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INFORMATION, POWER, AND GRAND STRATEGY:  
IN ATHENA'S CAMP—SECTION 1\*

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Information has been associated with power, war, and the state since at least the time of the Greek gods. One normally thinks of Ares, or the Roman refinement Mars, as the god of war. But where warfare is about information, the superior deity is Athena—the Greek goddess of wisdom who sprang fully armed from Zeus's head and went on to become the benevolent, ethical, patriotic protectress and occasional wrathful huntress who exemplified reverence for the state. According to Virgil, for example, Troy would be powerful enough to withstand all its enemies so long as it possessed and honored the Palladium, a sacred statue of Athena provided by Zeus or Athena herself. Understanding this, the Greeks arranged its theft, symbolically denying the Trojans the benefits granted by access to the goddess of wisdom. So Athena sided with the Greeks in the Trojan War, where she bested Ares on the battlefield and conceived the idea of the wooden "gift horse" secretly loaded with Greek soldiers. The Trojans made the monumental misjudgment of hauling it inside their fortress walls, over the protestations of the priest Laocöon and the seer Cassandra. The rest is history, and legend.

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Ever since, examining the relationship between information and power has attracted all manner of political and military theorists, as indicated by this sampling:

- Sun Tzu observed over 2,500 years ago: “Know thy enemy, know yourself; your victory will never be endangered.”
- Francis Bacon considered information the key to Elizabethan England's development as a great power: “For the conduct of war . . . in the youth of a state, arms do flourish; in the middle age of a state, learning; and then both of them together.”
- Clausewitz regarded the role of knowledge in warfare as “a factor more vital than any other.”
- Michel Foucault, who viewed knowledge and power as inextricably intertwined, considered mapmaking as an example of “knowing” that conveyed juridical, military, and political power: “Once knowledge can be analyzed in terms of region . . . one is able to capture the process by which knowledge functions as a form of power.”<sup>1</sup>

What does it mean to believe such statements? Conventionally, it means that something viewed as immaterial and abstract—like a specific piece of information or knowledge—can be put to hard, practical use to strengthen one party over another. The exercise of an actor's power may turn on the possession of such information; it becomes an instrument of power. But that conventional view barely begins to probe the depths of meaning embedded in statements that “information is power.”

In this essay, we offer some observations about the relationship between information and power. Our theme is that information, generally thought to be immaterial, is increasingly seen to be an essential part of all matter. In contrast, power, long thought to be based mainly on material resources, is increasingly seen to be fundamentally immaterial, even metaphysical in nature. As information becomes more material, and power more immaterial, the two concepts become more deeply intertwined than ever. These trends may generate some interesting implications for the theory and practice of warfare and for grand strategy in the times ahead.

The assumption that military power and grand strategy will still matter implies that states will still matter, and that the international system will remain state-centric in the emerging information age. We believe this to be the case, and differ from those who argue that the diffusion of information and the attendant erosion of hierarchy will inexorably weaken states, and that a “global village” of nonstate actors may someday even supplant the state system. The information age will surely transform the nature of states in many ways and will probably limit their range of action in many areas unless they cooperate with nonstate actors. But the state will remain vibrant, effective, and desirable as a time-tested form of administrative and political organization for societies, both for those that are still in search of self-determination and sovereignty, and those, presumably like the United States, that are highly advanced and on the verge of developing additional information-age structures.<sup>2</sup>

The endurance of the state and the state system in the information age will affect the tenets underlying both major schools of international political theory: the realist and the interdependence schools. The state-centric realist school will have to continue recognizing that non-state actors are multiplying and gaining power, constraining the roles of states in some issue areas. The interdependence school, which has emphasized the rise of non-state actors, will have to accept that states are going to have significant new political and other instruments at their disposal as a result of the information revolution. A similar conclusion is reached by Eugene Skolnikoff in his recent assessment of how today's scientific and technological revolutions may affect international politics. In his view, these revolutions will require the realist and interdependence schools of international political theory to rethink some propositions, but he finds little reason to doubt that “states remain the dominant structural element in the international system.” Indeed,

it would not be difficult to construct a scenario in which the emergence of major challenges to the planet or to a large part of human society led to much greater centralization of authority in the hands of a few states in the international system.<sup>3</sup>

In our view, the “softening” of power and the increasing “tangibility” of information may usher in a new golden age for states. What may be coming to an end, if anything, is not the state or the state system,

but rather the empire and imperialism in their classic forms. Indeed, it is not so much the state but rather the empire that dominated the international system after feudalism ended five hundred years ago. Empires, because of their size and resources, often survived even gross blunders. Witness the resilience evident during the long periods of imperial decline suffered by Rome, Byzantium, Spain, France, Britain, and Russia. However, in the 20th century, nationalism and other factors, including inherent incompetencies, have dealt a series of sledgehammer blows against empires, the last of which collapsed just a few years ago.<sup>4</sup> The state—in both its nascent and advanced varieties—is the key organization to venture into the vacuums created by the end of the classic empire. There is no orderly alternative.

At the same time, a new model of the state may emerge, probably one that is leaner, yet draws new strength from enhanced abilities to coordinate and act in concert with non-state actors. In this vein, Peter Drucker, after arguing that the classic nation-state metamorphosed into the unwieldy “megastate” in the 20th century by taking on excessive social, economic, and military duties, concludes that success in the post-capitalist age will require a different model.<sup>5</sup> Other thinkers are also starting to propose that what lies ahead is not the demise but the transformation of the state.<sup>6</sup>

By implication, the skillful exercise of military power and grand strategy may grow in importance in the information age. States are more compact than empires but have smaller margins for error. To do well in the times ahead, they must strive to understand that the nature of information and power, and the interaction between them, may be changing radically.

### THREE VIEWS OF “INFORMATION”

Most people think they know “information” when they see it, and any dictionary can provide a working definition. But like any concept that grows in importance, it has begun to acquire new meanings and imply new possibilities. It deserves closer scrutiny.

Three general views of “information” appear in discussions about the information revolution and its implications.<sup>7</sup> Each view approaches the concept differently; each harbors a different perspective of what is important. Two views are widespread: The first considers infor-

mation in terms of the inherent message, the second in terms of the medium of production, storage, transmission, and reception. The emerging third view transcends the former two; it speculates that information may be a physical property—as physical as mass and energy, and inherent in all matter.

### Information As Message

The first view is the most ancient, classic, and ordinary; indeed, it is the view found in the dictionary. Reduced to bare essentials, it regards information as an immaterial message or signal that contains meaningful (or at least recognizable) content and that can be transmitted from a sender to a receiver. Such information usually comes in the form of “reports, instructions, and programs.”<sup>8</sup>

This results in what many analysts call the “information pyramid.”<sup>9</sup> (See Figure 6.1.) The pyramid has a broad base of disorganized raw “data” and “facts,” atop which sits a stratum of organized “information.” The next, still narrower stratum corresponds to information refined into “knowledge.” Atop that, at the peak, sits the most distilled stratum, “wisdom”—the highest level of information. A cognitive version would place “awareness” at the base, “knowledge” above, and “understanding” at the peak.<sup>10</sup>

“Information,” then, corresponds to part or all of this pyramid, but the term is usually employed in the latter, expansive sense these days. This carries some risk of misunderstanding. The pyramid implies that the higher levels rest on the lower, but that is true only to a degree. Each layer has some independence—thus, more data do not necessarily mean more knowledge. Moreover, critics object sensibly that “information” should not be mistaken for “ideas.”<sup>11</sup>

Whatever the merits of these terminological debates, the expansive view of information continues to gain ground and stimulate new insights. In this vein, ethologist Richard Dawkins argues that information comes in varieties: from discardable old news items to

