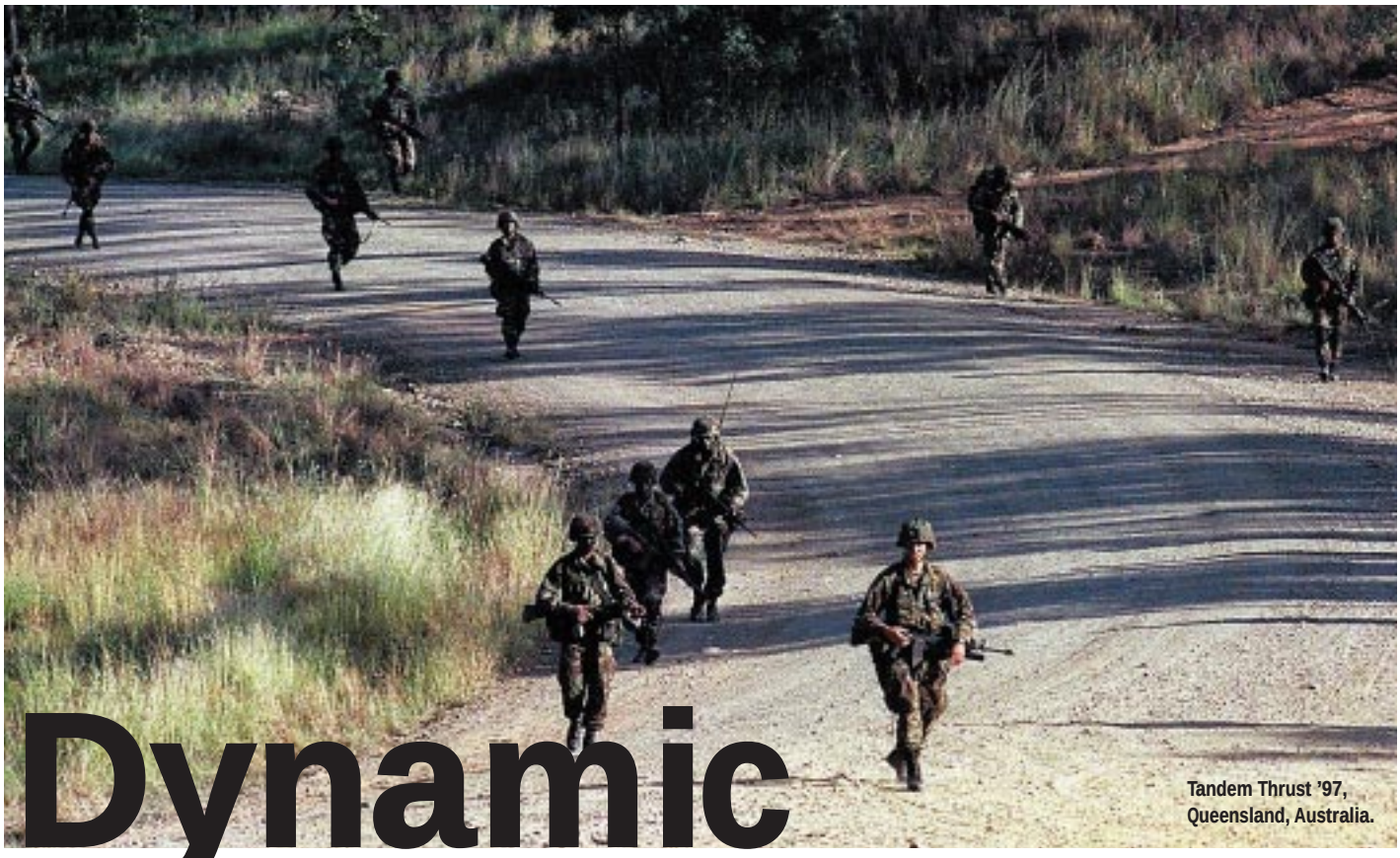

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DOD (Gary A. Bryant)

