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On Strategy, I: Chaos Confounded?

Strategy is difficult to do, but it is not impossible: chance always threatens to rule in war, but it does not reign. Clausewitz can mislead when he writes: 'In the whole range of human activities, war most closely resembles a game of cards.'[1] In emphasising rightly the roles of guesswork and luck in war, exactly because 'No other human activity is so continuously or universally bound up with chance',[2] he risks turning a sound point into an unsound one. It is almost mischievous for Clausewitz to hazard the analogy between cards and war, because there is a truly vital difference between them. Cards are dealt literally at random. By contrast, the dimensions of war and strategy include chance and uncertainty (perhaps gathered in the broad church of 'friction'),[3] but they do not reduce to them. Card players are obliged to perform with assets randomly selected, strategic players are not. To develop the analogy further, strategic performance is not akin to skill in poker. The superior poker player plays the person not the cards. The poker wizard will always win conclusively against inferior players, regardless of the cards that are dealt (at random of course), provided only that a series of hands is allowed. The luck of the cards has next to nothing to do with it. Needless to add, for players of equivalent skill, better cards could be the difference between them. In war, as in life, while a cruel and capricious fate may thwart rational calculation and predictability, by and large it does not. Ceteris tolerably paribus, objectively better armed forces tend to win wars.[4] Strategic skill is important, but unlike the case of poker, alone it is not a reliable foundation for victory. Inputs for strategic behaviour can reasonably be assumed to bear some usefully proportional relation to strategic outcomes. This is to say that strategic behaviour is substantially linear in character. None of this challenges the importance of chance, risk, accident, uncertainty, friction of all kinds, or guesswork. But it does challenge the strangely counterfactual and counterintuitive proposition that 'chaos rules' in war. Chaos does not rule. To paraphrase and expand on the biblical aphorism: 'the race is not always to the swift, nor the battle to the strong',[5] but that is the way to bet.

The discussion here and in Chapter 5 builds upon the brief remarks offered on strategy in Chapter 1. The purpose is to provide a theory usable for understanding how RMAs might work, and sufficiently flexible so that it can grow with feedback from analysis of historical data. Data as candidate evidence is

deployed in Chapters 6–8. Succeeding sections below explain the meaning of strategy, pursue its nature and character, explore the central issues of chaos versus predictability, and conclude by posing and answering the vital question of whether, or to what degree, strategy is 'chaotic'. The second chapter devoted to developing a usable theory of strategy—Chapter 5—considers RMAs as strategic behaviour and explains the multidimensional structure and dynamics of strategy. These two chapters stand or fall on their ability to present a theory of strategy which can help unlock the otherwise highly complex mystery that is the historical process of RMA.

Chapter 3 outlined a fairly rugged theory of RMA, but that theory would hang as if it were suspended in a vacuum were it not employed and exploited by a theory of strategy.

Lest there be any confusion, the theory of strategy and the theory of RMA are not comparable in importance or existentiality. There is always strategic effect, whether or not the bridge of strategy is solidly built and well maintained. Strategy as the purposeful threat or use of force for policy ends has to matter. There is a sense in which even if strategy as 'a plan of action' appears to be missing from action,[6] strategic effect will occur anyway, albeit significantly unplanned. By contrast, RMA theory is eminently contestable both conceptually and empirically. It is much more important to understand strategy, what it is and how it works, than it is to develop RMA theory. However, the RMA hypothesis, for all its fragilities, has an intriguing potential to provide, slingshot-like, 'gravity-assist' acceleration to the spacecraft of the theory of strategy. That is the guiding principle behind this analysis. RMA theory can help us understand how strategy works. The point is well made by Roger Beaumont when, discussing 'nonlinearity-complexity- chaos research', he writes: 'Even if such concepts proved to be transient faddism, weighing fresh ideas can lead to a reconsideration of basic principles and assumptions.'[7]

WHAT IS STRATEGIC?

As Clausewitz insists, 'Everything in strategy is very simple, but that does not mean that everything is very easy.'[8] Perhaps strange to record, the most essential aspect of strategy, the core of its meaning, is easy to grasp yet seems everywhere to be resisted. That core of meaning is the instrumentality of the threat and use of force. It is quite common, though not always helpful, to think of strategy as a plan of action, as a plan for using military means to achieve political ends. Why introduce the implied formality of plans and planning into a working definition? So many people have difficulty comprehending the core notion of strategy as the use made of force, or military means, for the ends of policy, that the strictly redundant introduction of the idea of a *plan* of action introduces gratuitously a further source of potential

distraction. The principal wrecking beacon for the understanding of strategy is the attractive power of the military instrument itself. The use of force is confused with the use made of force. The difference is small on the page, but cosmic in understanding.

There are many interesting and more or less useful definitions of strategy. For the purpose of this enquiry, to repeat the verbal formula offered in Chapter 1, strategy is understood as *the use that is made of force and the threat of force for the ends of policy*. Any fuzziness on the core meaning of strategy must impede progress in this analysis. Our approach to, and redesign of, RMA theory requires conceptual clarity. A great deal of the historical judgement on what is, and what is not, evidence for this or that RMA idea, lies in the realm of speculation and argument. It follows that special significance attaches to such navigation aids as are at hand. Sharp-edged and consistent employment of strategy and strategic is the leading such aid.

The strict idea of strategy as the bridge connecting the worlds of politics and military power, and expressing the consequences of the uses of military power, is extraordinarily important for research into RMA. My (neo-Clausewitzian) definition does not allow inherent, out-of-context, unusual importance to any particular kind of military instrument or mission. All forces are strategic in their effect, ergo none are distinctively strategic as a matter of general principle. As with *Qi* and *Zheng* in the Chinese military classics,[9] which is to say approximately the distinction between unorthodox and orthodox, so more strategic and less strategic is a difference that always must be determined locally. There are and can be no strategic forces *designated as such*, because strategic does not—at least, should not—mean (for example) nuclear-armed, long-range, or independently decisive. In each conflict, particular kinds of military forces will be relatively more significant than are others, but all forces generate strategic effectiveness on a sliding scale which registers near irrelevance at one end and close to the power of independent decision at the other.[10] Although strategy should be about attempting to achieve policy ends purposefully and hopefully in a predictable manner, in practice it is always about influencing the course of history. Plans may fail, assuredly they will need amendment in the real-time of unfolding events, but armed forces as threat and in action will help shape that course. When we dignify strategy to mean plans, as well as the use made of threatened action, we elect to emphasise the notion of value added by design to military behaviour.

It is significant for RMA theory that the understanding of strategy preferred here insists upon a holistic approach to military power. If one denies a necessarily strategic ascription to any particular character of military force—land, sea, air, space, mechanised, or whatever—then one is obliged to consider RMA in its full context. Recognition that all troops are ‘strategic troops’ and can,[11] in permissive conditions, perform the leading-edge role, should alert one to the possible limitations of some

lines of RMA advocacy. Could troop- and support-carrying helicopters, as well as helicopter gunships, effect an RMA, at least in air-land warfare in Vietnam in the 1960s? That question could not be answered with narrow reference to the allegedly new 'dominant weapon' of army aviation/air mobility itself,[12] nor even with regard to land warfare in south-east Asia. No matter how sound it was tactically and technically in general terms, the possible RMA, certainly MTR, of the new 'air cavalry' concept, had to play in a particular conflict. US Army aviation in the 1960s could not offer unusual military effectiveness ultimately for strategic effectiveness just because it was a truly revolutionary idea which worked. Armed forces, including armed forces shaped to express the latest RMA, work more or less well as an instrument of the complex whole of strategy in the context of real historical struggles. Deborah Avant makes this point convincingly.

> The primary aim of counterinsurgency operations should be to secure the population and ever-greater amounts of territory. Helicopter units allowed Army units to arrive in an area, kill some guerrillas, then leave without securing territory or population… In sum, the Air Cavalry, while a successful innovation, was of questionable importance for the counterinsurgency mission. Indeed, it was a successful innovation precisely because it was not designed for the counterinsurgency mission.[13]

Army Chief of Staff General Harold K.Johnson was surely sensible to advocate helicopter mobility because 'in the conduct of operations we are trying to escape the limitations that terrain imposes'.[14] The problem, as Johnson came to appreciate all too well, lay neither with helicopters nor with the air assault idea per se. Rather, the difficulty was that the US Army in Vietnam, commanded by General William C. Westmoreland, was conducting too many of the wrong sort of operations.

It is important to nest the theory and practice of RMA in the Clausewitzian understanding of strategy. Only as a consequence of that proper mental ordering is one likely to be suitably alert both to enemy options and to friendly synergies. Clausewitzian insistence on the instrumentality of 'engagements' helps counter the kind of goal displacement which sees armies promote their own organisational advantage as the supreme good. Sound strategy does not confuse means with ends, but the process of even honest promotion of much beloved means all but inevitably helps blur the distinction between the two. The political fight for a favoured RMA or MTR can hardly help but lead RMA visionaries, and then perhaps executors, to talk down rival, especially allegedly old-fashioned, military capabilities in order to promote the new.

