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RMA Anatomy: Patterns in History?

Anyone can manufacture definitions and coin terms with intriguing acronyms. Nothing as simple as the RMA idea per se, however, has been at stake in the debate. All debaters could, and by and large did, agree that *if the RMA concept is empirically plausible, and if contemporary trends appear to fit the concept well enough*, then the 1990s registered a radical change in the character or conduct of war, which is to say that the 1990s registered an RMA. The two qualifying 'ifs' are significant caveats. The debate in the 1990s included some, though probably insufficient, argument about the empirical plausibility of the RMA idea itself, the identity and character of the RMA(s) that might be under way, and also the prospective strategic significance of such an RMA. These three topics, though clearly interdependent, nonetheless are distinguishable.

This chapter poses and discusses the question 'what is an RMA?' Interesting though it is to pursue this enquiry certainly a cast of thousands believed so in the 1990s, readers are warned that an RMA focus to debate is inherently limited and fragile. This book is designed principally to explore what RMA debate tells us about strategy, war, and the course of strategic history, rather than about RMA itself. Because RMA is merely an intellectual construct, albeit an appealingly imperial one with great explanatory potential, it is not wise to accord it effectively iconic significance.

WARNING LABEL

There is much to say in praise as well as in criticism both of the RMA hypothesis itself and of the use to which the hypothesis has been put to date. It is useful to flag here some of the more significant grounds for reservation over the merit in the RMA idea. These caveats may be regarded as an effort at intellectual vaccination against the potential to mislead of an RMA literature and debate that often—to risk the reification—took its subject and itself too seriously, and which was always on the threshold of loss of perspective. The warning label which these critical comments convey are preemptive cautionary

counterpoints to the RMA anatomy as dissected in the balance of this chapter and to the discussion of RMA dynamics in Chapter 3. The issuing of clear warning at this stage largely obviates what otherwise would be a constant need to inject sceptical cautionary notes.

First, and hugely foremost, the RMA hypothesis bears what may be an empirically unsound bias in favour of discontinuity in strategic history. To observe that the discontinuity integral to the meaning of *revolution* in military affairs is simply a concentrated expression of the chaotically nonlinear nature of strategy and war would be no more than a half-truth, and a perilously misleading half-truth at that. As noted in Chapter 1, there is real value in borrowing complexity theory and the ideas of nonlinearity and chaos from the natural and mathematical sciences, but that value is rapidly lost if the borrowing is indiscriminate and excessive.[1] Strategic theorists can learn a lesson from the errors of those among their close associates in the fields of international relations theory and history who have borrowed and stolen not wisely but too well from literary 'critical theory', and other expressions of the post-modern ethos.[2] Both literary critical theory and complexity/chaos theory serve up at least two major kinds of hazards for the unduly credulous strategist. On the one hand, they are both contested bodies of ideas in their own scholarly realm-of-origin. On the other hand, both bodies of theory, especially in the simple (even often simplistic) forms in which they appear in strategic speculation, though potentially sources of important insight, have a distinctly ragged fit with the robust phenomenon of human nastiness that is the domain of strategy.

Even when the ideas of complexity and chaotic nonlinearity appear well adaptable to strategic experience, the central elevation of discontinuity, in RMA or military transformation, can be allowed inappropriately to prejudge enquiry as to what changed and what did not. Furthermore, such enthronement of discontinuity discourages careful consideration of the historical significance of preceding and succeeding periods. This argument should not be read as a bid to inflict lethal damage upon the RMA construct. All intellectual research tools come at a price. RMA is not unique in the fact that it carries some dangerous baggage. The transaction costs of employing the RMA idea include a constant need to make provision for the appreciation of continuities in strategic phenomena, because the RMA concept yields powerful oversteer in the opposite direction.

Second, no matter how carefully we speculate about RMA and apply theory to interpret strategic behaviour, there must always be an essential indeterminacy about the subject. I am acutely aware that by so organising this study as to deploy three hypothesised RMAs as case studies (in Chapters 6–8), I may appear summarily to dismiss important philosophical and empirical doubts. Whether or not the selected cases of RMA truly are such, the strategic behaviour that each encompasses assuredly occurred and is well worthy of investigation for our purposes. French Revolutionary and Napoleonic warfare happened

and was important, whether or not one approves of the idea of a 'Napoleonic RMA'. A label is only a label; the contents of the can are unaffected by their tagging.

My second caveat is intended to warn readers against the nominalist fallacy. If we have a name for it, and if that name passes into common currency, then 'it' assumes some quality of reality. Virtually all discussion of RMA, including this one, encourages acceptance not only of the concept itself, but also of particular *hypothesised* historical RMAs to which frequent reference is made. There is an almost insidious commonsense plausibility about the RMA hypothesis which can disarm potential sceptics, especially when the acronym is widely favoured in everyday usage. Andrew W.Marshall, the godfather of the American RMA debate in the 1990s, was eminently plausible when he told the Senate Armed Services Committee on 5 May 1995 that

The term 'revolution' is not meant to insist that the change will be rapid—indeed past revolutions have unfolded over a period of decades—but only that the change will be *profound*, that the new methods of warfare will be far more powerful than the old.[3]

Marshall is not, indeed cannot be, demonstrably correct, but he is certainly persuasive. However, grounds for scepticism lurk both about his recognition that 'revolution', to be such, need not happen speedily, and in his citing of the necessary truth that revolutionary change has to be *profound*. The trouble is that a distinctly non-speedy process of profound change might plausibly simply be regarded as the course of history much as usual. Is all profound change revolutionary? If we relax the temporal requirement for revolution, then surely change can hardly help but be profound?

A final quibble is the thought that 'new methods of warfare' may be judged revolutionary with reference to an absolute standard of unilateral effort, but how can that be a sensible approach for such a systemically bilateral (-plus) activity as war? Net assessment is inescapable, as Marshall, above all people, knows.[4] Investment in an RMA cannot itself guarantee that 'the new methods of warfare will be far more powerful than the old'. Strategic effect, which is, or should be, Marshall's meaning of power, can only be assessed in adversarial relation to the effect generated by the enemy. The complexity systemic to the nature of strategy and war limits the potency practicable for an RMA. The temporary outcomes possible through the dynamic, including nonlinear chaotic, character of strategy and war, are always likely to be governed and reduced by the enduring complex structure of the subject. This is an expression only of probability, not certainty, and is always liable to particular exceptions. A focus on,

say, German, or whomever's, RMA leadership, has major potential to mislead theorists into neglecting both the complex structure of strategy, and the central persisting importance of conflict's adversarial essence.[5]

Third, RMA is one of those mega-concepts which in the word processors of careful scholars can be a valuable tool of strategic analysis, but which in the word processors of others can encourage misleading reductionism. As acronymic shorthand, RMA is difficult to better. However, the convenience of the hyper-terse economy of RMA usage encourages a neglect born of familiarity. This 'acronym of choice' in the 1990s,[6] because of its popularity, fuelled an existential assumption born of the nominalist fallacy, and oversimple analyses born of reification. Thus far, RMA has been deployed here in the spirit of a collective noun, referring generically to possible or actual radical changes in the character of warfare. But the price paid for apparently sharpedged clarity in communication includes the possible encouragement of a grossly oversimplified view of the phenomena at issue. In general usage RMA is a compound term, a house with several rooms.

This third caveat is the point that all but universal reference to '*the* RMA debate', or to '*the* RMA', though harmless as informal communication among experts, can convey to those less expert the idea of a single kind of event and process. Observers of RMA debate could fail to notice that an important stake in the debate is decision on just what it is that is worth debating as RMA experience. By partial analogy, strategic commentators have to remember that in goodly measure limited war—and all wars are more or less limited—is waged both according to, and in violent contention over, particular limits. Careless contemporary references to 'the RMA' after a decade of intense debate illustrate the power of a handy acronym to fuel unrecognised reductionism.

Fourth, notwithstanding the popularity of social conservatism in the United States, and the lingering bitter aftertaste of a half-century of conflict with the heirs of the Bolshevik revolution (actually coup) of 1917, the idea of revolution remains a positive one for most Americans.[7] RMA, especially when explicitly nationally branded as 'the American RMA', enters the lists of US public debate with overwhelmingly positive cultural vibrations.[8] RMA sounds new, forward-looking, hi-tech, ruthlessly pragmatic, and, overall, hugely American. Inevitably, particular strategic cultures—consciously to risk oversimplification[9]—from seventh-century Byzantium to the United States today, favour ideas and methods which both fit their mix of strengths and weaknesses and have historical cultural resonance for them.[10] RMA today is as American as were machine tools in the 1840s,[11] the 'fleet train' in the 1940s,[12] and the global positioning system (GPS) in the 1980s.[13] RMA reflects an often admirable American preference for tackling big challenges in a suitably root-and-branch way, depending critically upon

practical technologies.[14] RMA seems to offer a near-perfect expression of the preferred American way in warfare, offering technological compensation for weaknesses elsewhere (e.g. social unwillingness to take casualties and political nervousness of American boots on the ground).[15]

Fifth, although it would probably be a mistake to dismiss RMA debate simply as the concept *du jour* throughout the 1990s for the strategic literati who always need some unifying idea and issue to which they can rally for profitable debate, fashion did inflate its apparent significance. RMA had an unusually long service life as a topic 'with legs'; indeed, it remains nominally alive (as 'military transformation') as an issue area even today. When a defence community as large and well funded as the American adopts a concept or issue, the consequences are certain to be flattering to that subject. One reason, of no small importance, why so many people wrote about RMA in the 1990s was, simply, because RMA was the topic of the day. Whatever some impossibly objective judgement about inherent worth might advise, a principal merit of RMA in the 1990s was that many people wanted to read about it. I am in no position to criticise such activity, and no such criticism is intended here. The point is rather that it can be difficult to find the diamonds when so much rock has been shifted. A lively public debate is inherently likely to benefit understanding. Analytical diamonds are reluctantly surrendered by a resisting terrain. But, to cite the famous distinction employed by Roberta Wohlstetter in her classic study of the intelligence context for Pearl Harbor 1941, there is a problem finding the true 'signals' amidst all the 'noise'.[16]

A decade of fashionable RMA debate has yielded a plethora of studies and commentaries which, necessarily, can be plotted for quality on a bell-shaped curve. In a strategic debating community as well populated as the American, the fashionable status of the RMA concept guaranteed production of a quantity of contributions that obscured quality. The potential for fashionable debates to mislead is truly formidable. Notwithstanding the powerful critiques to which leading RMA notions have been exposed, there is a distinct possibility that in the real world of American (inter alia) strategic practice, fashion may deliver imprudent efforts at implementation.

The five caveats about RMA aired immediately above are only caveats. The RMA hypothesis does not enjoy pole position here because the author believes it to be the golden key that opens the door for understanding the process of change in strategic history. Admittedly, though, even its theoretical applicability in such a heroic explanatory role is intriguing and exciting. RMA merits its prominent billing rather because it can be a useful enabler as a tool to prise open the complex edifice of strategy, for appreciation of strategy's structure and functioning. It follows that the proper focus for scepticism about RMA is not on the question, 'is RMA true?' (i.e. 'are there real live RMAs out there waiting to be captured?'), but rather, 'is the RMA hypothesis useful to improve strategic understanding?'

