis in the control of the new technology and induced a third information revolution known as the Agricultural Revolution. In addition to the five basic mechanical

tools—the lever, wheel, pulley, screw, and wedge—cultural tools like the alphabet, money, organized armies, towns, numbers, laws, and states all emerged to extend and enhance the natural capabilities of mankind. The Agricultural Revolution culminated with the design of a learning civilization that was, in effect, a control system that sought to regulate four essential tasks. First, governance through a central government, usually headed by a king, integrated all segments of society through a feed-forward system of laws. A primitive bureaucracy provided feedback control. Second, security through a military force protected the state and its interests. Third, logistics through an economic system ensured relative efficiency in the extraction, processing, and distribution of scarce resources. Fourth, science, embodied initially in a priesthood, ultimately sought to understand the world and extend man's fitness beyond his nature through new and innovative advances in technology while maintaining a privileged and proprietary lock on learning and knowledge. At the base of this revolution was an increasingly homogeneous society bound together through verbal and written flow of information. At the same time, the technology of writing and simple arithmetic provided the requisite information processing capability to guide civilization to its next control crisis.

For more than 10,000 years, civilization meandered along at the pace of a walking man. Information moved at the same rate. During this period, the extension of man's natural fitness had reached its design limit inherent in the existing technology and understanding. The limiting constraint was the fact that tools and tool-making were driven by the force of muscle-power. However, major technological advances of the Enlightenment of the 17th and 18th centuries supplanted the simple tool with the complex machine. The chief characteristic of a machine like the steam engine was in its use of inanimate sources of power.

The Industrial Revolution, while being a revolution in its own right, was in some sense a crisis of control. Because machines no longer required muscle power, they were no longer controlled by the direct hand of man. As a consequence, elaborate control systems had to be developed to control the new machines, and in this fashion, the new science of cybernetics was

born. Thus, "Gritty steam engines, not teeny [computer] chips, hauled the world into the information age."[57] Machines like the steam engine were quickly integrated into such complex systems as the railroad. Because of the distributed nature and speed of these systems, they had to be controlled in a new way. Just as nature resolved its second control crisis by means of an electronic-based nervous system, human civilization met its latest crisis with a similar electronic innovation—the telegraph.

The importance of the telegraph is profound:

> Although it may strike us as obvious now, it took a long while for the world's best inventors to transpose even the simplest automatic circuit such as a feedback loop into the realm of electronics. The reason for the long delay was that from the moment of discovery electricity was seen primarily as power and not as communication. The dawning distinction of the two-faced nature of the spark was acknowledged among leading German electrical engineers of the last century as the split between the techniques of strong current and the techniques of weak current. The amount of energy needed to send a signal so astoundingly small that electricity had to be reimagined as something altogether different from power. In the camp of the wild-eyed German signalists, electricity was a sibling of the speaking mouth and the writing hand. The inventors (we would call them hackers now) of weak current technology brought forth the most unprecedented invention of all time - the telegraph. With this device human communication rode on invisible particles of lightning. Our entire society was reimagined because of this wondrous miracle's [wireless] descendants.[58]

In one stroke the telegraph resolved the crisis of distributed control—how to control segmented distributed agents and activities separated by vast distances in space and time. For billions of years, the problem prevented single-cell organisms from becoming networked into a multifunctional distributed organism. As with the nervous system, electricity provided the key. In the human body, nerve tissue can sustain an information signal at 260 miles per hour, fast enough to regulate and control distributed agents like the arms and legs and activities like digestion and reproduction.[59] Degrade this flow of information any appreciable degree and death follows inevitably. Similarly, the telegraph was able to "framework" society, vast economic markets, huge government bureaucracies, and deeply distributed military formations because information was able to move unambiguously,

reliably, and swiftly. Of these, speed was the most important and establishes a quantitative milestone for the magnitude of the Information Revolution.

The previous few paragraphs discussed the material character—the *statics*—of information and the military forces it controlled and regulated. The continuous distributed nature of information supplanted the discrete concentrated form. Information and military forces coevolved, imparting to military art a much more fluid quality ultimately revolutionizing the *dynamics* of warfare. In a fundamental way, the physics of fluidity overturned the physics of solidity.

Another characteristic of mass is its ability to *move* through space and time. The most significant aspect of the control crisis and concomitant Information Revolution is the speed with which information was able to move. Only through the near-light speed of networked information can continuous control and regulation of distributed forces be maintained. Imagine, for example, the brain controlling limbs and life processes like digestion at the speed of a traveling horse. Distributed control and regulation would be impossible; life would cease. Today, for instance, the continuous, fluid, and wavelike nature of lightning-fast information is able to control and regulate all aspects. The practical significance of cybernetic warfare is that degradation in the speed of information flow decreases the commander's span of regulation and control over his subordinate units. There is also a parallel in human neuropathology: virtually every neurological disorder in man is a consequence of the degradation of information flow, making the body effectively too big and unwieldy to control. In human systems, information-derived energy binds organizations together in the same analogous way atomic forces bind matter together.

The new fluid-like quality of information in support of operational art, expressed most vividly in the control and regulation of distributed deep maneuver, fundamentally changed the general fabric of warfare. The movement and flow of distributed mass armies and networked information often manifested a state of *turbulence*, eddies of disorganization and disorder that for the first time in the history of the art of war transformed

the simple dense monolithic tactical structures into distributed complex operational organizations fighting at the edge of chaos. The forces of the Information Age now included a third dimension as air forces became networked with ground, naval, and amphibious forces: all bound together with the invisible thread of the electromagnetic spectrum. Naval operations themselves became networked with the ascent of carrier aviation.

A networked system is:

> ....a system [in which] a great many independent agents are interacting with each other in a great many ways....[T]he very richness of these interactions allows the system as a whole to undergo *spontaneous self-organization*....These complex, self-organizing systems are *adaptive*, in that they...actively try to turn whatever happens to their advantage....[E]very one of these complex, self-organizing adaptive systems possesses a kind of dynamism that makes them qualitatively different from static objects.... Complex systems are more spontaneous, more disorderly, more alive.... Each of these systems is a network of many 'agents' acting in parallel.... The control of a complex adaptive system tends to be highly dispersed....A complex adaptive system has many levels of organization....[They] are constantly revising and rearranging their building blocks as they gain experience....All complex adaptive systems anticipate the future.... They are active....It's essentially meaningless to talk about a complex adaptive system being in equilibrium: the system can never get there. It is always unfolding, always in transition.[60]

Diversity is a spontaneous consequence of imposing regulation and control on a highly distributed, fluid chaotic state. In a military organization, remove control—stop the flow of information—and the force loses internal cohesion to spin chaotically into disintegration. Because of its energy equivalence, information performs a control function directly analogous to the effect of a magnetic field on a pile of metal filings. The magnetic field *in–forms*—shapes—the filings the way information shapes an organization. The velocity of the magnetic flux approaches the same speed of light as the information moving through a modern communication network. It is the *density* and *velocity of information flow that objectively measures the diversity of an organization*.

From the foregoing, it appears that diversity has a number of dimensions, but all these aspects ultimately turn on the way a networked system

uses information. A modern military network uses information five ways.[61] First, it uses information to describe itself and the enemy. The more information required to describe itself and its adversary the more complex this description is. Second, a networked military system uses information to organize itself. Indeed, it is the energetic aspect of information that forces and shapes an organization into a particular structure. Third, after the Information Revolution, armies became algorithmically diverse. This means that the number of tasks or steps necessary to defeat an enemy increased dramatically. As noted earlier, we find evidence of this with the rapid increase in the size of planning staffs beginning in the American Civil War and in the increasingly protracted nature of modern war. The emergence of operational art during this period was another consequence of the algorithmic complexity of war. Wars could no longer be won with a few battles. Instead, commanders and staffs had to program and execute a whole mosaic network of deep and protracted operations to defeat an adversary. Fourth, the logistics of information—its acquisition, processing and distribution—itself became a network. It was no longer possible for the commander to sit on his horse and gaze out on the battlefield. Instead, he and his staff had to actively seek out information greatly distributed across countless battles in deep theaters of operations. Because information has the physical dimension of mass, it must be extracted, processed, and distributed like any other material resource. In this regard, information is like fuel for the mind with a kind of energy or octane rating; the greater the visual content of information, the higher its "octane." The electronic battlefield seeks to provide the same total visual awareness as the general on horseback. Finally, the information is only as good as how well it can be understood. The increased diversity of network warfare meant the rise in the importance of learning and education.

Military technology makes modern networked forces vulnerable in two respects. First, because the machines of the Information Revolution, unlike muscle-driven tools, rely on inanimate forms of energy like oil and electricity, the movement and sustainment of armies in the field relies increasingly on a network of distributed continuous logistics. The regulation

of this new form of logistics further drives the information and control needs of modern forces. Second, technology itself is embedded with information giving a networked rival the opportunity to rapidly transform himself. Not only do the new systems become more complex to use and produce, the technology carries within itself an increasingly dense and diverse pattern of its own design history. Because technology extends the natural capabilities of man, it gives him the potential for self-evolution and self-revolution by artificially changing his own genetic code—give a man a rifle and you have extended his natural lethal capability. Through technology, man becomes editor and author of his own genetic character. Each new piece of legacy technology contains all the information of a newer more advanced draft of a previous program of instruction that informs man's nature. The self-revolution of black light technology marks the beginning of a whole new book of evolution.[62] This new book is no longer comprehensible under the older industrial understanding: the grammar, language, syntax, and logic has become complex. Similarly, warfare can no longer be understood, spoken about, and waged successfully in terms of an old paradigm. The emergence of cybernetically diverse armies inexorably leads to the emergence of a new military design paradigm.

Modern armed forces are cybernetic systems that flow in a sea of information. Armies rush together like great rivers along broad turbulent fronts. Destroy that fluid medium and you have effectively frozen and paralyzed the enemy. The cybernetic paralysis and disintegration of armies is the essence of *cybershock*, this third form of warfare. Cybershock creates paralysis in at least six ways. First, through operations security, deception operations, and psychological operations, the enemy is denied complete information of his rival and himself. Second, electronic warfare destroys the organizational coherence and cohesion of the enemy, essentially freezing the opponent's nervous system. Third, active and intense reconnaissance and counter-reconnaissance at all levels blind the enemy. Fourth, the shock of surprise places a tremendous burden on the enemy's nervous system network, creating a broad state of uncertainty and panic. Fifth, the intensity, tempo, and rapidity of friendly operations inflict a

kind of cybernetic stupor upon an opponent. Finally, cybershock renders the rival *stupid* because he is unable to learn. In the ideal, paralysis reduces the adversary to its component, systemic parts. It would be a serious error, however, to believe that one could defeat an opponent by cybershock and paralysis alone. All these patterns of warfare are complementary and mutually reinforcing. The synergism among them creates an integrated posture of attack and defense meant to destroy networked military systems. Annihilation (attrition), exhaustion, and cybershock are all integrated through the *logos* of design.

The final outcome in this relationship occurs in the moral domain with the disintegration and destruction of the will to fight. Failure to consider these modern patterns of war in their totality can only lead to defeat. The simple fact remains that military systems are rarely destroyed by shock and paralysis alone. As we know, one of the remarkable qualities of networked military systems is that they are spontaneously *self-organizing*. A networked system like an army has its intelligence spread throughout itself. In war "each member reacts individually according to internal rules and the state of its local environment."[63] Properly designed, networked armies in battle have a distributed mind: a distributed being that has a swarm or hive-like quality. Sun Tzu, the ancient Chinese philosopher of war, noted a similar phenomenon. He wrote, "In the tumult and uproar the battle seems chaotic, but there is no disorder; the troops appear to be milling about in circles but cannot be defeated....Apparent confusion is a product of good order."[64] These writers have highlighted one of the fundamental qualities of modern forces—overall systemic paralysis and disorganization can be offset, up to a certain point, by self-organization and reorganization at lower levels of command. Thus, forces have the fractal quality of a *holograph*—a photo taken with laser-light that when shattered into pieces still retains the image of the whole in each fragment. A campaign design offers precisely the logical structure of a holograph.

Furthermore, there is a distinction between networked military systems and biological systems. For an organism like the human body, paralysis is total

in the sense that a person with a broken neck does not experience sudden self-organization and spontaneous control of his limbs. A joint force, on the other hand, may suffer complete cybernetic collapse—the analog to a "broken neck"—but spontaneously reorganize at lower echelons and continue with its mission. The whole efficacy of the German concept of *auftragstaktik* (literally "mission order tactics") is based on the self-organizing ability of subordinate units and local leaders.

The implications of operational systemic design to cybernetic warfare should be apparent. The final destruction of a disorganized rival may depend ultimately on his physical—and perhaps protracted—defeat in detail. If an enemy still has the will to fight, his fate will have to be decided with a simple bullet rather than a complicated piece of hardware. Campaigns like Iwo Jima and Okinawa should remind us how rare—and sweet—victories guaranteed by the technicians really are. These campaigns relied on intellectual sweat and deep understanding. The sleight of hand magic of technology and "shock and awe" warfare should not conjure up false hopes and visions of future war. At the same time, the armed forces must continue to unshackle the limit—and challenge the promise—of cybernetic warfare. In the end, wars are won by soldiers, not magicians.

The Information Revolution—and the computer it spawned—is still running its course through society and the military. And yet the Computer Age is already coming to a silent end. Ironically, the computer is being supplanted by the very thing it created—the Internet. The Internet has now given rise to a new transformation, the Digital Revolution, which will pose serious challenges for operational art and design.[65]

The Ecological Paradigm: User-Generated Warfare and the Rise of the Fractal-State

The question of a fourth paradigm moves us toward the observation of trends and the speculative future. Here the reader must bear in mind that any judgments about the future are always assertions, because they can never be proved.

Early in 1993, Mary Baudar of Winona, Minnesota, received an invitation from state school officials to attend kindergarten in the fall. The 104-year-old woman was puzzled; she had attended kindergarten years before crayons were even invented. But to the digitally myopic Minnesota computers, which could only recognize dates in the 20th century, Baudar was just another 4-year-old born in 1989. Four years later, the Amway Corporation, a $6 billion company based in Ada, Michigan, began rejecting a particular batch of solvents used in making cleaning products. According to the manufacturing plant's computers, the shelf life of the chemicals had expired. The system software read the expiration date of the year 2000 as 1900. In September 1997, the Aegis missile cruiser *USS Yorktown* lost propulsion due to a critical failure resulting from a software overflow error. These are all simple examples of the current technological revolution we find ourselves in—the Digital Revolution. While the Information Revolution culminated with the computer, the Digital Revolution has sprung forth with the Internet, which began essentially with the development of *embedded systems* like the ones described here.