Strategic understanding less than crystal clear on what is, and what is not, *strategic*, must risk misleading RMA debaters over the potential value of the novel capabilities at issue. Those challenged in their strategic comprehension also are likely to miss the synergistic benefit to be derived from using some of 'yesterday's' military capabilities in ways adjunct, or even integral, to more RMA-shaped forces. Above all else, inappropriate definition of *strategic* is very likely indeed to encourage unwise disdain for non-(or less)RMA forces and ideas, friendly and otherwise. A properly instrumental view of strategy and strategic enables us to construct the kind of scaffolding of theory necessary to explore historical RMAs fruitfully. That explanation should tighten our intellectual grasp on how strategy can work. If there is much that is mysterious about RMA phenomena, so a great deal remains to be explained about how strategy does its job.

PERMANENT NATURE, CHANGING CHARACTER

Strategy has a permanent nature, but an ever-changing character.[15] Nonetheless, the hypothesis of permanency can be challenged with respect to strategy's fit with both premodern and postmodern contexts. In addition, one can argue that in practice strategy tends to be captured by the structural dynamics of war, which is to say by war's very nature. Let us consider these points briefly.

First, challenge to the integrity of strategy's logic for premodern times focuses on the alleged inappropriateness of the concept of 'policy' in the means-ends nexus. The circular point is made that prior to the formation of modern states, the more or less organised violence that we identify as war quite literally could not serve the ends or objectives of such states (which did not exist).[16] 'War' could be conducted expressly as the expected social behaviour of a warrior class who waged it in large part because that was its function; it could be pursued to advance ideas of 'the right' (customary legal and religious); and it could be pursued for dynastic patrimonial advantage. But none of those long traditional premodern explanations of war fit comfortably within the strategic universe defined and explained by Clausewitz.[17] Premodern warfare does not pertain to a world wherein there is an inherently unstable equilibrium among the magnetic pulls of people, army and commander, and government with high policy.[18] Warfare as sacred duty, as existential expression of warriordom, as fun-filled energetic recreation, or as family aggrandisement, is not warfare as it was explained by Clausewitz as director of Prussia's Allgemeine Kriegsschule in the 1810s and 1820s.

Second, the postmodern challenge to the sense in strategy takes at least two forms. On the one hand, the point parallel to that just recorded for premodern times is noted: the arguably contemporary decline

of the state allegedly means a dead-end for strategy as the bridge between a state's policy and its military power. The decline and fall of (major) inter-state warfare has to imply a like obsolescence in the relevance of theory for such warfare, and specifically an eclipse of the authority of the leading theorist, Carl von Clausewitz. On the other hand, new forms in warfare, especially of nuclear and cyber kinds (though with biological and biotoxin possibilities in mind also), could threaten either to sever the logical links that make strategy work, if only in principle, or to alter war's very nature. The basic problem with strategy for nuclear weapons is not conceptual, rather is it almost extravagantly practical. Arguably, strategy cannot work for nuclear weapons because the military *instrument* might not be able to function as such. Nuclear weapons are so destructive that they are not obviously usable in action, which should mean that their use cannot credibly be threatened purposefully.[19] On this logic, nuclear weapons cannot function through strategy to serve policy. Even if one ultimately rejects this line of argument, as I do, still it requires careful answer.

It can be argued that cyberwar, including the use of electronic weapons of mass disruption, menaces the very core of the integrity of the concept of strategy and war. If cyberwar is war without the direct infliction of physical pain, what merit attaches to the more traditional definitions of strategy and war, including those strongly favoured in this book? Can cyber*war* in cyberspace fit the world of the strategist who requires and expects the threat and use of force to be wielded for policy ends?[20] Is electronic warfare congruent with the idea of the threat and use of *force*? In what sense can cyberwar be an expression of organised violence for the objects of policy? The answer to questions such as these, and to the challenges to the theory of strategy cited above as respectively pre-and post-modern, lies in a functional approach to strategy's meaning and purpose.

There is some truth in each of the criticisms just noted of strategy *à la* Clausewitz. However, those truths really amount to little more than restatement of obvious and incontestable facts. Unquestionably, the character of the political context, of warfare itself (which is to say, of war's 'grammar'),[21] and therefore necessarily of strategy, has shown much evolution, and possibly the detailed working of occasional revolution, over the course of history. That granted, this author discerns no pressing reason to confine the applicability of strategy, even of strategy as explained in Clausewitz's theory of war, to a modern era book-ended neatly by the Peace of Westphalia and the Yalta and Potsdam settlements. Politics and policy do not have to translate as the kind of politics and policy characteristic of modern times (a wide range indeed)[22] for them to function well enough as the ends in the means-ends nexus key to strategy.

There is no obvious reason to be strictly, indeed somewhat mindlessly, literal in scoping the domain of strategy and war. The military strategist employs military means in order to coerce for the control that

policy seeks.[23] But there is more to strategy than the military element, just as there is more to war than the organised and purposeful exercise of violence. If we are comfortable enough with the ideas of, say, political, psychological, and economic war, why not with cyberwar also? Each of those forms of warfare shares the characteristic of an absence of applied physical force. The policy-maker as grand strategist must choose among all the instruments available, including the military. My preferred definition of strategy—the use made of force and the threat of force for the ends of policy—signals unambiguously a focus upon physical coercion. That focus can be thought of as a beacon, a clear navigation aid. It is, however, compatible with the inclusion of matters that bear only fanctionally upon the subject. For discipline in analysis, it is helpful to assert some military centrality in the chosen definitions of strategy and war. Readers should interpret broadly both Clausewitz's reference to 'the use of engagements', and my resort to 'the use made of force and the threat of force'. Engagements need not mean battles, while the threat of force may loom more in the background to, than in the foreground of, events.[24]

Similarly, although war and warfare should not be divorced in our minds from the possibilities of organised violence as military force, they should be approached inclusively. For an apposite example, Norman Friedman writes contentiously but persuasively:

> There was never a victory parade, nor had there even been a declaration of war. Yet the Cold War was a real war, as real as the two world wars. It was not, as some imagined, an accident of misunderstanding. Conflicts such as those in Korea, Malaysia, Vietnam, and Afghanistan were all campaigns in the larger war. Throughout, the Cold War was shadowed by the hot war that might have been fought, the expected shape of which determined governments' reactions to unfolding situations.[25]

Third, in principle, war should be conducted by means of strategy to serve policy. In practice, policy can be conducted by strategy to serve war. This paradox is a political, but alas not a practical, absurdity. It is the core nature of strategy to be instrumental. Unfortunately, that inherent instrumentality is not tied to fixed identities for master and servant as between policy and war. An acute commentator notes that 'the nature of war is to serve itself'.[26] The same cannot be said of strategy. Strategy cannot even conceivably serve itself, because it is in its nature only to bridge, to be instrumental. Strategy inherently is an empty vessel, albeit one that is important and complex. Because of both apparent absurdity and inherent ambiguity, the effect of role reversal from Clausewitz's ideal type ('war is simply a

continuation of political intercourse, with the addition of other means')[27] can be difficult to recognise, at least the extent of the reversal may be protected from full notice.

Although many scholars notice instances where war appears to drive policy, only rarely is such notice allowed to make more than a guest appearance in analysis. A reason for that slimness of recognition is simply definitional, indeed it works all but viscerally on what we know as that treacherous phenomenon, commonsense. Specifically, scholars usually define war as a political event. Because war is distinguished inalienably for reasons of its political motivation from brigandage or crime, the notion that it is the more independent of the two variables (i.e. war and policy) tends not to be pursued.

The other leading reason why it can be difficult to appreciate a role reversal from the Clausewitzian ideal between war and policy lies in the complexity and ambiguity of the nexus. In theory, policy's broad purposes and more specific objectives are clearly distinguishable. In practice, however, the conduct of war at the elevated level of grand strategy is a process in which political desirability is in constant dialogue with political feasibility as enabled by dynamic military opportunities (gained or lost, real or only apparent). Clausewitz advises:

Once again: war is an instrument of policy. It must necessarily bear the character of policy and measure by its standards. *The conduct of war, in its great outlines, is therefore policy itself,* which takes up the sword in place of the pen, but does not on that account cease to think according to its own laws.[28]

He is correct, but possibly inadvertently misleading. Braving reification, perhaps even the pathetic fallacy, I am suggesting that although, following the great man, 'the conduct of war…is therefore policy itself, that conduct can be directed more according to the needs of war and the unfolding opportunities that its course appears to offer than in the service of some distinctive source of guidance known as policy. Because strategy is a collaborative process—actually, many interdependent processes—it has to mediate between and, effectively if not efficiently, fuse political with military advisory inputs. In practice, the dialogue (admittedly a severely reductionist term) between the realms of policy and military power often evades empirical disentanglement. Policy, in most senses, has to serve war, if not always the war that it thought it had chosen, once the iron dice are rolled. Furthermore, conceptual clarity persistently is in a state of tension with real historical fuzziness. Soldiers and politicians, war and policy, the demands of war's grammar and the goals of policy; none of these three neat binary nexuses are as sharp-edged in practice as they are in theory. The truth is that there is a continuum in the relative

influence of policy, as contrasted with the dynamics of war itself, over the conduct of war. This is not a straightforward case of either/or. The nature of strategy is not at issue, and neither are the structural dynamics of its 'working'. But whether strategy is more the bridge which enables military power to direct policy, or vice versa as the Good Book insists, is always determined in practice by actual circumstances and behaviour.