ANATOMY OF SPECIES

Much as zoologists discover that on close inspection a supposedly uniform species in fact comprises anatomically distinctive sub-species, so fieldwork by RMA hunters in the rough terrain of strategic history has located distinguishable classes of candidate-RMAs. There is no terminology officially sanctioned as correct, not even by Andrew W.Marshall, but research and debate in the 1990s did yield two persuasive distinctions and a range of plausible working hypotheses: between major and minor revolutions, and between revolutions that have technological innovation as their most potent catalyst and those that do not.[17] At a similarly superior level of generality and quality of insight, Williamson Murray argues that 'these revolutions [major, truly systemic changes, e.g. the French, industrial, and information revolutions] do not replace but rather overlay each other'.[18]

Given that RMA theory is difficult to test empirically, a fact that many people forget typically is true also for the non-laboratory physical sciences (e.g. geology, astronomy), our guide has to be an historically empathetic plausibility. Several alternative anatomies of candidate RMA phenomena contend for approval. Four distinguishable RMA anatomies have particular merit for their insight in explanation. None is, or can be, true, except in the sense in which each of the three first volumes of Lawrence Durrell's *Alexandria Quartet* is 'true'. Each of the four anatomies, though not presented as analytically of equal value—I acknowledge partiality—provides a different perspective on the same strategic behaviour.

Lest there be any misunderstanding over intellectual provenance, each of the four models, or paradigms, of RMA outlined below is inspired by a particular scholar or scholars. The judgements presented here are my own, but I am working with the intellectual products of the labours of many people over many years. So, what is the anatomy of RMA?

Great social waves of change

Alvin and Heidi Toffler offer us three great 'waves' in history. The three waves are in turn propelled by new kinds of productive activity, which function as the latest and most potent sources of wealth creation and allegedly find unique military expression in characteristic styles of warfare.[19] The Tofflers

identify first-, second-, and now third- 'wave' warfare, respectively with the rise of agriculture, then industry, and most recently with knowledge (or its close associate, information).[20] Notwithstanding the heavily Marxist underpinnings to their technologically and economically deterministic grand theory, the Tofflers and some of their followers have made an important contribution to RMA scholarship.[21]

The Tofflers' social-wave theory is elegant in its simplicity, for all its grandiosity, reductionism, and casual dating. Also, the theory stakes a massive claim about prime cause and (in this case, military) consequences which is highly plausible, significant, and, in more modest guise, is even endorsed by careful professional historians—reluctant though they might be to admit it. Many though the qualifications may be, there is certainly a broad-brush validity to the Tofflers' claims that the conditions for, and character of, warfare were revolutionised by the invention of agriculture, of industrial mass production, and, *ab extensio*—possibly today—of a knowledge-dependent economy.

To take just the modern case of so-called 'second-wave' warfare, there has to be some major, if not strictly all-case, validity to the hypothesis that societies and their polities prepare for war, and try to wage it, according to their fairly distinctive characters.[22] To find only three great social waves of revolutionary change is probably to be unduly demanding by way of criteria for revolution. However, it is scarcely more arbitrary, or less persuasive, than are theories which detect whole squads and platoons of RMAs. It is a principal virtue of the Tofflers' three-wave theory that it recognises, indeed risks over-recognising, the importance of context. As Andrew Latham notes, '[m]ilitary forces, of course, do not exist in a vacuum. Rather, they are products of complex historical processes that include social, political, material and cultural dimensions.'[23]

Ceteris paribus, security communities will wage war in ways, which is to say with styles, shaped by their more or less distinctive military and strategic cultures. Those cultures express traditional preferences deriving from the historical experience, geostrategic situation, and ideology of the society in question. 'National' strategic/military culture(s) and style are moderated by distinctive geostrategic contexts (e.g. maritime or continental, to risk over-simplification).[24] But they are also driven by the economic fuel identified in Toffleresque social-wave theory. For example, in 1914– 18 Britain was not at practical strategic liberty to wage its traditionally preferred style of warfare, at least not if it was to deny Germany victory in the war and therefore hegemony in Europe.[25] In the age of '[t]he rise and decline of industrialised total warfare',[26] Britain was obliged to wage second-wave, industrialised mass warfare against Germany, a second-wave foe if ever there was one. Similarly, quaintly atavistic ideas revived in the 1930s of a British limited continental liability were shown by the events of 1939–45 to belong to a bygone age, prior to the era of total war.[27]

The proposition that military revolutions must ride on the backs of revolutionary social, economic, political, and technological change yields a healthy antidote to a persisting source of error in American-authored theory and analysis. Antidote is needed to a characteristically American tendency to treat strategic affairs in isolation from politics and society.[28] The great (American) RMA debate of the 1990s was unusually apolitical as such debates go, and therefore it appeared hazardously astrategic.[29] American theorists and other commentators debated the RMA thesis of the possibility of radical change in military tools and methods. But they did not debate the purpose that urgent prosecution of such an RMA would serve.[30] The critics who found fault with those RMA theorists who proceeded naked of historically particular strategic purpose, were not entirely on solid ground. The absence of anything worth calling a national security strategy—the US condition in the 1990s, notwithstanding the appearance of official publications which bore that elevated title[31]—had to constrain efforts to implement an RMA. But that absence is not necessarily an error. The basic rationales for the information-led RMA debated in the 1990s were, first, that opportunity beckons and, second, that the world remains a dangerous place. In other words, a relatively unimpressive current threat-set simply is the way things are (or were, in the 1990s). Probably inadvertently, some RMA critics imply that a United States in pursuit of RMA advantage requires the kind of plausible commanding strategy that can come only from identification of definite foes. Such a view is unsound. At least, it is unsound if intended literally.

The real error in much of the technology-keyed RMA theory of the 1990s did not lie in its failure to name particular enemies. Instead, the contextual error was the one addressed as the principal theme of this book: the context that matters most is the complex structure and sometimes nonlinear functioning of war and strategy upon which, and through which, RMA must operate. We should not criticise RMA proponents of various persuasions for neglecting to tailor their military-revolutionary vision explicitly to a rising China, a reviving Russia, regional rogues by name, or specific non-state but robustly ‘networked’ political or criminal menaces (e.g. an Osama Bin Laden). Of course an RMA will yield greater strategic return if it is anchored to a threat-set that is accurately predicted. Indeed it is possible that most of the RMA debate of the 1990s focused upon what time will reveal to be the wrong foes.[32] However, it would be absurd to require particular threat identification as a condition for progress in RMA. If politically definite threats are not evident beyond argument, it is unwise in the extreme for strategic theorists to predict them to the point of invention as a matter of convenience.

To consider the RMA debate overall is to face the need to venture into the realm of judgement about the character, some would say the nature, of future war. Such broad-gauged analysis must also address the point that defence planning needs guidance as to probable and possible threats, even when that

guidance can only cite highly contingent menaces. The three-wave grand theory of the Tofflers, and other generically similar notions, suggest powerfully that truly infrequently a seismic shift in the context (s) and character of warfare leaves security communities with no practical option other than to ride the wave as best they are able. The Industrial Revolution of the nineteenth century changed modes of war systemically.[33] It is a broad proposition of many theorists of RMA that a knowledge, or information ('third-wave'), revolution is reshaping the terms and condition of conflict. Allegedly, this is a fact of today and tomorrow akin to the fact of industrialisation in the nineteenth century, and is no more avoidable in its implications.[34] Polities can try to ignore this information revolution, but the consequence for them assuredly would be revalidation of Joseph Stalin's famous aphorism: 'those who are left behind are beaten'. However, although plainly it is sensible to notice that this is significantly an information age, and while it is no less sensible to reason, *après* the Tofflers, that therefore this has to be an information age for warfare, the nagging question, 'so what?', lurks in the wings. The concept of information-age warfare, beyond being a tautologically necessary truth, may carry much less strategic meaning than some RMA theorists would have us believe. It is probably worth mentioning as a final sceptical note that it is far from certain that the Tofflers' third-wave hypothesis is well founded economically. While ours is obviously in some respects an information age, the idea that 'information' is the key to wealth creation is highly contestable.

Revolution in the revolution

If RMA is judged an idea useful both to help explain strategic history and also to provide focus for current defence policy and planning, and if one seeks a powerfully seamless architecture of theory, then one need look no further than to Williamson Murray's seminal article, 'Thinking About Revolutions in Military Affairs'. Murray draws a vital distinction between military revolutions (MRs), of which he finds only four in modern times, and RMAs, which are numerous indeed. In two strictly illustrative listings, he suggests respectively 21 and 23 RMAs since the fourteenth century.[35] Andrew F. Krepinevich suggested ten RMAs in an influential article in 1994. [36]

The two caveat 'ifs' with which this sub-section begins should not be dismissed as rhetorical flourishes or as merely token qualifiers. The reason why it is essential to preface this discussion with those caveats is precisely because Murray's treatment of the RMA postulate is so plausible, useful, and

even seductive. To be accurate, and strictly fair, he is more reporting on, and tidying up, the RMA debate than he is leading a charge for RMA theory of any persuasion. Additionally, in a series of strongly worded articles on military culture, Murray has explained beyond the possibility of honest misunderstanding that he is under-impressed by the advertised military and strategic promise in the more technological variants of the contemporary RMA story.[37] Those readers not familiar with the full Murray canon on RMA, but who have read only his article in *Joint Force Quarterly* on 'Thinking About Revolutions in Military Affairs' or the introductory chapter to his co-edited book on *The Dynamics of Military Revolution*, could be at risk of capture by an unduly powerful framework for the interpretation of strategic history.

Taking Murray's theoretical architecture as the core for understanding, and adding at the margins to that core from the writings of the Tofflers, Jeffrey R. Cooper, Steven Metz, Brian R.Sullivan, and Jeremy Shapiro, one has ample material for a working theory of waves of change in strategic history[38]—if, on balance, it is judged sensible to seek such a megatheory. For those attracted to a complex, RMA-keyed theory of strategic-historical change, the ideas of the authors just cited comprise a superior mixed breed. By way of the tersest of presentations of Murray's theory: (1) very occasionally history records a process of systemically radical change which registers on strategic history's Richter Scale as the seismic shock of a military revolution; (2) the earthquake that is the true military revolution (MR) is anteceded by pre-shock precursor, and by expressive direct and post-shock RMAs and (3) RMAs can be led by many possible factors, one of which is technological change—technologically driven RMAs are known as military-technical revolutions (MTRs).

Murray's nuanced presentation of the RMA concept in the context of occasional MRs appeals strongly to an intuitive grasp of how history moves, while empirically it is persuasive enough. Moreover, Murray's view is compatible with Toffleresque wave theory, with Metz's preference for a simple distinction between major and minor RMAs, with Sullivan's insistence upon an RMA/MTR divide, and also with Shapiro's thesis that there are characteristic strategists' and historians' views of military revolutions (see the discussion below). The thesis is that military revolutions are the product of such deep and broad forces, and have such all-pervading consequences and implications that they are beyond control by a cabal of enlightened, future-oriented, strategic thinkers and defence planners (or by anyone else). Cause and effect are not always unambiguously distinguishable, but the military instrument is more probably the child than the parent of broad and powerful social, economic, and political factors, interdependent though military matters and their context must be. This discussion skates dangerously close to the essentially contestable and unresolvable issue area of the relative importance of war, indeed of military concerns writ large, in history.[39] The analysis here deals with this immense topic only insofar

as it must with reference to particular RMAs. I harbour no additional ambition in this already ambitious enquiry to shed new light on the significance of *strategic* topics for the general course of history. If serendipity strikes, so be it.

Scholars have to be careful not to be seduced by conceptual classification schemes that can obscure as well as clarify. The central proposition advanced by Murray and others— that strategic history's discontinuities appear in larger and smaller kinds—is inherently, as well as empirically, plausible. Notwithstanding their grandiosity in conception, the Tofflers' 'threepeating' social-wave theory is at least uniform. Each great 'wave' is propelled by radical change in the leading method of wealth production (even though it is not proven that 'information' will qualify), which is to say by the leading idea of what is most valuable, and each has characteristic broad consequences for the conduct of warfare. By way of contrast, classification of MRs, or unusually great RMAs, by professional historians offers troubling complications, though the difficulty may be largely semantic. At least the Tofflers clearly separate cause (first-, second-, or third-wave context) and consequences (first-, second-, or third-wave warfare). What are we to make of the following argument by Murray?

