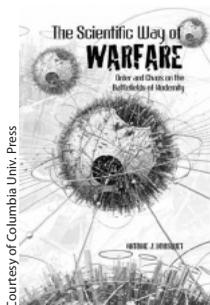


religious Pennsylvania city, this allowed the reviewer to connect with many of the author's revelations. If this book is any indication of the quality of the *Legacies of War* series, look forward to the upcoming releases.



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The Scientific Way of Warfare: Order and Chaos on the Battlefields of Modernity

by Antoine Bousquet

Reviewed by Kevin J. Cogan, COL (USA Retired), a former General Broehon Burke Somervell Chair of Management, US Army War College

If you like neither science nor military history, stop here and skip to another review. If you are still here, then first there is a little test: Jomini, Sun Tzu, von Moltke, Clausewitz, Napoleon, Frederick the Great, Boyd, Gell-Mann, Chomsky, Gödel, Mandelbrot, von Neumann, Lorenz, Schrödinger, and Shannon. If you are comfortable with the first six or seven names but started to fade with the latter names on the list, then reading this book will not extend your knowledge of warfare, but you will learn more about science. And if you were comfortable with the last half of the name list but not the beginning, then you will enhance your military acumen when reading this book. And if you are familiar with all the names on the list, you are not as likely to learn more about science or warfare, but rather you will modify your view of the world and its future in both domains.

The author organizes his book not by date, but around metaphors to describe modern battlefields: the clock for the mechanistic warfare era, the engine to introduce thermodynamic war, the computer to express cybernetic warfare, and the network to reveal the future vision for chaoplexic warfare. The reader is fortunate to have a common familiarity with the clock, the engine, the computer, and (maybe) the network (network in the sense of social networking, not routers and servers). From this familiarity, it is easy to see the impact that science has on warfare, not from a technical sense, but rather in the cultural way that society adopts its new technology and then manifests its acceptance of it throughout society including warfare. There are two primary points that the author makes: first, society has to eventually accept the new technology where acceptance is the internalization in everyday life of the science that has been wrought; second, with attribution to Alvin Tofler, “nations make war the same way they make wealth.” This latter point is expressed somewhat late in the book and the reader is left wondering when the philosophical underpinnings will emerge, and when they do, he finds that Bouquet's sentiments toward the United States are not very flattering. Be that as it may, it is amusing to associate the clockworks of the 16th century with the mechanistic way of war—structured, organized, precise, cause and effect. Armies march in step, obey predetermined orders, obey the “clockmaker” and hope that it worked when the smoke cleared.

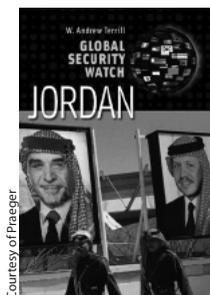
The emergence of the science of the engine, which transformed society as it entered and accepted the new industrial age, also transformed waging war with entropy, ballistics, and motors which define the thermodynamic era of warfare. Most notably, this era heightened destruction produced by more energetic weapons (to include nuclear) and eliminated any predictability that might have been assumed in the mechanistic (clock) era. The author injects Clausewitz's "fog of war" concept in the thermodynamic era but will also return to it when the cybernetic era is presented. The cybernetic way of warfare is delineated as post-Hiroshima which unleashed the most energetic means of war to that date. It was thought that cybernetics could either deter or control nuclear war with the new weapons of command and control, communications, computers (von Neumann), operations research/systems analysis, information theory (Shannon), and chaos theory (Gödel, Mandelbrot). The cybernetic way of warfare ushered in the belief that information was the opposite of entropy (thermodynamic warfare) and thus the probability of vast destruction could be controlled through robust command and control networks such as the World Wide Military Command and Control System (WWMCCS) and other similar references.