Much of the argument as just developed, if recognised at all, usually is cited as strategic pathology, really as the negation of strategy. Although I share the urge to reject as astrategic, even anti-strategic, role reversal between war and policy, still a nuanced approach is desirable. Definitional truths about strategy and war must not hold historical interpretation in thrall in the face of contrary evidence. Furthermore, it is not self-evident that strategy fuelled more by war's emerging opportunities than by policy's wishes must be oxymoronic. Such a case would balance means and ends, though the means would be policy and the ends advantage in war, and necessarily would have political meaning.

Overall, this third challenge to the integrity of strategy at best is only interesting and partially true. The threat or use of all forms of military power must have strategic effect. Similarly, that effect has political consequences for the course of history regardless of which sources of influence are dominant in the processes of strategy-making.

CHAOS AND PREDICTION

If the essence of strategy is instrumentality, the essence of instrumentality is predictability.[29] Strategists predict the achievement of desired outcomes through the threat or use of particular qualities and quantities of force. A series of defence budgets comprises financial expression of a dynamic prediction of the inputs (purchasable by the monies provided) judged adequate to enable the output in potential strategic effectiveness that should yield tolerable security. Strategy entails prediction at several levels. Defence communities have to predict how particular investments across many of strategy's dimensions (e.g. technology, new organisations, new operational ideas, infrastructure for training, fuel and ammunition for training and as ready war stocks) will reward the investors in enhanced potential for military effectiveness. Two critical levels of ascending challenge in predictability still lurk beyond the prediction problems of Clausewitz's 'preparations for war'.[30] The strategist has to predict how well his military power will perform in action against a live, distinctive, and reacting foe; that is the challenge of

predicting military effectiveness. More difficult still is the need for the strategist to predict how much, and what kinds of, military effectiveness will be required to yield the strategic effectiveness that matches political goals.[31]

For good or ill, the strategist cannot purchase military or strategic effectiveness directly. As with love and happiness, strategic effectiveness has to be approached instrumentally in an exercise critically more artistic than scientific. A principal difficulty for strategy is the fact of disaggregation. Readers should resist the temptation to think of a country's military power as a machine that bursts reliably and smoothly into life when the policy-maker turns the key. The reality of military power is that it is hugely articulated, disaggregated, somewhat fluid and ultimately is atomised. For a mob to be an army order has to be imposed by leadership in common purpose, exercising firm yet not overbearing command. Control is achieved by the management of command, and generally by coordination in the face of all the causes of friction which the enemy, nature, and 'friendly' incompetencies will trip into action.[32] The titles of this book and chapter flag the significance of chaos, though neither is intended to encourage the view that chaos rules. Indeed, the book's main title implies that strategic behaviour is appropriate even in chaotic situations. The title of this chapter suggests that chaos might be overcome by strategy. If chaos rules, then strategy departs.

The social scientist confronted by an attractive-seeming menu of explanatory concepts deriving from other domains of knowledge needs to decide what aids understanding and what does not. More challenging still is the requirement to decide just how relevant and useful are novel-sounding concepts that unquestionably have some pertinence. More difficult still, the social scientist needs a measure of self-awareness and an alertness to herd behaviour, in order to help distinguish real, from fool's, gold. In Beaumont's all too apt words:

Not all scientists have agreed as to whether chaos-complexity-nonlinearity is only a slight change of analytical perspective, or a fad, as opposed to being what Thomas Kuhn in *The Structure of Scientific Revolutions* called a'paradigm shift', that is, a major fresh conceptual configuration that moves perspective to a whole new order.[33]

If scientists do not agree on the significance of chaos-complexity-nonlinearity for the natural sciences, it behoves social scientists to be especially alert when their conceptual snatch squads bring home these difficult ideas and theories as booty for exploitation in an alien landscape. That granted, still I contend

that chaos, complexity, and nonlinearity speak persuasively to the nature of strategy and war. Almost as much to the point for this enquiry, those concepts and theories can help explain how RMAs work or fail to work, and they help suggest reasons why innovation and invention need not yield decisive military, for strategic, advantage. However, before the conceptual package of 'chaotics', of chaos-complexity-nonlinearity, can be unleashed for the better interpretation of strategic history, first it has to be tamed for local application.

As was lightly referenced in Chapter 1, there is a large and growing literature on chaos and complexity theory, and on the phenomenon of nonlinearity.[34] Scholarly as well as more popular science writing has been exploited by strategic theory in an attempt to apply these concepts in the dismal social science of strategic studies that deals with man's inhumanity to man. The relevance of chaos theory to this discussion of strategy and RMA is best explained with close reference to the evolving intellectual-historical context.

In common only with Thucydides among the greater theorists on war, Clausewitz emphasises that 'War is the realm of uncertainty; three quarters of the factors on which action in war is based are wrapped in a fog of greater or lesser uncertainty.' He claims that 'War is the realm of chance. No other human activity gives it greater scope; no other has such incessant and varied dealings with this intruder. Chance makes everything more uncertain and interferes with the whole course of events.'[35] He claims unambiguously that the problem is not only 'chance: the very last thing that war lacks',[36] because 'It is now quite clear how greatly the objective nature of war makes it a matter of assessing probabilities.' To that 'objective nature of war', 'the element of chance' adds 'guesswork and luck' which 'come to play a great part in war'. When Clausewitz overlays these claims for war's probabilistic, foggy, and chance-prone nature with his collective concept of friction, he leaves the eighteenth century's ideal type of a clockwork strategic universe far behind.

In the 1960s and 1970s some physicists, mathematicians, meteorologists, and biologists recognised and sought ways to explain—including ways to explain why some behaviour might be inexplicable in detail—'the highly complex behaviour of apparently chaotic or unpredictable systems which show an underlying order'.[37] Extant mathematics and mathematical tools could not model the turbulent behaviour of some very complex systems. Chaos, complexity, nonlinearity, and turbulence became important ideas attracting effort in scientific research. Probably the most significant insight was captured by Edward Lorenz in his famous phrase, 'the butterfly effect'. A mathematician-meteorologist, Lorenz argued persuasively that even minute events could have huge consequences. More to the point, hugely different consequences—hurricanes, calm weather—would follow from sets of initial conditions that

were only marginally distinctive.[38] This did not have to mean that in theory explanation-prediction is impossible. But it did mean that because all relevant initial conditions (in a highly dynamic universe) are in practice unknowable, accurate prediction in effect has to be impracticable.

In the 1980s and 1990s popular science writers picked up on chaos-complexity-nonlinearity. James Gleick's *Chaos* (1988) was a bestseller. In the mid-1990s, the dominant school of thought on RMA theory in the United States adhered to a notably orderly, mechanistically Newtonian view of strategic affairs. The holy writ of 'The American RMA', as proclaimed by Moses—Admiral William A.Owens—regarded the fog of war as a problem to be dispelled by the latest marvels of C4ISR, and indeed treated war itself as a challenge reducible to surgical application of precise remote bombardment.[39]

By the mid- to late 1990s, the extended US defence community contained scholars and practitioners who were distinctly uncomfortable with the vision of war implied by Admiral Owens' approach to the RMA, and as outlined schematically and authoritatively in the key JCS document, 'Joint Vision 2010'.[40] Some of these sceptics were historically trained, but virtually to a person they were steeped in the Clausewitzian worldview; at the least they were deeply respectful of what they believed the great Prussian had written. These sceptics noticed that Clausewitz had emphasised such un-Owens RMA-like factors as human beings, chance, uncertainty, fog (of war), guesswork, and luck.[41] It so happens that many of these people had not been, as it were, persuaded by Clausewitz's theory of war. Rather, that theory was persuasive because it matched the empirical evidence of those scholars' own military experiences (largely in Vietnam), and because it fitted like a glove what they understood to be the texture of strategic history at all levels.[42]

By a happy accident, in the late 1980s an American student of German history turned his considerable talent to the study of 'the implications of nonlinear science for the liberal arts', and the rest, as the saying goes, is history. Specifically, in the Winter 1992/93 issue of the leading journal in the field, *International Security*, Alan Beyerchen published a brilliant analysis which powerfully conflated 'Clausewitz, Nonlinearity, and the Unpredictability of War'. Beyerchen presents Clausewitz as a chaos theorist:

> The overall pattern is clear: war seen as a nonlinear phenomenon—as Clausewitz sees it—is inherently unpredictable by analytical means. Chance and complexity dominate simplicity in the real world. Thus no two wars are ever the same. No war is guaranteed to remain structurally stable. No theory can provide the analytical short-cuts necessary to allow us to skip ahead of the 'running' of an actual war.[43]

All of which is persuasive, *up to a point*. Unfortunately, Beyerchen's sound argument is imperilled by the excessive domain that he claims for nonlinearity. His impressive attempts to fuse Clausewitz and Lorenz (among others) were familiar to the critics of the Owens variant of RMA theory. It would be difficult to exaggerate the potency of the theoretical brew I am describing. Beyerchen provided just the argument for which many RMA sceptics were searching by the mid-1990s. He mixed the authority of Clausewitz with the excitement of the contemporary frontier of science, on behalf of a thesis that was an apparently perfect fit with the sceptics' personal military experiences, reading of history, and current debating needs. Of course, this is hindsight-foresight.