> There appear to be two distinct historical phenomena involved in radical innovation and change. The first can be called military revolutions. *These were by far the more important, for they fundamentally changed the nature of warfare in the West.* There appear to have been four (two occurring at the same time): creation of the modern, effective nation-state based on organised and disciplined military power in the 17th century; the French Revolution and the industrial revolution beginning at the same time during the period 1789–1815, and World War I, 1914–18. We might compare them with earthquakes. *They brought with them such systemic changes in the political, social, and cultural arenas as to be largely uncontrollable, unpredictable, and above all unforeseeable.…* Such 'military revolutions' recast the nature of society and the state as well as of military organisations.[40]

There is confusion, certainly some likelihood of the promotion of confusion, here. Murray usefully distinguishes greater changes (MRs) from lesser (RMAs), but is it helpful to equate context with hypothesised content? There may or may not have been a series of military developments in the sixteenth and seventeenth centuries that in long retrospect warrant classification as 'the military revolution of early modern Europe'. But it has to be unhelpful to claim that the '17th century creation of the modern state' was the military revolution. Similarly, there is no doubting the historicity of the French

and Industrial revolutions, and of the First World War, but were they the military revolutions in question? The Roberts-Parker debate, inter alia, among early-modern historians bequeathed to RMA theory writ large a somewhat casual titling of MRs which might have prejudicial consequences.[41] Was the modern state more the cause, or more the beneficiary, of a great change in warfare? Or was it both? The French and Industrial Revolutions certainly had radical consequences for warfare, but surely these were not themselves MRs, any more than was the First World War per se.

Murray's generally excellent analysis is not always as sensitive to the needs of theory-building as social scientists, at least this social scientist, would like. This is a less than systemic criticism of Murray, since much of his historical argument is strongly convincing. However, the point does relate to a central theme of this book. Specifically, the relations between historians and social scientists can be strained both when the former venture into theory-building, as does Murray on RMA, and when the latter voyage into historical analysis. Murray's analysis is outstanding for its success in 'getting the big things right enough'; certainly it appears so to this theorist. Nonetheless, several items in his essay merit critical attention, including points made in the quotation above to which I have added emphasis.

First, it is unfortunate that as an influential scholarly opinion-leader Murray should encourage the fallacious belief that military revolutions 'fundamentally changed the nature of warfare in the West'. Of course, one scholar's nature of warfare is another's character of warfare, but still it is implausible to claim that the French, Industrial, or First World War military revolutions effected as fundamental a change as is alleged. If the conduct of war alters from a typically limited military effort for limited political objectives to a far more ferocious and large-scale exercise, it is still war that one is discussing. War is war, whether it is waged by great armies or by small armies, and whether it is directed to secure heroically expansive or only modest political objectives.[42]

Second, Murray says of his four modern military revolutions that 'They brought with them such systemic changes in the political and social arenas as to be largely uncontrollable, unpredictable, and above all unforeseeable.' Excellent ideas are brought together in that sentence, but there is a vagueness, even opacity, about the words 'brought with them'. Did, indeed in what sense could, a postulated Napoleonic MR, for example, bring along the French and Industrial Revolutions? The meaning of Murray's phrasing is as inexact and puzzling as it is potentially significant. After all, what is under discussion is nothing less than the relationship between military revolution and its (inter alia) social, political, and economic contexts. This non-trivial matter of military event or process and its contexts pertains directly to cause and effect in military innovation.

The imposition of a pattern upon the course of (strategic) history is a perilous venture. Murray's hypothesised short list of four MRs in modern times does not include a nuclear revolution—an omission

he corrects in *The Dynamics of Military Revolution*.[43] He cites the possibility of a fifth MR, but that candidate new entry is the child of information technology, not of the weaponisation of atomic physics. This is a case where a scholar was wrong (he did admit as much) but principally for the right reason. On Murray's initial understanding of what makes for true military revolutions, it is easy to see why the creation of the modern state, the French and Industrial Revolutions, and the First World War, made the élite grade, but the nuclear discovery (and its consequences) did not. The nuclear revolution, if such it was, manifestly did not have a seismic impact upon the social, political, and economic contexts of strategy. Moreover, as Murray notes, that alleged revolution has been utterly invisible in actual explosive deeds in warfare since 1945 in the eponymous 'nuclear era'.[44] So, how might Murray have been wrong? Arguably, because at the core of the nuclear fact, and for the first time in strategic history, there is a weapon which really might alter the nature of war—a point he conceded for great powers, but apparently found relatively unimpressive.[45] Nuclear war might, but only might, have an outcome thoroughly incompatible with the basic integrity of the logic chain integral to the meaning of strategy. Largescale nuclear use could drop the bridge that is strategy; the bridge between political purpose and military capability.[46] Special respect is due a weapon that can trump all other weapons, that in effect could knock over the game table thereby cancelling the value of all other pieces on the board and all points scored to date.

Nuclear weapons have altered probably for ever the relationship between *grande guerre* and high policy. The facts that those weapons have not revolutionised politics domestically and have not changed much in the 'game of nations', should not mislead us. Murray was not persuasive when he sought to demote nuclear weapons simply to the category of 'possible RMA. He attached their singularity quite strictly to the claim that their revolution, uniquely among the 21 RMAs on his illustrative list, has been solely technological in character (albeit, as he notes, 'almost entirely political' in impact 'except for their first use against the Japanese'). Murray is exceptionally persuasive, however, when he emphasises the historically modest role of technology in RMAs. He writes:

> The list [of 21 'possible RMAs'] suggests a number of points. First, given the enthusiasm for describing the coming RMA as technological, the historical record suggests that technological change represents a relatively small part of the equation.[47]

So modest is the role of technology as occasional leading-edge element that there are grounds for scepticism over the merit in the concept of a military-*technical* revolution (MTR). First, all strategic behaviour must have a technological dimension: the threat or use of force—a distinguishing characteristic for strategic activity—requires weapons as tools of the trade. More generally viewed, all strategic behaviour occurs in a particular technological context. Second, as Murray notes tellingly, the historical candidates for technology-led RMAs, let alone MRs, are exceedingly rare. Third, even when technology is in the front rank pushing, or more likely pulling, for radical change, it can function as a catalyst for major enhancement of military power only when it is assisted by ideas, organisation, and numbers (mass).[48] Appreciation of the complexity of strategy and war should depress enthusiasm for the idea of MTR.

Understanding of 'the Murray version', or—to be just—simply 'the Murray reading' of RMA studies, is assisted by recognition of the sense in Jeremy Shapiro's insistence upon the distinction between a historian's and a strategist's view of RMA. Shapiro's 'historian's view' is closer to Murray's explanation of MR than it is to RMA. Shapiro advises that:

There are two radically different, though perhaps complementary, ways to view a military revolution. Historians typically take a long view and see a military revolution as an observable breaking point between two recognisably different types of warfare. This view of military revolutions tends to downplay the role of human agency in the making of a revolution. Such revolutions stem from exogenous forces which were bound, sooner or later, to spark a fundamental shift in the methods of war. Technological, demographic, or social changes in this sense 'push' the revolution into being.[49]

The Tofflers' three waves fit this bill suitably, as would Murray's four-(later five-) item short list of great military revolutions in modern history (the invention of the state, the French Revolution, the Industrial Revolution, the First World War, and nuclear). Shapiro proceeds to explain 'the strategist's view'.

The strategist is more concerned with the problems of the here and now and, as a result, sees a revolution as consisting of essentially clever, new solutions to previously insoluble geostrategic problems. These solutions usually, but not necessarily, use new technologies. In any case, the impetus is

not some new exogenous technological or social reality but rather a particular nation's strategic problems.[50]

Shapiro's 'strategist's view' fits quite closely Murray's understanding of RMA as contrasted with MR. Moreover, Shapiro effects a useful and largely plausible reconciliation.

These views of military revolutions do not strictly contradict each other. They can be reconciled by an understanding that sees the short-run motor of the strategist's revolution determining the path if not the ultimate outcome of the historian's revolution. However, in their details, these two views see very different revolutions and very different implications of any military revolution. *The strategist's revolution is made; the historians happens.*[51]

This is a perceptive addendum to the theorising by Murray and others about distinctions between MR, RMA, and MTR. Shapiro adds further lustre to his name when he thickens Murray's claim for the unpredictability of MRs.

The current proposed information-based revolution in military affairs has been the most self-conscious military revolution in history, yet most commentators have largely passed over the question of whether they see themselves as creating a strategist's revolution or predicting a historian's. While both types of revolution have analytical validity in retrospect, the utility of the historian's viewpoint to inform the current debate is very limited. While contemporaries can and must *create* military revolutions in the strategic sense, their ability to *predict* military revolutions in the historic sense is virtually nonexistent… These revolutions only seem clear in retrospect.[52]

Readers are at liberty to shop as they see fit for the concept or concepts they prefer among MR, RMA, and MTR (as well as alleged 'revolutions' in strategic affairs and security affairs). If taken too seriously,

these ideas threaten to confuse, and to confound commonsense, more than they help to enlighten. The paragraphs immediately below provide a respectful, yet critical, restatement of the somewhat competing, though largely complementary, RMA concepts just discussed.

The character of war is always changing, but from time to time the pace of change accelerates, or appears to do so, with the result that there is a change of state in warfare. War must still be war, but it is waged in a noticeably different manner.

The conduct of war and other strategic behaviour has to express characteristics distinctive to their social context, broadly understood. Rather like the history of global weather, which has cycles within cycles within cycles, and so forth, all modified by apparent contingency, war and strategy have a history of change that lends itself to highly contestable explanation by complex cyclical theory.

War and strategy can be revolutionised as their social context is transformed by the invention of agriculture, industrial mass production, and *just possibly* by the emergence of knowledge-based enterprise. But war and strategy also can be revolutionised by occasional great upheavals in the political and social worlds which owe little if anything to radical change in the means and methods of wealth creation. The hypothesised military revolutions that attended (created, defended) the emergence of the modern state, the French Revolution and (First) Empire, and the First World War, were none of them unarguably the product of Toffleresque social wave forces, but they certainly recorded radical changes.[53]

In addition to the rare, exceptionally systemic, upheaval in military affairs, many aspects of military affairs frequently record change in their limited, but important, realms that might be termed revolutionary. Candidate RMAs of modest scope and dimension can pertain directly to fortification, naval architecture, medical provision, land and air transportation, amphibious operations, and so forth. These many hypothesised RMAs may be likened to foothills or low mountains in relation to towering peaks. Evidence of a succession of near simultaneous, probably synergistically interacting, RMAs may signal the emergence or possibility of a much greater convulsion, a true military revolution which transcends in its features the sum of its (inter alia) multiple-RMA parts.

Although the US defence community is culturally prone to exaggerate the relative significance of technology for strategy and war, we need to be alert to the error of making a vigorous effort to demote technology by way of analytical (over)compensation.[54] Occasionally, there is a discontinuity in military affairs in which the cutting edge for change truly is, or certainly includes, technological innovation. Of course, there are always dimensions other than the technological in play. Technology needs translation into weapons, and weapons have to function in person-machine systems, properly organised, acquired in critical mass, suitably tactically trained, and employed for advantageous operational effect. Nonetheless, technology counts. It always must count for something, because all strategic behaviour occurs, and is

planned to occur, in a particular technological context. It may be useful to identify some episodes of change as constituting military-technical revolutions (MTRs). The adoption of the six-foot longbow by English armies at the beginning of the fourteenth century, the adoption of gunpowder artillery between the 1340s and the 1440s, the exploitation of railways for military logistics, the maturing of militarily practical aircraft, the weaponisation of the discoveries of atomic fission and fusion, and the military exploitation of the computer, could all be described as MTRs.

