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Of Arms and Men: A History of War, Weapons, and Aggression

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and social processes. We may not be able to control events, and every run made by our computers may produce different results, but when we study these models and their results we can begin to understand intellectually what was previously appreciable only after years of experience.

The computer programmed with chaos models may be the peacetime substitute for experience that was lacking in the Austro-Hungarian Empire—and the Cold War Pentagon. It is a school whose knocks are realistic without being devastatingly hard. Chaos models have the ability to show us how the unpredictable happens; they remind us that information is generated bottom-up, from the “bloomin’ buzzin’ confusion” of thermodynamic reality. Using chaos models may even nurture concepts of leadership more attuned to the demands of a technologically dynamic, continually evolving environment.

Gleick’s book introduces readers to some of the subtleties, most of the themes, and all of the major figures involved in the chaos revolution, but it does not show how the science of chaos can be practically applied. There are no mathematics here. However, the book will whet appetites for similar works.

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O’Connell, Robert L. *Of Arms and Men: A History of War, Weapons,*

and Aggression. New York: Oxford Univ. Press, 1989. 367pp. \$24.95

Evangelista, Matthew. *Innovation and the Arms Race: How the United States and the Soviet Union Develop New Military Technologies.* Ithaca, NY: Cornell Univ., 1988. 300pp. \$34.95

Given the proliferation of books addressing the relationship between technology, weapons, and warfare, a good historiographical introduction would be a welcome addition to one of them. Although Robert L. O’Connell’s *Of Arms and Men* features no such introduction, it does contain a prefatory justification for its existence. As a historian, civil servant and member of the U.S. delegation to the Conference on Disarmament in Geneva, O’Connell was dissatisfied with the way weapons had been studied. He was predisposed to believe “that the relationship between man and his weapons is a great deal more intimate and complex than heretofore has been admitted.” Our intimacy with weapons has developed over the millennia and is more the consequence of prehistoric man’s existence in a state of nature (the hunt) than our experience with total war. O’Connell examines how these aptitudes have governed innovation and warfare from ancient Sumeria to the present.

The particular insight which distinguishes Mr. O’Connell’s work from others is his examination of human belligerence from a perspective normally reserved for anthropologists and biologists. Central to his analysis is the distinc-

tion they draw between predatory aggression and intraspecific aggression (i.e., aggression among members of the same species).

Although O'Connell advises his readers that the question requires much more work, he nevertheless believes that it is instructive to compare our warlike proclivities with those of other animals. He notes that animals normally prey upon other species, but largely ritualize and consequently minimize the lethality of aggression within their own species (the piranha, for example, uses its teeth against other species, but strikes other piranhas with its tail fin). Man, however, is not only a predator of other animals, but also preys upon his fellow man to a degree which distinguishes him from other animals. Nevertheless, O'Connell focuses his attention upon the body of evidence which indicates that man often has chosen intraspecific restraint.

Controlled aggression within our species probably existed long before Homer's *Iliad* dramatized and imprinted it in our collective memory. Yet it was Homer's heroes, fighting in close, face-to-face combat against worthy opponents of equal rank, using similar weapons on a neutral field (away from women and children), who captured the European imagination. The warrior ethic of the Ancient Greeks influenced the martial activities of both the Roman legionaries and the Medieval knights (whose choice of the lance over the more lethal

crossbow, O'Connell asserts, was attributable to that ethic).

The gunpowder revolution all but nullified this heroic code. Soldiers became subordinate to weapons, wars were fought at greater, impersonal distances, and massive firepower created casualties of staggering proportions. Yet evidence of our intraspecific impulses persisted well into the twentieth century. These impulses influenced us to build dreadnoughts rather than submarines ("the whole manner of its attack implied skulking, treachery, and deception — qualities warriors traditionally disdained"), and directed aircraft technology towards the heroic (and relatively non-lethal) dogfight. But technology, predictably, surmounted such intraspecific constraints. Submarine warfare became acceptable, the airplane was utilized for bombing cities ("wholesale warfare against non-combatants"), and in the end, nuclear weapons were not only developed but actually used at Hiroshima and Nagasaki.

Given the focus of his study, O'Connell cannot offer us much hope. Notwithstanding the weak optimism of his final chapter, one concludes that nuclear weapons will probably be used again.