The error in Beyerchen and others' theory that war is chaos lies in its overly imperial essentialism. It is true that war is essentially nonlinear and chaotic. But war also is essentially economic, political, and even substantially predictable, which is to say compatible with purposeful strategy. When social scientists and historians boldly borrow concepts and theories from the mathematical and natural sciences, they need to be as daring in their use of the intellectual loot as they were in the initial inspiration to reach across the boundaries among disciplines. In practice, some strategic commentators have tried to be too faithful to the original scientific meaning of the borrowed concept, and have applied the ideas of chaos-complexity-nonlinearity uncritically. Chaos theory has been allowed undisciplined application against RMA advocacy of a mechanistically linear kind, because it packs such a potent punch.

As so often is the case, Clausewitz's *On War* is by far the best place to begin a search for balanced understanding of the nature of war and strategy. Bearing in mind that, uniquely among the authors of classic theories of war, Clausewitz allows full recognition of chance, uncertainty, risk, luck, guesswork, and friction,[44] does the great man believe that war is literally nonlinear and chaotic? 'War is the realm of chance', Clausewitz claims persuasively, indeed incontestably. But, by analogy, because the Great Australian Bight is the realm of the shark, it does not follow that swimming there is impossible. Similarly, the north and south polar regions are realms of cold lethal to man, but through extraordinary effort man can and does survive in both of them. A more apt analogy, perhaps, is the claim that even though a casino is quite literally 'a realm of chance', the playing field is structurally tilted to the advantage of 'the house'. An individual punter can win very big indeed, but 'the house' will always win, overall and eventually (i.e. on the all-important bottom line), against thousands of punters playing over a

period of time. A punter, even a syndicate of punters, might threaten to 'break the bank at Monte Carlo', but it would be a truly historic event (against the odds) for a casino to be bankrupted by the good luck of its clients.

History, logic, and intuition all combine to advise that although war is a gamble, it is not a realm of pure chance. As the saying goes concerning performance in the US National Football League, 'on any given Sunday any team can beat any other team'. Nonetheless, there are objectively superior football teams, and—injuries permitting— consistently they win many more games over the course of a season than do the less good football teams. To return from flights of analogy, good armies can have bad days, but— that granted—as a general rule good armies beat bad armies quite reliably. Of course, what makes for the military and strategic effectiveness of any army must be analysed in full context. By way of simple illustration, the armed forces of Iraq were hopelessly outclassed as an opponent of the US-led UN coalition in 1991, much as the armies of France and Britain were outclassed by the German Army in 1940.[45] War is a realm of chance in that conceivably Iraq could have plucked some simulacrum of a face-saving victory from the jaws of impending defeat. However, chance, even in a realm defined significantly by it, needs notable assistance. For chance to have saved Iraq in 1991, the UN coalition would have to have committed strategic errors on an epic scale.[46] All things are possible, but they are not equally likely. The friends of chaos theory for strategic studies have to be careful lest what begins as a powerfully insightful idea is rapidly transformed into a simplistic, and *demonstrably false*, essentialist nostrum to the effect that 'chaos rules'. Clausewitz did not say that; at least he did not quite say that, and the qualification is vital.

What Clausewitz attempts, brilliantly and by and large successfully, is to explain why strategy is difficult to do well. By analogy, he advises that it is in the nature of the terrain to be crossed for it to present an array of hostile natural and human obstacles to our safe passage. We can add the thought that in order to win the traveller simply has to complete his mission and arrive safely at an acceptable destination. War is not like competitive ice skating, where points are gained for technique and artistic presentation. In war the choreography may be brutally inelegant, but if it achieves its goal it will be good enough. Norman Friedman is correct when he advises that '[w]ars are messy, murky affairs. The winner is usually the side that makes fewer mistakes, not the side which perfectly executes a masterly strategy'.[47] Clausewitz does not mislead the reader, but some readers have misled themselves. For all his warnings about the uncertainty of war, and his ominous advice that 'friction is a force that theory can never quite define',[48] he does not abandon hope for strategy. Quite the contrary, in fact, as this mature passage reveals.

The good general must know friction in order to overcome it wherever possible, and in order not to expect a standard of achievement in his operations which this very friction makes impossible.[49]

To win a war you do not need to score a 'perfect ten' in military excellence, you just have to perform better, perhaps less badly, than the enemy. More telling even than Clausewitz's treatment of friction is his magisterial brief explanation of the quintessentially strategic character of a war intelligently conceived and conducted.

War plans cover every aspect of a war, and weave them all into a single operation that must have a single, ultimate objective in which all particular aims are reconciled. No one starts a war—or rather, no one in his senses ought to do so—without first being clear in his mind what he intends to achieve by that war and how he intends to conduct it. The former is its political purpose; the latter its operational objective. This is the governing principle which will set its course, prescribe the scale of means and effort which is required, and make its influence felt throughout down to the smallest operational detail.[50]

It is most significant that Clausewitz could envisage war in so strategically rational a way, despite his full recognition of the chaotic possibilities. Later in the same chapter (Chapter 2 of Book 8) he rubs home the gritty realism that underlies the strategic aspiration just quoted. Writing about the variety both of war forms and war performance, Clausewitz advises:

We must, therefore, be prepared to develop our concept of war as it ought to be fought, not on the basis of its pure definition, but by leaving room for every sort of extraneous matter. We must allow for natural inertia, for all the friction of its parts, for all the inconsistency, imprecision, and timidity of man, and finally we must face the fact that war and its forms result from ideas, emotions, and conditions prevailing at the time—and to be quite honest we must admit that this was the case even when war assumed its absolute state under Bonaparte.[51]

To say that war is the realm of chance and friction is not to say that war is the realm of those elements only. Although in the passages quoted Clausewitz struggles with only mixed success to reconcile his erstwhile fixation upon war's allegedly absolute nature with the historical experience of limited war, his struggle is revealing for our purposes. The following passage makes points central to our enquiry. Clausewitz argues that real historical, which is to say more or less limited, wars, have forms that express their origins, but that the inherent dynamics of war must reveal themselves in the particular detail of particular wars.

[I]f we must admit that the origin and the form taken by a war are not the result of any ultimate resolution of the vast array of circumstances involved, but only of those features that happen to be dominant, it follows that war is dependent on the interplay of possibilities and probabilities, of good and bad luck, conditions in which strictly logical reasoning often plays no part at all and is always apt to be a most unsuitable and awkward intellectual tool. It follows, too, that war can be a matter of degree.[52]

In the context of this passage, the opposite of 'logical reasoning' is not necessarily, let alone principally, the idea in the preceding phrase, 'of good and bad luck'

Against the backdrop of his theory of war, for Clausewitz strategy is possible, albeit difficult, even though his theory advises that 'war is the realm of chance'. Force can be used ('engagements') purposefully as an instrument of policy, despite the fact that attempts at such use frequently prove unsuccessful. What does chaos-complexity-nonlinearity theory add to our understanding of war and strategy? The starting point has to be recapitulation of the core meaning of these linked ideas that social science has borrowed.

- A system or phenomenon (e.g. war, strategy) is *complex* if it comprises several—more likely many—dimensions or elements, 'suggesting intricacy of structure and process, but not randomness, sometimes with a high degree of regularity in their dynamics up to a point of transition'.[53] Complexity 'usually implies a reasonable degree of predictability and controllability, which may quickly pass through a state-change into what is or seems to be "chaos"'.[54]

- A (complex) system or phenomenon is *nonlinear* when its performance shows radical discontinuities because of an apparent disproportion between inputs and outcomes.
- A system or phenomenon is *chaotic* when it shows both nonlinearity in performance and such extreme sensitivity to the downstream consequences of unknown variation in initial conditions, that predictive system behaviour is impracticable.

In summary: *chaos* theory applies to *(complex), nonlinear* 'dynamical' systems, which

- In summary: *chaos* theory applies to *(complex), nonlinear* 'dynamical' systems, which is to say systems with large numbers of shifting components that exhibit a tendency to express an endogenous, 'self-organising criticality'. That criticality produces a new nonrecurrent (i.e. non-periodic) pattern of order. In other words, a process of nonlinear dynamics irregularly produces orderly patterns which are not easily predictable, if they are predictable at all.[55]

These ideas fit war and strategy, but they do not fit perfectly. Indeed, the measure of imperfection is critically important and, if underrecognised, vitiates much of the merit in their relevance for strategic studies. Before considering the strengths and weaknesses of chaos-complexity-nonlinearity theory for strategic studies, there is no evading the problem of language. Social scientists have never been backward in willingness to layer obscurity upon opacity by enfolding the fog of war in a fog of specialised language. Even when chaos theory is clearly written, it presents the social scientist with what amounts to a barrier of difficult concepts expressed unusually (and that is to ignore the communication difficulty posed by the challenging algebra of nonlinear equations).

Lest we lose the plot, it is necessary to emphasise that the ideas in chaos theory are adapted for use in this enquiry strictly because they draw attention to several of the most vital features in the nature of strategy and war. In no important sense is this discussion a general celebration of the relevance of chaos theory for social science. Why are the ideas of chaos theory important for the better understanding of strategy?