It may be fun to do battle with competing acronyms, but it is not always enlightening. Scholars need to address more the empirical, if contestable, referents that can be gleaned from strategic history, than they do their most favoured categories of analysis. For example, the contemporary emergence of a (US) style in warfare dependent on exploitation of information technologies has been hailed variously as third-wave warfare, an MR, an RMA, and merely as an MTR (viewed either as a variant of, or as a lower form of change possibly independent of, RMA).[55]

Not all in the great RMA debate is scholastic trivialisation. Whatever one elects to call the evidence of military change seen today, it matters profoundly whether what appears to be on offer is simply a *plat*, or *plats, du jour*, which we can purchase or not more or less as our taste dictates, or whether what is on offer are but variants of a whole diet truly mandatory for our security health. As Murray and Knox note, periodically if irregularly, the whole context for strategic behaviour alters so radically that the only practicable choice lies between on the one hand versions of adoption and adaptation, and on the other obsolescence leading to marginalisation and probably eventual defeat.[56] Modern state structures, industrial methods, and information systems are none of them in the ‘optional’ column for polities and societies. Some revolutions can be ignored or evaded, but others cannot. This fundamental point underlines much of the debate, which otherwise can appear trivial, over MRs, RMAs, and MTRs.

Action and reaction

Intersecting the ideas on MR, RMA, and MTR addressed above is an earlier perspective upon RMA, first aired in 1991 by mediaeval historian Clifford J. Rogers, which sees a long causal chain of action and reaction.[57] It is tempting to consign Rogers’ theorisation to the bin of early efforts at RMA understanding subsequently overtaken by more refined notions. To propose such dismissal would not be

without merit. However, it would risk missing what a professional historian finds convincing to help explain his particular period of expertise (the fourteenth and fifteenth centuries), and it could discourage effort to explore causation in strategic behaviour.

In search of better understanding of the dynamics of historical change, Rogers borrowed the concept of 'punctuated equilibrium' from the biological sciences.

In 1972, Stephen Jay Gould and Niles Eldredge proposed a new model for the evolutionary formation of species, which they dubbed 'punctuated equilibrium'. They argued that evolution proceeded by short bursts of rapid change interspersed with long periods of near stasis rather than constant, slow alteration.[58]

Critics of Gould and Eldredge argued compellingly that the model should allow a greater role to incremental change, but the basic idea, of evolution proceeding with plateaux of largely business-as-usual interrupted by spikes of creativity (strategic moments, perhaps), was accepted.

This newer conception of punctuated equilibrium evolution, combining both incremental and 'revolutionary' change, seems to describe the process of military innovation extraordinarily well. After a long period of near-stasis, infantry began to evolve very rapidly around the beginning of the fourteenth century. Cannon appeared at about that time, evolved incrementally for a century, then in a burst of rapid advancement revolutionised war in Europe. Artillery fortifications began to develop at about the same time as artillery reached its height; evolved gradually over the course of a century; then in their turn effected a military revolution. *A similar process of punctuated equilibrium evolution in military technology continues even today.*[59]

Rogers summarises his theory thus: 'I will argue that Western military dominance derived from a *series* of sequential military revolutions, each an attempt to reverse a disequilibrium introduced by the previous one, rather than from a single "Military Revolution".'[60] It is understandable and probably laudable for historians to be uncomfortable with single conceptions so grand that they reduce drastically the rich complexity of history. Rogers writes critically of Roberts, Parker, and others who are tolerably content with the hypothesis of a single great early-modern Military Revolution.

By attempting to subsume the innovations of five centuries into a single phenomenon, we may be imposing an artificial teleological unity on to a series of inherently distinct, separate developments. And, in doing so, we may be clouding our understanding of a critically important area of history, an area which fully deserves to be studied through the clearest possible lens.[61]

While I believe Rogers overreaches with his use of 'punctuated equilibrium evolution' theory, he underreaches in the final sentence quoted. All areas of history are important, none inherently more or less than others, and a single lens, no matter how clear, cannot in this case cope with the traffic of required understanding.

In recent decades the essentially simple, but potentially theoretically powerful, idea which attracted Rogers has attracted other theorists. To summarise, Rogers suggests that strategic history reveals a process of innovation (RMAs) wherein and whereby disequilibrium among military elements is produced by short bursts of radical change. Those short creative bursts lead to periods of relative advantage for, say, infantry, or gunpowder siege artillery. The disequilibrium thus effected motivates a (ultimately successful) hunt for offsetting methods, and/or weapons, of war. Even for Rogers' mediaeval zone of special expertise, let alone for the 1990s (note the historical reach claimed in the italicised words quoted), his logically compelling idea is unduly simple.

In 'Thinking About Revolutions in Military Affairs', Murray suggests persuasively that Rogers' (inter alia) hypothesis of a neat series of sequentially discrete RMAs imposes an undue orderliness upon strategic history.[62] One should add to Murray's reservations the objection that the necessarily competitive context for strategic behaviour cannot be assumed to follow a strategically logical and tidy path of action and reaction. Rogers appears unaware of the fact that while early-modern, and then mediaeval and modern, historians were merrily debating 'the Roberts thesis' and 'the Parker variant' on *The* Military Revolution, physical and social scientists were energetically debating the dynamics of competitive armament, in a phrase, 'arms-race theory'. Contemporary defence professionals discovered, or at least thought they had discovered (there were, and remain, problems of evidence on causality), that even the most apparently self-evident of action-reaction chains often are not what they appear to be.[63]

Security communities, mediaeval and modern, certainly develop new military means and methods which might counter the forces and techniques of the contemporary foe or of the foe expected tomorrow. However, the dynamics of innovation rarely reduce neatly to an orderly sequence of action and reaction.

Innovation can proceed not so much, *à la* Rogers, 'to reverse a particular disequilibrium', but rather to exploit new possibilities for a strategically generic reason (e.g. it is desirable to be militarily more effective), to give practical expression to new military ideas, and even to serve domestic institutional interests. For example, American theorists in the 1960s invented a logically compelling theory of arms-race dynamics organised by the hypothesis of a tight linkage between arms-competitive actions and reactions borrowed simple-mindedly from the physical sciences: to every action there must be an equal and opposite reaction. This arms-race theory was deployed politically to claim that ballistic missile defence (BMD) would be strategically destabilising, a mortal sin in the Cold War universe of strategists. Allegedly, BMD *to protect people* would deprive the adversary of its hostages (if the BMD were tolerably militarily credible, that is, a logical consequence which must drive it to augment offensive nuclear forces so as to preserve the stability of deterrence).[64] It should follow logically that if an offence-defence action-reaction mechanism drives the 'arms race', then measures of arms control which stultify or forbid the defence must remove much of the policy motivation behind the build-up and modernisation of strategic nuclear offensive forces.

The problem with action-reaction theory as applied to the arms competition of the Cold War is that it is not true, at least it is not true enough. The ABM Treaty of 1972 broke the defence link in the offence-defence spiral in futility that supposedly drove the arms competition, but the offence expanded and modernised regardless.[65] In the immortal words of Charles E.Callwell: 'Theory cannot be accepted as conclusive when practice points the other way.'[66] The difficulty with Rogers' action-reaction theory of RMA is not that it has no merit. Of necessity there is an adversarial dimension to strategy and war. Rather, the difficulty is that Rogers and those theorists of more modern strategic affairs who favour a simple logic of RMA action and eventually offsetting RMA reaction, unwisely discount the salience both of historical contingency and of astrategic motivation.

For a telling case in point, a study by John France of the 300 years of 'Western warfare in the age of the crusades' appears at first sight to offer some limited support to Rogers' use of the theory of 'punctuated equilibrium evolution'. France informs us that '[t]here was no linear development [between 1000 and 1300] but, rather, a series of impulses produced changes that were not always sustained, and in the end much depended on powerful personalities.'[67] The idea of a 'series of impulses' could be interpreted as tolerably congruent with Rogers' use of the concept of punctuated equilibrium. Closer inspection, however, discourages such a view.

France is careful to bracket his registering of a 'series of impulses' with caveats claiming 'no linear development' and the fact that the changes in question 'were not always sustained'. The experience of Western mediaeval warfare as described by France thus on closer inspection does not fit easily with

Rogers' model. Instead of the orderly linear realm of 'a *series* of sequential revolutions, each an attempt to reverse a disequilibrium introduced by the previous one', France describes instead the world of war of a high middle ages wherein the nobility were the dominant force, and there could be no academy of war—no career structure of merit—which might challenge their position. This explains the conservatism of armies and the erratic nature of change in Western warfare.[68]

Earlier, he writes:

There was no forum in which to develop weapons. Warfare was episodic and there were no permanent staffs to form intellectual centres: the 'Twelfth-century Renaissance' bred no academies of war, for war already had its elite, who felt no need to give way to any new forces. By the end of the twelfth century, powerful monarchies were acquiring arsenals and these must have stereotyped arms and armour to a degree. But there was no marriage of thought and technology, so that advance remained piecemeal and by individual experiment. In these circumstances, new ideas would have been diffused only slowly and unevenly.[69]

Considered in conjunction, Rogers' model of the pattern of military innovation in early-modern Europe (and beyond), and France's near-rejection of any pattern for the high middle ages, suggest two points potentially important for our analysis. On the one hand, it is not wholly self-evident that the social context of Western warfare was so different in its essentials as between the periods 1000–1300 and 1300–1453 (or *c.* 1540), as to explain convincingly the contrast between the two views of military innovation. On the other hand, if we elect to trust in the period expertise of these scholars (i.e. not when they venture, as does Rogers, into open-ended extrapolation of his thesis), the possibility emerges that although strategy and war are structurally timeless, the architecture and dynamics of military innovation are not.

The possible period specificity of dominant explanations of RMA or its absence parallels the argument in David Kaiser's work on the causes of war. He allows that although war may be war in all periods, there will tend to be a similarity in war causality among polities in the same period.[70] France writes that 'It is a truth barely worth labouring that an army will reflect closely the nature of the society that produces it.'[71] That important, if commonplace, thought can be heavily amended for our purpose so

as to read: ‘An RMA will reflect closely in its origins, dynamics, course, and consequences the society (domestic and international) that produces it.’

While the concept of RMA may be usefully applicable to all historical strategic experience, we need to be alert to the strong probability that contextual differences among periods are likely to be reflected in different patterns in military innovation. It may be that any transhistorical grand theory of innovation, purporting to identify and explain a regular pattern in RMA, MR, or MTR, must be fundamentally flawed. The point is not that there is no such radical change, far from it. Rather, the argument is that any favoured theory which discerns a pattern in RMA occurrence (e.g. of punctuated equilibrium evolution, as in Rogers’ studies) characteristic of a particular era, and can explain plausibly the reasons for that pattern, has to be suspect when it ‘plays abroad’ in ‘away fixtures’ in different periods. This caveat on RMA grand theory does not extend to the basic structure of the life-cycle of RMA. Chapter 3 provides a theory of that life-cycle which can accommodate all potential RMA behaviour in all periods. A timeless structure is consistent with shifting patterns in occurrence and scale of activity.

Business as usual

In the interest of encouraging a healthy scepticism, it is useful to conclude this analysis of the anatomy of RMA with an existentially challenging view. Borrowing from Commandant Jean Colin, British soldier and historian Cyril Falls began his study *A Hundred Years of War* with a chapter on ‘The Transformations of War’.[72] Falls succeeds admirably in balancing recognition of change with issuing a warning against exaggeration of its importance. This chapter by Falls should be compulsory reading for those breathless discoverers of RMA who are, alas, all too often historically challenged in their understanding.[73] Falls provides the most persuasive generic corrective to RMA thinking known to this author. He is not in any sense reactionary. In fact he is not even particularly conservative, while his professional credentials must accord him an unusual measure of respect a priori. *A Hundred Years of War* was completed in 1953. Falls was a staff officer in, and an official historian of, the First World War, and subsequently worked as a journalist and as a scholar.[74] In short, Cyril Falls (1888–1971) witnessed, and in most respects experienced, the great changes in warfare of the twentieth century. If the First World War produced a military revolution, or if the atomic bomb marked a turning point in strategic history, then Captain, later Professor, Cyril Falls was a man in a position to be suitably impressed.