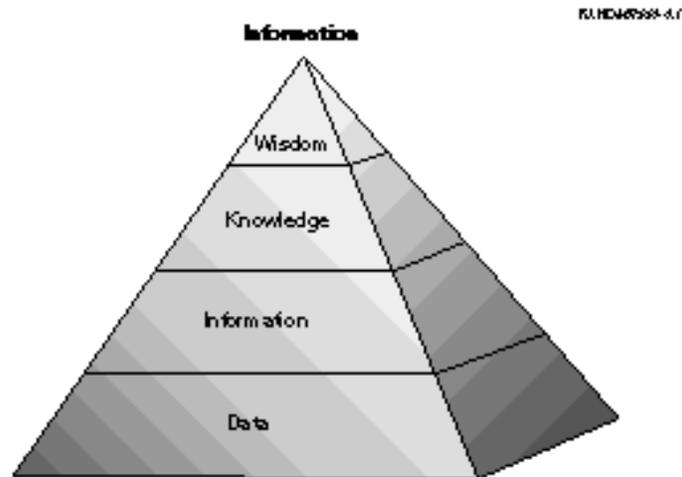


Figure 6.1—The “Information Pyramid”

types of information that are so powerful, so laden with vitality, that they may be deemed “alive.” Thus the most meaningful information “doesn’t merely embody order; it advances order and maintains it.”<sup>12</sup> This includes not only the biological information in the genetic replicator DNA, but also cultural information (e.g., ideas, fashions) that gets communicated gene-like in “memes”—a term Dawkins coined to convey that cultural as well as biological bodies are based on units of “self-replicating patterns of information”:<sup>13</sup>

Just as genes propagate themselves in the gene pool by leaping from body to body via sperm or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process which, in the broad sense, can be called imitation.<sup>14</sup>

### Information As Medium

The second view observes that information relates not just to the message, but more broadly to the system whereby a sender transmits a message to a receiver. So, this view directs the eye to the medium—in contemporary parlance, the conduit—of transmission

and reception. The key concern is the ability of a communications system to move signals clearly and precisely—that is, with low noise, low “entropy,” and often with high redundancy. In this view, the actual content is irrelevant; what matters are the encodability and the transmittability of a message, regardless of its content.<sup>15</sup> This view is more about communications than knowledge.

This second view gained influence in the 1940s and 1950s under the rubric of information theory, communication engineering, and statistical mechanics. It was elucidated initially by Claude Shannon, and then by Norbert Wiener, who developed “cybernetics” based on principles of control through feedback. This view then also filtered into the social sciences, helping to stimulate Marshall McLuhan's insight that “the medium is the message.”<sup>16</sup> Cybernetics influenced the social and related engineering sciences particularly with regard to theorizing about decision-making,<sup>17</sup> artificial intelligence, and the design of computers.

Here are two alluring, widely praised definitions of information that aptly summarize this second view. The first is by Norbert Wiener, the second by anthropologist-cyberneticist Gregory Bateson:

Just as the amount of information in a system is a measure of its degree of organization, so the entropy of a system is a measure of its degree of disorganization; and the one is simply the negative of the other.<sup>18</sup>

The technical term “information” may be succinctly defined as any difference which makes a difference in some later event. This definition is fundamental for all analysis of cybernetic systems and organizations. The definition links such analysis to the rest of science, where the causes of events are commonly not differences but forces, impacts, and the like. The link is classically exemplified by the heat engine, where available energy (i.e., negative entropy) is a function of a difference between two temperatures. In this classical instance, “information” and “negative entropy” overlap.<sup>19</sup>

In these and related writings,<sup>20</sup> we see a trend among theorists to equate information with “organization,” “order,” and “structure”—to argue that embedded information is what makes an object have an orderly structure. As this trend has developed, its emphasis has shifted. At first, in the 1940s and 1950s, information theorists em-

phasized the concept of “entropy”—and were thus concerned with exploiting feedback to improve “control.” Now, the emphasis has shifted to the concept of “complexity”—and this has led to a new concern with the “coordination” of complex systems.<sup>21</sup> Control and coordination are different, sometimes contrary processes; indeed, the exertion of excessive control in order to avoid entropy may inhibit the looser, decentralized types of coordination that often characterize advanced forms of complex systems.<sup>22</sup> What James Beniger called the “control revolution”<sup>23</sup> is now turning into what might be better termed a “coordination revolution.”

Entropy and complexity look like opposing sides of the same coin of order. About the worst that can happen to embedded information is that it gives way to entropy, i.e., the tendency to become disorganized. The best is that it enables an object to grow in efficiency, versatility, and adaptability.

### Information and Physical Matter

In the first and second views, information remains basically immaterial in nature. But a third view is emerging that has challenging implications. In this view, information is about much more than message and medium (or content and conduit). It is said that information is as basic to physical reality as are matter and energy—all material objects are said to embody not only matter and energy, but also “information.” The spectrum for this view runs from modestly regarding information as an output from the behavior of matter and energy; to regarding information as equal in importance to matter and energy in the composition of reality; to regarding information as even more fundamental than matter and energy.<sup>24</sup> Information, then, is an embedded physical property of all objects that exhibit organization and structure. This applies to dirt clods as well as DNA strands. New academic fields of study—e.g., “information physics” and “computational physics”—are emerging around such ideas (while also drawing on the older ideas about information).

One proponent, Tom Stonier, amid a highly speculative, abstruse discourse, sums up the basic idea quite clearly:

Its main thesis is that “information” is not merely a product of the human mind—a mental construct to help us understand the world

we inhabit—rather, information is a [physical] property of the universe, as real as are matter and energy.<sup>25</sup>

A physicist identified with such thinking, Edward Fredkin, reaches farther to say that the entire universe is tantamount to a giant computer.

What I'm saying is that, at the most basic level of complexity, an information process runs what we think of as physics. At the much higher level of complexity, life, DNA—you know, the biochemical functions—are controlled by a digital information process. Then, at another level, our thought processes are basically information processing.<sup>26</sup>

The views of information as message and medium persist, but are embedded in a view that all matter and energy in the universe are not only based on information but are designed to process and convey it. Information is the prime mover. Both order and “chaos” depend on it.

This line of thinking is not confined to physics. Social theorist Kenneth Boulding remarked that matter and energy “are mostly significant as encoders and transmitters of information.”<sup>27</sup> In other words, the organization and the complexity of all objects, including social objects, reflect and depend upon their informational content and processing capabilities.

This third view remains odd and unclear, but quite intriguing. If it proves a cutting-edge rather than a fringe view, it may yet lead to analytic paradigms of as much explanatory power as the first two views. This essay assumes it has some validity, so that we can point out some remarkable implications for military doctrine and strategy, as discussed later.

## PARALLEL VIEWS OF POWER

Volumes have been written about the concept of power—far more than about the concept of information. Yet, despite those volumes, power is never easy to define—as is the case with information. We do not attempt a definition.<sup>28</sup> Rather, what is notable here is that

three views of power can be discerned that parallel the three views of information—but with a reverse twist.

Our characterization is reminiscent of Kenneth Boulding's analysis of the triune nature of power, which he classified respectively into its destructive, productive and integrative dimensions.<sup>29</sup> The three views we discern, respectively, treat power as being material, organizational (or systemic), and finally immaterial in nature. Our characterization applies whatever strategic realm one is analyzing: political, economic, or military, all of which have material, organizational, and immaterial ideational bases.

### Power As Resources

The most basic view regards power in terms of the possession of resources and capabilities that can be used to coerce or otherwise control or influence a nation or some other actor. These are typically tangible material resources and capabilities like petroleum, weaponry, industrial capacity, or manpower. But they may also be less tangible, as in the possession of liquid financial assets, or of an office or instrument endowed with legitimate authority. In many respects, this is a natural, even instinctive, view of power and may be the most ancient of the three views.