First, strategy is complex in the sense conveyed by the notion of complexity employed by chaos theorists. Strategy has several or many dimensions (or elements) which function synergistically in intricate ways. The product of that synergy is a course of consequences in military effectiveness for strategic effectiveness which cannot be exactly modelled for predictability.[56] At least, effectiveness cannot be modelled usefully if it is understood to be the linear product of attritional combat. Vice Admiral Arthur K.Cebrowski, the leading figure pressing for a network-centric approach to military operations and war,[57] argues for a model of conflict which accommodates the feedback from interaction with the enemy (inter alia) and the influence of nonlinear dimensions of strategy. He explains thus:

There are practical reasons why attritional models are still used [so-called 'Lanchestrian models', after Frederick W.Lanchester]: their inputs are easily measured, their model 'runs' are easily reproduced, and their MOEs [measures of effectiveness] are readily understood. Simplicity wins out over complexity. The chaos of war appears to be so far beyond measuring in any reasonable manner that we consider it best to ignore (or explain away) such influences as leadership, morale, cohesion, information quality, and command and control. This is what expands the gap between models and reality.[58]

The admiral insists that '[w] e must make new models and find new MOEs with which to evaluate them. We must change our mental model.'[59] He claims that

Network-centric warfare is such a change. Network-centric warfare looks at war as a complex, adaptive system wherein nonlinear variables continuously interact. Physical forces play a part, but so do cognitive and behavioral factors. Within the constant dimensions of war (force, space, and time), the domains of belief, knowledge, and the physical world must be portrayed.

Notwithstanding the negative reaction which the bumper-sticker term 'network-centric warfare' invites, Cebrowski's understanding of war and how to think about it is close in detail, and even closer in spirit, to the one that I advance.

Second, strategy is nonlinear in that strategic consequences, or effectiveness, can show radical discontinuities. Such discontinuities, RMAs for one class of example, are not random events or accidents. However, they may occur as the result of action on, and synergistically among, so many of strategy's different dimensions as to be effectively beyond prediction, confident or otherwise. The same argument applies to the history of the international political system.[60] The course of international history from 1919 to 1939, for example, is a perfect case of a nonlinear, but substantially deterministic, dynamical system. Nazi Germany and its consequences for world order was not a random outcome of the first 31 years of the twentieth century. The emergence of the Third Reich was, however, an outcome

determined by so many factors, including so many genuinely unpredictable contingencies (e.g. in particular the fact, certainly the timing, of the Great Depression), that it was a surprising discontinuity, indeed a revolutionary surprise.

Causation for many of history's great discontinuities has been suspiciously easy to identify long after the surprising event.

Third, strategy is chaotic because it can register both the radical discontinuities in outcomes characteristic of nonlinearity, as well as consequences that differ on a range apparently wholly disproportionate to the scale of the initial impetus. Familiar examples of such chaotic performance in the realm of strategy include two famous cases in the American Civil War: the death of 'Stonewall' Jackson at Chancellorsville (30 April-6 May 1863), and Robert E. Lee's 'lost order' before the battle of Antietam (17 September 1862). The former accidental event probably literally was to deprive Lee of victory at Gettysburg in July 1863, while non-occurrence of the latter contingency might well have saved Lee from having to campaign at all in 1863.

The death of Jackson on 10 May 1863 eliminated 'the army's most gifted corps commander and Lee's principal adviser and confidant'.[61] Given that battlefield command is a collaborative matter of teamwork, that Lee did not have a hands-on command style vis-à-vis his corps commanders, and also that the army of the Confederate States of America was not amply blessed with superior generals,[62] one can appreciate how severe the effects of the loss of Jackson were likely to be.

Going back eight months from Jackson's death, on 13 September 1862 General George B.McClellan, the commander of the Federal Army of the Potomac, was handed a copy of Lee's 'Special Orders (SO) No. 191'.[63] SO191 was Lee's complete plan for the autumn campaign of 1862. This campaign, designed on a flood tide of battlefield victories, was intended to culminate in a major battle waged at a time and place in Maryland or, more likely, in Pennsylvania, of Lee's choosing, for the purposes of achieving foreign recognition and terminally discouraging the enemy. Such a success at that time would have the clear potential to end the war. The capture of the 'lost order' both destroyed Lee's plan to fight a battle in highly advantageous circumstances, and afforded McClellan one of history's more golden opportunities to destroy a dispersed enemy in detail. As it was, McClellan's timidity and procrastination enabled Lee to enforce at least a tactical draw at Antietam, even though the Army of Northern Virginia was obliged to fight at a two-to-one disadvantage.

A significant caveat has to be recorded concerning the counterfactuality assumption that tends to lurk under-recognised in chaos theory for history-based social science. Because (strategic) history is played only once, literally unrepeatably in real-time, strictly speaking an argument for chaotic behaviour can only be speculative. Theorists and historians may argue persuasively that history shows the chaotic

features of nonlinearity and the sensitivity of outcomes to often indeterminate initial conditions. But they cannot know for certain that they are interpreting truly chaotic behaviour; history is played only once.

Human affairs are not meteorology, no matter how suggestive ideas expressed and developed mathematically for the latter are for the former. Edward Lorenz's set of nonlinear equations could explain why his 'butterfly effect' should be true. A small change in a particular value in the contributors to the weather at a particular point in time in a particular region, might have distinctive, and possibly traceably predictable, but hugely disproportionate, consequences at a later time in other regions. Notwithstanding the structural similarities for theory between global weather and global politics, consider the robustness or otherwise of chaos theory with reference to an especially dramatic counter-factual occurrence. Suppose Adolf Hitler had been shot in the mêlée which concluded the 'beer-hall putsch' (announced in the Bürgerbraukellar) in Munich on 7–8 November 1923.[64] Many people, including many scholars, are so convinced of the eponymous truth in the thesis that the Second World War was 'Hitler's war', that the death of just that one man in 1923 seemingly self-evidently would have had consequences for the course of history radically different from what actually occurred.

I select the fictitious death of Hitler in 1923 because it appears to yield the strongest imaginable case for strategic history as chaos unveiled. However, one can argue plausibly that the outbreak of the Second World War was, if anything, overdetermined. History is the realm of contingency, but it seems to this theorist, at least, that no Germany in the 1930s—Weimar, Nazi, restored Hohenzollern, or whatever—could accommodate itself peacefully to the European order of the Versailles settlement.[65] Of course it mattered who ruled Germany, and how, but it is difficult to believe that a second round of *grande guerre* was avoidable. To suggest, as here, that a Second World War most probably was unavoidable, is not necessarily to suggest, its popular title notwithstanding, that it was simply 'round two' of a two-event series in a 'thirty years' war'.[66] The military-political outcomes in 1918–19 left vital questions of European and Asian order so unresolved that a rematch was probable. However, the character of the war at issue possibly depended hugely upon the many contingencies of 1919–39 (perhaps only of 1919–31). The Second World War might have been another balance-of-power struggle *d'après* 1914–18, rather than a war about preclusive German imperium in Eurasia (and perhaps beyond). In fact, 'Versailles Europe' had been thoroughly overturned *peacefully* in Germany's favour by 1939. This does not mean, however, that any German government other than one led by Hitler would have avoided another great war. Of course, a cynic could argue that the ostensible differences between German ambitions in 1914 and 1939 did not much matter. The reality of great-war dynamics flagged not entirely convincingly by Clausewitz with his writing about absolute war,[67] meant that both 1914–18 and 1939–45 were conducted by the leading belligerents with a view to achieving complete victory. Clausewitz observes:

If war is part of policy, policy will determine its character. As policy becomes more ambitious and vigorous, so will war, and this may reach the point where war attains its absolute form. If we look at war in this light, we do not need to lose sight of this absolute: on the contrary, we must constantly bear it in mind.

The problem with this explanation is that it fails to recognise that policy is likely to become more 'ambitious and vigorous' because of the evolving costs and opportunities revealed by the course of war itself.

Because chaos theory has become quite fashionable, and because it is intelligent as well as 'methodologically correct' for scholars to acknowledge the role of contingency, or chance, there is some danger that super-stable conditions may pass unnoticed as such. The outbreaks of both world wars, though naturally highly contingent in the detail of their actual historicity, probably were systemically deeply *non*-chaotic outcomes. It is plausible to argue that the outcome, 'war', was super-stable in the 1910s and 1930s/40s vis-à-vis preceding streams of events, even many hypothetical, alternative such streams.

This is not to deny that Hitler's ideology and demonic personality probably were vital for the character of war that the Second World War became.

For another example, a non-shooting outcome to the Soviet-American Cold War of 1947–89 lends itself to at least two rival explanations, neither of which is plausibly provable. On the one hand, Albert Wohlstetter, among other influential strategists, asserted that there was a 'delicate balance of terror'.[68] One deficiency, even one modest scale of deficiency, in nuclear-related defence preparation and deterrence could fail some truly historic road-test. On the other hand, some strategic theorists claimed that nuclear deterrence either did not much matter,[69] or was massively insensitive in its existentiality to competitive defence policy performance.[70] 'Normal accident' and organisation theory, as adapted by Scott D.Sagan, warns us that global nuclear peril might have occurred by reason of normally expected glitches in the performance of complex organisations over long periods of time.[71] The historical fact is, however, that although Soviet and US nuclear forces had many accidents, none led to a third world war. Thus we have a case allegedly systemically liable to exhibit chaos, but actually revealing what may be super-stable behaviour. It is only prudent to take the potential for chaos seriously. Nonetheless, a reasonable person could argue that Soviet-American strategic relations appear to have been accident-

insensitive; at least they were obviously, *and indisputably,* critically insensitive to the accidents and many miscalculations which actually happened.[72] Given that the Cold War was a single, unique stream of historical events, we have to be cautious in explaining the facts of both the non-occurrence of a great hot war and the reality of cold war.