Embedded systems monitor, regulate, or control the operations of devices, networks, and other systems. They are generally simple integrated chips that can be woven into a vast systemic network. They are embedded in all electronic technology, from wristwatches and video games to dedicated processors that control large industrial plants and electric-power grids. Embedded systems have time-sensitive logic written in permanently coded instructions called firmware. Likewise, the ability to compress thousands of lines of computer code into a few digital instructions or to send vast amounts of data through large electronic pipelines gives the Internet its power to transform society and the state in new and profound ways.

We all know what transpired on 11 September 2001. What we have yet to appreciate and understand is its significance for the emergence of a fourth paradigm. The events of that day represent the first instance of what we might call "user-generated conflict." The term is a paraphrase of Andrew Keen's *"user-generated content,"* a consequence of the greatly evolved

Internet. After the early manifestation of the Internet in the late eighties and early nineties, new broadband technology transformed the Internet from a curious, if sometimes frustrating novelty, into what Tim O'Reilly calls "Net 2.0." Now the massively networked, fully integrated, and continuously connected social culture is creating a kind of virtual nation that extends beyond the borders of any previously known or existing state. Net 2.0 is transforming society in many fundamental ways that may have serious security implications worldwide.

About 1860, the English biologist A.H. Huxley claimed, in summary, that if you had 100 monkeys pounding on 100 typewriters (actually, the typewriter had not been invented yet), you would eventually generate all of Shakespeare's sonnets. Net 2.0 has essentially created the conditions that could realize Huxley's metaphor:

> ...what had once appeared as a joke now seems to foretell the consequences of a flattening culture that is blurring the lines between traditional audience and author, creator and consumer, expert and amateur....Today's technology hooks all those monkeys up with all those typewriters. Except in our Web 2.0 world, the typewriters aren't quite typewriters, but rather networked personal computers, and the monkeys aren't quite monkeys, but rather Internet users. And instead of creating masterpieces, these millions and millions of exuberant monkeys—many with no more talent in the creative arts than our primate cousins—are creating an endless digital forest of mediocrity. For today's amateur monkeys can use their networked computers to publish everything from uninformed political commentary, to unseemly home videos, to embarrassingly amateurish music, to unreadable poems, reviews, essays and novels.
>
> At the heart of this infinite monkey experiment in self-publishing is the Internet diary, the ubiquitous blog. Blogging has become such a mania that a new blog is created every second of every day. We are blogging with monkeylike shamelessness about our sex lives, our dream lives, our lack of lives, our Second lives. At the time of this writing there are fifty-three million blogs in the Internet, and this number doubles every six months....
>
> If we keep up this pace, there will be over five hundred million blogs by 2010, collectively corrupting and confusing popular opinion about everything from politics, to commerce, to arts and culture. Blogs have become so dizzyingly infinite that they've undermined our sense of what is true and what is false, what is real and what is imaginary.[67]

Keen's polemic aside, he raises some key questions—and neglects others—that are worth exploring in a security context.

First, we note the blurring of the distinction between the creator and the consumer. This distinction has always been central to the notion of a marketplace and the foundation of an economy: the whole idea of supply and demand emerges from this distinction. In the Net 2.0 world, the consumer is his own producer, hence the notion "consumer-generated content." The fracturing of the age-old symmetry is affecting the very concept of value and worth: "Meanwhile, the radically new business models based on user-generated material suck the economic value out of traditional media and cultural content."[68]

Second, the broadband Net 2.0 also spawned the camcorder, "turning the Internet into a vast library of user-generated video content." Sites like YouTube and MySpace have begun to redefine the very idea of the media. Some of these sites even eclipse "the blogs in the inanity and absurdity of its content. Nothing seems too prosaic or narcissistic for these videographer monkeys."[69]

Third, the rise of the amateur and the eclipse of the professional take us back to the central point concerning 9/11. The distinction between soldier and civilian is becoming increasingly blurred in a similar manner. All the 9/11 hijackers were civilians, yet, thanks to post-industrial technology, when they seized control of the four airliners, they possessed more lethality than an entire World War II field army. It took the Greeks 10 years to destroy Troy but the hijackers destroyed the economic symbol of the world in a matter of hours. Moreover, for the first time in history, 19 civilians as "users" were able to supplant the military monopoly of the nation-state by igniting their own world war. In the past, only the state possessed the carefully and jealously guarded power to initiate war. After the 9/11 tragedy, a "global war on terrorism" was declared, making it the first "user-generated" war in history. The hijackers and their henchmen relied heavily on Net 2.0 to coordinate their "Pearl Harbor" strikes.

Fourth, the broadband power of Net 2.0 is changing the essential nature of the various media and creating one universal *digital medium*. We see this in the convergence of the broadcast media (both radio and television) and the print media into one digital expression. The conflation of the various media with the MySpace and YouTube genre is having several significant consequences: "Say good-bye to today's experts and cultural gatekeepers—our reporters, news anchors, editors, music companies and Hollywood movie studios. In today's cult of the amateur, the monkeys are running the show. With their infinite typewriters, they are authoring the future."[70] Society may be loosening its cohesion because the unifying bonds of give and take dialogue are being consumed by digital shouting matches. Without a relatively objective platform for dialogue and discussion, the very structure of logic is being weakened and is giving way to *argument by digital content*.

Fifth, perhaps most serious of all, the subject-object bifurcation that is giving rise to theory and science may be collapsing upon itself into self-absorbed subjectivity: we may arrive at the very place we began, where a narcissistic Achilles supplants the inquiring Odysseus. Already Net 2.0 supports millions of latter-day Achilles' around the world in *massively multi-player online role-playing games* (MMORG), spending millions of dollars and millions of idle hours in virtual death and destruction.

Finally, as part of the social fabric of Net 2.0, the world's security systems are being affected by the same digital expansion. The force of doctrinal and institutional authority is changing as more and more officers turn to the many military blogs and web pages for professional advice and understanding. Booz Allen is currently supporting the military as it adapts to these changes.

In summary, the *nation* part of the nation-state is becoming fractionalized and de-socialized. The individual will rise to his greatest potential in history, but this potential may lack crucial moral and ethical constraints that gave rise to civilization in the first place. A kind of chaotic *fractal matrix* may emerge where the individual may reign as king in his own digital, socially detached world.[71]

And what of the state? The current global economic catastrophe—the worst in more than 70 years—is generating changes that are being magnified by the Digital Revolution. These changes may further corrode national integrity and help subvert state sovereignty as we have known them. The consequence may be the fractal-state. In addition to the influence of Net 2.0, at least five political factors will contribute to these changes:

> (1)The recognition of human rights as norms that require adherence within all states, regardless of their internal laws; (2) the widespread deployment of nuclear weapons and other weapons of mass destruction that render the defense of state borders ineffectual for the protection of the society within; (3) the proliferation of global and transnational threats that transcend state borders, such as those that damage the environment, or threaten states though migration, population expansion, disease or famine; (4) the growth of a world economic regime that ignores borders in the movement of capital investment to a degree that effectively curtails states in the management of their economic affairs; and (5) the creation of a global communications network that penetrates borders electronically and threatens national languages, customs and culture.[72]

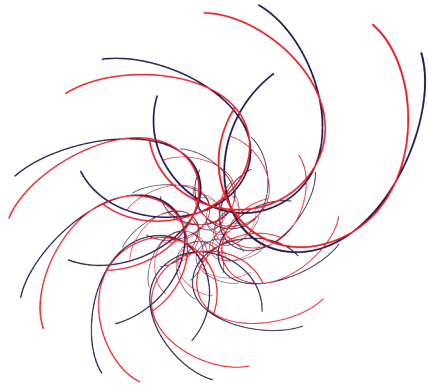
The current global economic situation might be mentioned again as well.

All these factors and others are contributing to a growing transformation of the very structure of the state and the security system that co-evolves with it. Historically, the state, the economy within the state that supports the state, and the security system that protects the state have all been co-terminus with the state and its boundaries. This fundamental symmetry has made prospects for co-evolution of state and security fairly straightforward. More recently, this symmetry is becoming subverted and broken under the current conditions of digital transformation. Just as state society—the nation—is being fractionalized, the very structure of the state itself is being transformed similarly.

Returning to the metaphor, a fractal is a geometric shape that has self-referent similarity as its predominant characteristic. This means that regardless of scale, the smallest portion of the figure contains the same shape as the whole (see Exhibit 1). The technological power of individual segments of the state now wield proportionally as much power as the

state as a whole, but the consequences of wielding that power are often disproportionately greater. The 9/11 hijackings are a case in point. When we contemplate non-state actors with nuclear weapons, the adjective, "non-state," becomes irrelevant and meaningless. Because all actors are driven by human motivation, everything we suggest here is contingent on that motivation: hostile feelings may lead to hostile intentions but hostile action may be held in abeyance indefinitely. Bernard Brodie, referring to Allied strategic bombing efforts to crack German will, pointed out long ago that "one of the important discoveries of the [Second World War was] that the influence of [attitude or feeling] upon [behavior] was much less immediate and direct than had been generally supposed."[73] We merely speculate, however, that with the rising social anonymity of Net 2.0, with its erosion of moral constraints, and with the rising of role of religious and secular fanaticism, the gap between attitude and behavior will narrow greatly: active maliciousness and depravity will often replace passive hostility and animosity.[74] The popular discontents of liberalism, secularism, and industrialism would likely continue to persist under the fractal-state, while the state would likely decline in its ability to reconcile these frustrations.

Exhibit 1 | Example of a fractal



Source: Lona Bozzay, Booz Allen Hamilton, 2009

The nation-state might transform fractally in another sense as well: imagine a blank sheet of paper—it has symmetry in two geometric dimensions, length and width. Crumple up that piece of paper, and you have destroyed the geometric symmetry and created a piece of paper with a fractional dimension: some dimension between 1 and 2. A fractional dimension also has some of the same properties of a fractal. The key point, though, is that by analogy, the security system must morph itself to conform to

the changing structure of the state if it is to properly secure that state in the first place. If we imagine the dimensions as space and time instead of width and length, or some other analogous relationship, it becomes possible to imagine the conceptual challenges facing strategic, diplomatic, and corporate decision-makers of the fractal-state. These challenges represent the essence of the Fourth Paradigm and the potential role for the application of design.

The fractal-state will face "user-generated" threats that will likely become increasingly more difficult to rationalize and predict through conventional decision-making techniques. Increasingly, the entire fabric of the state will have to share the burden of national security, with vigilance and diligence as the watchwords. These threats will increasingly be more irrational and driven by irrational motivations with a common source in a growing sense of cultural despair and a movement toward nihilism.[75] "True believers" might rise out of the ashes of failed states and failed economies offering new visions of salvation and retribution. Even where states maintain their sovereignty, the multidimensional nature of the emerging fractal-state would offer niches of existence. The multidimensional nature of the state envisioned here would demand a broad synthetic approach to the rationalization and resolution of conflict. The mediating role of the operational artist will become even more crucial because he/she must now synthesize across more functional areas of security than ever before. The convoluted, "crumpled" nature of the fractal-state and the viral nature of the rival will demand new and creative ways of thinking that transcend the narrow parochial views of current security professions.

Throughout the incipient paradigm shift just discussed, only one decision-making methodology is likely to keep pace with—and even anticipate—these emerging existential threats. As we have tried to demonstrate above, design offers a multidimensional approach to systemic operational decision-making that has maintained a close affinity and fidelity with its true historical and philosophical roots. We present a detailed discussion of the theory of Operational Design in Part II.

Part II: Operational Design:
A Theory of Mediation

System Framing as a Theory of Emerging Strategic Ecology

Part I, the Ascent of Operational Art, provides the background for the theory development that this section intends to explore. By extension, the structure is arranged into the following topical areas: first, the differences between planning and designing; second, mental constructs and system mapping; and third, the system framing space of inquiring, which is composed of four conceptual trends or process—orders of systemic inquiry and the systems of time, learning, and heuristics. This section concludes with the theoretical foundations for a self-regulating learning system.

Between Planning and Designing: The Difference That Makes the Difference

Being exclusively focused on execution of operations and injection of action into the real world, planners rarely bother to explore the *differences* between the prevailing strategic paradigm and the emerging context.[76] Because their main concerns are operational consistency and organizational effectiveness, they naturally tend to view the strategic emergence through the lenses of existing institutional knowledge and doctrinal patterns. This convention, which crystallized in the World War I industrial milieu, is what makes planning such a powerful form of command function.

However, the growing realization that the nature of strategic dynamics conforms more to Heraclitus' logos of flow and variety than to Aristotle's *eidos* (form) and *telos* (end) emphasizes the shortcomings of planning as a form of learning.[77] In other words, approaching every strategic context as unique and never-reproducible implies the continuous questioning of not only the conceptual contents of the institutional paradigm, but also the relevance of the learning methods associated with it. This proposition highlights the complementary relations between design and planning, as well as the essence of the system framing, as a key function in the learning aspects of design. By enabling the operational designer, whether

an individual or team, to exercise an elevated perspective of exteriority and critically explore the logical gap between the strategic emergence and the institutional paradigm, the concept of generating a system frame supports both the reframing of the existing knowledge boundaries and development of a comprehensive understanding relevant to the strategic context.

The coupling "System + Framing" implies a delicate cognitive dialectic. Because they are similar yet different, the words "system" and "framing" convey the entire depth of meaning of the cognitive operation, which constitutes the design-generated learning system. Framing implies the mental construction of a comprehensive understanding that results from the projection of an exterior perspective on a sphere of phenomena.[78] In other words, the frame presents the logical explanation of an observed variety, which, at first, appears complex. To construct a frame, or to bound an understanding, the designer explores the difference between the object of his/her observation and the paradigm he/she uses as an organizing reference. Or put in Peter Checkland's words, while observing the world outside himself, the beholder frames a system, or a systemic understanding.[79] The rationalization of the observed sphere is thus achieved by using systems logic as a mode of explanation. And, as argued by the cognitive psychologist Gerd Gigerentzer, once the frame of understanding crystallizes, it proposes the bounded rationale of the system constructed in the designers' minds, or a snapshot of the observed world as a system.[80] In this sense, framing implies a certain level of inertia, as in the way a camera snapshot frames but also solidifies for posterity but not for the future.

However, the compatibility with the process of flow, which is a centerpiece of both operational art and design, is accomplished through the concept of a system, in its broader meaning. A *system* as a mental construct is characterized by a certain tension between holism and comprehensiveness, on the one hand, and incompleteness or imperfection, on the other.[81] This premise derives from the very nature of learning, which is based on the understanding that, pursuing the flow of change in the world, our knowledge about any aspect of the world can never be complete. Moreover, manifesting the quality of becoming, a constructed system

is always in a state of transition, and therefore, in a cognitive sense, it comprises two essential components: a frame of understanding and a frame of intervention or operation.