With another stroke of disparagement towards the United States in the application of cybernetics in Vietnam, the notion of nonlinearity (chaos theory) and its mathematical underpinnings are introduced to state why low-intensity conflict is such a difficult task. Indeed, society widely accepted the computer in the last decade of the 20th century. Its adaptation to warfare had hoped to find order in disorder. Now enter chaos theory, complex adaptive systems, decentralization of command, and network centric warfare. Reenter Clausewitz and the fog of war as well as his friction in war. The author neatly marries Clausewitz's "friction" with chaos theory's "butterfly effect" of Lorenz which both essentially state that small disturbances in the initial conditions can have a great effect on the outcome.

At about this point the reader may have been fairly comfortable with the clock, engine, and computer metaphors for the scientific way of warfare. After all, at the dawn of the 21st century, these metaphors have been common societal and culturally accepted experiences for most. But the last metaphor, the network, is used to describe the emerging (and not yet accepted) chaoplexic way of warfare. Now the reader might say "I really don't want to read this anymore" but is committed to finish with only 80 pages to go. Here, physicist Murray Gell-Mann states that complexity, defined as "the edge of chaos," is at its maximum between the extremities of order and disorder. At this "edge" the author will show that positive feedback in decentralized and distributed networks will yield structures that are at their peak adaptability and creativeness. The warfighter reader might translate this to mean that the soldier immersed in the fog of war at the edge of the command and control system will emerge as the best decisionmaker. This is the antithesis of the clock metaphor, the earliest era of modern warfare presented in the book. But the notions of nonlinearity, complexity science, and self-adapting networks are not yet intuitive to most readers not to mention societal acceptance which was earlier stated to be

necessary for adaptation of new science to warfare and a manifestation of the way nations make wealth.

Although chaotic warfare may yet seem far off, reading about its possibilities, with the book's ample references to other texts, may be a fertile launch point for further independent research for both the military-minded and scientific-oriented readers. This was a good place to end the book. Unfortunately, the author regresses by trying to integrate Gell-Mann, John Boyd's Observe, Orient, Decide, and Act (OODA) loop in great detail, and an emerging "chaotic Clausewitz" by stamping it with quotes from the US Marine Corps' *FMFM1: Warfighting* manual. The real purpose of this last chapter, as this review alluded to earlier, is to denigrate the US adoption of Network Centric Warfare, also known internationally as NATO Network Enabled Capability (NNEC). Some may welcome this, but it really is an unnecessary political discourse and detracts from the otherwise excellent science/war dynamic of the book's stated intent. The first three metaphors effectively integrate science and warfare as a duality for each of the modern warfare eras. The last era, chaotic warfare, has yet to unfold and should have enjoyed greater elaboration in that chapter. If it had, the reader would recognize that each era of warfare was followed by accelerated adoption and societal acceptance of a new science and that chaotic warfare may be here faster than currently imagined.



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Global Security Watch: Jordan

by W. Andrew Terrill

Reviewed by Colonel Robert E. Friedenberg, currently serving as Senior Defense Official and Defense Attaché, US Embassy Damascus, Syria

Jordan is a poor Arab country with few natural resources, no oil, and a small population, yet its strategic importance has outweighed its lack of attributes. How have the Jordanians achieved this? Will Jordan remain strategically relevant to the United States following combat operations in Iraq, Jordan's neighbor to the East?

Dr. W. Andrew Terrill, a research professor at the US Army War College, attempts to answer these questions in this book. Well researched and clearly written, his book begins with an overview of Jordanian history, effectively combining both older sources and very recent ones. Weaving a narrative from current King Abdullah II's grandfather, Abdullah I, to his father, Hussein, to the present day, Terrill shows how the earlier monarchs managed threats, balanced competing interests and maintained alliances. Following a chapter on Jordanian political, economic, and military systems, Terrill then goes into detail on Jordanian relations with the Palestinians, the United States, Israel, its Arab neighbors, and Iran. It is here that the author's strengths as a historian of the region come into focus. Dr. Terrill has written in the past on King Hussein's rivalry with Yasir Arafat and the Palestine Liberation Organization