Dynamic Inter-Dimensionality: A Revolution in Military Theory

By ANTULIO J. ECHEVARRIA II

JUNIOR OFFICER PRIZE 96 REVOLUTION IN MILITARY AFFAIRS

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The debate over the revolution in military affairs (RMA) has become one of whither rather than whether. Most commentators agree that profound and inescapable changes are taking place in warfare. The discussion now focuses on defining this revolution more precisely, determining the extent and type of changes that it will effect in the near and long term, and what if anything should be done about them. Much effort has gone into determining how technology will alter the conduct of war in the information age from the National Command Authorities to the individual soldier. Yet no one has addressed the central issue of how this revolution will affect military theory—the foundation of doctrine. The exploitation of new technology demands a corresponding revolution in military theory that explains war as a broad-based,

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dynamically interactive continuum. It must provide a holistic view of war that represents its varied dimensions and accommodates new ones which emerge; and, similar to the paradigmatic shift that is occurring in science, it must depict the normal state of war as vigorous interaction and continuous change rather than static equilibrium. This approach must in turn form the conceptual framework for future military doctrine.

Before proceeding, the terms *military thought*, *theory*, and *doctrine* should be defined. For our purposes, military thought consists of the aggregate of developments, theories, approaches, perceptions, patterns, and frameworks (paradigms) that belong to a particular era, community, or person. It responds to and borrows from values and assumptions in its socio-cultural milieu and represents the solution or analysis of military problems in the abstract. Military theory involves the historical observation and the systematic study of organizations, strategies, tactics, techniques, and procedures from antiquity to the present. It educates warfighters and policymakers alike and also provides a basis for developing doctrine that in turn creates a common philosophy and practice for solving problems in the physical world, either through fighting or other means. Doctrine, in sum, is the accepted canon: it represents what the institution teaches officially and tacitly. It remains authoritative in nature but requires judgment when applied. Doctrine also shapes dialogue, defines capabilities, accommodates threats, and influences force disposition and resource allocation.

the ability to strike simultaneously will continue to blur distinctions among levels of war

Professional publications such as Field Manual 100-5, *Operations*, Field Manual 100-6, *Information Operations*, U.S. Army Training and Doctrine Command Pamphlet 525-5, *Force XXI Operations*, Fleet Marine Force Manual-1, *Warfighting*, Air Force Manual 1-1, *Basic Aerospace Doctrine of the U.S. Air Force*, and Joint Publication 3-0, *Doctrine for Joint Operations* reflect common warfighting philosophies for specific services or forces, functions, and levels of warfare. They thus draw from accepted or newly developed theories or concepts to describe official practice relating to current or potential problems. This theory in turn reflects concerns in military thought, such as how to incorporate expanding capabilities of information-age technology into all types and levels of warfare. This article considers the impact of new theory on FM 100-5.

Dimensions of War

RMA has introduced a number of new conditions into the conduct of war. For one thing, the ability to strike simultaneously throughout an ever-expending battlespace has made sequential operations all but obsolete. This simultaneity will continue to blur the already tenuous distinctions among tactical, operational, and strategic levels of war. Moreover, future operations will involve an indefinite extension of the battlespace—the depth, breadth, and height of a battlefield—brought about by increases in the range, accuracy, and lethality of new weapons systems. This expansion reflects an evolutionary tactical trend accelerated by rapid technological advances. It threatens to remove safe areas from the battlefield, intensifying danger and uncertainty. Future conflicts might well consist of a single, continuous strike lasting hours, days, or even months rather than a series of battles or campaigns. Operations in Grenada, Panama, and Kuwait hint at what simultaneous or near-simultaneous strikes can achieve.

Digitization is transforming command and control on the tactical, operational, and strategic levels. Digital systems are rendering battle command nonhierarchical. Organizations process and disseminate information in nontraditional patterns so that others can exploit it in a timely manner. Situational awareness will soon become automatic and the transmission of the commander's intent instantaneous. Digital displays will soon depict individual vehicles and weapons systems with precise logistic and geographical information, all constantly and automatically updated and shared with other systems. The goose egg will become obsolete and unit boundaries, combat formations, and battlefield graphics unnecessary.

In addition, information-age technology is making the environment in which future military operations occur more dynamic and unpredictable. It renders national economies more sensitive to global developments, heightens cultural and political awareness on the part of world populations, and fuels radical movements that promote world-wide political fragmentation and destabilization. Information-age technology can deliver the effects of military actions, large and small, to a global audience almost immediately. Images of war and peace—either real or contrived—can decisively influence national will or public opinion before authorities confirm or repudiate their authenticity. Paradoxically, a flood of real or near-real time information puts greater demands on intelligence gatherers and decisionmakers alike, forcing them to rely more on their intuition and Clausewitzian *coup d'oeil* than ever before.