This view undergirds most geopolitical analyses. As Inis Claude observed, the power of the nation-state consists of “essentially military capability—the elements which contribute directly or indirectly to the capacity to coerce, kill, and destroy.”<sup>30</sup> In more formal academic terms, this view has found expression in the widely used “composite capabilities index,” which consists of military, industrial and demographic factors grouped around the size of armed forces and military budgets, steel production and industrial fuel consumption, and total population, particularly the urban portion.<sup>31</sup>

### Power As Organization

A second view looks at power in terms of how it is “mediated”—how a people, a nation, or other actor or system is organized to use the resources and capabilities at its disposal. This view emphasizes that power is a function or a reflection of the design and performance of a

social system, whatever its resource base. Thus even a nation that lacks many physical resources, like Japan, may still become very powerful, as proved by its rise to the first rank of nations in the early 20th century.

This view has classical roots,<sup>32</sup> but its proponents are mainly contemporary. The pathbreaking studies of administrative behavior in the 1950s illuminated the fact that power depends on organization.<sup>33</sup> (Some of these studies led the way in showing how organizational designs are basically about how communications channels and information flows are structured.) More recent theorists have repeatedly observed that power does not exist in the absence of relationships; “power is a relation among people, not an attribute or possession.”<sup>34</sup> Resources matter in this view, but just how depends on the identity, reputation, location, and other relational attributes of the actor or system that has (or lacks) those resources.

The importance of organization for power is noticeable throughout history. Consider the evolution centuries ago from tribes to states—i.e., from kinship to hierarchy as the dominant form of societal organization. States, molded around centralized institutions like monarchies and armies, emerged far more powerful than tribes which, in their classic form, could barely conduct collective agriculture, much less administer conquered tribes.<sup>35</sup> By the 18th century, state institutions proved less capable than competitive market actors for processing complex commercial transactions and energizing industrial development. Today, a fourth major form of organization is on the rise: information-age multi-organizational networks. They are proving “powerful”—more so than the tribal, hierarchical, and market forms—for dispersed civil-society actors, like human-rights groups, who want to share information, coordinate strategies, and act jointly.<sup>36</sup>

In addition, consider whether democratic or authoritarian (or totalitarian) systems are better designed for asserting power. The debates about this question are increasingly resolved in favor of democratic systems over the long run.<sup>37</sup>

Overall, this view implies that power, much like information, is mediated; power's significance (i.e., its meaning) is affected by the medium of expression, by the system of generation and transmis-

sion. Moreover, this view implies that power, again like information, is the antithesis of entropy, but potentially subject to it.

### Power As Immaterial

The third view moves even farther from the resources view. It looks at power as depending on deep psychological, cultural, and ideational structures; it makes “the power of power” virtually metaphysical. Power becomes more like a message embedded in the air than a raw material raised from the ground. Exactly what power embraces under this third view is often unclear, especially in the more abstract, speculative versions. But in the more grounded versions, it is not entirely separable from the first and second views.

In some respects, this too is a classical view of power. It is well recognized that nationalism and ideology may be sources of power. More to the point, aerial bombing campaigns—a maximalist assertion of material power—have often failed (e.g., in Britain, Germany, Vietnam) to break a resolute people's willpower. Among scholarly theorists and strategists, Hans Morgenthau's expansive definition of national capabilities included ideological and morale factors.<sup>38</sup> For Joseph Nye, the current era is one of the “reduced tangibility” of power, and the rise in importance of its “softer” side.<sup>39</sup>

This view of power receives some of its deepest articulations in modernist philosophizing. From a Marxist perspective, Antonio Gramsci's views regarding “hegemonic” ideologies and media fall into this category.<sup>40</sup> From a different perspective, Friedrich Nietzsche built the body of his philosophy on the notion that power was created as an act of will, and that this “will to power” lay at the root of prevailing ethical-legal systems.<sup>41</sup> Michel Foucault, as noted earlier, was a major exponent of the notion that ideas convey power, making him in some ways a direct heir of Hegel's notions to similar effect.<sup>42</sup>

The appeal of the immaterialist view of power appears to be spreading among speculative thinkers of the information age. Indeed, in many respects, it is a view attuned to the information age.<sup>43</sup>



who are trying to think about information and power together—and who may not be aware yet of the Athena cell.

A military force whose doctrine is built around an Athenan view should be able to defeat one built around a systems concept; and it in turn should be able to defeat one built around a Mars view. While we have not discussed each cell in the matrix, in general, a cell should represent a stronger approach than any cell beneath and/or to the left of it. This is roughly indicated by the shading—the darker the shading, the more potent the cell. This depiction parallels Martin Van Creveld's view of military history, wherein he traces the evolution of war in terms of its being based first on the tools and materials of war, second on systems of warfare, and thirdly on information-based technologies like the computer.<sup>44</sup>

Which views or blends of information and power one prefers affects how one proceeds to think about the implications for warfare. In the remainder of this essay, we presume that thinking about information and power is moving in the "Athenan" direction, where Fredkin's views may meet with Foucault's. Our intent is to tease out the implications for doctrine and strategy.

## IMPLICATIONS FOR MILITARY DOCTRINE AND STRATEGY

The U.S. military is in the early decades of its own "information revolution," and "information warfare" has become the cutting edge of a "revolution in military affairs" (RMA). Yet, what "information" means for military theory and practice is much in debate. The evolution in thinking about information and power discussed above matches the evolution that is under way in military circles:

- From a traditional Mars-like view that says information has always been important for particular aspects of warfare—e.g., signals, intelligence, C3I, psychological warfare—and sees that those aspects are becoming more salient;
- Toward a new Athena-like view that says information is a bigger, deeper concept than traditionally presumed, and should be treated as a basic, underlying and overarching dynamic of all theory and practice about warfare in the information-age.

This is a dramatic, contentious shift. The quest for new concepts has created new analytical problems and new bureaucratic and budgetary tangles—and opportunities. Many leading intellectuals grappling with information-age issues affecting the military—e.g., C. Kenneth Allard, Carl Builder, Jeffrey Cooper, Martin Libicki, Thomas Rona, George Stein, Col. Richard Szafranski, Alvin and Heidi Toffler—have one or both feet planted in the newer, broad view. They are all in Athena's camp.<sup>45</sup> But many operators and practitioners remain firmly rooted in the older, narrow view.

Which view prevails may make a difference bureaucratically as well as militarily. In some versions of the narrow view, there is a tendency to make “information warfare” (IW) mean little more than computer warfare, and to treat it as more an intelligence than a military activity. This in turn reduces the scope of issues to little more than security and safety in cyberspace. This is an important topic, to be sure, but an overemphasis on it could engage the notion that one should improve the U.S. government's ability to control society at large, even if this means making society more closed than open under some scenarios. We share a concern raised by John Rothrock that some interpretations of information warfare could

require fundamental changes in how we understand conflict and the appropriate responses of our society to it . . . . Does our society want to be the sort that is adept at the degree and types of control of information that some of the more enthusiastic advocates of Information Warfare seem to presume?<sup>46</sup>

The Athenan view of information and power implies that it is advisable to develop a broad vision of “information warfare.” This is so partly because this kind of warfare is inherently multidimensional. Additionally, a broad vision should prove less susceptible to authoritarian tendencies.