Falls chose to emphasise the empty half of the glass of military change that is half full. He did so, moreover, with an analysis whose long Olympian perspective does not require the suppression of theoretically inconvenient facts.

It will be seen therefore that the century to be covered [1850–1950] began with great innovations [e.g. rifling of breech-loading firearms, railways, electric telegraph]. And it kept up the process. The submarine, the internal combustion engine, the aircraft, wireless telegraphy and telephony, the tank, and finally the atomic bomb, complete a remarkable development.

Having flagged his full recognition of technical change in the conduct of war, Falls then proceeds to state a powerful caveat.

Yet if there be one warning rather than any other which ought to be given at the beginning of our study, it is that the student should not believe everything moves only when he sees the process at a glance, and stands still when he does not see it moving. It is his eyes which are at fault. They see movement of a pattern and in circumstances which are familiar to them; they fail to detect it when those are unfamiliar. The more scholarly the enquirer becomes, the more conscious is he of endless change.[75]

Williamson Murray notes what amounts to a variant upon Falls' argument when he writes that once Clifford J.Rogers had implanted the idea that 'there was not one military revolution but a series that reached from the middle ages to the present day…[n]ot surprisingly there has been a rush to examine virtually everything from the strategy of Edward III to *Blitzkrieg* operations in the light of what we call *revolutions in military affairs*.'[76] I suspect that had the idea of business as usual, or near continuous innovation, rather than RMA, been the intellectual flavour of the time in the early 1990s, that is what careful scholarship most probably would have unearthed. To adapt the sanguine biblical aphorism of 'seek and ye shall find': 'know what you seek, and you are likely to find it'. Some words by Cyril Falls may help balance RMA theory.

Observers constantly describe the warfare of their own age as marking a revolutionary breach in the normal progress of methods of warfare. Their selection of their own age ought to put readers and listeners on their guard. Careful examination shows that, historically speaking, the transformations of war are not commonly violent. The invention of gunpowder was one of the most violent; the construction of a heavier-than-air flying machine was a second; the exploitation of atomic energy may be expected to be another. Gunpowder and aircraft, however, proved less revolutionary—using the word

in its true sense as connoting both complete and violent change—than contemporaries expected. Atomic energy has not, as these lines are written [1953], been tested in this respect.

Falls' punchlines could hardly appear more challenging to much of the radical transformational spirit of some of the RMA theory of the 1990s.

It is a fallacy, due to ignorance of technical and tactical military history, to suppose that methods of warfare have not made continuous and, on the whole, fairly even progress… It is also true that there have been periods in which progress has been slower than in others, at least in some respects… These are exceptions, and in any case it is not to be expected that science in war, any more than in other activities, should be perfectly regular in its development. The irregularities are minor when the whole process is surveyed.[77]

This is as bold an analysis in denial of the RMA hypothesis, as that hypothesis, and its variants, is bold in its imperial claim to explain the patterns in the process of change in strategic history. Falls is, indeed can be, neither right nor wrong in his broad-brush characterisation. However, he was at least as competent a military historian as are those who signed on to serve in one or other of the competing legions of RMA theorists in the 1990s. Moreover, Falls' first-hand experience of 'the birth of the modern style of warfare' for three years on the Western Front from 1915 to 1918,[78] and his intimate, if some-what less perilous long subsequent involvement in strategic matters, translate as formidable credentials as a base from which to theorise.

Falls' judgements are not quite as damning of the RMA thesis as a swift reading might mislead one to credit. He denies neither that change, even 'major transformations of war',[79] occurs, nor that the pace of change can vary. Most RMA theorists should be tolerably comfortable with this interesting summary by Falls of his views.

The point which it is desired to make is that movement [i.e. innovation] goes on all the time and that since the sixteenth century it would be hard to find any period of fifty years at the end of which an army, with contemporary weapons and tactics, could not with ease have utterly destroyed an army with those

of the start of the half-century. This is almost equally true of naval fleets, and recently at least as true. In air warfare the transformations which render obsolete equipment and tactics take place every six years at the longest.[80]

As noted above, Falls' perspective does not exclude recognition of the phenomenon of 'transformations of war', indeed quite the contrary. It does, however, accord more weight and significance to the irregularly paced processes of innovatory business as usual between historical episodes of RMA. By analogy, the outbreak of what became the Great

War of 1914–18 can be explained in temporally complementary fashion with reference to: (1) crisis moves at the very end of July and in the first days of August 1914; (2) the events of the whole summer of 1914; (3) the policies and strategies of the relevant great and lesser powers in the decade leading up to 1914; (4) the structure of European balance-of-power politics, and the attendant ethos and assumptions,[81] from the 1870s to 1914; and (5) 'waves of great wars' in modern European history (1494–1529, 1618–48, 1672–1713, 1791–1815, and 1914–45).[82]

A QUESTION OF CONTINUITY

Scholars can employ their imagination to read the same data in different ways, none of which is correct or incorrect. This is why my 'anatomy of species' provides distinctive, yet generally complementary, lenses on the subject. The point of this discussion has been to enrich understanding of the processes of change in strategic history. Most emphatically, the purpose has not been to test more and less fashionable concepts and select a winner. Each school of thought on RMA contributes to strategic understanding not so much because it aids historical interpretation, but more because it helps expose the structure and dynamics of strategy and war.

Figure 2.1 illustrates notionally the patterns of change in the four perspectives on RMA anatomy presented above. Given the subjectivity in assessment of the incidence of allegedly revolutionary occurrences, the simple social-wave graphic alone is intended to match precisely the speculations of particular theorists. Each graph plots a claimed pattern of relative significance of military change over time.

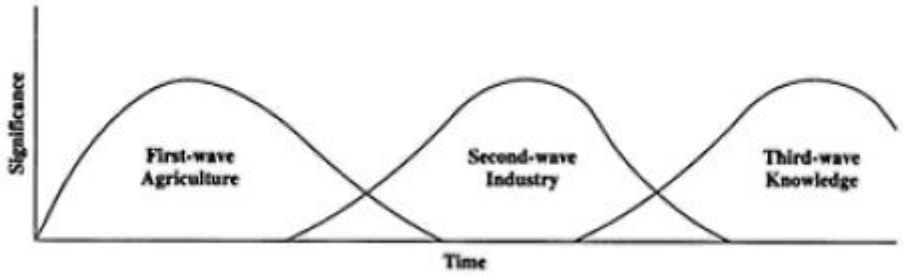
So rich and intuitively appealing is the literature on RMA theory that fundamental questioning of the sense in its founding premise risks dismissal as a scholarly profanity. That founding premise appears

with admirable directness in the first sentence of an interesting extended definition offered by Michael J. Vickers.

Military revolutions are major discontinuities in military affairs. They are brought about by changes in militarily relevant technologies, concepts of operations, methods of organisation, and/or resources available. Relatively abruptly—most typically over two to three decades—they transform the conduct of war and make possible order-of-magnitude (or greater) gains in military effectiveness. They sharpen the advantage held by the strategic/operational offense and create enormous intertemporal differentials of capability between military regimes. A hierarchy of change links these revolutions with broader social, economic, and scientific transformations.[83]

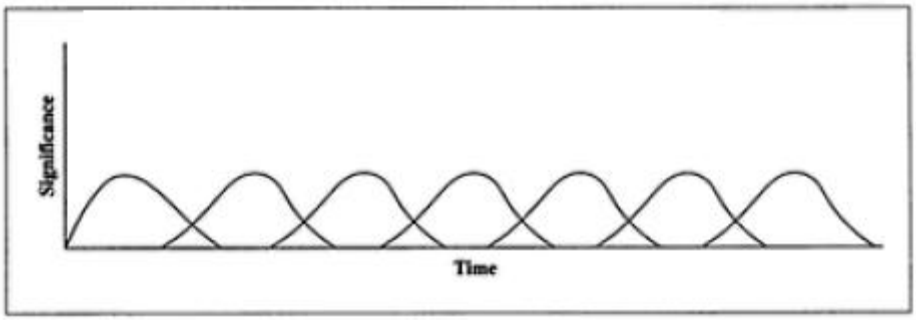
One cannot ask very usefully whether or not Vickers' exciting and exceptionally clear description is true. But one can and must enquire whether or not the description is misleading. By analogy, one can ask of troops who are impressive on parade: 'very pretty, but will they fight?' Vickers merits praise not only for the clarity of his definition and description of RMA, but also for the ruthlessness of his summary dismissal of a confusion of competing RMA concepts (if I may thus coin the collective noun for RMA notions): 'The "revolution in military affairs" should be considered interchangeable with military revolution or military-technical revolution.'[84]

1.Toffler three-wave theory



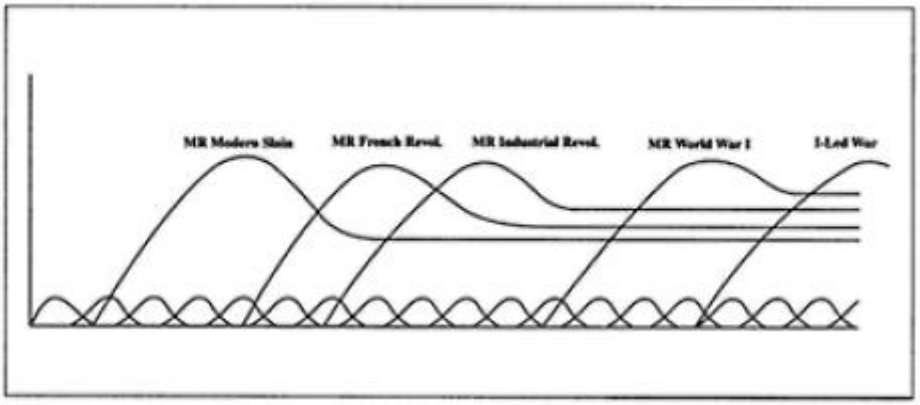
- The first wave lasted nearly 7,000 years, the second 250 years, the third is now nearly 50 years old.

2. Revolution in the revolution: MR, RMA, MTR theory



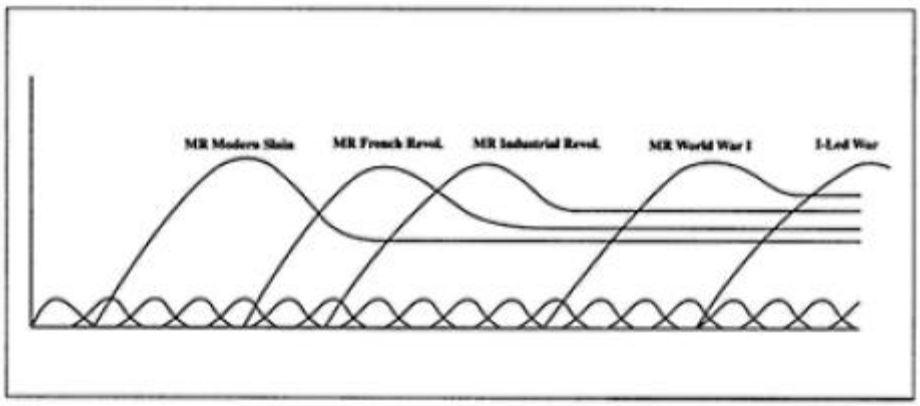
- The five MRs layer upon, rather than totally succeed, each other.
- The foothills arc prc-shock, direct, and after-shock RMM (to the "earthquakes" of the five MRs).
- Some RMAs will be MTRs.
- Some theorists distinguish RMAs from MTRs.
- Strategic history is not as regular as the patterning here might suggest to the unwary.