Combat Camera Imagery (Paul A. Hawthorne)

Airborne battle staff during Deny Flight.

Since the classical age enemies have waged war in five overarching dimensions—political, social, technological, operational, and logistical—which approximate the four elements of national power—political, socio-psychological, military, and economic—and indeed serve as conduits for directing that power. Neglecting one can lead to catastrophic defeat as in the case of the infamous Schlieffen Plan, which dismissed the German political situation as irrelevant, or Hitler's war with the Soviet Union, which egregiously underestimated economic and socio-psychological elements.

The political dimension consists of political aims and politics as a process. Political aims, whether manifested in terms of protecting national security interests, an aggressive policy for economic expansion, a commitment to worldwide religious or ideological conversion, a desire for retaliatory assassination, the promotion of state-sponsored terrorism, or mere entertainment, have always directed war, though not always coherently. In addition, politics as a process influenced by culture, geography, and personality has always affected the direction of war, though not always constructively. While the decisionmaking that Tartar bands used to formulate policy might appear less sophisticated than those of modern states (which is debatable), they proved no less effective in developing strategies and direction for military force in pursuit of political goals. These objectives emerged as a product of resources available to the Tartars, their geopolitical position as a composite of Turkish and Mongol nations located in Central Asia, their nomadic culture and traditions, and the influence of Islam. FM 100-5 recognizes the role of the political dimension in directing force to achieve strategic goals but does not discuss the influence of politics as a process on the planning or execution of military operations.

The social dimension—the attitude and the commitment of people—also remains essential to warfighting. The Peloponesian and Punic Wars demonstrate the importance of popular support even when only limited segments of society actively participate in combat. The significance of the social dimension receded to a certain extent in the medieval era when knights assumed the principal roll as warfighters. It emerged again in the 17th century as armies grew larger, levelled in the 18th century "cabinet wars" which relied somewhat less on popular support, and grew once again in the 19th century as states moved toward the concept of a nation in arms. Indeed, the increase in army size combined with the emergence of mass politics has made the cultivation, if not manipulation, of public opinion essential in warfighting. FM 100-5 recognizes the "attitude and commitment of the populace" as the human (physiological, psychological, and ethical) dimension of war.

Technology affects every dimension and all levels of warfare. It interacts with culture and physical events in time and space to influence the duration, nature, shape, and outcome of conflict. Technological advances, while always important, take on greater significance when a "gap" exists between one force and another, as the Battle of Omdurman demonstrated in 1898. Such advances also produce military technical revolutions that can lead to larger, more inclusive RMAs such as the one launched by Gustavus Adolphus in the early 1600s. Gustavus actually capitalized on the effort by Maurice of Nassau to effect military reform in the 1590s. Maurice developed a system with linear formations, discipline, drill, and volley fire based on the Roman model to which Gustavus added pike and musket, the perfection of the salvo, lighter and more maneuverable field artillery, and smoke and direct-fire suppression in the attack. This led the Swedish king to many victories and the title Father of Modern Warfare. It also affected the strategic, organizational, and socio-political realms of warfighting, resulting in an early modern European RMA. FM 100-5 addresses the role of technology in warfare and doctrinal development, but not as a warfighting dimension; and it confuses the roles of doctrine and theory in the exploitation of technology. Doctrine never truly initiates or drives change per se but attempts to channel or focus it through the identification of appropriate warfighting tasks. The relationship between doctrine and technology is

subsumed in the reciprocity between military theory or concept and desire for—or emergence of—enhanced or increased capabilities.

The operational dimension refers to the conduct of war. It consists primarily of attempts to dominate the physical space of the battlefield with combat power and to destroy an enemy's will to fight. From antiquity to the modern age, commanders and staffs have conceptualized the battlefield primarily in physical terms. Great captains from Alexander to Napoleon generally had to consider only two dimensions—breadth and depth—in deploying forces. But with the 20th century aircraft had extended battlespace to three dimensions, and submarines arguably added a fourth. Spacecraft now make it five. In addition, FM 100-5 recognizes the operational dimensions of tempo, depth, and synchronicity. It must go one step further, however, and acknowledge information and force as warfighting dimensions as well.