### A Force-Reformer As Well As Force-Multiplier

It was said that the new information technology provided a “force-multiplier” for U.S. forces in the Gulf War.<sup>47</sup> Armed with more and better information, the American-led coalition swiftly defeated a large enemy field army in a very short time, and at astonishingly low cost in terms of casualties. Yet putting the emphasis on a quantita-

tive point—the multiplier effect—overlooks a deeper qualitative point: Information is also a force-modifier, a force-reformer.

Making full use of today's information revolution implies not only adopting new technologies but also rethinking the very bases of military organization, doctrine, and strategy. All this requires reformulation in order to fulfill Clausewitz's exhortation that "knowledge must become capability"<sup>48</sup> in the information age. The information revolution is not simply technological in nature; it has powerful conceptual and organizational dimensions as well. The new meanings of power and information discussed earlier favor the argument that wars and other conflicts in the information age will revolve as much around organizational as technological factors.<sup>49</sup>

There are both entropy and complexity issues here. A doctrinal implication of the Athenan view is that "entropy" replaces Clausewitz's "friction" as a concern in warfare. The latter concept was attuned to the pre- and early industrial ages, when forces, however well organized, faced inevitable shocks and delays that caused action in war to resemble Clausewitz's notion of "moving in a resistant element."<sup>50</sup> Presently, a post-machine age is dawning where friction will no longer be quite the right concept. A key goal will be to minimize one's own vulnerability to disruption and disorganization—i.e., to entropy—while fostering it in an enemy's systems. The strength of a system will be a function of not only how much mass, energy and information it embodies, but also how vulnerable, or resistant, it is to "entropizing."

The U.S. military is thinking about this. One example is Horizon, an effort to ensure compatibility among all information systems in the U.S. military. According to Lt. General Carl O'Berry,

[Horizon] brings order out of something that until now has been an atmosphere of entropy. For the first time we have taken interoperability to the domain of science instead of emotion. I'm taking the guesswork out of C4I [command, control, communications, computers and intelligence] systems architecture.<sup>51</sup>

As the information revolution develops further, the notion of how complex, or ecologically diverse, a system is in terms of not depending too much on any single form or principle of organization seems likely to grow in importance. A key question is whether hierarchical

or networked systems are more robust in the face of disruptive campaigns. Hierarchy is the traditional form of military organization, and a hierarchical core remains *de rigeur*. Yet a body of evidence from the wars of the 20th century suggests that hierarchies, once compromised, often collapse swiftly. The fall of France in 1940 and the defeat of Iraq in 1991 offer perhaps the best examples of this phenomenon. In contrast, the networked organizational style of guerrilla fighters during the same half-century suggests the tremendous robustness of these fighters in the face of even the sternest countermeasures. The Vietnam War provides the best example of a networked insurgency withstanding everything the American hierarchy threw at it.<sup>52</sup>

The interplay between having complexity but not displaying it harks back to the sage doctrinal dispensations of Sun Tzu, who likens an army to flowing water, and advises that

The ultimate in disposing one's troops is to be without ascertainable shape. Then the most penetrating spies cannot pry in nor can the wise lay plans against you.<sup>53</sup>

### New Definitions of Weapons and Targets

Information-age warfare implies various shifts in the nature of weapons systems and their targets. One is a shift from using lethal material weaponry (e.g., tanks, planes, ships) to attack material targets, toward also using such weaponry to attack cyberspace-related targets like C3I and RISTA systems and communications networks that have no firepower but represent an enemy's electronic sensory organs, nervous system, or brain. Another aspect of the shift is the use of nonlethal electronic techniques (weapons?) to disable an enemy's lethal systems, or its cyberspace systems that store, process, and transmit information. This use of nonlethal weapons to disable lethal systems may constitute something of an historical watershed, as it allows the possibility of effectively disarming without having to kill an adversary. Previously, nonlethals have been tightly coupled with one's own lethal systems, with the former paving the way for the more efficient use of the latter.

The elucidation of these shifts is sensible but draws only lightly on the previous discussion of power and information. That discussion raises a number of speculative, challenging implications, especially if the increasing materiality of information is adopted as a framework.

This third view of information—that it is a physical property—would treat all military systems as being based on, if not composed of, information. This curiously implies that information may be viewed as something that, like mass and energy, can be literally hurled at an enemy. Warfare has long revolved around who can hurl the most mass—as in the aptly named *levée en masse* of the Napoleonic era, or the human wave assaults on the western front in World War I and the eastern front in World War II. In the nuclear age, the emphasis shifted to hurling energy, as exemplified by the shock waves and radiation released by the splitting or fusing of atoms in bombs. Victory depended not only on directing mass or energy to deplete an enemy's warfighting stocks, but also on keeping that enemy from hurling mass and energy at oneself, and on being able to absorb and recover from whatever mass and energy it did hurl.

If information is a veritable physical property, then in the information age winning wars may depend on being able to hurl the most information at the enemy, while safeguarding against retaliation. This notion would affect how we think about all manner of weapons systems. Compare, for example, round shot fired from an 18th century smooth-bore cannon, to a shell fired from a modern rifled artillery barrel, to a new wire-guided anti-tank missile. How do they rate, relatively, in terms of mass, energy, and information? The mass of each may be about the same, but the energy each represents differs greatly. More to the point, each consists of different materials organized in dissimilar ways. Each sums up a very different set of sciences and technologies. Thus each represents a radically different embodiment of not only mass and energy but also information to hurl at an enemy. And the one that represents the most information—the missile—is the most effective. In other words, as these systems exemplify, an historical progression has occurred in the amount of information that can be hurled by weapons.

More to the point, the Athenan view of information and power implies targeting whatever represents or embodies the most information on an enemy's side. In a war, this means ascertaining and at-

tacking the most information-rich components of an adversary's order of battle; to do otherwise may be to court defeat. An example appears in the Falklands War, where the Argentine air force (FAA) chose to attack the British warships that were most capable of hurling mass in shore bombardments, seriously neglecting the transports that moved mass, energy and information supplies. Some observers hold that this targeting mistake cost Argentina the war.<sup>54</sup>

This point also applies to operations-other-than-war (OOTW). For example, an implication for counternarcotics operations is to attack traffickers' electronic funds transfers and other financial transactions, rather than trying to chase smugglers or eradicate drug crops that represent lower information content.<sup>55</sup>

Three decades ago Marshall McLuhan concluded, in his own way, that hurling "information" at an enemy made sense:

Since our new electric technology is not an extension of our bodies but of our central nervous systems, we now see all technology, including language, as a means of processing experience, a means of storing and speeding information. And in such a situation all technology can plausibly be regarded as weapons. Previous wars can now be regarded as the processing of difficult and resistant materials by the latest technology, the speedy dumping of industrial products on an enemy market to the point of social saturation.<sup>56</sup>

### Rising Importance of Social and Human Capital

The Athenan view implies an increased importance and capability for hurling messages and "memes" at an adversary's society through propaganda, psychological operations,<sup>57</sup> "public diplomacy,"<sup>58</sup> "knowledge strategies,"<sup>59</sup> and even "neo-cortical warfare."<sup>60</sup> As the information age advances, many if not all dimensions of international interaction may be subject to information-influence strategies. An information offensive aimed at an enemy might seek to deter and dissuade a belligerent society without having to destroy its armed forces. In this, strategic information warfare would resemble prior systems, from strategic bombing to countervalue nuclear targeting.

The oft-voiced notion that war is moving toward a largely automated and robotic future is overstated.<sup>61</sup> From the Athenan viewpoint, the

information age will raise the value of social and human capital, as man remains the purest, richest information-hurling system. In the words of pulp cinema icon, John Rambo, "the mind is the greatest weapon." The rising importance of human capital clearly applies to the skillful training and deployment of our own and our allies' information-age warriors. At the same time, this view of capital implies that the armed forces of adversaries among less developed countries may find new ways to remain militarily viable in the information age, as the development of human capital lies well within their grasp.