3.Punctuated equilibrium, action-reaction



- Each RMA is negated fairly neatly in sequence by a succeeding and offsetting RMA
- The periods between RMAs witness sonic significant evolution in means and methods for military effectiveness.

4.Businesss as usual, continuous innovation



- Periodic transformations of war occur, but they stand out from a normal condition of generally steady innovation, not from periods of near-stasis.

Figure 2:1: Patterns of Change

What is most troubling about the RMA premise is not its claim that the conduct of war can be transformed in means and methods. So much is but an incontestable statement of the obvious. The problem lies in the potential of RMA theory to de-emphasise elements of continuity, as contrasted with discontinuity. In particular, there is a noteworthy possibility that the focus upon revolutionary change and its most immediate agents will incline RMA proponents to neglect those elements of continuity that are necessary enablers if revolution is to be effected.[85] Both historically and conceptually there are substantial grounds for disquiet over the popularity of RMA theory of recent years. The fourth 'anatomy of species' presented above was that of British soldier-historian Cyril Falls: recall that he argued for transformation by an evolution in military affairs. His writings serve as a sobering, yet non-atavistic, corrective to the outpouring of RMA theory in the 1990s. Falls advises that each new invention, each new tactic, takes its place in the armoury of warfare, meets new currents of opposition, fails here, triumphs there, adds to itself in this direction, lets a part of itself drop in that, and finally becomes so changed as to be almost unrecognisable. Yet it does not disappear altogether, and sometimes, a century, three centuries after-wards, circumstances become favourable to its re-establishment in a form astonishingly similar to the original.[86]

Falls also offers a basic judgement on what it is, actually who it is, that enables strategy to be done, no matter which style of warfare prevails. ‘But we must never forget that it is the unknown fighting man who garners the fruits of strategy. Dogmatism which leaves out of account the human factor is worthless.’[87] The cutting-edge literature in the mid- 1990s which explained and advocated ‘the American RMA’, was notably quiet in its treatment of the human factor.[88]

The discussion has considered different claimed anatomies of the historical pattern of RMA. The analysis proceeds next, in Chapter 3, to make sufficient sense of RMA theory—with relevant caveats—as to equip us to proceed into the realms of strategy and then of historical cases. In the trajectory of this book, as in the real world of strategic behaviour, the time has come dramatically to reduce, if not wholly banish, confusion, and identify an RMA theory that assists, rather than detracts from, strategic understanding.

NOTES

1 . Since chaos theory invites excessive claims for its explanatory domain even among the ranks of professional scientists, it is scarcely surprising that its terms-of-art, or specialised jargon, have notable potential to mislead unwary social scientists. For example, Peter Coveney and Roger Highfield warn that ‘In everyday language chaos is synonymous with randomness, making people contrast it with ordered behaviour, and thus think of some kind of precarious balance between opposites. But its scientific usage is quite different; there, as we have pointed out, the term masks the fact that chaotic dynamics is actually exquisitely organised’: *Frontiers of Complexity: The Search for Order in a Chaotic World* (London: Faber & Faber, 1995), p. 277. Alan Beyerchen’s brilliant article, ‘Clausewitz, Nonlinearity, and the Unpredictability of War’, *International Security*, 17, 3 (Winter 1992/93), pp. 59–90, both exaggerates war’s nonlinearity and, most especially, inevitably has had the effect of encouraging such exaggeration by others. Complexity, chaos, and nonlinearity are important and valid ideas that are applicable to, indeed are inherent in the structure and dynamics of, strategy and war, but their relevance should not be overstated, as I fear is the case in these otherwise strongly praiseworthy articles: Williamson Murray, ‘Clausewitz Out, Computer In: Military Culture and Technological Hubris’, *The National Interest*, 48 (Summer 1997), p. 61; Mackubin Thomas Owens, ‘Technology, the RMA, and Future War’, *Strategic Review*, 26, 2 (Spring 1998), esp. pp. 65–7; and Paul K.Van Riper and F.G.Hoffman, ‘Pursuing the Real Revolution in Military Affairs: Exploiting Knowledge-Based Warfare’, *National Security Studies Quarterly*, 4, 3 (Summer 1998), pp. 4–6. My

point is not that these authors and their leading source of inspiration (Beyerchen on Clausewitz) are wrong. They are not. Rather, the problem is that inadvertently they abuse the good idea of nonlinearity by neglecting the fact that much, perhaps most, strategic behaviour in peace and war is significantly linear.

2 . See Horace L.Fairlamb, *Critical Conditions: Postmodernity and the Question of Foundations* (Cambridge: Cambridge University Press, 1994), for a root-and-branch review of the basics of critical theory; Keith Jenkins (ed.), *The Postmodern History Reader* (London: Routledge, 1997), for new history—if history it is—with a vengeance. Critical theory for historians is dismissed plausibly, if probably too gently, in Richard J.Evans, *In Defence of History* (London: Granta Books, 1997); while strategic studies is offered a 'critical' future in Keith Krause and Michael C.Williams (eds), *Critical Security Studies: Concepts and Cases* (London: UCL Press, 1997), and Richard Gwyn Jones, *Security, Strategy, and Critical Theory* (Boulder, CO: Lynne Rienner Publishers, 1999). I appreciate that assertion is not argument and that my belief that critical theory is largely folly is only my belief. As at the time of writing, no 'mainstream' scholar of strategy has made the effort to publish a comprehensive refutation of 'critical' security theory. The over-whelming reason—certainly for this author—is that 'critical' theory has been judged unworthy of the time and effort needed for its refutation. This explanation, though true, is not a happy one. Since some serious scholars have 'gone critical' over the past decade or so—Ken Booth, for example (see his contributions to Krause and Williams, *Critical Security Studies*, pp. 83–119 and (with Peter Vale) 329–58)—the time is overdue for direct engagement in debate between traditional views and 'critical' critiques.

3 . Andrew W.Marshall, Prepared Statement before the Senate Armed Services Committee, Subcommittee on Acquisition and Technology, 5 May 1995, p. 2 (emphasis added).

4 . See George E.Pickett, James G.Roche, and Barry D.Watts, 'Net Assessment: A Historical Review', in Andrew W.Marshall, J.J.Martin, and Henry S.Rowen (eds), *On Not Confusing Ourselves: Essays on National Security Strategy in Honor of Albert and Roberta Wohlstetter* (Boulder, CO: Westview Press, 1991), pp. 58–85. Carl von Clausewitz advises that 'War is nothing but a duel on a larger scale. Countless duels go to make up war, but a picture of it as a whole can be formed by imagining a pair of wrestlers. Each tries through physical force to compel the other to do his will': *On War*, trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976 [1832]), p. 75.

5 . Edward N.Luttwak, *Strategy: The Logic of War and Peace* (Cambridge, MA: Harvard University Press, 1987), is a classic statement of the paradoxical logic of conflict which has strategy's adversarial quality as its centerpiece. André Beaufre, *An Introduction to Strategy*, trans. R.H.Barry (London: Faber & Faber, 1965), declares that strategy 'is therefore the art of the dialectic of force, or, more

precisely, *the art of the dialectic of two opposing wills using force to resolve their dispute*' (p. 22, emphasis in original).

6 . Williamson Murray, 'Thinking about Revolutions in Military Affairs', *Joint Force Quarterly*, 16 (Summer 1997), p. 69.

7 . S.P.MacKenzie identifies as a problem for sound scholarship 'the almost a priori assumption that revolutions have generated new ways of war and above all a new and more effective type of soldier. Universal and fervent belief in a revolutionary cause, to put it in very simple terms, is assumed to translate into military innovation and greater effectiveness on the battlefield: or, to simplify even more, right equals might': *Revolutionary Armies in the Modern Era: A Revisionist Approach* (London: Routledge, 1997), p. 1.

8 . For example, William A.Owens, 'The American Revolution in Military Affairs', *Joint Force Quarterly*, 10 (Winter 1995–96), pp. 37–8. The fact that Owens was Vice Chairman of the JCS when he signed this article to press renders it substantially authoritative as a national proprietary claim.

9 . Shu Guang Zhang, *Deterrence and Strategic Culture: Chinese-American Confrontations, 1949–1958* (Ithaca, NY: Cornell University Press, 1992); Colin S.Gray, *Modern Strategy* (Oxford: Oxford University Press, 1999), ch. 5; Alastair Iain Johnston, 'Strategic Cultures Revisited: Reply to Colin Gray', *Review of International Studies*, 25, 3 (July 1999), pp. 519– 23; and Keith Krause, 'Cross-Cultural Dimensions of Multilateral NonProliferation and Arms Control Dialogues: An Overview', in Krause (ed.), *Culture and Security: Multilateralism, Arms Control and Security Building* (London: Frank Cass, 1999), pp. 1–22.

10 . Pending the appearance of Edward N.Luttwak's long-promised study of Byzantine strategy, see Walter Emil Kaegi, Jr, *Some Thoughts on Byzantine Military Strategy* (Brookline, MA: Hellenic College Press, 1983); and John Haldon, *Warfare, State and Society in the Byzantine World, 565–1204* (London: UCL Press, 1999), esp. ch. 2. For the contemporary United States of America, see Edward N.Luttwak, 'Toward Post-Heroic Warfare', *Foreign Affairs*, 74, 3 (May/June 1995), pp. 109–21; and idem, 'A Post-Heroic Military Policy', *Foreign Affairs*, 75, 4 (July/August 1996), pp. 33–44; in the light of Russell F.Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (New York: Macmillan, 1973); and Colin S.Gray, 'Strategy in the Nuclear Age: The United States, 1945–1991', in Williamson Murray, MacGregor Knox, and Alvin Bernstein (eds), *The Making of Strategy: Rulers, States, and War* (Cambridge: Cambridge University Press, 1994), esp. pp. 589–98.

11 . Merritt Roe Smith, ‘Army Ordnance and the “American System” of Manufacturing, 1815– 1861’, in Smith (ed.), *Military Enterprise and Technological Change: Perspectives on the American Experience* (Cambridge, MA: MIT Press, 1987), pp. 39–86.

12 . The ‘fleet train’ that enabled the US Navy to operate in seas remote from its infrastructure of land bases was the innovatory response of a service that was denied by politicians fortified bases in the western Pacific. See Edward S.Miller, *War Plan Orange: The US Strategy to Defeat Japan* (Annapolis, MD: Naval Institute Press, 1991), pp. 75–6, 345–6; and Thomas M.Kane, *Military Logistics and Strategic Performance* (London: Frank Cass, 2001), ch. 3.

The navy was thus saved from itself. A great naval base in the western Pacific would have been indefensible in 1941–42.

13 . See Peter Anson and Dennis Cummings, ‘The First Space War: The Contribution of Satellites to the Gulf War’, in Alan D.Campen (ed.), *The First Information War: The Story of Communications, Computers and Intelligence Systems in the Persian Gulf War* (Fairfax, VA: AFCEA International Press, October 1992), pp. 126–8; and Benjamin S. Lambeth, ‘Air Power, Space Power, and Geography’, in Colin S.Gray and Geoffrey Sloan (eds), *Geopolitics, Geography and Strategy* (London: Frank Cass, 1999), p. 74.

14 . Owens’ grand concept of a ‘system-of-systems’ finds ambitious naval interpretation in Arthur K. Cebrowski and John J.Garstka’s idea for ‘Network-Centric Warfare: Its Origins and Future’, US Naval Institute *Proceedings*, 124, 1 (January 1998), pp. 28–35. For a yet broader examination of the network concept, see John Arquilla and David Ronfeldt, *The Advent of Netwar*, MR-789-OSD (Santa Monica, CA: National Defense Research Institute, RAND, 1996).

15 . See Edward N.Luttwak, ‘From Vietnam to *Desert Fox:* Civil-Military Relations in Modern Democracies’, *Survival*, 41, 1 (Spring 1999), pp. 99–111.