The logistical dimension has evolved from literally living off the land and ad hoc foraging to intricate if cumbersome depot/supply and push and pull systems. Subsistence, accouterment, ammunition, fuel, and transport provide the stuff of war, the lifeblood of armies. These essentials have affected the size, range, and potency of forces throughout history. Consumption rates for fuel, ammunition, and water have increased more than ten-fold since 1945. A division consumes as much today as a field army during World War II. The successful projection of force across the globe also depends on logistic and support infrastructures such as airfields, seaports, and ground transportation networks. Had Iraq established even a modicum of control over Southwest Asian sea and airports through alliances or other means, coalition forces would have found it much more difficult to execute Desert Storm. Until alternatively powered vehicles and weapons are developed, logistics will remain the decisive problem for Force XXI operations. FM 100-5 recognizes that logistics operations are a critical element of warfighting, devoting an entire chapter to the subject. It does not, however, address logistics as an interactive dimension.

theoretical frameworks have remained linear—closed, balanced systems oriented on sequential events

New Trends

Although the nature and significance of each of these dimensions has varied from era to era, each has clearly remained essential to the conduct of war. Commanders have deliberately, though not absolutely, influenced activities within these dimensions to impact their own and the enemy's combat power. However, due to limitations imposed by human beings trained—and thus constrained—to think in terms of static, two-dimensional maps and symbols, full integration of these dimensions into a comprehensive theoretical framework has not yet occurred. Accumulating dimensions one upon another has only made visualization of the battlefield more complex instead of more sophisticated or complete. In short, theoretical frameworks have remained linear—closed, balanced systems oriented on sequential events.

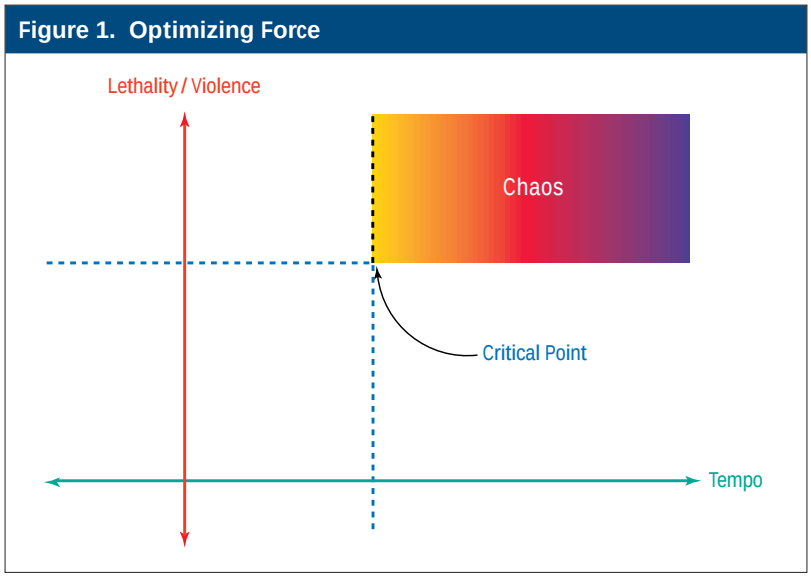
RMA has also made it possible—and thus necessary—to view military operations through two newly emerging dimensions for which current theory does not account. We can now effect action across a broad spectrum of options within the domains of information and force (lethality and violence). While armies have traditionally conducted military operations within these realms, the dynamic and fluid conditions of 21st century warfare have made deliberate consideration and doctrinal recognition of them essential.

Obviously, the increased speed and precision of modern weaponry make information—the heart of RMA—an essential dimension of warfare. Commanders must win the information war to succeed today. Domination of the electro-magnetic spectrum will play a critical part in war as will position cloaking and deception. However, we must not treat information as a physical dimension like land, sea, or air. Information superiority does not function like air superiority.

Additionally, non-lethal weapons including sticky foam, antitraction materials, infrasound, anesthetics, and microwave transmitters provide a range of options under force application. Within certain limitations, commanders can now decide what level of lethality to introduce in an operation as well as how and when. However, recent observations indicate that there are numerous glitches to be worked out before such weapons prove truly useful. Nonetheless, by deliberately raising levels of violence and tempo we can attack the "state of being" of an enemy, ultimately pushing it into chaos where its rate of tactical, operational, and strategic errors increases decisively.