By contrasting the understanding of the observed state or the current system with the assumption of a desired systemic state, the designers fabricate the potential space for constructing the frame of intervention. The gap or *delta* between current system and desired system is full of dead, unknown, or *problematized* space that must be made known through intervention and exploration. Deriving its logic from the system framing, the frame of intervention provides the conceptual basis for the operational or campaign plan. The *execution* of the design through planning—its *operationalization* of the frame of intervention in a real world theater—would inevitably stimulate a *problematization* of the initial system framing. This would yield a higher level of understanding about the changing world, which would prompt a reframing. In essence, design *assume*s that intervention through execution will not unfold as designed. This drives the tendency toward creating a *mosaic* or *system of operation*s that in a tentative fashion explores the unknown path toward the desired system. The striving toward the desired system in no way implies that even if the system becomes manifest as designed, the process stops: it never stops—like learning.

In a narrow sense, one can argue that design is a practice of constructing both a systemic frame of understanding about the world and a systemic frame of intervention that operationally pursues the potential logic set by the operations frame.[82] By integrating operationalization as a factor prompting reframing into the conception of design, one expands its meaning from a practice of system framing into a cognitive movement between systemic frames: from legacy system through current system to desired system. Viewing design in this broader sense indeed discloses its potential as a self-regulating learning system. Moreover, following this line of thought, we can add to the rationale of system framing as the function of providing the conceptual reference for reframing through operations, or reflection in action, as proposed by Donald Schon.[83]

Mental Constructs and Systems Mapping

System framing is a mental construction about the emerging strategic ecology, viewed through the lenses of systems logic. Therefore, the theoretical mapping of the contextual reality as a system is by no means a literal representation of the world. Rather, it is the embodiment of the subjective logical interpretation of the world in terms of its structure (*logos*) and its material nature (*physis*), as observed by the designers, in the relevant circumstantial context. As already argued, the framing of a systemic understanding about a certain phenomenon, or an emerging context, implies first and foremost the exploration of the *difference* between the "spatial object" observed by the designers and the existing paradigm, which provides a "subjectifying" reference in the same way a lens allows us to view the world. This deliberate positioning in a "conceptual median" or center, which is the essence of design in general, and system framing in particular, enables designers to perform three critical cognitive functions: construct a singular systems artifact that embodies the logic of their understanding; outline the comprehensive boundaries for a projected (into future operational space) learning system; and maintain the level of criticism required for development of a contextual understanding free from the biasing dictate of the institutional paradigm. In all this, theory becomes crucial because it provides the means whereby the system is *seen* in the first place and distinctions perceived.

A simplistic application of a systems matrix can easily lead one to project a mechanistic, even ritualistic, view on a complex world, and thus create a false impression of understanding.[84] Striving to immunize the inquiry against declining into a pattern of engineering analysis, the system framing, as the initial learning operation for the entire design inquiry, is based on three rationales: a comprehensive, multidimensional approach; critical thinking; and cognitive mediation. All these aspects make the fundamental distinction that we are dealing with *human systems* as opposed to physical or biological systems. Because systemic learning occurs among the commander, his design team, and his subordinates, a self-regulating community of learning and practice emerges. The systemic

nature of this emergence ensures that a perpetual inquiry (both prior to the operation and in the course of its execution) is established and maintained. The system framing space of inquiry develops through the application of four conceptual trends or processes.

Orders of Systemic Inquiry

First, while developing the comprehensive frame that embodies the systemic understanding of the strategic context, the designers simultaneously operate in three orders of inquiry.[85] By questioning the logical relevance of the institutional strategic paradigm, they may foster a paradigm shift.[86] Thinking about their thinking (meta-thinking), the designers examine the compatibility between the existing methodology of the inquiry and the cognitive challenges implied by the circumstantial context, and thus, may reframe the structure of their learning process.[87] Finally, by developing relevant understandings about subject matter implied by the context, they may formulate new conceptual contents and coin novel terminology.

Unlike planning, where the performers are confined to the "shackles" of interiority determined by institutional paradigm, doctrine, and jargon, designers strive to achieve both external and internal coherence.[88] Moreover, because the construction of a mental system implies first and foremost an exogenous reconstruction of the boundaries of knowledge and understanding in relation to the observed context, planners, no matter how passionately they talk the systems talk, are cognitively prevented, by the very convenience of institutional interiority, from actually *walking the systems walk* because the "shackles" of ritual hold them in place. However, by deliberately operating in the above-mentioned three cognitive orders, designers manage to construct a comprehensive learning system that produces an intellectual system of theoretical and conceptual artifacts that are coherently related, both exogenously and endogenously. It is this mode of functioning that, by expressing a certain level of conceptual subversion (or heresy) to complement planners' natural idealism, enables designers to maintain a continuum of coherence in their learning.[90] *Cognitively, the designer is asked to "jump off his shadow" to see both the strategic object of his thought and its operational reflection in order*

to construct a new synthesis of both. This new synthesis is necessarily heretical and may challenge the existing strategic paradigm.

The system framing inquiry opens, like each of the other generating concepts that follow, with a thorough exploration of issues of thinking, understanding, and learning. Unlike planning, where the planners follow a given process, and use institutional references from a given doctrinal inventory, designers have to set both the structuring frame of their inquiry (exteriority) and accordingly construct the internal order of their learning process.[91] In a sense, the conceptual challenges designers confront each time they are summoned to conduct a strategic inquiry are similar to those confronted by the great geographical explorers. They have to set the theoretical boundaries of the specific geography they are about to explore; they have to hypothetically define the unique nature and principal characteristics of this geography; and they have to develop the kind of map and navigation tools that will enable them to explore the unique space that they have theorized in their mind, and also afford them means and references for orientation.[92] Finally, they have to chart the episodic track that will referentially guide them when operationalizing their research trip in space and will furnish them a with formal grid to foster changes in their route, in compliance with emerging phenomena that imply new logic.[93] The strategist directs the designer, in the metaphor, to explore a certain region, but the designer/explorer is obligated to inform his sponsor that he may be exploring the wrong region entirely.

The cognitive challenge of structuring learning and developing the relevant methods for understanding the circumstantial context that observers are about to explore, implies that designers must confront matters that, by definition, reside outside the existing strategic paradigm. What references, both academic and experiential, would enable them to observe critically the difference between the emerging ecology and the existing knowledge?[94] What metaphors would help them lift the cognitive fog screening those variables hidden by the uniqueness of the situation?[95] Which projected perspectives would help them order their inquiry in a manner that unravels the complexity implied by the idiosyncratic context? What approaches would

facilitate cognitive bridgeheads for understanding operations in extraneous cultures, eccentric modes of thought, and alien forms of behavior and functioning?[96] What kind of questions would promote the disclosure of implicit factors insinuated by the strategic constellation?[97] When we speak of ecology, we are talking about the dynamic, largely human, elements that reside within a given geography. Thus, the strategic sponsor may suggest which territory we explore, but the designer must be aware of the nature of the diversity that flourishes upon the terrain and resist inquiry.

When arguing that what is known is obsolete, T.E. Lawrence, as an operational designer, put himself in the cognitive position to explore the space of deliberation that constitutes the system framing inquiry.[98] Unlike planners who approach the tactical action with a strict learning package, designers who focus on the operations of understanding must frame a relevant epistemology, construct a pertinent theory of learning, and develop an appropriate practice of investigation that would enable them to critically appreciate the novelty of the environment they observe. Doing that, designers who actualize a perspective of exteriority (meta-perspective) not only set the systemic boundaries (system framing) for the understanding of the environment of the future campaign, but also set conditions for coherent planning.[99]

The System of Time

The second conceptual trend or process in the system framing space of inquiry is time. While constantly expanding the boundaries of their systemic understanding about the strategic flow of events, the designers simultaneously conduct the inquiry in three dimensions of time. By applying a genealogical approach, they investigate the circumstantial developments that have brought about the current strategic crisis or impasse.[100] In other words, by reflecting critically on the institutional history and constructing the legacy system, they explain the strategic anomaly. By focusing on the present, they construct the map explaining the current system. And finally, by cognitively projecting into the future, they investigate the potential for transformation and map the desired system. Unlike designers, planners—who are action oriented—are exclusively focused on the present: this is their strength as well as

their weakness.[101] Moreover, being fortified in the doctrinal shelter of functioning activities, action patterns, and communication templates, planners, when developing a future operation, are in fact cognitively incapable of departing from the prevailing logic of the present. Rooted in a systemic appreciation of thinking and learning, the rationale for the operation of designers in three dimensions of time concerns three ideas: cognitive continuum of learning, critical thinking through problematization, and the heuristics of construction—deconstruction. When framing the historical antecedents of the impasse, the designers develop the cognitive basis for a deeper understanding of the present. And while framing the present they, introduce the foundations for mapping the future or a desired state. By projecting into the past, the designers establish conditions for critical reflection on the present. Moreover, by exploring toward a future, which is definitely different from the current reality, they problematize their understanding of the present. Finally, in their conceptual journeys into the past and the future, they employ the mapping of the present not as a mandatory frame, but rather as a reference for deconstruction or reframing. These dynamics will regulate the learning of the designers, both in the inquiry prior to the operation, and during the operationalization of their initial design.

A System of Learning Configurations: Story—Plot—Narrative

Third, to a large degree, the creative functioning of designers is based on storytelling, story construction, and story operationalization.[102] Because the profession of arms and the functioning of commanders employ storytelling as a mode of expression and form of learning, it is the function most common to designers and planners alike. However, whereas for planners the use of stories is exercised in the backstage of their formal activity, in the case of designers, stories are very much used as a principal form of learning in the front stage.[103] Relating to storytelling as doctrinally alien, time consuming, and loosely structured, the highly engineered executive process of planning has almost no tolerance for this form of functioning. Design, on the other hand, can be viewed as a story-producing learning project.[104] In the case of designers, story production serves as a

multilevel platform for constructing understanding—as a form of systems mapping, as an expression of the learning–operationalization continuum, as the embodiment of time sequence, as an artifact communicating their understandings, as a space for critical discourse with superiors, peers, and subordinates, and as a reference for reflection on emerging situations once the design is being operationalized.[105]

Serving the purposes of learning that generates raw material, fabric for reflective thinking, and medium for constructing understanding, the use of stories by designers is reflected in three qualitatively different, yet tightly linked, learning configurations: the initial story, the plot, and the narrative.

The initial story, which is perpetuated through primal observations of circumstantial materials, events, or phenomena, expresses the function of description in the learning system cycle and lays the basic fabric for reflection, composition, and reframing. As argued by the anthropologist and cybernetician, Gregory Bateson, the initial story, which articulates existing knowledge, provides only a reference for the evident. Without deliberately subjecting the initial story to a process of problematization, the *difference* between the referential *evident* and the unique emergence can never be appreciated, and without identifying the *difference that makes the difference*, one cannot depart from the existing understanding and create new knowledge that is more relevant to the context.[106] For instance, a fiction writer creates a plot that is always full of issues and problems that confront the protagonists: he is "problematizing" the narrative space. As the protagonists wrestle with their problems and resolve them, they create drama and denouement and, ultimately, learning.

By projecting the plot or a system of questions, rigorous propositions, and differential logics on an initial description, the designers structure a problematization of the initial story, thus subjecting it to a process of critical reflection. Through the plotting, designers deliberately introduce the cognitive conditions for both the exploration of tensions and contradictions in the initial story. The plot line is the essential logic that structures the story and gives the characters in the story their active shape (*morphos*) as thinking actors.[107] Thus, we see in the two Homeric epics, *The Iliad and*

The Odyssey, a particular plot but each with its own unique logic. In the real world, the actors themselves intervene to change the very logic of the narrative, which makes reframing so essential. Essentially, the character helps the author write the book.

The narrative expresses a higher level of relevant understanding, achieved by the designers through the synthesis of the initial story with the plot. Manifest at the macro level in the spiral movement between the three time dimensions, this pattern of learning produces the strategic or meta-narrative, which is the principal artifact of the system framing. Nevertheless, the same pattern is applied, at the micro level, when the designers develop the understandings related to the legacy system, the current system, and the desired system. Every narrative, both at the macro and micro levels of inquiry, is a temporal product because once it crystallizes it becomes a reference for further inquiry.

The use of story production offers a non-engineering metaphor that allows military designers to overcome cognitive impediments imposed by a milieu dominated by a positivist approach and a preference for hard sciences, and to synthesize the three system constructs (legacy system, current system, and desired system) into a comprehensive, coherent system frame. Socially, offering a non-rigid form of doing business, the story production learning spiral promotes synergy with non-military functioning agencies, and a smoother inter-organizational interface. Finally, in terms of heuristics, this form of inquiry provides the designers with a guiding mechanism to steer their learning movement from the explicit to implicit, and from pattern recognition to pattern creation.

Assuming that learning entails construction of a new understanding transcending one's existing frame of knowledge, we can argue that most planners end the creative part of their learning when they create an articulate description of a potential operation. In the process of accomplishing this project, they analyze the mission through the lenses of current strategy; use, both methodologically and conceptually, the inventory of authoritative doctrinal documents to study the situation; anticipate a desired end state by employing the prism of prevailing strategic credo;

and outline the entire ensemble of combined activities, leading them from the present to an artificially constructed future, by projecting on drawing boards and map-sheets patterns of action and organization borrowed from the reservoir of doctrinal knowledge and institutional conventions. Idealizing consensual functioning, smooth communications, and measures of effectiveness, and striving to conform to the existing paradigm, planners are destined to examine the present from a past perspective and foresee the future from the point of view of the present. Therefore, because the entire nature of military learning is reverse driven, and the project of planning is incapable of breaking through the bondage of the current paradigm, one cannot but agree with the banal saying that *military institutions are doomed to fight the wars of the past.*

In an ideal world of cultural symmetry and strategic stability, "re-fighting" could indeed work, and what planners, as military paragons of engineering, are actually required to do is to establish the conditions for exploiting, both generally and locally, superiority in mass, material, and firepower. The intellectual climate of the Cold War ensured that the planners were never confronted with the challenge of reframing. The nuclear deadlock locked the strategic narrative into one endless plot line.

The institutional failure to appreciate the heuristic shortcomings of the planning method, in a world dominated by dynamics of strategic flow accelerated by dramatic increase in variety, unconsciously turns military planners into victims of existing knowledge by locking them in paradigmatic boxes. Ironically, the preference of conceptual unanimity, doctrinal uniformity, and institutional control leads state militaries of today to witlessly give up the greatest advantage their war fighters hold over insurgents—that of intellectual potential.

The System of Heuristics: Description, Problematization, and Synthesis

Focused primarily on understanding rather than on action, the whole logic of operational design as a dynamic form of knowledge creation is based on a system of heuristics combining three functional components, or three

planes of learning: **description**, **problematization**, and **synthesis**.[108] Here lies the essence of the fourth and final conceptual trend.