The importance of human capital may be seen not only in the technical skills of warriors, but also in the continued surfacing of "true believers" ready to act indiscriminately and murderously in the name of some blind faith. To take a term from Dawkins, such fanatics and martyrs amount to "memoids"—people who are so possessed by a meme that they can justify any deed, while feeling that neither their own nor their opponents' survival matters as long as the meme goes forward.<sup>62</sup> In a sense, a memoid's power as capital for his or her cause, and for hurling information at an enemy, stems from total possession by a belief system and accompanying attitudes.

### New Assessment Methodologies Needed

If these speculations are worth pursuing, a generation of new assessment methodologies is needed. The challenges for development may include new methods for analyzing the "information quotient"<sup>63</sup> of weapons and other military systems, for describing an "information order of battle," and for analyzing an enemy's intentions, capabilities, and vulnerabilities—in short, for doing a net assessment. It may turn out that a new language must be devised, lest we overburden that already overused term "information." If the concept of information continues to gain significance, a new academic discipline may be advisable.<sup>64</sup> New centers and schools are already being established for the U.S. military that will help address such challenges. The question might also be addressed as to what an "information war room" would look like.

As we in the United States grapple to define our own concepts, we should keep an eye on how information may be defined in other societies and cultures that are trying to gain advantages from the information revolution. To some extent, our nation should aim to

identify concepts to which others can relate, and which may thus serve as bases for future alliances and other forms of cooperation, where relevant. But we should also seek knowledge of others in order to develop early warning signs of potential adversaries, including non-state adversaries, who may invent concepts that are unusually difficult for us to counter. This may be particularly the case with “neo-cortical”<sup>65</sup> or psychological and cultural aspects of warfare.<sup>66</sup>

### Game Analogies: Chess/Kriegsspiel and Go

As in the past, war and other modes of conflict in the information age will continue to bear resemblances to the game of chess. But such conflicts will increasingly take on characteristics of the “double-blind” chess variant kriegsspiel, and of the oriental game Go. A refinement of chess and kriegsspiel, so that one's own side has sight of both his and his opponent's pieces, but the opponent can only see his own pieces, offers an analogy for military “cyberwar.” A similar refinement of Go so that, again, one's own side sees all pieces but the opponent sees only his own pieces, is an analogy for social and other types of “netwar.”<sup>67</sup>

In chess, each side has a king and five other types of specialized pieces. Each piece, including the king, has a different “value” and a different ability to move. Each side lines up its pieces in assigned positions on opposite sides of the game board. Thus the two sides face off across a front line. Then, each side maneuvers in ways that are generally designed to fight for control of the board's center, to shield one's valuable pieces from being taken, to use combinations of pieces selectively to threaten and capture the opponent's pieces, and ultimately to achieve checkmate (decapitation) of the one-and-only king. Warfare before World War II was often like this and, indeed, frequently continued to retain this linear flavor up through the Persian Gulf War.

For the age of cyberwar, a modified kriegsspiel analogy is more apt. Kriegsspiel is based on chess—the board, the pieces, and the rules are similar—but the game is operationally distinct. Each side has his own board and arrays his pieces as in chess. A screen to block vision stands between the two boards, manned by a monitor (referee). Thus, once the game starts, each side knows where he has moved his pieces, but cannot see where the other side moves. The monitor sig-

nals when contact has been made. Then, whoever's turn is next gets to choose whether to take the contacted piece or make another move. He does not see what piece he may take until he has taken it, and it is handed to him by the monitor. Throughout the game, each side speculates but rarely knows which of the opponent's pieces are where. The game revolves around information vacuums and uncertainties. A premium is placed on deception. Indeed, a player who opens with classic chess moves and strategies—e.g., controlling the center—is likely to lose. The edges of the board may become more important for maneuver than the center.

The aim of cyberwar is for our side (the United States) to play chess—i.e., to have full sight of our own and the opponent's pieces—while blinding him so that he has to play *kriegsspiel*, at best knowing the location only of his own pieces, and maybe not even that. In this analogy, both sides start with similar mass and energy—the same set of pieces—at their disposal. But we have an enormous informational advantage—what David Gelernter calls “topside”<sup>68</sup>—and because of this, each of our pieces is well informed. This advantage means we should not require as many pieces to win; we might even be able to achieve checkmate without taking many of the opponent's pieces. The Gulf War was, in some respects, rather like this and marks a watershed in the transition from traditional attritional warfare to a new generation of information-age warfare.

The game of Go provides a better analogy for netwar, i.e., for networked types of conflict and crime at the opposite end of the spectrum from high-intensity conventional warfare. Whereas chess starts with all pieces on the board, this game starts with an empty board. It looks like a vast, grid-like chess board with lots of tiny squares. Each side takes turns placing pieces called “stones” anywhere on the board, one by one. But the stones are placed not in the squares as in chess, but on the points where the grid lines intersect. All stones are alike—there is no king to decapitate, and no queen or other specialization. Once placed, a piece cannot move; it can only be removed, if surrounded and captured according to the rules. But in this game, taking pieces has secondary importance. The goal is to surround and hold more territory than one's opponent. Once emplaced, a piece exerts a presence in that part of the board, making it easier for the player to place additional pieces on nearby points in the process of surrounding territory. As a result, there is almost never a front line,

and the major battles are less for control of the center than for the corners and sides (since they are easier to box off). And whereas in chess no piece is ever totally secure, in Go a piece of territory can be made totally secure if it is surrounded in a particular way (in Go parlance, given two “eyes”).

Thus Go, in contrast to chess, is more about distributing one's pieces than about massing them. It is more about proactive insertion and presence than about maneuver. It is more about deciding where to stand than whether to advance or retreat. It is more about developing web-like links among nearby stationary pieces than about moving specialized pieces in combined operations.<sup>69</sup> It is more about creating networks of pieces than about protecting hierarchies of pieces. It is more about fighting to create secure territories than about fighting to the death of one's pieces. It is also less linear than chess. Thus Go is more like social, criminal, and revolutionary forms of low-intensity conflict than like full-scale military war. It might even be said that the forces of North Vietnam and the Viet Cong played Go while U.S. forces tried to play chess.<sup>70</sup> Finally, in line with this notion of Go's tie with irregular warfare, the game's tactics are very unforgiving of efforts either to build fortifications or to seize unclaimed territory. Bastions or redoubts are subject to implosive attacks that bring them down from within, while “ground taking Go”<sup>71</sup> is entirely predictable, allowing a smart adversary to ambush these strung-out forces, defeating them in detail.

The metaphoric possibilities for netwar deepen if one imagines combining Go with the key characteristic of *kriegsspiel*: the screen that obstructs sight. Again, presume that one side has full knowledge of his own and the opponent's array, but the opponent can see only his own pieces until contact is made with an opposing piece. The dynamics of Go differ from those of chess/*kriegsspiel*, but the point still stands: Both sides start play with virtually equivalent mass and energy at their disposal. But the side with topsight has far more information. Thus, it should win handily over a blinded player and require (or need to risk) far fewer pieces to do so.

It might be illuminating to run experiments about this point, not only to test its validity, but also to see whether a minimum essential force size can be defined that invariably wins at chess/*kriegsspiel* or Go so long as its side has topsight and the other side is blinded. The

experiment could vary the amount of information available to either side, in order to see what types and thresholds of information may make the most difference. To refer back to the “information pyramid,” it might be found that a game will turn in favor of whoever has better knowledge and wisdom, so long as both sides have full view of the board. But the more one side is blinded, the more the game may turn simply on who has the most data and information in the narrow senses.

