A Review of *Science, Strategy and War: The Strategic Theory of John Boyd*

written by Frans P. B. Osinga
reviewed by Sean Lawson
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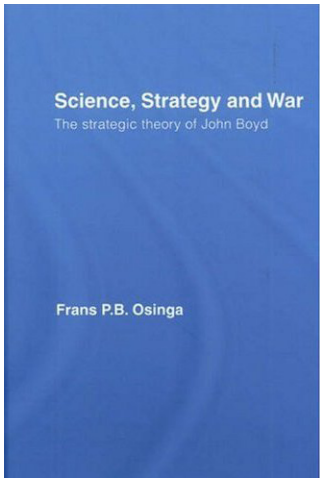

The title of Osinga's book conveys well the overall focus of the study: the often overlooked but profoundly important relationships among science, military strategy, and war. It is a big topic, to be sure, so to ground his study Osinga has chosen to explore these relationships as exemplified in the strategic theory of the late USAF Colonel John Boyd, a former fighter pilot and intellectual core of the Military Reform Movement of the late 1970s and 1980s. He examines the role of science in shaping Boyd's thinking, and the impact that his thinking has had upon the U.S. military since Vietnam.

Over the last thirty years, Boyd's ideas have had a profound impact on the U.S. military, as well as the business community. He is most famous for his OODA (Observation-Orientation-Decision-Action) loop theory of knowledge formation. The OODA loop describes how humans interact with their environments to construct mental models of their environment that are shaped both by immediate observation and orientation (pre-understanding based on previous experience, culture, history, genetics, etc.). These mental models are used to decide upon and carry out courses of action. The results of action feed back into the system through observation. Yet, there is always a necessary tension between the mental model and reality, resulting from the fact that orientation shapes perception. As time passes, Boyd argued, a mismatch develops between mental models and reality. When individuals or organizations become internally focused, sticking to out-dated orientations, a breakdown occurs in understanding, leading to disorder, chaos, confusion, and panic. Thus, the process, according to Boyd, is always one of "destruction and creation," destroying old models and creating new ones in a never-ending cycle, with the goal of adapting to an ever-changing environment so as to promote individual or organizational survival by increasing the capacity for independent action.

Osinga's goal, then, is to "provide a better understanding of the strategic thought developed by John Boyd" (p. 1). In so doing, he aims to correct a number of misconceptions related to Boyd's thinking. He argues that "Boyd's OODA loop concept, as well as his entire work are more comprehensive, deeper and richer than the popular notion of 'rapid OODA looping' his work is generally equated with" (p. 7). Additionally, Osinga argues that Boyd's thinking is about more than "tactical and operational level war fighting," but "also about organizational agility, about the creation of organizations in general" (p. 7). As such, he asserts that we can learn as much from the way that Boyd thought, constructed arguments, and the sources he used, as from the content of his ideas.

To achieve his goal, Osinga has made the greatest use yet of Boyd's personal library and collection of personal papers archived at the Marine Corps University in Quantico, Virginia. For his research, he read the same books that Boyd himself read, using Boyd's handwritten notes, marginalia, and markings in those books to determine from where Boyd was drawing specific ideas, as well as which authors and books had the greatest impact upon Boyd's thinking. He uses his sources to take the reader on an intellectual journey through the "formative factors" that shaped Boyd's thinking, trying

as much as possible to recreate the process of learning that led to Boyd's theory. With these formative factors in mind, he provides an exhaustive explanation of Boyd's thinking.

Osinga's second chapter is devoted to exploring three of the four "formative factors" which shaped Boyd's thinking. First, based on previous biographies by Robert Coram and Grant Hammond (Coram, 2002; Hammond, 2001), Osinga quickly summarizes Boyd's professional background, including his days as a fighter pilot, his educational background in both economics and industrial engineering, and his work in aeronautical research and fighter aircraft design. Next, he recounts Boyd's central role in the debate over military reform which took place in the United States in the aftermath of Vietnam. Finally, he examines the way that Boyd's study of military history shaped his thinking.