IS STRATEGY CHAOTIC?

Chaos theory is thus a useful tool for social scientists, provided it is not permitted unduly to shape strategic historical data as evidence so as to suit its arguments. Up to a point, and in some senses, strategy (and war) is chaotic, complex, and nonlinear. Moreover, focus upon chaos, complexity, and nonlinearity should prove helpful in revealing how strategy and strategic history work, especially in the guise of hypothesised RMAs. There is nothing really new about this. The language of chaos theory may be novel, but the core ideas of complexity, nonlinearity, and many synergies, have long been understood. For example, General Sir Ian Hamilton, who was a profound thinker about war, even if he was less than stellar as a high commander, caught some of the essence of what today we call ‘chaos theory’ when he wrote about complexity and nonlinearity in 1921:

From many points of view there has never been a moment when all the elements of the art of war have been so much in the melting-pot as at present. A little change in one direction and quality gets the complete whiphand of quantity; a little change in another direction and the hordes of Asia may swamp our Western civilisation; a tiny discovery in a third and the whole face of war will be altered and all its historical machinery be thrown upon the scrap-heap.[73]

Sir Ian appears to anticipate Lorenz’s ‘butterfly effect’.

Though certainly complex, strategy is not beyond meaningful planning and execution. Similarly, although strategy can be nonlinear, much of strategic behaviour actually is linear. The better armies, like the better football teams, though in principle ever liable to a defeat, will win the bulk of their operational tests. Strategic performance can be chaotic in that causes and consequences (inputs and outputs) appear

disjointed. Nonetheless, the downstream impact of modest changes in input (change in generals, a new generation of fighter aircraft, and so forth) are not beyond all sensible prediction, even when one does not neglect to consider the independent will of the enemy. Overall, while alert to the domain of chaos and suitably respectful of the power of contingency, the scholar of strategic history is likely to be impressed by the limited scope of that domain.

I have suggested that the outbreaks of the world wars were overdetermined and as events probably were anything but chaotic. I would suggest similarly, and with high confidence, that in 1943–45 the defeat of Nazi Germany was entirely a linear process. I would suggest also, though much more cautiously, that in 1917–18 the defeat of Imperial Germany was linear and non-chaotic. Strategy was feasible in both cases. Indeed, notwithstanding the facts of chaos—complexity-nonlinearity, history generally allows purposeful strategy, as well as intended strategic effect, far more than a token walk-on role. Chaos can be confounded.

NOTES

1 . Carl von Clausewitz, *On War,* trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976 [1832]), p. 86.

2 . Ibid., p. 85.

3 . Clausewitz does not fuse chance and uncertainty with friction (ibid., pp. 119–21), but it can be useful to do so. See Colin S.Gray, *Modern Strategy* (Oxford: Oxford University Press, 1999), p. 41. Chance occurrences plainly have the potential to produce friction, ‘the force that makes the apparently easy so difficult’: Clausewitz, *On War*, p. 121. For extensive commentary on Clausewitz’ idea of friction, see Barry D.Watts, *Clausewitzian Friction and Future War,* McNair Paper 52 (Washington, DC: Institute for National Strategic Studies, National Defense University, October 1996); and Stephen J.Cimbala, *Clausewitz and Chaos: Friction in War and Military Policy* (Westport, CT: Praeger Publishers, 2001).

4 . By ‘objectively better’ I do not mean to imply any foolish autarchy about foe assessment. Of course, the performance of armed forces ultimately can be measured only *strategically*, as means employed against a foe to achieve ends. However, it is sensible to compare, say, methods of recruitment, realism in training, and tactical effectiveness of equipment between armies, and, if appropriate, judge one party superior to the other. At least it is possible to make such comparison with specific reference to these important inputs to the generation of fighting power and military effectiveness.

5 . *Ecdesiastes*, 9:11.

6 . On strategy as a plan of action, see J.C.Wylie, *Military Strategy: A General Theory of Power Control*, ed. John B.Hattendorf (Annapolis, MD: Naval Institute Press, 1989 [1967]), p. 14. Readers in search of a whole menu of strategy definitions can consult Edward N.Luttwak, *Strategy: The Logic of War and Peace* (Cambridge, MA: Harvard University Press, 1987), pp. 239–41, and Colin S.Gray, *Modern Strategy* (Oxford: Oxford University Press, 1999), pp. 17–23.

7 . Roger Beaumont, *War, Chaos, and History* (Westport, CT: Praeger Publishers, 1994), p. 12. One should not read Beaumont's and my praise of RMA theory for its potential value as stimulant to fundamental enquiry as a blanket endorsement of any and every seemingly glittering concept *du jour*. Scholars skilled in, indeed professionally rewarded for, theoretical invention often apparently for its own sake, can generate an awesome scale of pointless intellectual industry. RMA is an interesting concept, unlikely to prove transient even though it was certainly 'faddish' in the 1990s.

8 . Clausewitz, *On War*, p. 178.

9 . Sun Tzu, *The Art of War*, trans. Ralph D.Sawyer (Boulder, CO: Westview Press, 1994), pp. 147–50; and Chen-Ya Tien, *Chinese Military Theory: Ancient and Modern* (Oakville, Ontario: Mosaic Press, 1992), pp. 43–6.

10 . Even if a particular kind of military instrument, air power for example, is judged to enjoy systemic most-case advantage in relative effectiveness over say, land power and sea power, that does not make it a uniquely strategic agent. Just such a claim for dominant status is made for (US) air power in Benjamin S.Lambeth, 'The Technology Revolution in Air Warfare', *Survival*, 39, 1 (Spring 1997), pp. 65–83.

11 . 'We're strategic troops, so what we do behind enemy lines can have serious implications': Andy McNab, *Bravo Two Zero* (London: Bantam, 1993), p. 8.

12 . I borrow the idea of the dominant weapon from J.F.C.Fuller. He argued that the dominant characteristic of a weapon is its range of action, which is 'the characteristic which dominates the fight. Therefore the parts played by all other weapons should be related to the dominant one. Otherwise put, the weapon of superior reach or range should be the fulcrum of combined tactics': *Armament and History* (London: Eyre & Spottiswoode, 1946), p. 21. For example, whether or not the belligerents recognised the fact, artillery was the dominant weapon in land warfare in 1914–18, a status much more arguably enjoyed by rotary-wing aviation in Vietnam.

13 . Deborah D.Avant, *Political Institutions and Military Change: Lessons from Peripheral Wars* (Ithaca, NY: Cornell University Press, 1994), p. 69. Avant draws heavily upon the judgement of Sir Robert Thompson in his *No Exit from Vietnam* (New York: David McKay, 1969).

14 . Harold K.Johnson quoted in Lewis Sorley, *Honorable Warrior: General Harold K.Johnson and the Ethics of Command* (Lawrence: University Press of Kansas, 1998), p. 170. The best treatment of most of the relevant issues remains Andrew F.Krepinevich, *The Army and Vietnam* (Baltimore, MD: Johns Hopkins University Press, 1986), esp. pp. 118–27, 168–72. Robert Mason, *Chickenhawk* (New York: Penguin, 1984), is a superior memoir of the helicopter war, written by a 'Huey' (Bell HU-1 Iroquois) pilot.

15 . My thesis in *Modern Strategy*.

16 . See Martin van Creveld: *The Transformation of War* (New York: Free Press, 1991); 'What is Wrong with Clausewitz?', in Gert de Nooy (ed.), *The Clausewitzian Dictum and the Future of Western Military Strategy* (The Hague: Kluwer Law Institutional, 1997), pp. 7–23; and *The Rise and Decline of the State* (Cambridge: Cambridge University Press, 1999).

17 . The most unsympathetic of Clausewitz's current critics, John Keegan, offers a notably astrategic view when he suggests that 'war is collective killing for some collective purpose': *War and Our World* (London: Hutchinson, 1998), p. 72. Keegan proclaimed the obsolescence of Clausewitz's worldview, at least of that worldview as he understood it, in his extraordinary work, *A History of Warfare* (London: Hutchinson, 1993). Clausewitz also figures as yesterday's theorist in Mary Kaldor' s insightful study, *New and Old Wars: Organized Violence in a Global Era* (Cambridge: Polity Press, 1999). Impressive, if not wholly persuasive, speculation anticipating a notably non-Clausewitzian condition of widespread chaos pervades Ralph Peters, *Fighting for the Future: Will America Triumph?* (Mechanicsburg, PA: Stackpole Books, 1999).

18 . Clausewitz, *On War*, p. 89.

19 . Nuclear-armed polities may not be able to threaten to take action likely to have suicidal consequences. They can, however, behave dangerously and promise contingently to pose 'the threat that leaves something to chance'. Thomas C.Schelling, *The Strategy of Conflict* (Cambridge, MA: Harvard University Press, 1960), title of ch. 8.