16 . Roberta Wohlstetter, *Pearl Harbor: Warning and Decision* (Stanford, CA: Stanford University Press, 1962).

17 . These distinctions are made clearly in Steven Metz and James Kievit, *Strategy and the Revolution in Military Affairs: From Theory to Policy* (Carlisle, PA: Strategic Studies Institute, US Army War College, 27 June 1995), p. 10 (major and minor RMAs), and Murray, ‘Thinking About Revolutions in Military Affairs’, p. 70 (technology-led RMAs and others).

18 . Murray, ‘Thinking About Revolutions in Military Affairs’, p. 71.

19 . Alvin Toffler and Heidi Toffler, *War and Anti-War: Survival at the Dawn of the 21st Century* (Boston, MA: Little, Brown, 1993).

20 . Van Riper and Hoffman praise the Tofflers for their emphasis on knowledge rather than mere information: ‘Pursuing the Real Revolution in Military Affairs’, pp. 2, 3, 7.

21 . For example, Andrew Latham, ‘Re-imagining Warfare: The “Revolution in Military Affairs”’, in Craig A.Snyder (ed.), *Contemporary Security and Strategy* (London: Macmillan, 1999), pp. 210–35, is distinctly Toffleresque. The title is unpromisingly postmodern, and a Toffleresque/Marxist pedigree is not an unmixed blessing, but the analysis is sharp and insightful.

22 . This, the Tofflers’ central hypothesis, is compatible with the argument advanced by some strategic theorists that national strategic culture shapes a national style in strategy. Colin S.Gray, *Nuclear Strategy and National Style* (Lanham, MD: Hamilton Press, 1986), ch. 2; Krause, *Culture and Security* . Controversy over the evidentiary base, and most appropriate research methodology, for the study of strategic culture, should not be permitted to obscure the dominant plausibility of the central culturalist hypothesis.

23 . Latham, ‘Re-imagining Warfare’, p. 212.

24 . I recognise that not all nations ‘have’ states, just as I acknowledge that the political and security communities we recognise today as states are, in some features of their statehood, expressions of a modern invention which already is showing signs of severe wear around the edges. See Emanuel Adler and Michael Barnett (eds), *Security Communities* (Cambridge: Cambridge University Press, 1998); and Martin van Creveld, *The Rise and Decline of the State* (Cambridge: Cambridge University Press, 1999). In common with Michael Howard, ‘When are Wars Decisive?’ *Survival*, 41, 1 (Spring 1999), pp. 126–35, I believe that strategic affairs pertain to all security communities in all periods, regardless of whether or not (modern) states are involved: Gray, *Modern Strategy*. A comprehensively different view animates John Keegan, *A History of Warfare* (London: Hutchinson, 1993).

25 . On that British style of warfare, see David French, *The British Way in Warfare: 1688–2000* (London: Unwin Hyman, 1990); and Hew Strachan, ‘The British Way in Warfare’, in David Chandler and Ian Beckett (eds), *The Oxford Illustrated History of the British Army* (Oxford: Oxford University Press, 1994), pp. 417–34. Michael Howard, *The Continental Commitment: The Dilemma of British Defence Policy in the Era of the Two World Wars* (London: Temple Smith, 1972), is characteristically well argued, but is likely to be judged unduly continentalist by the balance of future historiography. A leading historian of the maritime persuasion, Andrew D.Lambert, laments the fact that a ‘shift of arms’ to the waging of total war ‘forced her to participate in very un-British operations to sustain her allies’. It is not very helpful for Lambert to observe that ‘Had the Entente used its armies wisely in 1914 there would have been no need for a massive British Army’ As he himself notes, ‘[i]n 1914 unrealistic offensives launched by the French and Russians deprived the Triple Entente of two million

soldiers': review of Chandler and Beckett (see above, this note) in *The Journal of Strategic Studies*, 19, 2 (June 1996), p. 284. Niall Ferguson, *The Pity of War* (London: Allen Lane, 1998), is entirely sceptical of the need for Britain to participate in the Great War.

26 . Latham, 'Re-imagining Warfare', p. 213.

27 . B.H.Liddell Hart, *The British Way in Warfare* (London: Faber & Faber, 1932), ch. 1. The best treatment remains Brian Bond, *British Military Policy between the Two World Wars* (Oxford: Clarendon Press, 1980). There is, inevitably, a (tiny) school of thought among British historians critical of Britain's decision to go to war in 1939, and especially critical of Winston Churchill's determination to fight on in 1940 after the fall of France. For the argument of the leading critic see John Charmley, *Chamberlain and the Lost Peace* (London: Macmillan, 1989); idem, *Churchill: The End of Glory* (London: Hodder & Stoughton, 1993); and idem, *Churchill's Grand Alliance: The Anglo-American Special Relationship, 1940–57* (London: Hodder & Stoughton, 1995). The most persuasive response to Charmley (and others) is, first, to agree with his argument that the conduct of the Second World War, even participation in its ultimately victorious conduct, proved ruinous to Britain economically and as an imperial power. But, second, the point must be made that Britain had no prudent choice but to continue to resist, because Hitler was not a 'normally' grasping would-be hegemonic statesman into whose concept of a new international order Britain could fit with security. The necessity for an open-ended British commitment to war in 1940 is wonderfully explained, by powerful analogy, in Paul W.Schroeder, 'Napoleon's Foreign Policy: A Criminal Enterprise', *The Journal of Military History*, 54, 2 (April 1990), pp. 147–61.

28 . Hedley Bull, 'Strategic Studies and Its Critics', *World Politics*, 20, 4 (July 1968), pp. 593– 605; Colin S.Gray, *Strategic Studies: A Critical Assessment* (Westport, CT: Greenwood Press, 1982), ch. 4. The RAND style of defence analysis by rational choice, characterised by the methods and ethos of economic theory, could not cope with such qualitative factors as culture or strength of political motivation. Strategic analysis thus deprived reduces to a calculable science innocent of human beings, political stakes, or most of what generates friction. For example, see Glenn A.Kent, Randall J.DeValk, and David E. Thaler, *A Calculus of First-Strike Stability (A Criterion for Evaluating Strategic Forces)*, N-2526-AF (Santa Monica, CA: RAND, June 1988), a study that offers arbitrary quantitative values, no hint of strategy, and no breath of real political context. Much of the root of the problem can be seen or inferred from the classic text, E.S.Quade (ed.), *Analysis for Military Decisions* (Chicago, IL: Rand McNally, 1964), a book advertised as 'the RAND lectures on system analysis'. My strictures are neither critical of quantitative methods per se nor dismissive of 'military science'. There is a 'grammar' of war (and strategy) that needs to be understood by those who would employ a military

instrument: Clausewitz, *On War*, p. 605. Richard K.Betts, 'Should Strategic Studies Survive?' *World Politics*, 50, 1 (October 1997), esp. pp. 22–6, advances persuasively the important and unfashionable argument that 'military science' is a 'missing discipline'.

29 . Metz and Kievit, *Strategy and the Revolution in Military Affairs;* and Brian R.Sullivan, 'The Future Nature of Conflict: A Critique of "The American Revolution in Military Affairs" in the Era of Jointery', *Defense Analysis*, 14, 2 (August 1998), pp. 91–100, emphasise this criticism.

30 . It is only slightly unfair to comment that Joseph S.Nye, Jr, and William A.Owens, 'America's Information Edge', *Foreign Affairs*, 75, 2 (March/April 1996), pp. 20–36; and William J.Perry, 'Defense in an Age of Hope', *Foreign Affairs*, 75, 6 (November/December 1996), pp. 64–79, suggest so militarily potent an 'RMAed America' that strategic capability will be in the driving seat navigating for foreign policy ambition. While part of the problem was the difficulty of designing foreign policy for a post-Soviet 1990s, another assuredly was a Clinton administration bereft of people skilled in foreign policy navigation.

31 . For example, William Clinton, *A National Security Strategy for a New Century* (Washington, DC: The White House, May 1997).

32 . Metz and Kievit, *Strategy and the Revolution in Military Affairs*, esp. pp. 18–26.

33 . Bernard Brodie, *Sea Power in the Machine Age* (Princeton, NJ: Princeton University Press, 1941); William McElwee, *The Art of War: Waterloo to Mons* (London: Weidenfeld & Nicolson, 1974), ch. 4; Dennis Showalter, *Railroads and Rifles: Soldiers, Technology and the Unification of Germany* (Hamden, CT: Archon Books, 1975); William H.McNeill, *The Pursuit of Power: Technology, Armed Force, and Society since AD 1000* (Chicago, IL: University of Chicago Press, 1982), chs 6–8; Edward Hagerman, *The American Civil War and the Origins of Modern Warfare: Ideas, Organization, and Field Command* (Bloomington: Indiana University Press, 1988); Martin van Creveld, *Technology and War: From 2000 BC to the Present* (New York: Free Press, 1989), pt 3; Philip Howes, *The Catalytic Wars: A Study of the Development of Warfare, 1860–1870* (London: Minerva Press, 1998); Manfred F. Boemke, Roger Chickering, and Stig Förster (eds), *Antidpating Total War: The German and American Experiences, 1871–1914* (Cambridge: Cambridge University Press, 1999).

34 . See Colin S.Gray, *The American Revolution in Military Affairs: An Interim Assessment*, Occasional Paper 28 (Camberley: Strategic and Combat Studies Institute, Joint Services Command and Staff College, 1997), pp. 25–7, for another statement of this claim.

35 . Murray, 'Thinking About Revolutions in Military Affairs', pp. 70, 73. For his second thoughts on the listing see Murray and MacGregor Knox, 'Thinking About Revolutions in Warfare?', in Knox and Murray (eds), *The Dynamics of Military Revolution, 1300–2050* (Cambridge: Cambridge University Press, 2001), p. 13.

36 . Andrew F.Krepinevich, 'Cavalry to Computer: The Pattern of Military Revolutions', *The National Interest*, 37 (Fall 1994), pp. 30–42.

37 . Murray, 'Clausewitz Out, Computer In' and 'Does Military Culture Matter?', *Orbis*, 43, 1 (Winter 1999), pp. 27–42; 'Military Culture Does Matter', *Strategic Review*, 27, 2 (Spring 1999), pp. 32–40.

38 . Toffler and Toffler, *War and Anti-War*, Jeffrey R.Cooper, *Another View of the Revolution in Military Affairs* (Carlisle Barracks, PA: Strategic Studies Institute, US Army War College, 15 July 1994); Metz and Kievit, *Strategy and the Revolution in Military Affairs;* Steven Metz, 'The Revolution in Military Affairs: Vision and Alternatives at Century's End', unpub. paper (Carlisle Barracks, PA: Strategic Studies Institute, US Army War College, September 1999); Sullivan, 'Future Nature of Conflict'; and Jeremy Shapiro, 'Information and War: Is It a Revolution?', in Zalmay M. Khalilzad and John P.White (eds), *Strategic Appraisal: The Changing Role of Information in Warfare*, MR-1016-AF (Santa Monica, CA: RAND, 1999), pp. 113–53. Shapiro's essay, though sceptical of much of RMA theory, manages to separate babies from bathwater.

39 .Those in search of inspiration on this subject could do worse than consult McNeill, *Pursuit of Power;* Martin van Creveld, *The Transformation of War* (New York: Free Press, 1991); Keegan, *History of Warfare;* idem, *War and Our World* (London: Hutchinson, 1998); and Jeremy Black, *War and the World: Military Power and the Fate of Continents, 1450–2000* (New Haven, CT: Yale University Press, 1998).

40 . Murray, 'Thinking About Revolutions in Military Affairs', pp. 70–1 (emphasis added).