The fact that linear forms of conceptualization have dominated military thinking throughout history should not surprise us. Our educational institutions have taught us to convey and process information in a rigidly structured, step-by-step, left-to-right, or top-to-bottom sequence in which input remains proportional to output. We study major disciplines like economics, sociology, and psychology separately, as closed systems, as if knowledge and developments related to one have no bearing on the others. Each field presupposes equilibrium as its norm and flux as an aberration.

Figure 1. Optimizing Force



Likewise, warfighting schools have taught commanders to view battle as sequential, as a relatively closed system with identifiable start and endpoints and comprised of forces that produce proportional effects. For example, to facilitate command and control, military missions began with a specific not-later-than (NLT) start date and time, a set of clearly delineated phases or phase lines, and a presumably attainable goal or objective, also generally associated with a NLT date and time for its accomplishment. Moreover, the desired outcome or endstate of a mission drove the amount of force required; that is, successful attacks usually require a 3:1 force ratio of attacker to defender. Although we recognized such measures as artificial, until the advent of information-age technology few reasonable alternatives for exercising command and control and calculating force disposition existed. Until recently, the wherewithal to calculate the myriad outcomes of nonlinear systems simply was not available. A small change in a nonlinear system can produce an exponential number of new outcome possibilities, each of which might branch into any number of additional likelihoods. Each subsequent path and combination would then require thorough mathematical investigation that might literally take a lifetime to calculate. Consequently, we embraced linear analytical systems not only because our intellectual conditioning led us in that direction, but for practical reasons as well. Thus military thought, like its civilian counterpart, became inseparable from closed, well-ordered systems, from structure and sequence, from balance and equilibrium.

Unfortunately, the nature of war doesn't fit in the limits of a linear system. As Clausewitz explained, war has a "dual" nature consisting, in the first place, of several internal constants—fog, friction, chance, uncertainty, physical exertion, danger—that render it unavailable to mathematical calculation. Such imponderables result from the interplay of opposing forces, nearly simultaneous and continuous action, and propensity toward escalation. The second nature of war, a chameleon-like character according to Clausewitz, consists of a capacity to assume various forms over time as enemies introduce new weapons, tactics, techniques, and procedures. Thus warfighting remains in a constant state of flux. A successful approach in one era may yield little in another. Combined, the internal and external characteristics of war make it a complex of independent and dependent variables that interact in unexpected ways to produce multiple outcomes in a range of dimensions.

Inter-Dimensionality

To grasp this interplay, military theory must assume an inter-dimensional approach. Inter-dimensionality is more than adding one dimension to another: it requires rotating, translocating, and transforming axes in multiple ways to examine the effects of various combinations of events at different times (figure 1). This sort of thought process stretches intellectual capacities to the limit. However, advances in information-age technology can assist in multidimensional conceptualization by allowing us to construct computerized models to simulate the battlefield (for example, JANUS) and rapidly wargame scenarios from as many perspectives as can be built into the system. On the other hand, such simulations will probably never accurately replicate Clausewitz's imponderables which by definition defy quantification. Multidimensionality must thus include the commander's intuition and *coup d'oeil*. Finally, we must never use it to predict, only to problematize.

Hitherto, theory has not addressed the inter-dimensional nature of warfighting or war itself as a broad-based, interactive, and dynamic continuum. Military theorists have always viewed war in a segmented and compartmentalized fashion. They have analyzed warfare by breaking it into its essential parts and classifying it. Such analyses have addressed issues ranging from the complex relationships between politics and strategy to the practical conduct of war—whether conventional, nuclear, or some other variety. Overall, these analyses have contributed immensely to the way we see war. However, with the notable exception of Clausewitz's *On War* which remains incomplete, these contributions either left their subject

in a disassembled state or never approached war as an interactive whole in the first place.