The prime challenge confronting designers of operations today is how to release their thinking from the safe haven of institutional knowledge.[109] In other words, without a deliberate assault on the conceptual conventions, one would not be able to attain the conditions for critical observation of unique or potential strategic emergences.[110] What this approach actually advocates is by no means to ignore existing knowledge embodied in the institutional paradigm. Rather, on the one hand, it obliges designers to seriously regard the existing paradigm, and on the other, it requires them to assume (exercise) their ultimate intellectual responsibility and critically review the gaps and mismatches between the paradigm and the relevant context. By inevitably stimulating a reframing (or deconstruction) of the institutional paradigm, such an initiative would generate conceptual as well as organizational change, on the one hand, and on the other hand, it would most definitely yield new understandings more relevant to the observed context.

In heuristic terms, by seriously considering the institutional paradigm, we mean using it or its various components to construct a descriptive understanding of an observed phenomenon or context. This incipient form of learning is the most intuitive. However, because the innocent beholder tends almost naturally to explain the object of his observation through the patterns, templates, and "boxes" that have already been stored in his mind through previous experiential learning, unless he deliberately initiates an operation of questioning, his initial supposition (presupposition) will never ascend above the level of description, and thus remain in a state of reprocessed understanding, with only loose logical relations to the relevant context.[111]

By laying out a descriptive map of the observed phenomenon or situation, the designers structure a grid or *frame* of understanding dominated by the paradigm's conventions and biased by the doctrinal conceptual patterns. In other words, by instrumentally packaging their existing understanding about an issue, phenomenon, or situation into a descriptive mode,

they introduce the heuristic conditions for applying terms of exteriority, or to put themselves in a position to project critical perspectives onto their own knowledge. However, whereas planners, who by articulating a description of their operational understanding, reach the peak of their learning, and inertially fortify themselves in the sophisticated conceptual laager of the end product they have set, designers only start their arduous learning expedition here.[112] In an operational design mode of learning, there can never be an *end product* as such. Designers temporally create relative frames that serve a higher level of critical inquiry or *problematization*, as Michel Foucault referred to it.[113] Only by deliberately explaining or describing the evident, does one establish the conditions for critical reflection, and expose existing understanding to a process of problematization, whether this is accomplished through conceptual discourse or operationalization by action projection, and thus, deliberately generate the heuristics for reframing.[114] In the terms of the French philosophers Gilles Deleuze and Felix Guattari, what designers are actually doing is, by addressing the existing evident from the perspective of a *nomadic war machine, they are exercising terms of exteriority for smoothening or reframing the striation of the territorial understanding of the state apparatus*.[115] Without referential description, there can be no problematization; without deliberately putting oneself in a position to project a perspective of exteriority on a bounded (structured) concept, there can be no critical thinking; without critical thinking, there can be no reframing of a former understanding; and, without reframing of an existing frame of knowledge or paradigm, there can be no change.

Surprisingly, the concept of learning and knowledge creation through problematization is neither new, nor the invention of post-structuralist philosophers. For instance, the whole notion of Problem-Based Learning (PBL) makes this assumption. The roots of the dialectical approach to learning can be found throughout the history of the development of philosophical discourse, both in oriental and occidental contexts. The conceptual triad *thesis–antithesis–synthesis*, which is popularly attributed to the German idealist philosopher Friedrich Hegel, basically offers three

arguments, which are relevant to our case.[116] First, every learning or advancement of understanding implies a critical attack on an existing conceptual proposition. Second, without the mediating attack upon a proposed understanding, one cannot reach the state of synthesis, which implies the deliberate acquisition of a higher or more relevant state of understanding. And, third, it is through the application of the learning dialectics, which is perpetuated by the mediating problematization, that knowledge progresses.[117] As we alluded to in the introduction, the *tactical bias* creates a cognitive impediment in this dialectical process, namely: the *thesis* is never properly and effectively challenged by a more powerful *antithesis*; the assault is always tactical, that is, "local" in its challenge. As a consequence, a higher operational or even strategic *synthesis* can never be created. *Problematization* examines every aspect of the existing *thesis* (as existing knowledge) in order to find its vulnerabilities for "destruction." The *antithesis* shatters the old existing order and creates a new *synthesis* out of the ashes. Of course, this is explicit in the metaphor of the narrative: the whole plot line of the story is carried forward through the dramatic, dialectical tension and resolution among the characters. Thus, Achilles meets his own inevitable fate dialectically unfurled around the logical pole of the plot line.

The description function, both in regard to comprehensive fields of inquiry, and/or particular issues, phenomena, or concepts, initiates a learning spiral by driving a design team to intuitively map its existing understanding regarding the investigated object.[118] In proposing this natural, yet highly biased and dubiously relevant understanding, they establish conditions for self-reflection. Through the deliberate pursuit of tensions, contradictions, incoherencies, and differences between the initial descriptive map and the investigated phenomenon, the function of problematization promotes the designers' understanding to a higher level of understanding, and pushes them to transform their mind about the observed matter. The function of synthesis, which follows the arduous session of problematization, manifests the critical reframing of the initial frame of understanding.[119]

Theoretical Foundations for a Self-Regulating Learning System

The process of the design praxis, by perpetually spiraling designers to higher levels of learning, encourages them to acquire more relevant knowledge while constantly transforming their mind. The dynamics of this heuristic system is manifested in four levels of applying learning to the design praxis. At the level of learning system of systems, which is reflected in the flow of the campaign, the problematization of the initial design frame yields a new strategic frame more compatible with the new logic that emerges in the course of the operation (operationalization).

At the level of learning system, which is reflected in the development of the complete design process, the construction of the opposition system problematizes the initial system frame and produces a higher level of synthetic synergy. The rival becomes the fundamental element of antithesis. This may be reframed again, at least once, through the construction of the operation framing. At the level of learning operation, which reflects the evolution of understanding within the system framing generating concept, the construct of the current system is reframed at least twice—first through the problematization caused by the construction of the legacy system, and second, through the problematization caused by the construction of desired system.

Finally, at the level of learning unit, which reflects the construction of understanding related to any explored phenomenon or discussed matter, each initial descriptive proposition prompts problematization leading to a synthesis of higher appreciation.

As a singularly constructed body of knowledge related to a unique strategic context, the system framing combines two functional theories, which are dialectically linked. Endeavoring to provide the epistemic conditions for a critical understanding of the "logic underlying the order of things" (*logos*), within the dynamics of constant flow, the theory of learning both explains the particular cognitive challenges implied by the unique circumstantial context and proposes a special structure of thought conforming to these observations.[120] The second theory, defined by architect and theoretician

Christopher Alexander as *patterns of events*, descriptively explains the singular strategic logic embodied in the emergent ecology.[121] In general terms, the learning theory deals with one big question; How does one understand the logic embodied in the flowing situation? Whereas the second covers three questions: What is the systemic logic of the current strategic emergence? Which system of circumstantial developments brought about this strategic emergence? And, what is the systemic potential for transforming this emergence into a more favorable constellation?

Developing a theoretical framework that integrates the three logics (legacy system; current system; and, desired system) into a comprehensive whole, one can practice two complementary approaches or modes of expression—a textual manifestation of a literary narrative and a spatial manifestation of a graphic mapping.[122] Because both are practically different, yet cognitively complementary, they function as a system facilitating the designers' learning and communication. To develop a system construct embodying a certain strategic *logos*, whether in the form of a written text or a spatial map, one can use two sets of design tools—tools of vertical striation, which may include subject matter such as culture, politics, economics, society, strategy, learning and command, organization and logistics, and operations; and tools of horizontal striation, which may include assembling categories such as entities (actors), functions, relationships, tensions, and propensities or attractors.[123]

The system framing is the initial learning operation that sets operational design in motion. It is an enquiry into the nature of the existing *thesis*. By applying a perspective of exteriority (meta-perspective) in relation to the existing strategic paradigm, the system framing and learning process enables the design team to construct a comprehensive explanation of the complex emergence or *becoming*. By viewing strategy as a rationalization–operationalization dialectical continuum, the system framing and learning process permits the design team to map a strategy for potential transformation through *antithetical* intervention. Finally, by emphasizing critical thinking, heuristics, and appreciation of *logos*, the system framing

process supports the efforts of the design team to transform the relevant community of command into a self-regulating learning system. In practical terms, as a multidimensional system mapping, the initial learning process sets the conceptual boundaries for the particular design inquiry, structures the specific learning methodology, implied by the singularity of the strategic environment, explains the unique logic of the emerging context, explores the potential for transformation, and defines the limits for the strategic intervention.

In summary, system framing is the initial learning operation that sets operational design in motion. System framing, then, is an inquiry into the nature of the existing *thesis*. System framing and learning processes (together) enable designers to construct a comprehensive explanation of the complex emergence or *becoming* by applying a perspective of exteriority (meta-perspective) in relation to the existing strategic paradigm. Also through the system framing and learning processes, designers can map a strategy for potential transformation through antithetical intervention by viewing strategy as a rationalization-operationalization dialectical continuum. Finally, the system framing process supports the efforts of designers to transform the relevant community of command into a self-regulating learning system by emphasizing critical thinking, heuristics, and an appreciation of *logos*. The initial learning process sets the conceptual boundaries for the particular design inquiry, structures the specific learning methodology (implied by the unique strategic environment), explains the unique logic of the emerging context, explores the potential for transformation, and defines the limits for the strategic intervention. In practical terms, the initial learning process constitutes a multidimensional system mapping.

System Framing Summary: Essentials for Practicing the Theory

Cognitive Characteristics

The rationale of the system framing field of inquiry (generating concept) rests on the following cognitive foundations:

- The system framing sets the conceptual space explaining the singular logic of the relevant context.
- The system framing mediates between the ambiguity of the continuous flow of strategic change and the rigor of a logical explanation focusing on a snapshot of the strategic circumstances.
- The system framing mediates between a unique directive and existing conceptual patterns.
- The system framing explores the logical difference between the emerging context and the existing strategic paradigm.
- The system framing sets the heuristic conditions for critical thinking about the complex circumstances.
- The system framing examines the circumstantial developments and learning processes that induced the current crisis.
- The system framing synthesizes the emerging variety into a coherent systems rationale.
- The system framing synthesizes the history of strategic evolutions with the complex present crisis into a coherent future.
- The system framing structures the design inquiry to comply with the cognitive challenges implied by the contextual circumstance.
- The system framing sets the heuristic conditions for self-regulating learning in the course of the campaign conduct.
- The system framing (comprehensively) investigates the potential for transforming the current constellation.

Structure: The Domains of Conceptual Inquiry

The basic structure of the system framing comprises four domains of conceptual inquiry:

- **System of understanding**—Structuring the design inquiry in compliance with the relevant circumstances

- **Legacy system**—Mapping the logical roots of the emerging crisis and developing the systemic reference for a critical construction of the current reality
- **Current system**—Constructing a (systemic) map explaining the logic of the emerging strategic context and laying out the logical frame for the anticipation of a desired future
- **Desired system**—Exploring the potential for transformation through (operational) intervention, mapping an alternative system to the current one, and laying out a logical frame for critical reflection on the present.

Associations

The system framing, both as a process of inquiry, and an artifact (end product) is associated with the following learning processes, both external and internal (to the OD process);

- **External**
    - The system framing establishes the conceptual conditions for a learning discourse between the operational design team and the superior strategic command.
    - The system framing provides the conceptual reference for critical reflection on the strategic context that emerges in the course of the campaign, once the design is operationalized.
    - The system framing provides the cognitive basis for reframing in the course of the campaign.
    - The system framing developed by a certain design team, in a certain context, provides a natural external reference for "exploiting difference," by another design team, while striving to rationalize another strategic emergence.
- **Internal**
    - The system framing establishes the logical setting for observing potential for contention, which provides a structuring perspective for the conceptualization of the opposition system.
    - The system framing establishes the logical setting for observing potential for cooperation, which offers strategic elements that can be integrated into the construction of the command system.
    - By defining the strategic potential, campaign space, and operational time calculus, the system framing lays the basis for

conceptualizing the issues of mobilization and deployment when framing the system of logistics.

- By conceptualizing both the current and the desired system, the system framing sets the space for constructing the logic of the intervention and for framing the operation.

Artifacts

Because the system framing is the embodiment of a knowledge ensemble developed in context, there is neither a doctrinal recipe nor a standing formula relating to its end products. Therefore, the formulation of the specific artifacts embodying the knowledge constructed in each systemic inquiry should comply with the following cognitive criteria:

- The system framing artifacts should manifest the structure and logic of the inquiry, as well as the forms and content of the understandings created in the course of its process.
- The structure, form, and content of the system framing artifacts are objects for the creative thinking of the specific design team.
- The utility of the system framing artifacts should serve the following purposes:
  - Conceptual reference for the construction of the other generating concepts and further development of knowledge in the course of the design inquiry
  - Communication of the knowledge constructed by the design team
  - A source for deeper knowledge for the planners who depart from the operation framing and the planning guidance
  - The textual basis for the learning discourse between the design team and the superior strategic command.
- The potential for packaging the artifacts, communicating their message, and generating further learning can combine the following options:
  - Theory paper
  - Knowledge or conceptual maps
  - Written narrative
  - Reframing of the directive

The Opposition System: The Constructed Medium for Strategic Self-Reflection

The Difference Between Enemy Courses of Action and Opposition System

The difference between *planning* enemy courses of action (ECOA) and *designing* a theory of the opposition system is extremely important. If the difference is not fully appreciated, erroneous contextual decisions will be made and the logical basis of operational art may be completely lost. Military officers performing operational command and staff functions who fail to make this observation or appreciate the difference are inclined to apply knowledge they have acquired from their tactical experiences to their operational functioning sphere. In such cases, they either reduce the operational inquiry of potential opposition into a mechanical discussion or completely reject the need for a distinct learning operation.[124] The difference between planning ECOAs and designing a theory of the opposition system, for example, is clearly manifested in the way T.E. Lawrence shifted his conceptualization of the potential opposition to an insurgent campaign in the Hejaz. The shift was from planning that exclusively focused on tactical action against the advancing Turkish corps (prior to Wejh) to a design approach that focused on the systemic neutralization and operational exploitation of strategic potential. This occurred in the course of T.E. Lawrence's conceptual illumination in Wadi Ais.[125]

For a planner, the rival or the enemy is an organizational entity, which by bearing material presence in space, stands between the executing agent and the accomplishment of his tactical mission.[126] The physical nature of the environment of action determines the cognitive conditions for appreciating the rival materially rather than abstractly.[127] The compliance with Newtonian order implies that, on the one hand, the logic of a tactical rival is conclusive (evidential); on the other hand, due to the indefinite amount of operating variables, the circumstances of a concrete engagement are governed by randomness, and therefore, remain probabilistic. Moreover, because of the tactical, material, and technological

symmetry between the planner and his potential rival in applying universal patterns of action and demonstrating common templates of organization, the planner is able to put himself/herself in the position of his/her opponent, project on the physical situation two or three reasonable courses of action, and thus conceptually define the space of probability for action of his enemy.[128] Cognitively, as long as conditions for observing the rival's formal pattern exist, the planner is capable of competing with the challenges implied by planning ECOA, even if the scale of the deployment is strategic.[129] However, in cases where the potential competitor deprives the planner of conditions for pattern recognition by concealing his form, then one has to shift to a design approach in order to learn and understand the rival's true shape.[130]