Matthew Evangelista's *Innovation and the Arms Race* offers us a startling alternative. Although he confines his analysis to the events of the last forty years, Evangelista's attempt to discover a "parsimonious" theory to explain the Soviet-American arms

race is as much all-inclusive as it is reassuring.

In brief, the professor (political science, University of Michigan) demonstrates that the United States, with its strong, diverse economy and decentralized political system, has a high capacity for innovation. Having high incentives, U.S. scientists normally initiate the process of weapons innovation by promoting their latest discoveries. At a second stage, the scientists generate interest within the military-technical community, often by advertising the new technology as all things to all people. At the third stage, the technology becomes a weapon. Advanced research and development is authorized, and bureaucratic turf battles erupt over whose weapon (and of what specific type) it will be. In the fourth stage, external threats (real or projected) are cited as justification for production of a certain weapon by a specific military service, and production of prototypes is authorized. At the fifth stage the weapon's promoters seek high-level endorsement in order to begin large-scale production.

In the Soviet Union (a weaker economy with a centralized political system), scientists seldom initiate the innovative process. They have almost no incentive to take risks, while numerous disincentives exist. There is almost no analogous second-stage consensus building, because the Soviet state's penchant for secrecy bottles up the few low-level ideas that emerge. Thus the initiative to innovate usually occurs at the third

stage, and after the Soviet leadership becomes aware of an external threat. They usually respond by directing short-term counters to the threat and approve long-term plans of symmetrical weapons development. At the fifth stage, large-scale production begins. Eventual quantitative superiority is the normal result.

Having introduced the reader to his theory, Evangelista then grounds it in a case study of the origins of tactical nuclear weapons, a study that consumes almost half of the book. He then devotes a chapter to examining the extent to which the histories of other American and Soviet weapons fit the theory. With but a few exceptions, they do.

Evangelista's study persuasively demonstrates not only that the United States has driven the arms race, but also that the United States consistently has "fallen victim to the fallacy of the last move — the belief that the Soviets would not choose, or would not be able, to match a U.S. initiative in the arms race." He therefore proposes a different approach: The U.S. should accept limits upon its technology in return for Soviet limits on quantity (e.g., Star Wars technology for SS-18 missiles).

Evangelista's study does contain a few shortcomings. It addresses neither the matter of incremental innovation nor the process which brings U.S. scientists to one discovery rather than another. Nevertheless, *Innovation and the Arms Race* is an extremely important work. Not only

is Matthew Evangelista's theory parsimonious, it is also definitive.

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Moodie, Michael. *The Dreadful Fury: Advanced Military Technology and the Atlantic Alliance*. New York: Praeger, 1989. 160pp. \$34.95

Michael Moodie has written an important book. The title however, is deceiving. He has focused more on policy aspects of technology and the Atlantic Alliance than on the military operational aspects of technology advances. His book addresses four questions that challenge Nato: 1) How can Nato cope with rapid and extensive technological change? 2) How can Nato's military structures adapt to take advantage of advanced technology? 3) How can Nato both share technology with allies and protect it from adversaries? and 4) How should Nato organize its industries to respond to technological changes?

The technical substance of the book is frustrating. It has the feel of commercial brochurishment: positive and upbeat about the potential of new capabilities, generally non-specific, overly simplified, and full of contemporary buzzwords ("quality vs. quantity," "hi-tech vs. low-tech," "revolution vs. evolution," etc.). More substantial are the policy and political discussions which address industrial and defense policy dimensions of technology protection and technology transfers. The com-

plexities of international arms cooperation are treated with insight, both in regard to potential benefits and possible problems for domestic industry. U.S. policies behind the Balanced Technology Initiative and Competitive Strategies programs and their implications for Nato are explored in the concluding chapter of the book.

The author is a senior fellow at the Center for Strategic and International Studies and spent four years as a special assistant to the U.S. ambassador to Nato. His perspective, therefore, is more that of the alliance than American, which makes this book different from most of those published in this country on this subject. Three significant case studies are used to highlight Moodie's points: the potential for "Follow-on Forces Attack" that may result from technology advances is used to illustrate the options that technology may offer commanders in the future; the "Toshiba-Kongsberg Affair" is used to illustrate technology transfer challenges; and the "European Fighter Aircraft" is used to examine arms cooperation.

Moodie's clear enunciation of both the obstacles to and potential benefits from wise choices in regard to technology may help Nato policymakers (and their advisors) steer a more steady course through the turbulent 1990s.

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