A brief and by no means conclusive review of their efforts will serve to illustrate the major trends of military theory. Vegetius, like others, approached war to reform its methods of conduct. His classical work, *On Military Affairs*, enjoyed more influence a millennium after it was written, but suffered from numerous misunderstandings and impracticalities concerning weapons systems of the period. Machiavelli, too, advocated military reform; he developed principles derived from the ancient Roman model and insisted on applying them to Renaissance warfare. Montecuccoli concerned himself with reducing military expertise to fundamental rules and incorporating them in a theory of war. Clausewitz, perhaps the most profound military thinker, came nearest to actually developing such a theory of war, one that reflected the multidimensional and dynamic character of conflict. Due to an untimely death, his work went unfinished and remains largely misunderstood. Basil Liddell Hart, deeply affected by the catastrophic loss of life in World War I, also sought to reform the conduct of war. He developed an indirect approach to strategy which he argued would be more effective and less costly than head-on counterparts. Edward Luttwak's historical studies provide thorough and painstaking analyses of the way that governments from Rome to the Soviet Union developed and executed strategy; however, his work amounts to a theory of strategy as a process rather than of war as a phenomenon. Not surprisingly, the views of each of these thinkers reflect one or more of the intellectual undercurrents of their own day as well as their experiences. Our efforts to place war within a theoretical framework rarely transcend their socio-cultural milieu. On the contrary, it is that very milieu which provides the substance and context of meanings for developing and communicating ideas. Paradigm shifts and intellectual revolutions within the larger milieu will often, in one way or another, inform military theory.

intellectual revolutions within the larger milieu will often inform military theory

The scientific community is on the verge of a paradigm shift. Information-age technology in the form of computer simulations and math coprocessors makes nonlinear calculations a matter of routine. Scientists in every field have begun to re-examine or in some cases jettison traditional linear models in favor of more dynamic, open-ended, nonlinear ones. Consequently, information-age technology has launched a scientific revolution equal to that which brought 16th and 17th century Europe from a theologically to a mathematically described universe. This revolution shatters the paradigm of a "clockwork universe" expressed in Newton's laws of motion whereby equilibrium formed the natural state of the physical world.

This new paradigm assumes that continuous change and dynamic interaction, rather than equilibrium, represent the normal state of the universe. It employs an interdisciplinary rather than segregated approach to science, borrowing from disparate disciplines to explain the dynamic nature of physical phenomena. The fundamental principles of this new paradigm maintain that:

- every system component, no matter how small or insignificant, plays a part in deciding the outcome; thus we must treat systems holistically rather than focusing only on key players
- predictable and nonpredictable phenomena coexist and interact in the physical world to produce complex networks with too many variables or relations to consistently calculate outcomes
- a small change in the input to a system can result in disproportionate effects
- systems—individuals, armies, bureaucracies—tend to evolve toward greater complexity
- complex adaptive systems spontaneously reorganize themselves when confronted with challenges; at such moments systems are generally found at their most innovative and creative.

This paradigm shift offers unique opportunities to theorists. We now possess the tools and intellectual framework to construct a theory of warfare that more accurately reflects the dynamic and inter-dimensional nature of conflict. A new theory in turn will lead to a better understanding of war and a more realistic representation of warfare in professional study and instruction. Of course, as Clausewitz warned, no theory can predict the outcome of a conflict.

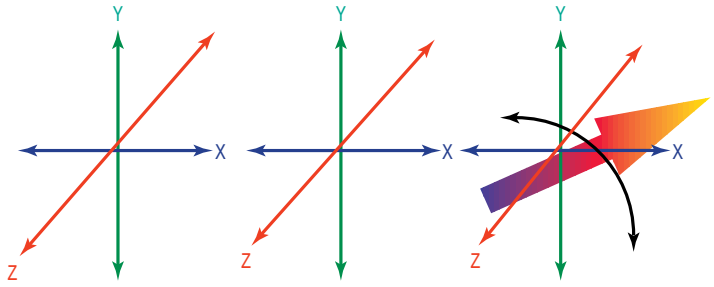
Historical Perspectives

New military theory contributes three additional characteristics to an understanding of war. First, it proceeds with the assumption that war operates as a continuum. In other words, war as a state of being exists before the first clash of arms or official declaration of war and may continue beyond the final treaty or cease fire. We identify September 1, 1939 and August 15, 1945 as the start and the conclusion of World War II; yet these dates omit a great deal. They do not account for Germany's military build-up in violation of the Versailles Treaty, the invasion of the Rhineland, the annexation of the Sudentenland and Czechoslovakia, or the so-called *Anschluß* with Austria. They also exclude Italy's conquest of Ethiopia and Japan's invasion of Manchuria. In fact, to fully understand the conditions that gave rise to World

***USS Lake Erie* leading ships in the Pacific.**

U.S. Navy (James W. Olive)

Figure 2. Multi-dimensionality



War II one must go back at least to the end of World War I, to the provisions of the peace treaty, the issue of war guilt and reparations, the global depression of the 1930s, and the ultimate failure of the Weimar Republic. Moreover, the struggles between the Soviet Union and the West which ushered in the Cold War period had their origins in World War II. Key players changed roles slightly, but a new state of war began to emerge before, and continued well after, 1945. Thus we might extend Clausewitz's definition of war as a "contest between opposing wills" to include the idea of war as a contest between opposing wills expressed violently via aggressive channeling of national power (see figure 2). Indeed, war becomes nothing more than a deliberate focusing of national power to achieve an objective.