In addition, it might be illuminating to identify for study a series of cases where apparently small, weak military forces effectively defeated or defended against what appeared to be much larger, stronger forces. The offensive skill of the Mongol “hordes” of Genghis Khan (which were anything but hordes) comes to mind, as do the strategically defensive campaigns waged by the Royal Air Force and related elements in the Battle of Britain, and by hard-pressed U.S. Navy forces up through the Battle of Midway during the Pacific War. There are always many explanations why a smaller, weaker force wins—but a crucial constant may be superior intelligence and communications, be that because of fast scouts on horseback (the Mongol case), breakthroughs in radar and cryptography (the British and American cases), or other technological and organizational innovations. Indeed, an historical study could help illuminate not only the importance of the information factor, but also the extent to which it depends on correctly combining the technological and organizational dimensions of innovation. Such a study, along with the gaming experiment proposed above, might offer lessons for whether and how the United States could move to develop military forces that may seem lighter and leaner yet are more effective than those of any potential rival in the information age.

## NOTES

<sup>1</sup>Sun Tzu, *The Art of War*, ed. and trans. by Samuel B. Griffith (New York: Oxford University Press, 1971), p. 129; Francis Bacon, “Of Vicissitude of Things,” in M.A. Scott, ed., *The Essays of Francis Bacon* (New York: Charles Scribner's Sons, 1908), p. 270; Carl von Clausewitz, *On War*, ed. and trans. by Michael Howard and Peter Paret (Princeton: Princeton University Press, 1976), p. 147; and Michel Foucault, *Power/Knowledge*, ed. and trans. by Colin Gordon (New York: Pantheon, 1980), p. 69.

<sup>2</sup>A thoughtful analysis of the continuing, perhaps growing, importance of the state is by John Garnett, “Why Have States Survived for so Long?” in J. Baylis and N. Rengger,

eds., *Dilemmas of World Politics* (Oxford: Clarendon Press, 1992), particularly p. 63, where he concludes that "states enjoy decisive advantages over all other organizations in domestic and international affairs." See also Robert Jackson and Alan James, "The Character of Independent Statehood," in their edited volume, *States in a Changing World* (Oxford: Clarendon Press, 1993). Of the effects of the information revolution on states, they contend that "a major effect has been to enhance [state] significance: the State has been a major supporter and beneficiary of economic, scientific, and technological advance" (p. 6).

<sup>3</sup>Eugene B. Skolnikoff, *The Elusive Transformation: Science, Technology, and the Evolution of International Politics* (Princeton: Princeton University Press, 1993), especially pp. 241–246; quotes taken from p. 243 and p. 245, respectively.

<sup>4</sup>Criticism of empires is hardly new. The fundamental inefficiency of imperial organization is well explicated in L.H. Gann and Peter Duignan, *Burden of Empire* (Palo Alto: Hoover Institution Press, 1967), which focuses upon the failure of empires in sub-Saharan Africa. V.I. Lenin, *Imperialism: The Highest Stage of Capitalism* (New York: International Publishers, 1939) argues that empires will clash and ultimately destroy themselves in competition over ever-scarcer resources from which to extract surplus. Rupert Emerson, *From Empire to Nation* (Boston: Beacon Press, 1960) provided an argument that nationalism would triumph over great empires, whether of the more liberal (e.g., the British Empire) or totalitarian variety (e.g., the USSR). More recent studies have pointed out the inefficiencies of empire as caused by either unruly domestic political processes or hypervigilant concerns over potential external dangers. See, respectively, Jack Snyder, *Myths of Empire* (Ithaca: Cornell University Press, 1991); and Charles Kupchan, *The Vulnerability of Empire* (Ithaca: Cornell University Press, 1994).

<sup>5</sup>Peter F. Drucker, *Post-Capitalist Society* (New York: HarperCollins Publishers, 1993), esp. Chapter 6.

<sup>6</sup>For example, Kenichi Ohmae, *The End of the Nation-State: The Rise of Regional Economies* (New York, The Free Press, 1995) proposes that trans-border "region-states" are on the rise.

<sup>7</sup>Our threefold treatment of both information and power is deliberately sketchy, and cannot do full justice to the view of any single thinker. But that is not our intent. Rather, we seek to show that there has been an evolution in how people view these concepts. This evolution has implications that might be missed if one were to focus more on the details of specific views.

<sup>8</sup>A classification suggested in Robert Wright, *Three Scientists and Their Gods: Looking for Meaning in an Age of Information* (New York: Harper & Row, 1989), p. 110.

<sup>9</sup>Notably, Harlan Cleveland, *The Knowledge Executive: Leadership in an Information Society* (New York: E.P. Dutton, 1985); and Robert Lucky, *Silicon Dreams: Information, Man, and Machine* (New York: St. Martin's, 1989).

<sup>10</sup>The cognitive version is used in Jeffrey R. Cooper, *Another View of the Revolution in Military Affairs* (Carlisle, PA: Strategic Studies Institute, 1994); and John Rothrock, *Information Warfare: Time for Some Constructive Skepticism* (Stanford: Stanford Research International, 1994a, draft). A short version of Rothrock's paper was published under the same title in the *American Intelligence Journal*, Spring–Summer 1994, pp. 71–76.

<sup>11</sup>See, for example, Theodore Roszak, *The Cult of Information: The Folklore of Computers and the True Art of Thinking* (New York: Pantheon Books, 1986).

<sup>12</sup>Richard Dawkins, *The Selfish Gene* (New York: Oxford University Press, 1989), p. 94.

<sup>13</sup>*Ibid.*, p. 329.

<sup>14</sup>*Ibid.*, p. 192.

<sup>15</sup>Elaborations appear in Steve J. Heims, *The Cybernetics Group* (Cambridge: MIT Press, 1991); in Kevin Kelly, *Out of Control: The Rise of Neo-Biological Civilization* (New York: Addison-Wesley, 1994); in Lucky, *Silicon Dreams*; and in Roszak, *The Cult of Information*.

<sup>16</sup>See Norbert Wiener, *Cybernetics: or Control and Communication in the Animal and the Machine* (Cambridge: The MIT Press, 1948), and Wiener, *The Human Use of Human Beings* (Boston: Houghton Mifflin, 1950); and Marshall McLuhan, *Understanding Media: The Extensions of Man* (Boston: MIT Press, 1964/1994). Also see Heims, *The Cybernetics Group*. Shannon's writings are highly technical; but his basic points are presented in books cited above by Heims, Kelly, Lucky, and Wright, among others.

<sup>17</sup>Notably, Karl W. Deutch, *The Nerves of Government: Models of Political Communication and Control* (New York: The Free Press, 1963); and John D. Steinbruner, *The Cybernetic Theory of Decision* (Princeton: Princeton University Press, 1974).

<sup>18</sup>Wiener, *Cybernetics*, p. 11.

<sup>19</sup>Gregory Bateson, *Steps to an Ecology of Mind* (New York: Ballantine, 1972), p. 381.

<sup>20</sup>See especially Heims, *The Cybernetics Group*, and Wright, *Three Scientists and Their Gods*.

<sup>21</sup>A thoughtful exposition is by M. Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos* (New York: Simon & Schuster, 1992). John Horgan, "From Complexity to Perplexity," *Scientific American*, June 1995, pp. 104–109, voices the prospect that "complexity" studies may turn out to be another academic fad—as tenuous a basis for interdisciplinary theory as "cybernetics" was in earlier decades.

<sup>22</sup>Thus tribes, hierarchies, markets, and networks all exhibit different patterns of control and coordination.

<sup>23</sup>James Beniger, *The Control Revolution* (Cambridge: Harvard University Press, 1986).

<sup>24</sup>Wright, *Three Scientists and Their Gods*, p. 5.