Establishing order and setting the organizational grid for the execution of a system of activities and actions, planning pre-defines missions as a consequential logic to be attained by forms of action. The physical manifestation of the form of action in space insinuates the type of opposition and the magnitude of the expected resistance. In other words, problems of military planning are measured through the relations between the rationale of the mission, the form of action, and the relevant spatial circumstance.[131] Intuitively, a planner considers two optional sources of opposition or resistance to his projected move, those implied by the relevant geographical features, and those implied by human indoctrination, organization, and deployment (military or civilian).[132]

The heuristics for military planning, very much like those of problem-solving engineering, are limited to a learning space defined by the doctrinal constants of mission, form, and the physical variable implied by the concrete space of action. Unless deliberately reframed by an operator (operational designer) in compliance with the logic of the emerging rival system, the reference for defining the mission can be easily found in the body of prevailing conventions, encompassed within the existing strategic paradigm. The operational patterns for assembling a maneuver are provided by the inventory of existing patterns of action and organization formulated in the current doctrine.[133] As the single dynamic factor in the

equation, the environmental variable adduces the conceptual thrust for adapting the existing patterns and forms to the particular conditions. Because the exercise of the natural advantage planners possess centers on conforming to the obliging doctrine, their ability to introduce substantial changes that will comply with the contextual characteristics is limited to adaptation of existing conventions and formal patterns. In other words, in being confined to a perspective of interiority, planners of action can quickly adapt, yet their cognitive ability to transform, both conceptually and organizationally, is very limited indeed.[134]

Deliberately assuming a position of critical thinking by applying a perspective that is exterior to the prevailing paradigm, designers establish the conditions to examine the tension between the uniqueness of the emerging strategic logic and the universality of the existing institutional conventions. By liberating themselves from institutional mindsets, they transform their thinking, and by doing that they constitute the heuristics for achieving different and probably more relevant understandings.[135] Once they reframe their understandings about the emerging rival system, designers can redefine the doctrinal boundaries of the space within which planners and operators can logically orientate themselves and operationally adapt. This last observation constitutes the essence of the magic word *orientation*, which the late John Boyd used to describe the cognitive operation planners and operators practice when transiting from *observation* to *decision* or pattern selection.[136]

Appreciating the acute dependence of action planners and operators on the conceptual regulation of the mission–doctrine–environment triangular space, design theory stresses the crucial role of design practitioners to reframe its logical boundaries coherent with the emerging strategic context. Unless the designers explore the particular logic of the strategic context and the logic of the operating environment, the planners remain deprived of a coherent framework for their orientation, both in regard to the options for action and in regard to the rival whom they have to consider. Thus, by deliberately exploiting a cognitive position enabling them to observe the relations among the "world" (ecology), the paradigm, and the space of

functional action (battle space), designers re-construct for the planners a coherent frame for understanding, re-define the cognitive space for operational and organizational adaptation, and reframe potential rivals within the relevant environmental context.[137]

System of Opposition: The Cognitive Transition from Strategic *Telos* to Operational *Logos*

The system of opposition is the first among the three generating concepts that constitute the cognitive transition from system framing as a framework of rationalization toward operation framing as a working frame for intervention. A successful accomplishment of this transition, which is definitely not a trivial one, implies that designers have to consider seriously five cognitive challenges. First, how can one problematize the initial system frame and achieve a higher or deeper understanding about the potential embodied in the emerging strategic ecology? Second, how can one reinforce heuristic conditions enabling the exploration of implicit elements unobserved in the course of the system framing learning operation? Third, how can one address the dialectics of the self–other relation and complement the initial system construct by adding the "missing dimension"? Fourth, how can one influence the initial strategy for transformation to a higher, more refined level of synthesis? And finally, how, by exploiting the dialectics of logic–form, can one frame the logical space for intervention and provide the operation framing with a formal reference?[138]

Therefore, by enabling architects of strategy and designers of operations to explore, in a higher mode of criticism, the space differentiating transformation and potential, the cognitive operation of constructing an opposition system facilitates the transition from the abstract understanding of the emerging logic to the framing of intervention in the real world.[139] Moreover, because strategic opposition is not necessarily evident but rather a matter constructed through the beholder's contextual perspective, the structuring of the opposition system cognitive operation is based on meta-questions such as: What are the logical parameters for defining potential opposition in the relevant context? What are the cognitive

conditions for a critical appreciation of opposition in the relevant context? Which methods of inquiry and conceptual references would reinforce a critical learning of the opposition system in the relevant context? Which functions, actors, relationships, tensions, and propensities constitute the opposition system in the relevant context? And, how should the relevant strategy reflect the logic of the constructed opposition system?[140]

Defining the learning methods and tools of inquiry for constructing the understanding of the opposition system, as well as formulating the conceptual contents expressing these understandings, the system of opposition, as a process of conceptual development, unfolds through four planes of logic. The first, which focuses on the structure of the inquiry or the logic of learning "how to learn"—the so-called meta-level—about the opposition system, addresses issues such as the history of the learning that preceded the inquiry; the difference, in terms of understanding the potential for opposition, between the observed case and other cases; the cognitive implications, for a critical understanding of the opposition system, of the tensions between the institutional strategic paradigm and the emerging circumstances; and, conceptual references and subject matter experts that can promote the understanding of the opposition system.[141]

The second, which concerns the exploration of the factors that shape the potential strategy of the opposition system investigates thematic spaces such as the cultural foundations of the opposition's strategic thinking, the political roots of the opposition's strategic practice, the economic dynamics affecting the opposition's strategic thinking, and the social setting underlying the opposition's behavior.

The third focuses on the deliberate construction of the opposition's strategic logic, and the relevant approaches, or potential for its transformation. And, conceptualizing the opposition's operational system, the fourth explores matters such as the opposition system's operational functioning, modes of command, patterns of deployment, and methods for neutralization, disruption, dislocation, or dismantling of the opposition's operational system.

Opposition System Summary: Essentials for Practicing the Theory

Cognitive Characteristics

The rationale of the opposition system field of inquiry (generating concept) rests on the following cognitive foundations:

- The system of opposition constitutes the cognitive mediation between one's strategic logic and operational form, system framing and operational framing, and frame of rationalization and frame for intervention.
- The system of opposition provides the heuristic platform (position of exteriority) for the problematization of the system framing.
- The system of opposition sets the thematic space for constructing a theory of opposition.
- The system of opposition sets the conceptual conditions for strategic self-reflection and for the application of a higher level of synthesis of one's own strategy.
- The system of opposition affords an alternative perspective for studying the relations between (strategic) potential and (operational) transformation.
- Affording a scaffold for constructing a strategic plot, the system of opposition bridges between strategy and stratagem.
- Providing a plane for critical thinking, the system of opposition enables the disclosure of implicit variables.
- The system of opposition creates the opportunity for deepening one's knowledge about the environment and its characteristics.
- Reframing the triangular space (mission–doctrinal form–environmental variable), the opposition system provide planners with a coherent grid to consider optional rivals.

Structure: The Domains of Conceptual Inquiry

The basic structure of the opposition system comprises of ten domains of conceptual inquiry;

- **Mapping "otherness"**—Plotting the potential (logical boundaries) for strategic competition and exploring the cognitive obstructions for understanding the logic of the opposition system

- **The opposition's cultural system**—Mapping the cultural factors and value order shaping the social structure, economic dynamics, political propensities, and military strategy of the opposition system
- **The opposition's political system**—Mapping the power bases, sources of legitimacy, and political organization constituting the strategy of the opposition system in the current context
- **The opposition's system of economics**—Mapping the sources of wealth, key functions, trade relations, goods traffic, and food chain, determining the strategic potential of the opposition system
- **The opposition's social system**—Mapping the power structure, functional components, sources of cohesion, generators of tensions, and mechanisms for social self-regulation affecting the strategic behavior of the opposition system at the current context
- **The opposition's strategic system**—Mapping the development of strategic discourse, behavior and activities, organization of space, and external interfaces of the opposition system in the current context, as a basis for constructing one's own strategy for transformation; potential for intervention; conditions for disruption
- **The opposition's learning and command system**—Mapping the learning patterns, intelligence capabilities, decision-making processes, command functions, methods, and organization that regulate the strategic and operational functioning of the opposition system
- **The opposition's system of logistics**—Mapping the elements of space and time, the infrastructure, the mobilization of resources, the deployment in space, and method of sustainment that characterize the environment of intervention
- **The opposition's operational system**—Mapping the maneuvering functions, systemic relations, and the operational form manifesting the strategic logic of the opposition system
- **Conditions for systemic transformation, strategic disruption, and operational dislocation**—Mapping the "negative reference" for constructing one's own stratagem and outlining the "conceptual grid" for operationalizing the future intervention.

From Logos to Morphos: the Mediation of Operational Aesthetics

Operation Framing: The Embodiment of Mediation

The rationale of the generating concept, which brings the design inquiry as a learning system into a temporary state of cognitive culmination, centers on the relations between three ideas—*Mediation, Operationalization*, and, *Aesthetics*. As the practical transition from design, as a functional system enhancing strategic understanding, to planning, as a functional system enabling action of any kind through the arrangement of forms in space—the operation framing, more than any other element of design, manifests the critical space between *forms of knowledge* (knowledge about knowing) and *knowledge of forms* (knowledge about action and organization).[142] It is the cognitive navigation through this uncharted learning space that makes the operation framing the most challenging of all the design components. In this respect, the operation framing is the military expression of the unique qualities suggested by architecture as a metaphor.[143] Through the final expression of his artistic faculties, an architect composes an endless inventory of existing formal patterns with a unique sponsoring idea, aspiring to transform a relevant living sphere, through the application of a singular building project, bearing form in space.[144] In a similar, yet not identical way, a military designer, when framing an operation, synthesizes the plethora of universal warfare conventions with a particular strategic logic into a complex form of intervention that strives to transform a certain ecology by conveying a system of meanings.

The purpose of operational design is to rationalize complex human emergences, by developing system constructs indicating potential for strategic transformation, through the application of operational interventions.[145] Therefore, no system construct reaches coherence unless the systemic rationalization is complemented by an outline proposing forms of intervention that comply with this rationale. Moreover, when designers construct a system framing explaining the context they observe, their knowledge will always be relative, limited, and even flawed. The integration of an intervention frame striving to operationalize this knowledge in the

real world, with the frame of explanation, which is an open system by nature, introduces the conditions for further learning and reframing of the initial system construct. What this means in fact is that by applying a design approach, the command agent operating in the cognitive median, very much like the Roman mythological gatekeeper Janus, projects two different perspectives to synthesize a frame for relevant functioning.[146] By projecting his critical inquiry into the sphere of strategy, he engages in constructing the relevant *logos*. On the other hand, when the designer simultaneously projects a critical inquiry into the sphere of action or tactics, he/she engages in constructing the relevant *morphos* and develops the formative combinations, conforming to the *logos*. In other words, the deliberate exploitation of their mediating positioning within a potential contact zone is what enables designers to construct a unified system integrating strategic sense-making with tactical projection of forms of action.[147]

For all its conceptual richness and inspirational insight, the system framing cannot be a true expression of the operational architect's mediating function. If exclusively confining himself/herself to this part of the design inquiry, the strategic sponsor remains trapped in a studious discourse without being able to appreciate whether his/her intent can coherently materialize. The planners and executioners, however, while being deprived of a relevant frame for orientation, keep guessing in the dark and fortify themselves in the shelter of existing doctrine. Only when operational designers reframe the system of apprehension into a system of intervention can they actually introduce a form of reference common to all functioning agencies in the command system. Once this multidimensional formative grid connoting operations in space is produced, the conditions for transforming the entire command apparatus into a self-regulating learning system are established. Moreover, with a relevant theory of warfare or intervention as an organizing logic, the planners can develop the infrastructure to support the operations that bridge the present to the future.

Through the framing of the operation, the designers conceptually create the pertinent space of synthesis within which the spiral of learning discourse, involving the various functions in the relevant command system, can be perpetually harmonized, regardless of differences and tensions intensified by the turbulence of operational occurrences. And, because for planners as well as for executioners of action, the rationale or function is always embodied in a structured form, the *morphing* of the strategic direction (*telos*) into an operational architecture provides them with the cognitive unity that can support their orientation when observing, deciding, acting, and adapting.

Apart from priming the planning session by providing the planners with a robust reference for orientation, the synthesis of strategic direction and tactical form within a unified operational frame sets one end for a potential space of critical discourse among sponsors, designers, and actors. By translating the operation framing general grid into detailed arrangements of various initiatives and operational efforts distributed in space and time, the planners set the other end. Thus, exploiting the "discoursive" space extending between the differentially related references, the entire community of command submits the coherence of the operational frame to yet another critical trial. Focusing on the application of the knowledge embodied in the operation framing to the practical conditions of the "battle space," this spiral discourse engines the operationalization.

Operationalization: The Process for Self–Regulating Learning Systems

Generated by a plan-determined injection of physical energy into the space of praxis, the function of operationalization is reflected in two conceptually interlinked domains: formal expression (*morphos*), and logical appreciation (*logos*). The first, which is related to planning, is best manifested in episodic ensembles, confined to closed-loop-like couplings of exertion, or fragmentary rationale and unitary action. Because every fractalized ensemble of effort starts with defining the objective and planning the

mission, and ends with their accomplishment, it can metaphorically be explained as a closed system. When accomplishing its mission, each of these action fractals changes the physics of the battle space, in a manner complying as close as possible with the conditions set by the plan. In other words, the actualization, in space and time of the physical conditions concluding each ensemble of actions provides a fractal component of the operationalization as a physical manifestation of an unfolding maneuver system. Within this context, operationalization implies a unilateral cognitive dependence of planners on the initial provision of the operation framing by designers.

However, the actualization of every fractal ensemble of action in space and time introduces a certain logical tension or divergence between the initial frame (logic and form), constructed prior to the operation, and the "system in becoming," that emerges in the course of the operation or campaign. This observation brings us to the second domain, that of logic appreciation, which is closely related to design and the functioning of designers. Because in operationalizing the maneuver-system in the physical medium, or the domain of formal expression, planners and executioners effect the conditions for designers to operationalize the learning-system in the cognitive medium, or the domain of logical appreciation, one can argue that through the operationalization, designers perpetuate their learning by pushing their understanding of the system to a higher level. Put in simpler words, operationalization is the mechanism causing designers to cognitively move from an initial frame to a reframe embodying the logic of the relevant emergence they observe.