In an effort to trace the changes in science that influenced Boyd's thinking, chapters 3 and 4 "present a panorama of the scientific *Zeitgeist* of Boyd's lifetime" (p. 52). For its part, chapter three examines the impact on Boyd's thinking of early twentieth century developments in science, as well as the philosophy of science. Beginning with the philosophy of science, he examines the importance of Boyd's study of the writings of Karl Popper, Michael Polanyi, and Thomas Kuhn. He continues by tracing the emergence of a more nonlinear, holistic worldview within twentieth century science which, he argues, had its roots in scientific developments such as thermodynamics, the theory of evolution, relativity, quantum mechanics, the Heisenberg uncertainty principle, and Goedel's incompleteness theorem. He demonstrates the impact on Boyd's thinking of this shift, in addition to the impact of postwar developments in cybernetics and "systems thinking." Taken together, these developments served as the conceptual and metaphorical foundations of Boyd's 1976 essay, "Destruction and Creation," which formed the intellectual core of his subsequent work.

Chapter 4 demonstrates the importance for Boyd's thinking of the neo-Darwinist work of Richard Dawkins and others, Ilya Prigogine's work on dissipative structures, and finally the emerging sciences of chaos and complexity. When combined, these ideas led Boyd to see militaries as open, complex, adaptive systems which exist far from equilibrium in the chaotic, unpredictable environment of war, in which change is constant and the effects of change are nonlinear. Finally, and perhaps most surprisingly, Osinga outlines the similarities between Boyd's thinking and the postmodern philosophy and social theory of scholars such as Jean-Francois Lyotard, Anthony Giddens, and Jacques Derrida.

The last three chapters put knowledge gained in the previous three chapters to good use by providing the most thorough and in-depth explanation of Boyd's thinking to date. In chapters 5 and 6 he takes the reader slide by slide through Boyd's fourteen-hour briefing, "A Discourse on Winning and Losing," explaining every idea, where it came from, and its importance to Boyd's overall theory. The last chapter argues for the continuing relevance and influence of Boyd's ideas by reviewing the recent works of a number of prominent U.S. military thinkers whose own theories either share an affinity with Boyd's ideas, or were directly influenced by Boyd's ideas.

Osinga's years of studying Boyd have paid off; there is no doubt that he accomplishes his objective. One cannot read this book without coming away with a deeper understanding of Boyd's thinking. He absolutely demonstrates the importance for Boyd's thinking of concepts and metaphors drawn from emerging science. In so doing, he helps to provide a needed, general corrective to the history of science literature which has been concerned mainly with the impact of the military upon science, but not the reverse. In particular, he invalidates the arguments made by a number of historians of science who have argued that the emerging sciences of chaos and complexity have had no impact upon U.S. military thinking (Gray, 1998: 2) and that the Military Reform Movement had no lasting impact (Edwards, 1996: 287-288).

The main weakness of Osinga's book is that it leaves the reader wanting more. First, while examining the "scientific *Zeitgeist*" during Boyd's lifetime helps to explain where

his ideas came from, it does not explain why Boyd's ideas were successful, why they persisted while so many others failed.

Second, as previously mentioned, while Osinga provides a needed corrective to the literature on the relationship between science and the military, he may have gone too far in the other direction. In Osinga's account, science seems to come from out of nowhere to impact military thinking. However, there was (and still is) very much a circular relationship between the military and science. There is a need to better integrate the story of Boyd's thought and contributions with what historians of science have already written about postwar American science, particularly the histories of cybernetics, operations research, and systems analysis (see Fortun & Schweber, 1993; Galison, 1994; Ghamari-Tabrizi, 2000; Hughes & Hughes, 2000; Mindell, 2002), each of which were important to the military but receive too little attention in Osinga's account.

Finally, Osinga's treatment of Boyd's thinking is largely uncritical. If Boyd is correct (and Osinga makes a strong case that he is), then we should expect that there are mismatches between Boyd's theory and reality, imperfections and contradictions that will lead to its evolution over time. Otherwise, stagnation will lead to death. Thus, there is a need to explore those mismatches, imperfections, and contradictions, not to denigrate Boyd's theory, but to build upon and expand it. Osinga has proved himself most qualified to take on this task.

However, none of these criticisms can or should overshadow the success of Osinga's endeavor. They merely suggest that he has not, in fact, written the final word on Boyd, that there is much work left to be done where Boyd's ideas are concerned. That is one of the greatest tributes he could have paid to Boyd. Osinga's book should be read by military professionals and academics alike, but also by anyone interested in the social and cultural impacts of science in general, and chaos and complexity theories in particular. *Science, Strategy and War* will and should remain required reading for years to come.

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