<sup>25</sup>Tom Stonier, *Information and the Internal Structure of the Universe: An Exploration into Information Physics* (London: Springer Verlag, 1990), p. 107.

<sup>26</sup>Cited in Wright, *Three Scientists and Their Gods*, pp. 10–11.

<sup>27</sup>*Ibid.*, p. 288.

<sup>28</sup>Efforts to define power remain risky, for they often verge on tautology. Herbert Simon, "Notes on the Observation and Measurement of Political Power," *Journal of Politics*, 15/4:500–516 (1953) admonishes his fellow scholars to avoid considering power tautologically, as though it simply amounted to the ability to influence others.

His admonition has been difficult to heed. For example, a classic article by Robert Dahl, "The Concept of Power," *Behavioral Science*, 2:201–215 (1957) treated power as essentially the ability to influence others. Formal quantitative studies of power sometimes reflect this emphasis. A. F. K. Organski and Jacek Kugler, *The War Ledger* (Chicago: University of Chicago Press, 1980), focus on the identification and measurement of "power transitions," and argue that national power "can be defined simply as the ability of one nation to control the behavior of another for its own ends" (p. 5).

<sup>29</sup>Kenneth E. Boulding, *Three Faces of Power* (London: Sage, 1989) provides one of the most systematic efforts to classify the dimensions of power. Other attempts, often resulting in fewer dimensions, include P. Bachrach and M. S. Baratz, "Two Faces of Power," *American Political Science Review*, 56:947–952 (1962). Joseph S. Nye, Jr., *Bound to Lead: The Changing Nature of American Power* (New York: Basic Books, 1990), especially pp. 173–201, relates a pertinent distinction between "hard" (tangible) and "soft" (intangible) components of power.

<sup>30</sup>Inis Claude, *Power and International Relations* (New York: Random House, 1962), p. 6.

<sup>31</sup>Bruce Bueno de Mesquita, *The War Trap* (New Haven: Yale University Press, 1981), pp. 102–109 gives an outstanding exposition of this view of power, while also noting the vitiating effects of distance on the projection of material power. He enriches the basic capabilities index by incorporating his variant of the "loss of strength gradient" introduced by Kenneth Boulding, *Conflict and Defense* (New York: Harper & Row, 1962), especially pp. 245–247. The composite capabilities index became one of the foundations of the "Correlates of War" data set maintained by the Interuniversity Consortium for Political and Social Research.

<sup>32</sup>Thomas Hobbes' *Leviathan* calls for using centralized organization to maximize state power. Karl Marx's *Communist Manifesto* heralds an altogether differing view of political organization, in which the greatest gains will come from the "withering" of predatory states.

<sup>33</sup>This is a central theme of Herbert Simon, *Administrative Behavior* (New York: The Free Press, 1957). Another example is Philip Selznick, *TVA and the Grass Roots; a Study in the Sociology of Formal Organization* (Berkeley: University of California Press, 1949). Klaus Knorr, *The War Potential of Nations* (Princeton: Princeton University Press, 1956), especially chapters 6–8, notes the overarching importance of administrative efficiency. Tibor Scitovsky, Edward Shaw and Lorie Tarshis, *Mobilizing Resources for War* (New York: McGraw-Hill, 1951) provides a policy-oriented (for its day) blueprint for developing a national-level degree of organization to maximize state power.

<sup>34</sup>Jack Nagel, "Some Questions About the Concept of Power," *Behavioral Science*, 13:129–137 (1968), p. 129. This view was thoroughly analyzed in Harold Lasswell and Abraham Kaplan, *Power and Society* (New Haven: Yale University Press, 1950).

<sup>35</sup>R. E. Smith, *The Failure of the Roman Republic* (London: Cambridge University Press, 1955), pp. 47–56, argues that Rome could not realize its power potential until it engaged in a fundamental reorganization, jettisoning its vestigial tribal structures in favor of administrative structures that could effectively command and control its ever-increasing resources and subjects. Of this period of institutional redesign, and the sometimes unpredictable behavior that accompanied it, Smith concluded that "it is a phase through which all States pass during their growth and development" (p. 53).

<sup>36</sup>Background appears in David Ronfeldt, *Institutions, Markets, and Networks: A Framework About the Evolution of Societies* (Santa Monica: RAND, DRU-590-FF, December 1993). Sources on the evolution from tribes to early states include Elman R. Service, *Primitive Social Organization, An Evolutionary Perspective*, Second Edition (New York: Random House, 1971); Elman R. Service, *Origins of the State and Civilization: The Process of Cultural Evolution* (New York: W.W. Norton and Company, 1975); and Joseph A. Tainter, *The Collapse of Complex Societies* (New York: Cambridge University Press, 1988).

<sup>37</sup>For a recent example, see David A. Lake, "Powerful Pacifists: Democratic States and War," *American Political Science Review*, 86/1:24-37 (1992), for an argument that less hierarchical systems must respond to constituent demands and thus become inherently stronger than those polities whose rulers may extract surplus from a people without their permission or support.

<sup>38</sup>Hans Morgenthau, *Politics Among Nations* (New York: Alfred A. Knopf, 1948), pp. 91-100. On balance, Morgenthau's view of power is dual, because he mixes intangibles like nationalism and militarism with tangible geopolitical factors (pp. 116-120).

<sup>39</sup>Nye, *Bound to Lead*, p. 195.

<sup>40</sup>See Antonio Gramsci, "Intellectuals and Hegemony," in David McLellan, *Marxism: Essential Writings* (London: Oxford University Press, 1988). It should also be noted that writers identified with the Realist approach to international relations have sometimes argued that even such matters as international trading regimes rely heavily on the "hegemonic stability" afforded by the presence and participation of a preponderant state. See Stephen D. Krasner, "State Power and the Structure of International Trade," in Jeffrey A. Frieden and David A. Lake, *International Political Economy* (New York: St. Martin's Press, 1987).

<sup>41</sup>See Friedrich Nietzsche, *The Will to Power* (New York: Vintage Books, 1964 edn.) and *The Genealogy of Morals* (New York: Carlton House, 1887).

<sup>42</sup>On the importance of ideas, see G. W. F. Hegel, *Reason in History*, trans. by Robert S. Hartman (Indianapolis: Bobbs-Merrill, 1951). A modern affirmation of the Hegelian view of ideas and power appears in Francis Fukuyama, *The End of History and the Last Man* (New York: Free Press, 1992).

<sup>43</sup>Alvin and Heidi Toffler, *War and Anti-War: Survival at the Dawn of the 21st Century* (Boston: Little, Brown, 1993), emphasize the increasingly immaterial nature of power.

<sup>44</sup>Martin Van Creveld, *Technology and War: From 2000 B.C. to the Present* (New York: The Free Press, 1989).