Therefore, once the campaign commences and the maneuver or action system undergoes operationalization, the designers' ability to operationalize the learning system, in order to obtain a more relevant understanding of the emerging logic, becomes dependent on both planners and executioners. In terms of command relations, the initial dependence of planners on designers in providing them with the operation framing, as a mechanism priming their functional activity, is thus reversed. However, this reversal concerns an aspect deeper than the change of mechanical

direction implied by the traditional chain of command hierarchy. To comprehensively reconstruct the logic of the relevant emergence, which by the very nature of systemic flow will be different from the one anticipated prior to the operationalization, designers always need to reframe a more relevant system. Here, the conventional mode of reporting about plan adjustments, requirements for further resources, or accomplishment of missions, fall short of satisfying the epistemological needs implied by the cognitive operation of reframing a new system of logic. In this operation, which is an ultimate exercise of abstract construction, the designers, who are physically detached from the "battle space," can perform their function of systemic reframing only under one condition: the planners, as well as each command agent implementing an ensemble of initiatives (action fractals), render them the relative interpretations explaining the emerging systemic ramifications, stimulated by each space-time limited operation. And, because from a cognitive point of view, a plan constitutes a closed system, the external reference for self-reflection, or systemic appreciation of one's own endeavor in the relative time-space, can only be provided by the operation framing. This last observation raises yet another argument reinforcing the understanding that the transition from design to planning is not a simple bureaucratic transfer of information. Rather, through the operation framing the designers establish the conditions for a learning discourse, which provides a platform for educating the planners in the logical specifics of the operating system.

In a physical sense, the operationalization of the numerous components of the maneuver system, distributed across the space of operations, expresses the dimension of current time, in the conceptual evolution of the campaign, as a process of becoming. In a metaphysical sense, or the plane of functioning concerned with the relations of mind and matter, cognition and substance, the operationalization of the same maneuvering system drives the learning system forward, or rather projects the understandings of the command system into the dimension of future time. This argument explains the behavioral inability of planners to detach themselves from the present and coherently plan ahead of the present.

By constructing a new or relevant systemic interpretation, which is related both to the conditions operationalized by the running maneuvering system and to the initial framing preceding the current operation, designers lay out a "cognitive spring board" for projecting the learning of the command, as a community of practice, into the future. In other words, by exploiting the formal expression of the operationalization, designers develop the logical appreciation elevating their learning to a higher level, reframe their understanding, and perpetuate conditions for a coherent continuum of operationalization. Therefore, in their deliberate addressing of these dynamics, they enable the process of planning to compete in a more coherent manner with the challenges implied by the constant flow of change. Moreover, bearing this understanding in mind, one can, almost naturally, reinforce the somewhat lost synergy within the operational staff as a system, by interfacing two complementary functional components; a planning element, synchronizing operations in the present, and a design element, systemizing learning and understanding into the future.

Perceiving operationalization as an expression of form, planners are almost naturally inclined to idealize actions, engagements, or battles, which are formal manifestations of their functioning rationale. Being aware of this phenomenon, designers also are implicitly predisposed toward viewing action, in a broader sense, as an instrumental tool for testing their hypotheses, inquiring into unexplored knowledge, and expediting new theories. Unless this realization is translated to a more coherent theory of command and expressed in an education system that supports it, the ability of state military institutions to exploit the systemic potential of their command apparatuses remains dubious. However, in a military culture whose proponents are exclusively addicted to forms of heroic command, tactical performance, and idealization of engineering, the digestion of such an idea offers a profound institutional challenge.

The relations between operation framing, as a form of knowledge creation, and operationalization, as a form of learning generation imply yet another reversal in cognitive dialectics. In the process of systemic inquiry that precedes the campaign, designers exploit the dialectics of

logic–shape, or *logos–morphos* by moving from a system of explanation to a system of intervention. In other words, they start by constructing a systemic frame, rationalizing the emerging context, and end by proposing an operational frame, which manifests the form of intervention complying with the initially constructed systemic logic. This is the beginning of the movement from thesis/antithesis to *synthesis*. However, once action is applied through planning, and the formal expression is operationalized in space, the cognitive dialectics of logic–form are reversed. The construction of systemic logic, in the pre-operation design session, lays the foundations for the construction of the form. And once the designers accomplish the cognitive transition, through the development of the opposition, command, and logistics system, the conditions for launching the project of operation framing and complementing the form are indeed established. The execution of the plan, through the actualization of various mission components, projects into the space of the operation numerous organizational clusters expressing form.

Once this form is generally conceptualized, through the command discourse that exploits the difference between its unfolding spatial manifestation and the initial operation framing, the cognitive conditions for the construction of the emerging logic are introduced. Using the operationalized form as one reference, and reflecting on the initial design frame, as the second reference, the designers can now construct the logic of the emerging system.

Operational Aesthetics: The Pursuit of Meaning Through Formal Expression[148]

As the climax of the design inquiry, the operation framing as synthesis of strategic *telos*, operational *logos*, and tactical *morphos*, organically manifests, more than any other generating concept, the idea of aesthetics.[149] For the majority of laymen, military activity, almost naturally, connotes an impression of destruction, brutal killing, or devastation. Therefore, any attempt suggesting a linkage between operations and aesthetics may sound like an oxymoron.[150] Yet, even among soldiers, who are unwilling to think about the profession of arms beyond simplistic terms

of effective action, there is no higher level of tolerance regarding such a linkage. The truth is that the application of any kind of exertion, intervening in a human sphere, implies the use of forms of action, organization, or communication. And because the creation, utilization, operation, and assessment of forms concern some level of artistic functioning, there can be no separation between military praxis and aesthetics. The whole rhetoric about the art of war, despite its frequent "banalization," actually confirms this argument.

Military planners and proponents of action, very much like craftsmen and engineers, are cognitively committed, by the nature of their praxis, to formal patterns, schematic procedures, and structured templates, bounded by the constants of their discipline or doctrine. Being confined in their thinking to existing operational and organizational "boxes," planners and men of action are limited, both in their capacity to construct a systemic explanation of the potential logic, embodied in the unique context, as well as in their ability to create a singular comprehensive form of intervention. Moreover, cognitively speaking, the mediation between the unique logic of a systemic explanation, and the singular form of a systemic intervention, implies that both the architect and the operational designer, after developing the first, have to create the particular aesthetical parameters and artistic criteria that would coherently structure their construction of the second.[151]

In other words, the strategic sponsor truly expects the operational architect to perform three qualitatively different, yet tightly linked, cognitive functions. First, the architect must systemically explain the unique logic of the context and comprehensively frame the potential to transform the emergent ecology by projecting a system of operations. Second, he/she must develop a particular system of logical principles and aesthetical concepts that would serve as a relevant theoretical basis for critical thinking and coherent structuring of a new form of warfare. And, third, the operational architect must apply the aesthetical considerations, proposed by the relevant theory of warfare, to comprehensively construct a singular form of an intervention system. Conforming to the unique strategic

direction, the deliberately constructed, aesthetics-based theory of warfare enables designers to depart from a mode of doctrinal repetition and apply a mode of poetic creation. Being aware of the fact that the construction of a singular theory of warfare aesthetics implies thinking in terms of exteriority or outside of the existing paradigm. Sponsors, both in the world of building and politics, whenever intending to initiate a project that would positively affect the ecology, start by addressing a chosen architect rather than a group of engineers or a community of craftsmen, who actually perform the various functions of building.

In exploiting the operation framing space of inquiry, designers manage to create an aesthetical theory of warfare. As already argued, this theory proposes both the unique consideration for constructing a form of operation, compatible with the unique strategic direction, and the descriptive narrative characterizing the operationalization of this into a unique logical structure within the theater of the relevant campaign.[152] In the course of the theory development, the designers transform their mind by shifting their thinking from logic to form. With the theory realization, they outline an operational form, conveying strategic meaning that orients the planners in translating the whole into ensembles of action fractals. Finally, with the operationalization of the form in space and the emergence of new logic, the designers reach the state of reframing their operational understanding or *meta–morphing* their theory of warfare. Thus, the aesthetic theory of warfare expresses metamorphosis at all three levels of logic; *meta*, which implies structuring by applying an external perspective; *morphos*, which connotes a form creation or expression; and, *metamorphosis*, which implies a transformation or change in form.

As a self-made theory of aesthetical criticism, the operation framing develops rigorous tools of thought for structuring the construction of the operational form, to comply with the logical characteristics, implied by the relevant strategic context. As such, it also affords designers and planners alike, the critical perspective to assess organizational gaps between the doctrinal inventory of existing formal patterns, and the specific requirements implied by the context. In this sense, it provides a vehicle

for institutional self-transformation, guaranteeing compatibility between the applied forms of expression and the pursued strategic meaning. Moreover, it provides the entire operational community of practice, commanders, designers, planners, and executioners at all levels, with a cognitive mapping for aesthetics orientation and sense-making, when encountering ambiguous phenomena associated with emerging unfamiliar forms of warfare.[153] Offering operators an instrument for hermeneutics of form (formal hermeneutics) is the particular aspect that makes operations framing such a relevant platform of thought in the current conditions of warfare.

Operation Framing Summary: Essentials for Practicing the Theory

Cognitive Characteristics

- The operation framing provides the space of inquiry exploring the relations between strategic logic and operational morphos.
- The operation framing is a plane of thought perpetually exploiting the dialectics of logical appreciation—formal expression.
- The operation framing constitutes the learning experience for constructing theories of warfare and organization complying with the unique characteristics of the observed strategic context.
- The operation framing defines the spatial manifestation for the strategy of transformation, and thus it provides the formal grid for exploiting the potential embodied in the system.
- The operation framing as a mental construct bridges the space between the current and desired systems.
- The operation framing establishes the heuristic conditions for the appreciation of emerging form and logic in the course of the campaign.
- The operation framing constitutes the conceptual engine for learning self-regulation.
- The operation framing affords the logical principles (mediating rationales) and aesthetical criteria for constructing the form of intervention.
- The operation framing defines the various functions comprising the system of intervention, as well as the relations between them. Therefore, it constitutes the system of operational systems.

- The operation framing outlines the campaign map's external boundaries, as well as the principal coordinates within its internal space.
- The operation framing specifies questions and issues for investigation in the course of the campaign operationalization.
- The operation framing constructs a singular form of warfare, as well as patterns of operation and organization, conforming to the circumstantial characteristics of the emerging strategic context.
- The operation framing constructs the conceptual space, synthesizing the command discourse involving all functions and agencies.
- The operation framing sets the conceptual and practical conditions for planning.

Structure: The Domains of Conceptual Inquiry

- Operational heuristics: Constructing the self-regulating learning system
- Transformation embodiment: The spatial manifestation of the strategic logic (or spatial manifestation of potential exploitation)
- Mediating rationales—structuring principles—aesthetical criteria
- Transformation conditioning: The network plotting the campaign narrative
- System of operations: The structure of the campaign development.

Part III: Conclusion: Thinking on a Higher Plane

Beyond the Horizon

As we think about the genealogy of operational art presented in the précis, moving through the paradigms, there has been an increasing ability to "see"—not only literally *farther* in terms of space, but also metaphorically *further* in terms of time. We consider leaders to be successful if they can keep their eyes on the horizon. And if leaders can do this even part of the time, then they are more successful than most, because so many cannot see beyond the terrain that is only meters in front of them. But is seeing out to the horizon good enough? Many people in the past could see that far and still thought the world was flat. So, while keeping one's eyes on the horizon may sound promising, it is still too limited. We must be able to see farther and further. But how is it possible to do so?

Seeing is a metaphor we are using to refer to our ability to understand, to conceptualize. Our ability to conceptualize depends ultimately on language. Language is the tool we use to build—and in some cases re-build—concepts with which we can see. Our ability to conceptualize is another way of referring to our ability to theorize. We need to understand better what we mean by *theory*. As we noted earlier in Part I, the roots of *theory* have to do with the idea of seeing. The word "theater" may also have its roots in this meaning. To have a theory, in its most basic sense, then, is to have a way of looking at things, of seeing things. So, the way we improve our ability to see—in our case hopefully to see beyond the horizon—is to improve our theory. Operational design has a theory with a level of sophistication that allows us, for the first time, to see further, and better.

To see beyond the horizon, to engage the level of theory—to practice operational art using operational design—one must become comfortable with ambiguity. We have heard this phrase before, but let's look at what it really means. To be comfortable with the ambiguity of language is to be able to navigate the numerous meanings, references, and usages of words

and phrases that constitute the way our minds relate to the world. We navigate these multiplicities naturally through the nuances of contextual clues. We should not confuse ambiguity with vagueness. Vagueness is something we should avoid, but we should embrace ambiguity. To be vague is to lack precision. To be comfortable with ambiguity is not to embrace imprecision; on the contrary, navigation through the ambiguity of language based on context requires us to be even more precise. In a fundamental way, this feature distinguishes operational design from any doctrinal practice because doctrine attempts to fix language with specific meanings. Fixing language, viewing the world through our doctrinal lens, actually works to fix our ability to conceptualize, and this fixation, or stagnation, keeps us from being able to see as far as we could.

Many people ask why we need design when we already have institutional doctrines that guide us in the decision-making and problem-solving activities that compose our practice, especially our highly refined planning processes. These processes are well-embedded and are constantly, reciprocally reinforced among training, doctrine, and field experience. Many within this community of practice have become ardent students and often zealous teachers of these methods. They have become experts in the doctrines of leadership, decision-making, and problem-solving methods that have facilitated their maneuvering through the world of tactical realities in which they live. We are familiar with the logic of tactics, the logic of problem-solving, the logic of engineering that enables us to solve problems: the logic of *technical rationality*.

Operational art, though, requires that we mediate between the logic of strategy and the logic of tactics. What is there to mediate between if we fashion our forms of strategic thought out of tactical logic, thinking of strategy in terms of this same logic of technical rationality? There would be a requirement for mediation only if the logic of the two realms differs. Here is where operational design brings a new understanding to light, by teaching us that we must first come to grips with the logic of the strategic dimension, which is not the logical extension of the tactical reality. For example, the vaunted discovery of the paradoxes of counterinsurgency

operations exists as such only when tactical logic is imposed strategically. Paradoxes imply contradictions or incoherencies, but the history of paradox teaches us that paradoxes exist because the concepts only appear to be inconsistent, and they are inconsistent because of ambiguities. Ambiguities can be resolved when the ambiguity is embraced and the nuances are disclosed. The paradoxes of counterinsurgency could be resolved if we were to understand better the logic of strategy and either become more comfortable with the ambiguity or develop a new vocabulary to deal with the different concepts of the strategic realm, rather than use the same tactical vocabulary, grounded by the same logic of action.