20 . Intellectually pioneering studies include: John Arquilla and David Ronfeldt, 'Cyberwar is Coming!' *Comparative Strategy*, 12, 2 (April-June 1993), pp. 141–65; Martin Libicki, *What Is Information Warfare?* (Washington, DC: Institute for National Strategic Studies, National Defense University, August 1995); idem, *The Mesh and the Net: Speculations on Armed Conflict in a Time of Free Silicon* (Washington, DC: Institute for National Strategic Studies, National Defense University, August 1995); and Roger C. Molander, Andrew S.Riddile, and Peter A.Wilson, *Strategic Information Warfare: A New Face of War* MR-661-OSD (Santa Monica, CA: RAND, 1996). See also James Adams, *The Next World War* (London: Hutchinson, 1998).

21 . Clausewitz, *On War*, p. 605.

22 . Periodisation is both eminently contestable and can imperil, as well as assist, understanding. The title of my book, *Modern Strategy*, contains a redundant adjective. Strategy is strategy, 'modern' or other. As to when modern war began, selection of the key diagnostic principle is all important. For example, the following doctor-historians diagnose the condition of modernity according to rather different principles: Robert M.Epstein, *Napoleon's Last Victory and the Emergence of Modern War* (Lawrence: University Press of Kansas, 1994), identifies modernity with war planning which integrates different theatres of operations, mobilises fully the resources of the state, and conducts war at the operational level; Edward Hagerman, *The American Civil War and the Origins of Modern Warfare: Ideas, Organization, and Field Command* (Bloomington: Indiana University Press, 1988), equates modernity with the military adoption and employment in mass warfare of the new technologies of the Industrial Revolution; while Jonathan Bailey, *The First World War and the Birth of the Modern Style of Warfare*, Occasional Paper 22 (Camberley: Strategic and Combat Studies Institute, Staff College, 1996), records the arrival of modernity with the technical achievement of three-dimensional warfare which allowed success for combined arms keyed to the near-perfection of predicted indirect (i.e. not directly observed) artillery fire. 'Modern war' began for these three authors in *c.* 1809 (Epstein), *c.* 1863 (Hagerman), and 1917–18 (Bailey) respectively. It is well to remember that one historian's periodisation is another's artificial barrier. Medievalist Jonathan Riley-Smith, for example, in a book review of a collected work, *Medieval Warfare: A History* (Maurice Keen (ed.), Oxford: Oxford University Press, 1999), complains that 'The collection…gives the impression, heightened by the omission of any treatment of Byzantine warfare, that somehow Western medieval history was self-contained. It is assumed that what divided medieval from early modern warfare was primarily technological, but the use of gunpowder was relatively advanced by the middle of the fifteenth-century, and it is arguable that warfare remained fundamentally unchanged—except perhaps in scale—until the late eighteenth': 'The Uses of Violence', *Times Literary Supplement*, 28 January 2000, p. 27.

23 . This formulation conflates the theorising of Wylie, *Military Strategy*, with that of the contributors to Lawrence Freedman (ed.), *Strategic Coercion: Concepts and Cases* (Oxford: Oxford University Press, 1998).

24 . With reference to the kind of strategic effect intended, military force can function either as a 'general deterrent' or as an 'immediate deterrent', or as both. See Patrick M. Morgan, *Deterrence: A Conceptual Analysis* (Beverly Hills, CA: Sage Publications, 1977), ch. 2.

25 . Norman Friedman, *The Fifty-Year War: Conflict and Strategy in the Cold War* (Annapolis, MD: Naval Institute Press, 2000), p. xi.

26 . Richard Henrick, *The Crimson Tide* (New York: Avon Books, 1995), p. 75. I am grateful to Richard K.Betts for bringing this neat paraphrase of Clausewitz to my attention. See his inspired analysis, 'Is Strategy an Illusion?', *International Security*, 25, 2, (Fall 2000), p. 37 n74. On p. 87 of *On War*, Clausewitz writes thus: 'War, therefore, is an act of policy. Were it a complete untrammelled, absolute manifestation of violence (as the pure concept [of 'absolute war'] would require), war would of its own independent will usurp the place of policy the moment policy had brought it into being; it would then drive policy out of office and rule by the laws of its own nature.' He proceeds to explain why 'this view is thoroughly mistaken'.

27 . Clausewitz, *On War*, p. 605.

28 . Ibid., p. 610 (emphasis added).

29 . Richard K.Betts hits the spot when he writes: 'Without believing in some measure of predictability, one cannot believe in strategic calculation', and 'Unless strategists can show that a particular choice in particular circumstances is likely to procure a particular outcome, they are out of business': 'Is Strategy an Illusion?', p. 16.

30 . Clausewitz, *On War*, pp. 131–2.

31 . A British Chief of the General Staff, Field Marshal Sir Nigel Bagnall, has written plaintively that 'over the centuries identifying a nation's future strategic priorities has proved to be a very imprecise art, and as a result peacetime force structures have seldom proved relevant when put to the test of war'. Foreword to Michael D.Hobkirk, *Land, Sea or Air? Military Priorities, Historical Choices* (London: Macmillan, 1992), p. x.

32 . The literature on leadership, command, and control is vast. G.D.Sheffield (ed.), *Leadership and Command: The Anglo-American Military Experience Since 1861* (London: Brassey's (UK), 1997), is particularly educational. The editor's 'Introduction: Command, Leadership and the Anglo-American Experience' is most useful.

33 . Beaumont, *War, Chaos, and History*, p. 11.

34 . See ch. 1 above, n10.

35 . Clausewitz, *On War*, p. 101.

36 . Ibid., p. 85.

37 . *Philip's Science and Technology Encyclopedia* (London: George Philip, 1998), p. 69.

38 . See James Gleick, *Chaos: Making a New Science* (London: Penguin, 1988), pp. 11–31, 'The Butterfly Effect'; and Peter Coveney and Roger Highfield, *Frontiers of Complexity: The Search for Order in a Chaotic World* (London: Faber & Faber, 1995), esp. pp. 169–70.

39 . William A.Owens: 'The Emerging System of Systems', US Naval Institute *Proceedings*, 121, 5 (May 1995), pp. 35–9; 'System-of-Systems', *Armed Forces Journal International*, January 1996, p. 47; and *Lifting the Fog of War* (New York: Farrar, Straus & Giroux, 2000).

40 . Joint Chiefs of Staff, 'Joint Vision 2010: America's Military—Preparing for Tomorrow', *Joint Force Quarterly*, 12 (Summer 1996), pp. 34–49.

41 . The respect for Clausewitz is worn as a badge of honour. Consider these titles: Watts, *Clausewitzian Friction and Future War*, Williamson Murray, 'Clausewitz Out, Computer In: Military Culture and Technological Hubris', *The National Interest*, 48 (Summer 1997), pp. 57–64; and Cimbala, *Clausewitz and Chaos.*

42 . Many among the RMA sceptics have in common both a professional education in history and a personal 'strategic moment' in or (literally) over Vietnam. This may be a case of spurious correlation, but such prominent sceptics as Williamson Murray (USAF), Barry D.Watts (USAF, F-4 pilot), Brian R.Sullivan (USMC), Allan R.Millett (USMC), Mackubin Thomas Owens (USMC), Paul K.Van Riper (USMC), F.G.Hoffman (USMC), and Robert H.Scales, Jr (USA) all feature Vietnam more or less prominently in their resumés. My firsthand knowledge of this group reinforces what common sense would suggest anyway: personal experience of the complexity and chaotic contingency of combat is apt to incline scholars to be sceptical of the promise of war as a near-faultless exercise in surgical bombardment. Murray goes so far as to suggest that the physical environment in which land forces (Army and Marine Corps) operate—as contrasted with those for the sea and air forces—shapes a distinctive institutional military culture 'friendly to a more Clausewitzian view of war'. He suggests that the Air Force and the Navy are predisposed by their geographical foci towards a 'mechanistic approach' to war, indeed 'towards a technological, engineering approach': 'Does Military Culture Matter?', *Orbis*, 43, 1 (Winter 1999), p. 36. While it is true that navies and air forces engage in capital-, as opposed to people-, intensive warfare in relatively simple environments (the terrain is much more uniform), the scope for Clausewitzian chance, uncertainty, and friction is common to operation in all geographies.

43 . Alan Beyerchen, 'Clausewitz, Nonlinearity, and the Unpredictability of War', *International Security*, 17, 3 (Winter 1992/93), p. 90.

44 . It is, however, a common error to exaggerate the differences between Clausewitz, Sun Tzu, and Jomini. This tendency is readily corrected by a reading of Michael I.Handel, *Masters of War:*

Classical Strategic Thought, 3rd edn (London: Frank Cass, 2001), *passim*. I claim only that Clausewitz is uniquely insistent upon the importance of chance and friction, not that he is unique in recognising their salience.