<sup>45</sup>Writings in this camp include C. Kenneth Allard, "The Future of Command and Control: Toward a Paradigm of Information Warfare," in L. Benjamin Ederington and Michael J. Mazarr, eds., *Turning Point: The Gulf War and U.S. Military Strategy* (Boulder: Westview Press, 1995); Jeffrey R. Cooper, *Another View of the Revolution in Military Affairs* (Carlisle Barracks, PA: Strategic Studies Institute, 1994); Brian Nichiporuk and Carl Builder, *Information Technologies and the Future of Land Warfare* (Santa Monica: RAND, 1995); Martin C. Libicki, *The Mesh and the Net: Speculations on Armed Conflict in a Time of Free Silicon* (Washington, D.C.: Institute for National Strategic Studies, National Defense University, McNair Paper #26, 1994); George Stein, "Information Warfare," *Airpower Journal*, Spring 1995, pp. 30-39; Richard Szafranski, "Neo-Cortical Warfare? The Acme of Skill," *Military Review*,

November 1994, pp. 41–55; and Szafranski, “A Theory of Information Warfare: Preparing for 2020,” *Airpower Journal*, Spring 1995, pp. 56–65. Pertinent but more reserved views are expressed by Steven Metz and James Kievit, *The Revolution in Military Affairs and Conflict Short of War* (Carlisle Barracks, PA: Strategic Studies Institute, 1994); and by John Rothrock, “Information Warfare . . .” (1994a, 1994). Three journalists have provided particularly good coverage of key ideas and issues: Peter Grier, “Information Warfare,” *Air Force Magazine*, March 1995, pp. 34–37; Oliver Morton, “A Survey of Defence Technology: The Softwar Revolution,” *The Economist*, Vol. 335, No. 7918, June 10th, 1995, pp. 5–20 (special insert after p. 50); and Doug Waller (*Time Magazine*). For additional discussion, see Arquilla and Ronfeldt, “Welcome to the Revolution . . . in Military Affairs,” *Comparative Strategy*, Vol. 14, No. 3, Summer 1995.

<sup>46</sup>Rothrock, “Information Warfare . . .” (1994a), p. 7. Is there a risk of an information-age iteration of industrial-age fascism? If so, no term exists for it yet. The closest is “friendly fascism”—a term coined by socialist sociologist Bertram Gross, *Friendly Fascism: The New Face of Power in America* (Boston: South End Press, 1980), to warn that the new information technologies may be used by government and business to centralize surveillance and control over society. In some places (Singapore?), the information revolution may foster hybrid political systems and practices that purport to be democratic but are not. See also David Ronfeldt, “Cyberocracy Is Coming,” *The Information Society*, 8/4: 243–296 (1992).

<sup>47</sup>Colin Powell, “Information-Age Warriors,” *Byte* (July 1992), p. 370.

<sup>48</sup>Clausewitz, *On War*, p. 147.

<sup>49</sup>This perspective is developed at some length in John Arquilla and David Ronfeldt, “Cyberwar is Coming!” *Comparative Strategy*, 12/2:141–165 (Summer 1993).

<sup>50</sup>Clausewitz, *On War*, p. 120.

<sup>51</sup>Lt. Gen. (USAF) Carl O’Berry, as reported in *Defense News*, September 12–18, 1994, p. 54.

<sup>52</sup>Vietnam also provides an example of the United States playing chess against an adversary who was playing Go. See below for elaboration.

<sup>53</sup>Sun Tzu, *The Art of War*, Griffith, ed., pp. 100–101.

<sup>54</sup>See, for example, Jeffrey Ethell and Alfred Price, *Air War South Atlantic* (New York: Macmillan, 1983); and, from the Argentine point of view, B.H. Andrada, *Guerra Aérea en las Malvinas* (Buenos Aires: Emecé Editores, 1983), pp. 38–40. Wayne Hughes, Jr., and Jeffrey Larson, *The Falklands Wargame* (Bethesda, MD: Concepts Analysis Agency, 1986), offer an interesting official report that explores the possibilities opened up by alternative targeting. But the most severe critique of Argentine errors is rendered in Air Marshal R.G. Funnell, “It was a Bit of a Close Call: Some Thoughts on the South Atlantic War,” in Alan Stephens, ed., *The War in the Air, 1914–1994* (Fairbairn, Australia: Air Power Studies Center, 1994). Funnell’s conclusion is that “properly used, air power could have achieved the Argentine national aim” (p. 229).

<sup>55</sup>See David A. Andelman, “The Drug Money Maze,” *Foreign Affairs*, July/August 1994, pp. 94–108.

<sup>56</sup>Marshall McLuhan, *Understanding Media: The Extensions of Man* (Cambridge: The MIT Press, 1964/1994), quote from p. 346, emphasis added.

<sup>57</sup>Psychological operations from an information warfare and special forces perspective is discussed by Col. Jeffrey B. Jones, "Psychological Operations in Desert Shield, Desert Storm and Urban Freedom, Special Warfare, July 1994, pp. 22–29.

<sup>58</sup>See Jarol B. Manheim, *Strategic Public Diplomacy & American Foreign Policy: The Evolution of Influence* (New York: Oxford University Press, 1994).

<sup>59</sup>The term "knowledge strategy" is from Toffler and Toffler, *War and Anti-War*.

<sup>60</sup>Szafranski, "Neo-Cortical Warfare . . . ."

<sup>61</sup>Statements of this notion include: Eric H. Arnett, "Welcome to Hyperwar," *The Bulletin of the Atomic Scientists*, vol. 48, no. 7 (September 1992), pp. 14–21; Manuel De Landa, *War in the Age of Intelligent Machines* (Cambridge: MIT Press, 1991); and Les Levidow and Kevin Robins (eds.), *Cyborg Worlds: The Military Information Society* (London: Free Association Books, 1989).

<sup>62</sup> See Dawkins, *The Selfish Gene*, pp. 330–331, where he writes: "What a weapon! Religious faith deserves a chapter to itself in the annals of war technology, on an even footing with the longbow, the warhorse, the tank, and the hydrogen bomb." Eric Hoffer, *The True Believer* (New York: Harper & Row, 1951) pointed out that an all-consuming faith need not be religious.

<sup>63</sup>An information quotient, once operationalized, would reflect the informational content of a weapon system relative to its mass and energy. The quotient reflects both the natural and man-made content of that system, in the context of its intended use. Many high-tech weapons systems would probably have high information quotients. However, a high-tech system (like the strategic nuclear missiles of the Soviet Union during the Cold War) might have a low information quotient even if it has very high mass or energy quotients.

<sup>64</sup>Ronfeldt, "Cyberocracy . . ." proposed the field of "cyberology." Thoughts of moving in this direction should be tempered by reading Heims, *The Cybernetics Group*, which recounts an unsuccessful effort in the 1940s and 1950s to create interdisciplinary studies around the concept of cybernetics.

<sup>65</sup>Szafranski, "Neo-Cortical Warfare . . . ."

<sup>66</sup>A 1962 piece by Arthur C. Clarke, "I Remember Babylon," reprinted with comment in Arthur C. Clarke, *How the World Was One: Beyond the Global Village* (New York: Bantam Books, 1992), pp. 181–193, tells of his encounter with a shady fellow who was purportedly planning to orbit satellites to broadcast television programs that would perversely charm and then undermine U.S. society.

<sup>67</sup>The concepts of cyberwar and netwar were fielded in Arquilla and Ronfeldt, "Cyberwar . . . ."

<sup>68</sup>See Gelernter, *Mirror Worlds*.

<sup>69</sup> However, the extension of a single piece into a line of pieces (a chain network?) might be considered a form of maneuver over time.

<sup>70</sup>Arthur Smith, *The Game of Go* (New York: Moffat, Yard and Company, 1908), which has gone through many reprintings, remains an unsurpassed, lucid study of the game. Sociologist Scott Boorman, *The Protracted Game: A Weich'i Interpretation of Maoist Revolutionary Strategy* (New York: Oxford University Press, 1969) assesses the Vietnam war in terms of Go-like principles of strategy. Deconstructionists Gilles Deleuze and Félix Guattari, trans. by Brian Massumi, *Nomadology: The War Machine*

(New York: Semiotext[e], Foreign Agents Series, 1986), pp. 1–11, compare war to chess (“a game of State, or of the court”) and to Go (whose pieces are “anonymous, collective”).

<sup>71</sup>Smith, *The Game of Go*, p. 27, notes that this phrase (*Ji dori go*) is a “contemptuous epithet” for the uninspired conventionality of such strategies.