Unfortunately, we have transplanted these tactical methods (forms) into the strategic realm, and the logic of the tactical realm is incommensurable with the logic of the strategic one. We have never quite come to grips with the logic of the strategic dimension. For example, thinking of strategy in terms of ends, ways, and means is simply to attempt to use a form that embodies the logic of tactics rather than the logic of strategy. There is another approach that is required to think adequately about strategy as well as translate strategic thinking into tactical thinking. This required approach is that of design. Tactical logic organizes our tactical practice around the tactical forms of leadership, decision making, problem solving—all communicated through doctrine. Strategic thinking is not just about leadership; it is not just about decision making; it is not just about problem solving. Design, similarly, is not about any of these things, either, but rather about understanding. Tactical logic in essence is embodied within the Western scientific paradigm of technical rationality. We have always approached human challenges from within this paradigm, but it may be time to admit that we cannot adequately face these challenges through our engineering approach. We have witnessed the limits of technical rationality, which is not able to adequately deliver an understanding of human dynamics. Strategy requires a different way of thinking outside of the tactical logic of technical rationality, and this is why we need design.

What differs dramatically from anything we have done before is using heuristics in operational design, and when abstracted to the level that

bridges theory to practice, there are three: 1) *systems logic*, which is the inquiry that involves framing rationales; 2) *cognitive mediation*, which amounts to synthesizing understandings; and 3) *projected learning*, which requires critical thinking and the employment of theory. Applying these heuristics involves the deliberate and self-conscious movement within the realm of theory and logic, which means that design does not occur within our normal frame of reference or plane of thought—we must design from a higher plane. It may take a while to grasp this difference—why design is new—but when the gravity of employing these three operational heuristics are grasped, then it will be readily apparent that they are not currently part of our planning and decision-making processes. These heuristics allow us to see beyond the horizon.

Systems Logic [Framing Rationales]

So far, everything that has been written about operational design has been about form (*morphos*), not about logic (*logos*). We have seen doctrinal publications, journal articles, student monographs, and student texts describing operational design, but these writings have all been about the morphos of design, the form of design. These writings have dealt with the description of design, the organization of design, or the communication of design. They have been attempts to answer the practical questions of design: Who should be doing it? How is the commander involved? What do the briefing products look like? These are all questions of form, not logic. These forms take on a shape that is coherent. But what happens here is that because we recognize something taking shape, we give in to our urge to continue to shape it by striating it, codifying it, categorizing it, and describing it until we have developed a doctrine of forms depicted with linear charts and procedures. These forms will be the existing patterns that will always become outmoded. Forms become outmoded because doctrinal patterns are an attempt to impose artificial stability on a reality that is inherently unstable. This is problematic because the world is naturally unstable, and because any imposition of something unnatural is artificial, the stability we attempt to impose through doctrine is artificial. We would understand much better how and why and when these forms become

outmoded if we could come to grips with the logic that exists behind the forms. Because we do not spend time deliberately seeking out the logic, it is usually long and costly empirical trial and error that convinces us that our forms are outmoded. What should become more evident is that we can better answer the practical questions only after we have dealt with the logic, or answered the theoretical questions.

We must get to the level of logic in order to do the business of framing. A frame is a boundary. Most of us are familiar with physical or geographical boundaries. And when most of us go to frame a system, for example, we will be tempted to frame it spatially. It's one thing to put a boundary around a terrorist *network*. But what does a boundary around a terrorist *movement* look like? Networks are primarily physical, and movements are primarily mental. There will be physical and geographical and cultural boundaries when framing in design. However, the most important kind of boundaries are the cognitive boundaries, and the frames we are most interested in are cognitive frames. While we are familiar with physical frames, we are not so familiar with cognitive frames. Designers have to learn about cognitive boundaries, the logic of different frames of mind, which do not make up the normal content of either our studies or our experiences.

How does logos differ from morphos, the logic from the form? The form should follow the logic, so the logic has to be expressed from another level, a higher level, or a higher plane. Design is done from a higher plane; it cannot, by definition, be done from the plane of planning, the plane of forms. We talk a lot about *developing a new understanding* when we do design, and we must take this claim seriously. When we develop a new understanding, that means that we are not discovering this understanding, but that we are creating it. And the fact that it is new also means that we may also have to destroy something that is old. So, the act of creation is the logic we construct, or the theory we construct. Because the form should follow the logic, we then fabricate the forms that we need. Sometimes we rely on pre-fabricated forms, but often these forms will be problematic because of the challenges of a new environment.

New challenges often require new concepts to understand them. We talk about the world in terms of increasing complexity, but we often don't know exactly what we mean because there is ontological (in the world) complexity and epistemological (in the mind) complexity to consider. Ontologically, the world is getting more complex if we think of the increase in variety of things along with the accelerating flow of things (implied are the new relations among things), and these processes render understanding the emergences all the more difficult. Epistemologically, complexity increases because as we come to understand something better, we also come to understand that there is much more that we do not understand. Hence, our old patterns of thought to deal with what we used to know become potentially more and more irrelevant. The use of old forms for new emergences will likely be inadequate and may even be counterproductive. With *new* emergences (this phrase is actually redundant), these old patterns are bounded cognitively by a vocabulary and the concepts this vocabulary circumscribes. The terms that are internal to a set of forms are called terms of interiority. Doctrine circumscribes a cognitive boundary, which is bounded by the language, by the *terms of interiority*. We can rarely deal with new challenges by resurrecting old doctrine because the terms of interiority cannot generate the new concepts that are required to deal with the emergence. Only by reaching from outside this cognitive boundary, by creating new concepts—often with new language—can we deal adequately with emergences. The language used by transcending these cognitive boundaries are referred to as *terms of exteriority*. Notice that the very premise of doctrine, which is to draw a common picture through the use of a common language, is the limiting factor in being able to develop new concepts, to build new frames, to confront new challenges. While the forms of doctrine are self-referencing, the logic of design is hetero-referencing. While doctrine depends on a common understanding, design depends on difference.

It is very natural for us to frame the form, relying on our doctrinal templates and patterns. However, to really do design, we must frame the logic. Sometimes we can frame the logic first, which can be helpful

because form follows logic. It doesn't have to be framed first; often that is hard to do. Sometimes it works to frame the form, then abstract the logic, then fix the logic, and then re-create new forms. Framing the form focuses on performance, on action. Design focuses on understanding, on theory.

To think about framing, let's continue with our counterinsurgency example, because most people, mistakenly, think of it as a good example of framing in design terms. It is a good example to use, because the better we come to understand that we need to re-frame counterinsurgency, the better we understand the concept of design. Counterinsurgency is a form of maneuver, a pattern of action, a form that is quite old. The counterinsurgency doctrine does not address the logos, only the morphos of this form of maneuver. The book necessarily as doctrine deals at the level of tactics, not at the level of strategy or policy. The larger, strategic questions, the questions that deal with why people might become insurgents are set aside in the introduction of the book. So, the manual goes to great lengths to teach forces how to defeat insurgents tactically, drawing on a few historical examples. But naturally, the strategic questions are set aside. Is this the best policy? The controversial nature of the relevance of the historical examples is set aside. Has the complexity of this challenge, with the acceleration of flow and the increase in variety made this form of maneuver viable? The questions surrounding the legitimacy of revolutionary change are set aside. Do we never address what motivates the insurgents? The questions of the legitimacy of governments using their armed forces against their own people are set aside. Are militaries the appropriate response? And the questions of the American armed forces and their allies assisting foreign governments using their militaries against their own people are set aside. All these issues are embraced through the holistic methodology of design, which seeks to synthesize among various levels of analysis and not just consider the tactical level.

The next section deals with the idea of cognitive mediation. Cognitive mediation is an essential feature of design, so without the engagement of the strategic dimension, there technically is no design.

Cognitive Mediation [Synthesizing Understandings]

If the claim about the incommensurability between tactical and strategic logic seems foreign or just vague, that could be because we're not used to thinking at the theoretical level deeply enough to consider the logic that is behind the scenes. Most of us live most of the time in the concrete world of action, and most of us turn to proven doctrinal methods in order to act. A method embodies a form, a form that follows a certain logic, and these methods are appropriate when the logic is appropriate. But we should not use a method (or form) if it does not follow from the logic that is operative. The methods we use when employing Euclidean geometry, for example, embody a form that follows from the logic of two-dimensional space. Alternatively, the methods of Riemannian geometry embody a form that follows the logic of spherical space. The logic in each kind of space differs; in fact, at the level of logic—the level of theory—we would say that this difference entails incommensurability. Because the logic in the two different kinds of space differs, the form used in each will differ as well. For example, Euclid's fifth postulate, concerning parallel lines, does not apply in Riemannian space. In two-dimensional space, if two lines are not parallel, then they intersect at one point. The postulate does not hold in spherical space: for example, longitudinal lines on the Earth—a sphere—intersect at both the north and south poles—two points, not one. The logic of strategy differs as much from the logic of tactics as the logic of three-dimensional space differs from two-dimensional space, as will soon become apparent.

We must remember that form follows logic. We may or may not be aware of the logic of the form when we apply a method, but it is there nevertheless. Because form follows logic, we must also remember that if the logic changes, then the form changes, too. Using methods across different domains that have incommensurable logic violates the principle that form must follow logic. For example, at the tactical level, we often employ methods that attempt to reconcile means with ends. And means–ends reasoning has been well-embedded in the Western world since Aristotle codified this logic in his body of works known as *The Organon* (the logical

writings). Means–ends reasoning is a good tool to use when situations are concrete and easy to understand. However, using this tool when situations are neither clear nor easy to understand is fraught with peril. When we think of strategy in terms of ends, ways, and means, we are imposing a tactical form in a dimension that demands a different logic, because at the level of strategy, situations are neither concrete nor easy to understand. When we use our tactical problem-solving methods at the level of strategy, we are violating this principle, much like trying to use Euclidean geometry in non-Euclidean space. This transplantation of a tactical form into our strategic thinking is a violation of our principle: form following logic. We know when a transplant is too foreign that the body will reject it. To actually do design—deliberately and self-consciously—we must move out of the realm of form and into the realm of logic. We should revisit this relationship between form and logic.

One way we know that our current planning processes do not accomplish what is intended with operational design is that planning is about action, about tactics. Operational design is part of operational art, and operational art is the activity of cognitive mediation between strategy and tactics. Our current planning processes do not really engage the world of strategy. They may acknowledge the strategic dimension by apprehending guidance in terms of strategic directives, but they do not become part of the discourse that helps to determine what that strategic guidance may be. One way to think about the need for design is this: if the guidance and decisions we received were coherent, complete, and thought through adequately—arrived at through a critical thinking process with discourse and transparency—then there would be no need for design. Operational art via operational design requires that the operational leader engage the strategic realm actively and directly, not simply passively and indirectly. It may seem no different to some, but at the root is the difference between being *active* and being *reactive*. Up to the present time, operational art has been reactive; operational design involves active engagement in both the strategic and the tactical realms.

Operational design requires that we rethink and come to grips with the way we learn as a profession, the way we create institutional knowledge. This process of thinking about how we learn as a profession is taking what we would call a meta-perspective, a deeper look from a deeper perspective. We can look at another profession in order to reflect on our own by analogy: the medical profession. The way that this profession has created, developed, maintained, put into practice, and evolved—even transformed its knowledge when necessary—is through the combination of what we may call *the clinic and the university*. The clinic is the place where the practitioners apply their knowledge, but the creation of that knowledge does not develop apart from the university. The community of practice includes both the clinic and the university. The university is the place where there is time to work at the level of theory, for if the knowledge is not grounded at the level of theory, then it may be grounded in appearance only—the appearance that the practices work well, or are efficacious. The connection between theory and practice is an important one. Theory here does not refer to disconnected abstractions having nothing to do with practice. Theory is the body of thought that allows us to conceptually understand, explain, evaluate, and justify the practice. Theory has two basic measures for assuring its quality—coherence and reliability. Coherence ensures that the theory is conceptually cogent and sound while reliability ensures that it works in practice.

Cognitive mediation cannot occur if we are merely passive executors of strategic policy. Design requires that operational leaders engage strategic leaders in the creation of strategy and policy. The counterinsurgency template misses this point entirely. The chapter on operational design in the manual puts design on the production schedule, making it simply part of the planning process. It allows no possibility for the formation of strategy or policy, simply assuming that counterinsurgency as a form of maneuver is a "given." Like viruses, insurgencies always adapt, making our template irrelevant. While the doctrine has maintained its shape by lifting lessons learned from historical examples, the doctrine necessarily fails to capture that there has been this shift in the logic. If we never address the

motivation of the insurgency, or continue to misunderstand or misrepresent it—which is a strategic concern—then no quantity of counterinsurgency operations will ever succeed. It's quite possible that the motivation of an insurgency is to maintain an instability. The very presence of foreign and domestic military forces engaging in counterinsurgency operations may be exactly the sustainment of instability that the insurgents desire.

We understand in the practice of design today that form follows logic. We once thought, half a century ago, that form follows function. Doctrinal forms are organized around function, and we compartmentalize and distribute tasks along functional lines—consider the distribution of the logical lines of operation in the counterinsurgency doctrine as an example. Logic can take many shapes, but one of the more important is in the form of meaning. So, it is important to understand that when we say *form follows logic*, this often translates into *form follows meaning*. If the insurgents are acting in ways that give them meaning, then things that give us meaning will be irrelevant. Their narrative is about *resistance* and ours is about *victory*. We even judge past and present counterinsurgencies in terms of victory. This must be critiqued.

Projected Learning [Critical Thinking]

Critique is the methodology—the operational heuristic—that enables us to actually create something new, not merely resurrect old ideas from the past. Here is where we must become philosophers in order to do design. Most people are happy slavishly copying existing forms and methods. If they move from the realm of form to the realm of logic—from morphos to logos—then they are happy slavishly embracing the concepts created by the great thinkers. To do design—to create new concepts to deal with the accelerating flow and variety that challenges us in the form of complexity—we must do what philosophers actually do and not merely do what they tell us we should do: we must create new concepts. New concepts are rarely products of their own time or environment. They do not emerge from the stasis of doctrinal fixity. It is the production of new concepts that our design work yields, and these new concepts enable us

to project our learning. Projecting our learning is something very different from the normal business of predicting or forecasting. These activities are passive. But then again most of our activities are passive, especially when they are tied to problem solving. Critique is active; projecting our learning is active. They are active because we do not simply sit back and wait to react to new problems, to new threats. They are active because we do not simply passively make educated guesses trying to describe what will happen to us. They are active because they are part of creating the future. They are part of creating the future, not because we are simply acting to offer solutions to the problems that have been thrust upon us, but because we are changing the logic, and things that happen are driven by the logic. The creation of concepts involves the creation of new language that must be understood. Understanding new concepts is not merely the reactive process of apprehending an idea through the filter of our current understanding. Understanding new concepts is the active process of comprehending an idea through the alteration of our current understanding—which requires that we actually change, or transform. Critique is the business of creating the future most significantly because it is the business of changing ourselves, of transforming ourselves.