Second, the multiple dimensions of war interact dynamically. Events from one flow into others. Decisions made in the political domain can impact events in the operational dimension and vice versa. Bismarck's decision to storm the fortress of Düppel in the Schleswig-Holstein War of 1864 emerged purely from a desire to acquire political clout by demonstrating Prussian resolve. Political circumstances in early 1916 dictated the execution of the Somme offensive at a time and place—one of the strongest points in the German line—that neither Douglas Haig nor Ferdinand Foch wanted. In each case, decisions made in the political domain directly affected events in the

operational dimension. On the other hand, the battle of Antietam (Sharpsburg) in 1862 is a case of operational events affecting other dimensions. Antietam ended in a tactical draw when McClellan failed to take advantage of several opportunities to annihilate Lee's army; but clever manipulation of the outcome by Lincoln yielded a strategic, political, and moral victory for the North. Antietam resulted in the continued isolation of the South from Europe, prevented Maryland's secession from the Union, and gave rise to a moral victory with the Emancipation Proclamation a few days later. Thus an essentially indecisive event in the operational dimension produced conspicuous effects in the logistical, political, and social dimensions of war.

Third, all events in war have weight; even the least can have disproportionate effects. For example, the personality of a commander looms as large as the size and preparedness of an army. Prussofilia on the part of Czar Peter III saved Frederick the Great from probable defeat in 1763. Peter, a prince of Schleswig-Holstein, an honorary general in the Prussian army and a long-time admirer of Frederick, assumed the throne on the death of Empress Elizabeth and reversed Russia's political course away from participation in the Seven Years' War, an endeavor which many in his court considered little more than a near-ruinous expedition to further the glory of an ally, Austria. The fortuitous discovery of Lee's "lost order" (special order 191) by Union troops before the battle of Antietam gave McClellan the information he needed to attack and destroy the Army of Northern Virginia. Nonetheless McClellan's dilatory nature saved Lee from utter defeat. Likewise, an event as simple as an undelivered message can be catastrophic. Soldiers of the Royal Newfoundland Regiment failed to get word that their attack on the afternoon of July 1, 1916, the first day of the Somme offensive, had been canceled. Consequently, they advanced unsupported and in single-file through narrow gaps in their own wire that were covered by German machine guns. The regiment suffered 85 percent casualties launching an attack that should not have occurred.

A dynamic, inter-dimensional approach to military theory requires corresponding changes in doctrine. Specifically, doctrinal vehicles such as FM 100-5 must stress the interconnectedness of the dimensions of war. Doctrine forms the basis of the Army's warfighting philosophy and instructs, guides, and educates military professionals of all services. Accordingly, it must clearly convey the nonlinear nature of war and recommend suitable tactics, techniques, and procedures. It must encourage a multidimensional approach to military problems and emphasize that wars do not occur in a vacuum.

The changes wrought by RMA will likely make warfighting more rather than less difficult. The means, environment, and dimensions of future war continue to transform it. To keep abreast of such changes, we need an integrative, multidimensional approach to military theory—one that remains relevant to developing practical warfighting doctrine. Thus theory must approach warfare as a phenomenon comprised of continuous change and dynamic, interactive dimensions rather than as a closed system predicated on the notion that balance and equilibrium represent the natural state of the universe. Thanks to revolutionary developments in computer-age technology and a shift in scientific thinking, we have the means to develop, sustain, and use an inter-dimensional approach to war. Doing so amounts to nothing less than a revolution in military theory. JFQ

This article is an edited and abridged version of an entry that received the prize for the best submission by a junior officer in the 1996 *JFQ* "Essay Contest on the Revolution in Military Affairs" sponsored by the National Defense University Foundation.