45 . The point is not that coalition forces in 1991, or German land-air forces in 1940, performed flawlessly. Rather is my argument that they were so much more militarily effective than their enemies, that virtually no sets of alternative real-time choices by those enemies plausibly would have saved them from defeat. In both cases the key to success lay not in technology, but in the ways in which technology was used. It is probably true to claim that Iraq suffered from a true, and truly lethal level of, technology shortfall. But it is no less plausible to argue that the US-led coalition would have won in 1991 even had it been fighting with the same equipment as the Iraqis. In 1940, German equipment of all kinds was good enough, but barely so. It is interesting that some potent analyses have made similar points about these two cases. James S.Corum claims flatly that' [t]he training factor alone would have proven decisive in 1940': *The Roots of Blitzkrieg: Hans von Seeckt and German Military Reform* (Lawrence: University Press of Kansas, 1992), p. 205. Looking at the French side of the equation, Eugenia C.Kiesling makes close to the same point: 'The connection between inadequate training and battlefield failure would be revealed in the 1940 campaign': *Arming against Hitler: France and the Limits of Military Planning* (Lawrence: University Press of Kansas, 1996), p. 82. The whole story is exceptionally well told in Alistair Horne, *To Lose a Battle: France 1940* (London: Macmillan, 1969). With respect to the Gulf War of 1991, Stephen Biddle has challenged the popular belief that Iraq was caught dramatically short by a foe on the leading edge of an information-led RMA. He argued instead that the extraordinarily lopsided military contest can best be explained as the result of synergy between very high military skills and advanced technology. Coalition military effectiveness was far greater than simply the *sum* of troops' skills and technology: 'Victory Misunderstood: What the Gulf War Tells Us about the Future of Conflict', *International Security*, 21, 2 (Fall 1996), pp. 139–79. Biddle's thesis is debated extensively by Dayl G.Press ('Lessons from Ground Combat in the Gulf: The Impact of Training and Technology'), Thomas A. Keaney ('The Linkage of Air and Ground Power in the Future of Conflict'), Thomas G.Mahnken and Barry D.Watts ('What the Gulf War Can (and cannot) Tell Us about the Future of Warfare'), and by Biddle again ('The Gulf War Debate *Redux:* Why Skill *and* Technology are the Right Answer'), in *International Security*, 22, 2 (Fall 1997), respectively pp. 137–46, 147–50, 151–67, 163–74.

46 . Israeli military intervention was the possible event with the greatest promise to fracture the coalition. Had that occurred it would have been the product not of chance, but of successful incitement by Iraq.

47 . Friedman, *Fifty-Year War*, p. 486.

48 . Clausewitz, 49. Ibid.

49 . Ibid.

50 . Ibid., p. 579.

51 . Ibid., p. 580.

52 . Ibid.

53 . Beaumont, *War, Chaos, and History*, p. xiv.

54 . Ibid.

55 . 'Dynamical' and 'self-organising criticality' are terms of art for the priests of chaos theory. For example, see Stephen H.Kellert, *In the Wake of Chaos: Unpredictable Order in Dynamical Systems* (Chicago: University of Chicago Press, 1993), pp. 2–3, and Coveney and Highfield, *Frontiers of Complexity*, esp. ch. 6. Stephen R.Mann, 'Chaos Theory and Strategic Thought', *Parameters*, 22, 3 (Autumn 1992), pp. 54–68, is a brave venture in cross-disciplinary fertilisation.

56 . On the limits of the theory of rational choice, and its associated models, see Stephen M.Walt, 'Rigor or Rigor Mortis? Rational Choice and Security Studies', *International Security*, 23, 4 (Spring 1999), pp. 5–48; and his reply to his critics, 'A Model Disagreement', *International Security*, 24, 2 (Fall 1999), pp. 115–30 (Walt's critics romp enthusiastically on pp. 56–114 of that same issue).

57 . Arthur K.Cebrowski and John J.Garstka, 'Network-Centric Warfare: Its Origins and Future', US Naval Institute *Proceedings*, 124, 1 (January 1998), pp. 28–35; and Cebrowski and Wayne P.Hughes, 'Rebalancing the Fleet', US Naval Institute *Proceedings*, 125, 11 (November 1999), pp. 31–4.

58 . Arthur K.Cebrowski, 'President's Notes', *Naval War College Review*, 52, 4 (Autumn 1999), pp. 5–6. For F.W.Lanchester's attritional models of combat, see his *Aircraft in Warfare: The Dawn of the Fourth Arm* (London: Constable, 1916), chs 5–6.

59 . Cebrowski, 'President's Notes', p. 6.

60 . A great deal of scholarly work needs to be done on the vexed question of world order(s) and the even more vexed question of the relationship between world order(s) and war. Torbjorn L.Knutsen, *The Rise and Fall of World Orders* (Manchester: Manchester University Press, 1999); T.V.Paul and John A.Hall (eds), *International Order and the Future of World Politics* (Cambridge: Cambridge University Press, 1999); and Andrew Williams, *Failed Imagination? New World Orders of the Twentieth Century* (Manchester: Manchester University Press, 1998), map the field for enquiry quite usefully.

61 . Michael A.Palmer, *Lee Moves North: Robert E.Lee on the Offensive* (New York: John Wiley and Sons, 1998), p. 49. For the most extreme of recent claims for Jackson's indispensability, see Bevin

Alexander, *Lost Victories: The Military Genius of Stonewall Jackson* (Edison, NJ: Blue and Gray Press, 1996). On the Stonewall Jackson hagiography industry, see William C.Davis, *The Cause Lost: Myths and Realities of the Confederacy* (Lawrence: University Press of Kansas, 1996), ch. 10, 'Stonewall Jackson in Myth and Memory'. The new standard biography is James I.Robertson, Jr, *Stonewall Jackson: The Man, The Soldier, The Legend* (New York: Macmillan Publishing, 1997). In my opinion, the death of Thomas J.'Stonewall' Jackson did have fatal consequences for the military fortunes of the Army of Northern Virginia, and hence very directly for the cause of Southern independence. The issue is not so much the genius, or otherwise, of Jackson, but rather the vital role he played in helping Lee to be a better general. Generalship really mattered in the Civil War.

62 . A crucial point developed well in Gary W.Gallagher, *The Confederate War* (Cambridge, MA: Harvard University Press, 1997), esp. pp. 152–3. Elsewhere Gallagher rather misses the point when he claims that 'Jackson never led a real army and proved sadly deficient in administrative and political acumen': '"Upon their Success Hang Momentous Interests": Generals', in Gabor S.Boritt (ed.), *Why the Confederacy Lost* (New York: Oxford University Press, 1992), p. 89. To win its independence in the 1862–63 period the Confederacy did not require another Lee, though that would have been welcome. What it needed was a lieutenant to Lee who would lift Lee's campaign, and particularly his battlefield, performance.

63 . See Stephen W.Sears, *Controversies and Commanders: Dispatches from the Army of the Potomac* (Boston, MA: Houghton Mifflin, 1999), ch. 5, for a full account of the 'lost order' episode of Special Orders 191 of 9 September 1862.

64 . For details of this shambolic event, see Ian Kershaw, *Hitler, 1889–1939: Hubris* (London: Penguin, 1998), pp. 204–12. Kershaw comments: 'Had the bullet which killed Scheubner-Richter been a foot to the right, history would have taken a different course' (p. 211). But would it? If so, in what ways?

65 . The military continuities from Weimar to Nazi Germany were formidable. See Hans W.Gatzke, *Stresemann and the Rearmament of Germany* (Baltimore, MD: Johns Hopkins University Press, 1954); Wilhelm Diest, *The Wehrmacht and German Rearmament* (Toronto: University of Toronto Press, 1981); and Corum, *Roots of Blitzkrieg.*

66 . Gerhard L.Weinberg, *A World at Arms: A Global History of World War II* (Cambridge: Cambridge University Press, 1994), ch. 1, 'From one war to another', convincingly demolishes at least a good fraction of the proposition that the two world wars can be viewed as two rounds of what really conflates to a single event. He is, however, insufficiently alert to the habit of war's grammar to produce similarities in scales of effort, even when the political stakes initially are somewhat different.

Also, Weinberg risks missing the political action when he argues the case for the terms of the Treaty of Versailles being rather moderate. Excellent reappraisal of major aspects of Versailles is offered in Manfred F.Boemke, Gerald D.Feldman, and Elizabeth Glaser (eds), *The Treaty of Versailles: A Reassessment after 75 Years* (Cambridge: Cambridge University Press, 1998).

67 . Clausewitz, *On War*, p. 606.

68 . Albert Wohlstetter, 'The Delicate Balance of Terror', *Foreign Affairs*, 37, 2 (January 1959), pp. 211–34.

69 . See John J.Mueller, 'The Essential Irrelevance of Nuclear Weapons: Stability in the Postwar World', *International Security*, 13, 2 (Fall 1988), pp. 55–70; and Kenneth N. Waltz, 'Nuclear Myths and Political Realities', *American Political Science Review*, 84, 3 (September 1990), pp. 731–45.

70 . Robert Jervis, *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Armageddon* (Ithaca, NY: Cornell University Press, 1989).

71 . Scott D.Sagan, *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons* (Princeton, NJ: Princeton University Press, 1993).

72 . Non-expert concerned citizens reading, say, Bruce G.Blair's superior study, *The Logic of Accidental Nuclear War* (Washington, DC: Brookings Institution, 1993), should not forget that somehow, notwithstanding Blair's exciting title, accidental nuclear war has not happened, at least not yet.

73 . Ian Hamilton, *The Soul and Body of an Army* (London: Edward Arnold, 1921), p. 70. Sir Ian may not have shone while in command at the Dardanelles, but he was certainly no fool as a military philosopher. John Lee, 'Sir Ian Hamilton and the Dardanelles, 1915', in Brian Bond (ed.), *Fallen Stars: Eleven Studies of Twentieth-century Military Disasters* (London: Brassey's (UK), 1991), pp. 32–51, is a persuasively empathetic assessment.