One way to apply critical thinking is to evaluate the relevance and cogency of the forms currently being applied. To adequately evaluate the forms, we must understand and be able to critique the logic that these forms follow. More often than not, we simply apply our old methods in new contexts, usually because of our experience, because if our experience tells us that these methods have been successful for us in the past, then they will be successful for us now. In most situations, we stay at the unreflective level of applying familiar methods; we do not even go deep enough to abstract the actual forms we are using when we apply these methods, let alone get to the logic supporting the form. We have all heard, for example, that we should challenge our assumptions. For the most part, we look at our assumptions individually. To think of our assumptions critically would involve systemizing these assumptions until we understood what form they were taking, and once we had accomplished grasping their form, then we

would pursue the further inquiry into understanding the logic from which these forms come. An honest critique of the logic may yield a competing logic, which would dictate new forms, and in turn would produce a different system of assumptions. Assumptions are conclusions that we infer. We have to infer these conclusions not because we lack information but because we have an incomplete grasp of the logic that is at stake. Gaps in knowledge have to do with logic, not information. These gaps in knowledge are not filled by seeking out more information but by coming to grips with the logic of the information that we already have.

This kind of critique could also be done with guidance we receive. To make sense of the guidance we receive—or more important, the guidance we give—we should engage in critical thinking. If we were to systemize the guidance, what form would it take? And once we have a handle on the form, what logic dictates this form? Is the logic coherent? Is there an alternative logic? Once we have arrived at a coherent logic, then what form should our guidance take? And what should our guidance then look like?

It may not be intuitive at first, but critique—critical thinking—is an active process—and that which it critiques—structure/method—is actually reactive. The forms and methods we develop to solve problems—as well as the deep structures of thought that support these forms and methods—are developed as tools to solve problems. In other words, they are developed in reaction to what we perceive to be problems—which by definition makes them reactive. Critique is in many ways the opposite of problem solving. Critique is the business of creating problems, not solving them. The process of critique is the process not of problem solving, but the process of problematization. Problematization is the *sine qua non* (not without which), or, in other words the essential feature, of discourse. Without problematization, discourse is merely dialogue. Problematization is the search for inconsistencies or incoherencies in the logic of the methods or the deeper structures being applied. When these inconsistencies and incoherencies are brought to light, then and only then is it possible to gain a deeper perspective, which we call a meta-perspective. When we identify

and articulate these weaknesses in our logic, then and only then have we found the gaps in our knowledge—which is much more than simply going out and acquiring more information. Critical thinking is about logic management, not information management.

Process is different from structure. In a static structural depiction, one will see actors and then perhaps relationships. These structural maps cannot depict forces that drive processes. Forces are at work in determining how processes unfold. If we did build and use process maps with forces, such a depiction would eclipse actors and relationships, which would be relegated to margins and footnotes. Such an orientation on process comes from a different philosophical plane of thought, from a different plane of immanence. The difference at the level of form between *structure* and *process* points to the difference between *being* and *becoming* at the level of theory. There has always been a marginal alternative built around a philosophy of becoming, starting with Heraclitus, long before Plato. But Plato and Aristotle solidified for the Western world a root theory of being that makes substances and their qualities, or essences, primary constituents of nature. The alternative root theory revolved around becoming, which makes the processes of change of primary interest. The alternative view, from a different plane, a higher plane, would radically reinterpret just about everything we've come to know. Such an exploration, though, is the type that could yield a different understanding, a different frame with different logic, and as a result different forms. Let's look at our counterinsurgency example to illustrate this idea, specifically the prescription for using logical lines of operation. These are actually functional lines of operations, not logical lines (information operations, security operations, etc.). Instead of coming to understand an operation in terms of its tasks and purposes, categories, and functions, what if we looked at it in terms of the processes and forces that are at play? What is the process of engagement? Escalation? Diffusion? Resolution? What forces drive them? How do these work exactly? And how should we influence these processes? Being and becoming as root theories depict different ontologies. When actors and their relationships become secondary, then we may be able to

see that deeper forces are at work. We may begin to see that we have over-inflated the efficacy of human agency, particularly the agency of those in charge. It may very well be that the vast majority of the processes that are unfolding are outside of the influence of presidents and generals.

Creating Our Future

As a result of the erosion of relationships, there is a new kind of intellectual leadership required to do design. The different conclusions drawn by individuals during the design process should not be controlled and decided upon by our usual decision-making practices. Sometimes experience can be of benefit when developing a new understanding, but just as often, it can be a hindrance because experience often reinforces old patterns of thought that hinder learning. What becomes paramount, of first importance, in the design process is for everyone to learn. This means specifically that what we need most from commanders during the design process is not their guidance and decisions, but their ability and willingness to learn along with everyone else. Commanders are still in charge, but the easiest way to make the design process dysfunctional is for commanders and staff leaders to use our normal troop-leading procedures—the most damaging element of this procedure would be to put design onto the production schedule, to put design into the planning timeline. We still have to plan and execute according to our best understanding (and prepare and assess, etc., etc.), and these activities occur in real time. But design occurs in virtual time—it takes as long as it takes, it never stops, it can be revised at any time, it can be done in any order (it is not *sequential and progressive*), and it is an open-ended process. It is not easy, and it takes time. Sometimes it takes 2 weeks; sometimes it takes 2 months; sometimes it takes 2 hours. Some may say that this aspect of design reduces our agility. On the contrary, once we come to grips with the logic, then this understanding is exactly what will give us agility, the agility to change our mindset and our form, then and only then, freely being able to employ both critical and creative thought. Our community of practice will include both the clinic and the university, and everything we do should abide by the learning principles embedded in design thinking.

Endnotes

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[3] A comprehensive overview can be found in Paul Bloom, "Is God an Accident?" *The Atlantic Monthly* (December 2005), 105–112.

[4] Robert M. Pirsig, *Zen and the Art of Motorcycle Maintenance* (New York: HarperCollins, 2005), 254–55.

[5] W. Ross Ashby, *An Introduction to Cybernetics* (New York: John Wiley & Sons, Inc., 1956), 206–213.

[6] Derek Bickerton, *Language and Human Behavior* (Seattle: University of Washington Press, 1995), 138–39.

[7] Ibid., 139.

[8] Ibid., 140.

[9] Arthur Koestler, *The Act of Creation* (New York: Macmillan Co., 1964), 89.

[10] Keld Zeruneith, *The Wooden Horse* (New York: Overlook Duckworth, 2007), 312.

[11] Ibid., 21.

[12] E.J. Hobsbawm, *The Age of Revolution* (New York: NAL Penguin, Inc., 1962), 17.

[13] Bruno Snell, *The Discovery of Mind* (New York: Dover Publications, 1982), 33.

[14] Stephen Toulmin, *The Return to Cosmology* (Los Angeles, CA: University of California Press, 1982), 239.

[15] Snell, op. cit., 4.

[16] The concept of the logos plays a central role in Heidegger's later philosophy. See especially William Barrett, *The Illusion of Technique* (New York: Anchor-Doubleday, 1979); Lawrence J. Hatab, *Myth and Philosophy* (La Salle, IL: Open Court Press, 1990); Martin Heidegger and Eugen Fink, *Heracleitus Seminar, 1966/67* (University, AL: University of Alabama Press, 1979); Charles H. Kahn, *The Art and Thought of Heraclitus* (Cambridge: Cambridge University Press, 1979); Kenneth Maly and Parvis Mead, editors., *Heidegger on Heraclitus* (Lewiston, NY: Edwin Mellen Press, 1986); John Sallis and Kenneth Maly, editors., *Heracleitean Fragments* (University, AL: University of Alabama Press, 1980); and G. J. Seidel, *Martin Heidegger and the Pre-Socratics* (Lincoln, NE: University of Nebraska Press, 1964).

[17] Ibid., 145.

[18] Snell, op. cit., 185, 151–2.

[19] Julian Jaynes, *The Origins of Consciousness and the Breakdown of the Bicameral Mind* (Boston: Houghton Mifflin, 1990), 22–47, 447–69.

[20] Ibid., 59–66.

[21] David Bohm, *Wholeness and the Implicate Order* (London: Routledge & Kegan Paul, 1980), passim.

[22] William Barrett, *The Illusion of Technique* (New York: Anchor-Doubleday, 1978), 155–73.

[23] Richard Rorty, *Philosophy and the Mirror of Nature* (Princeton: Princeton University Press, 1980), 17–69.

[24] Snell, op. cit., 67–83.

[25] Rorty, op. cit., 170.

[26] Ernest Gellner, *Plough, Sword and Book: the Structure of Human History* (Chicago: University of Chicago Press, 1989), 70.

[27] Ibid., 71.

[28] Ibid., 71–2.

[29] Charles Sanders Peirce, "The Fixation of Belief," *Popular Science Monthly* (12: November 1877), 1–15.

[30] Gellner, op. cit., 73.

[31] Ibid., 75.

[32] Ibid., 279.

[33] Ibid., 15.

[34] Cited in John L. Casti, *Paradigms Lost* (New York: William Morrow & Co., Inc., 1989), 39.

[35] Cited in Ibid., 41.

[36] Zeruneith, op. cit., 21.

[37] E.J. Hobsbawm, *Industry and Empire* (New York: Penguin Books, 1986), 13, 21–22.

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[39] Henry Petroski, *Design Paradigms* (Cambridge: Cambridge University Press, 1994), 57.

[40] Ibid., 52.

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[42] Bruce D. Porter, *War and the Rise of the State* (New York: Free Press, 1994), *passim*.

[43] James J. Schneider, *The Structure of Strategic Revolution* (Novato, CA: Presidio Press, 1994), passim.

[44] Porter, op. cit., 258.

[45] Ibid., 151.

[46] "Magic Realism," *The Economist,* March 2, 1996, 74.

[47] For a thorough overview of the current debate, see Eliot A. Cohen, "A Revolution in Warfare," *Foreign Affairs* (March/April 1996), 37–54.

[48] R.L. DiNardo and Daniel J. Hughes, "Some Cautionary Thoughts on Information Warfare," *Airpower Journal* (Winter 1995), 69–79.

[49] James R. Beniger, *The Control Revolution* (Cambridge, MA: Harvard University Press, 1994), 7.

[50] James Burke and Robert Ornstein, *The Axemaker's Gift* (New York: Grosset/Putnam, 1995), xvi.

[51] W. Ross Ashby, *An Introduction to Cybernetics* (New York: John Wiley & Sons, Inc., 1956), 9.

[52] Beniger, op. cit., 8.

[53] Norbet Wiener, *Cybernetics* (Cambridge, MA: MIT Press, 1961), 1–29.

[54] Beniger, op. cit., 54.

[55] Ibid.

[56] Fred Hoyle, *Man in the Universe* (New York: Columbia University Press, 1964), 24–25.

[57] Kevin Kelly, *Out of Control* (New York: Addison-Wesley, March 1995), 115.

[58] Ibid., 116.

[59] William F. Ganong, *Review of Medical Physiology* (Los Altos, CA: Lange Medical Publications, 1977, 8th ed.), 29.

[60] M. Mitchell Waldrop, *Complexity* (New York; Simon & Schuster, 1992), 11–12, 145–147; emphasis in the original.

[61] James J. Schneider, "A New Form of Warfare," *Military Review* (January-February 2000), 56–61.

[62] The term "black light" refers to the invisible or "black" portion of the electromagnetic spectrum that is the domain of x-rays and radio waves. "Black light" is used in another sense, however. In boxing, a fighter may receive a hard shot to the head that causes a knockout. In the knockout, some boxers report seeing "black lights" before they sink into oblivion. They see and become surrounded by a shimmering, glowing aura of darkness that is referred to in medical terminology as a "visual scotoma." The boxers are experiencing the paradox of being conscious of their unconsciousness. The reason for this phenomenon is that the higher cognitive centers of the brain shut down, and the lower areas of the brain, called the limbic system, kick-in and preserve a primitive sense of awareness. Thus, a kind of self-organization occurs among human systems in the same ways armies undergo self-organization after the initial clash of arms. Air theorists like John A. Warden, III, and David A. Deptula develop an argument for "parallel warfare" that is based on a fundamental disregard of military systems' ability to self-organize at lower echelons of command. The ability for self-organization greatly limits the practical utility of so-called parallel warfare. See: John A. Warden, III, "The Enemy as a System," *Airpower Journal,* (Spring 1995), 41–55; COL David A. Deptula, "Firing for Effect," *Defense and Airpower Series* (Arlington, VA: AEF, 24 August 1995), passim; and Michael E. Ruane, "Wisdom of Smart Bombs Still Debated," *Philadelphia Inquirer,* 14 August 1996, 1,3.

[63] Kelly, op. cit., 22.

[64] Sun Tzu, *The Art of War,* tr. Samuel B. Griffith, USMC (Oxford: Oxford University Press, 1963), 92.

[65] This brief section fails to do full justice to the contemporary issues regarding Information Operations. A serious study of these issues must necessarily begin with the significant theoretical work of BG (ret) Huba Wass de Czege. See especially "Re-thinking IO," *Military Review* (November–December 2008), 36–43; "Re-defining the Military Problem Set," *Army* (November 2008), 19–25; "Unifying Physical and Psychological Impact During Operation," *Military Review* (March–April 2009), 13–22; "Keeping Friends and Gaining Allies," *Military Review* (May–June 2009). These essays offer a useful general introduction to Wass de Czege's deep thinking on IO theory. More generally, see his "The School of Advanced Military Studies: An Accident of History," *Military Review* (July–August 2009) 2–7.

[66] Andrew Keen, *The Cult of the Amateur* (New York; Doubleday, 2007, 2008), *passim*.

[67] Ibid., 2–3.

[68] Ibid., 16.

[69] Ibid., 4–5.

[70] Ibid., 9.

[71] Matt Lawrence, *Like a Splinter in Your Mind: the Philosophy behind the Matrix Trilogy* (Malden, MA: Blackwell Publishing, 2004), *passim*.

[72] Philip Bobbitt, *The Shield of Achilles* (New York: Knopf, 2002), xxii. See also Kenichi Ohmae, *The End of the Nation State* (New York: Free Press, 1995), 7–57.

[73] Bernard Brodie, *Strategy in the Missile Age* (Princeton, NJ: Princeton University Press, 1965), 132.

[74] Dominique Colas, *Civil Society and Fanaticism* (Stanford, CA: Stanford University Press, 1997), 1–41.

[75] Fritz Stern, *The Politics of Cultural Despair* (New York: Anchor Book, 1965), 1–22, 326–361. Paul Berman, *Terror and Liberalism* (New York: Norton, 2003), passim.

[76] Gregory Bateson, *Steps to an Ecology of the Mind* (Chicago: Chicago University Press, 2000), 448–66 ("Form, Substance, and Difference"). The epigram "The difference which makes the difference" is related to anthropologist and member of the initial cybernetics group, Gregory Bateson. He discusses this idea in the related essay.

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[81] David Bohm, *On Creativity* (London: Routledge, 2004), 44–72. Mihaly Csikszentmihlyi, *Creativity: Flow and the Psychology of Discovery and Invention,* (New York: Harper Perennial, 1997), 27–36, 111–13, 116–23.

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