41 . Professional historians provided the American policy-oriented community with the powerful concept of temporally bounded military revolutions. This was an idea just waiting for its strategic moment to be exploited. In 1956 Professor Michael Roberts of the University of Belfast wrote a seminal article (deriving from an inaugural lecture in 1955), hypothesising that a military revolution was effected by Maurice of Nassau and Gustavus Adolphus of Sweden in particular and could be dated generously to 1560–1660 ('The Military Revolution, 1560–1660', in Clifford J.Rogers (ed.), *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe* (Boulder, CO: Westview Press, 1995), pp. 13–35). This alleged revolution was keyed to what amounted to the invention of the early modern style of warfare. Roberts argued that those leaders achieved a dramatic improvement in tactical effectiveness by (inter alia) drilling pike-protected

infantry with gunpowder hand weapons to fight with extreme discipline in linear formation. These military developments were purportedly vital to the process of modern-state building, a thesis explored extensively in Brian M. Downing, *The Military Revolution and Political Change: Origins of Democracy and Autocracy in Early Modern Europe* (Princeton, NJ: Princeton University Press, 1992). The 'Roberts thesis' was challenged powerfully by Geoffrey Parker, initially in an article first published in 1976, a challenge that he repeated over the course of the next decade. Geoffrey Parker, 'The "Military Revolution, 1560– 1660"—A Myth?', in Rogers, *Military Revolution Debate*, pp. 37–54. In the same book Parker answers his critics: 'In Defense of The Military Revolution', pp. 337–65. Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500–1800* (Cambridge: Cambridge University Press, 1988), is another landmark publication. Parker did not dispute the postulate of a single great early modern military revolution; rather he believed that Roberts, preeminently an expert on Sweden, was unduly in thrall to the brief period of Swedish success at the beginning of the Thirty Years War (1618–48). Parker, in essence an expert on the Spanish Habsburgs, suggested that the date for the commencement of the early modern military revolution should be wound back to 1530. See Geoffrey Parker: *The Army of Flanders and the Spanish Road: The Logistics of Spanish Victory and Defeat in the Low Countries' Wars* (Cambridge: Cambridge University Press, 1972); *Phillip II* (London: Cardinal, 1988); *The Dutch Revolt*, rev. edn (London: Penguin, 1985); *The Grand Strategy of Phillip II* (New Haven, CT: Yale University Press, 1998). He argued that the revolution needs to be identified with efforts to overcome the revolutionary developments of gunpowder-artillery-proof fortifications, especially the so-called *trace italienne*, and with Spanish military prowess in general. The Roberts-Parker debate was riveting stuff for the edification and amusement of professional historians. Clifford J.Rogers, 'The Military Revolution in History and Historiography', in Rogers, *Military Revolution Debate*, pp. 1–10; David Eltis, *The Military Revolution in Sixteenth-Century Europe* (London: Tauris Academic Studies, 1995), ch. 2; Michael Prestwich, Armies and Warfare in the Middle Ages: *The English Experience* (New Haven, CT: Yale University Press, 1996), ch. 14; and James Scott Wheeler, *The Making of a World Power: War and the Military Revolution in Seventeenth-Century England* (Stroud: Sutton Publishing, 1999), are helpful overviews of the debate among professional historians. Predictably perhaps, this historians' debate had at least two consequences important for our subject. First, the two decades of unchallenged sway enjoyed by the 'Roberts thesis', and then the additional decade and more of emergence and dissemination of the 'Parker variation' (a telling phrase borrowed gratefully from Jeremy Black, *A Military Revolution? Military Change and European Society, 1550–1800* (London: Macmillan, 1991), pp. 4–7) locked many people rather uncritically into belief in the Military

Revolution as existential historical reality. Not all historians were so persuaded, of course. For an excellent example of dissent, David A.Parrott wrote in 1985: 'Thus on counts of both tactics and strategy, I have reservations about the concept of a "military revolution" in the period 1500–1660': 'Strategy and tactics in the Thirty Years War', in Rogers, *Military Revolution Debate*, p. 245. This is the common problem of the Nominalist Fallacy. If something has a name, constantly is discussed, and is not fundamentally challenged, the audience, even those licensed as experts, are apt to accord 'it' a birth certificate and citizenship in the column of 'real items'. Second, no less inevitably, sparks from the ongoing Roberts-Parker debate eventually set fire to the imaginations of historians other than specialists on early-modern Sweden and Spain. If Roberts and then Parker could make a splash professionally, and if they could stake out well-respected claims for the relatively superior importance of *their* particular piece of historical turf, then so could others. Jeremy Black has divulged how it can be open season for RMA-spotting. Those consumers of historians' scholarship who look for a definite and usable (for possible policy relevance) history, might be dismayed by this among Black's judgements: 'Thus, on both land and sea, and in both qualitative and quantitative terms, there were major changes in the period after 1660. Whether they deserve description in terms of a revolution is of course subjective: *there are no agreed-upon criteria by which military change, especially qualitative developments, can be measured or, more significantly, revolution discerned'* ('A Military Revolution? A 1660–1792 Perspective', in Rogers, *Military Revolution Debate*, p. 98, emphasis added).

42 . Such at least is my view. Gray, *Modern Strategy*, provides explanation and argument.

43 . Murray and Knox, 'Thinking About Revolutions in Warfare', pp. 6, 11.

44 . On nuclear eponymity see Colin S.Gray, *The Second Nuclear Age* (Boulder, CO: Lynne Rienner Publishers, 1999).

45 . In 1997, Murray admitted nuclear weapons to a long list of 'possible RMAs', but he did not then admit them to MR status. He wrote: 'In fact there is only one example on the list of possible RMAs that is entirely technological: nuclear weapons. But even here there is some ambiguity since the impact of nuclear weapons has been almost entirely political except for their first use against the Japanese. Outside of great-power competition, nuclear weapons have *not* changed the nature of warfare': 'Thinking About Revolutions in Military Affairs', p. 70 (emphasis in original).

46 . See Robert Jervis, *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Armageddon*(Ithaca, NY: Cornell University Press, 1989), ch. 1.

47 . Murray, 'Thinking About Revolutions in Military Affairs', p. 70.

48 . Ibid., 'The record further suggests that the crucial element in most RMAs is conceptual in nature'. See also Krepinevich, 'Cavalry to Computer', p. 30.

49 . Shapiro, ‘Information and War’, p. 136.

50 . Ibid., p. 137.

51 . Ibid. (emphasis added).

52 . Ibid., p. 138 (emphasis in original).

53 . For just one example, the Industrial Revolution, see Trevor Wilson and Robin Prior, ‘Conflict, Technology, and the Impact of Industrialisation: The Great War, 1914–18’, *Journal of Strategic Studies*, 24, 3 (September 2001), pp. 128–57.

54 . As possibly in Stephen Biddle, ‘Victory Misunderstood: What the GulfWar Tells Us about the Future of Conflict’, *International Security*, 21, 2 (Fall 1996), pp. 139–79, with its emphasis upon tactical skill. I also may be guilty of an undue unfriendliness to technology in my *Weapons for Strategic Effect: How Important is Technology?* Occasional Paper 21 (Maxwell AFB, AL: Center for Strategy and Technology, Air War College, January 2001).

55 . See particularly Sullivan, ‘Future Nature of Conflict’.

56 . Murray and Knox, ‘Thinking About Revolutions in Warfare’, p. 7.

57 . Clifford J.Rogers, ‘The Military Revolutions of the Hundred Years War’, in Rogers, *The Military Revolution Debate*, pp. 55–93.

58 . Ibid., p. 77.

59 . Ibid. (emphasis added).

60 . Ibid., p. 57 (emphasis in original).

61 . Ibid., p. 77.

62 . Murray, ‘Thinking About Revolutions in Military Affairs’, p. 70.

63 . Samuel P.Huntington, ‘Arms Races: Prerequisites and Results’, in C.J.Friedrich and S.E.Harris (eds), *Public Policy, 1958* (Cambridge, MA: Harvard University Press, 1958), pp. 40–86; Colin S. Gray, ‘The Arms Race Phenomenon’, *World Politics*, 24, 1 (October 1971), pp. 39–79; idem, ‘Arms Races and Other Pathetic Fallacies: A Case for Deconstruction’, *Review of International Studies*, 22, 3 (July 1996), pp. 323–35; Patrick Glynn, *Closing Pandora’s Box: Arms Races, Arms Control, and the History of the Cold War* (New York: Basic Books, 1992); Grant T.Hammond, *Plowshares into Swords: Arms Races in International Politics, 1840–1991* (Columbia: University of South Carolina Press, 1993); Barry Buzan and Eric Herring, *The Arms Dynamic in World Politics* (Boulder, CO: Lynne Rienner Publishers, 1998).

64 . The theory of arms race dynamics driven by an action-reaction mechanism was blessed by Secretary of Defense Robert S.McNamara in a speech delivered on 18 September 1967: ‘San Francisco Speech’, in Philip Bobbitt, Lawrence Freedman, and Gregory F. Treverton (eds), *US Nuclear Strategy: A*

Reader (New York: New York University Press, 1989), pp. 267–82. McNamara states that '[w]e do not want a nuclear-arms race with the Soviet Union— primarily because the action-reaction phenomenon makes it foolish and futile' (pp. 274–5). Action-reaction theory is explained further in George W.Rathjens, 'The Dynamics of the Arms Race', *Scientific American*, 220, 4 (April 1969), pp. 15–25, and Paul Warnke, 'Apes On A Treadmill', *Foreign Policy*, 18 (Spring 1975) pp. 12–29.

65 . Relying on highly credible testimony from Colonel General Nikolai Detinov, an engineer general officer with protracted first-hand knowledge of Soviet policy-making throughout the period in question, William E.Odom adds nails to the coffin of an action-reaction dynamic driven by a conservatively estimated anxiety lest BMD deprive offensive forces of deterrent value. 'The US proposal for an ABM treaty…came as a pleasant surprise. By ending the US ABM program, it would free the Soviets from engaging in simultaneous competition in both strategic offensive and defensive systems and permit Soviet ICBM programs to move ahead on schedule. Thus the ABM treaty appeared to have allowed a considerably larger number of offensive nuclear weapons in the Soviet arsenal than there would have been without it. According to Detinov, the logic of US views on the winnability of a nuclear war [i.e. that such a war could not be won] and how to achieve strategic "stability" played no role at all in the Soviet acceptance of the ABM treaty': *The Collapse of the Soviet Military* (New Haven, CT: Yale University Press, 1998), p. 71. The views of Detinov, to which Odom rightly allows great weight, are supported amply by the testimonial evidence presented in John G.Hines, *Soviet Intentions, 1965–1985, Vol. I, An Analytical Comparison of US-Soviet Assessments During the Cold War*, and *Vol. II, Soviet Post-Cold War Testimonial Evidence* (McLean, VA: BDM Federal, 22 September 1995). Alternative theories of arms race dynamics are scrutinised sceptically in Colin S.Gray, *The Soviet-American Arms Race* (Farnborough: Saxon House, 1976). Although there is considerable scope for creative theorising about the dynamics of the Soviet-American arms competition, we do know *for certain* that the theory of strategic stability which identified fear of BMD as the principal engine of offensive-force modernisation and augmentation was wrong. Of course, the Soviet defence community was motivated to negate whatever might emerge by way of US BMD deployments. However, behind that sincere motive was a preeminent concern to be able to wage nuclear war effectively for relative strategic advantage, not to preserve a condition of mutual assured destruction. The USSR never accepted the vulnerability of Soviet society as a desideratum beneficial for a cooperative regime of strategic stability. That enlightened prospect was a conceit of the American arms control community, born of wishful thinking.

66 . C.E.Callwell, *Small Wars: A Tactical Textbook for Imperial Soldiers* (3rd edn, London: Greenhill Books, 1990 [1906]), p. 270.

67 . John France, *Western Warfare in the Age of the Crusades, 1000–1300* (Ithaca, NY: Cornell University Press, 1999), p. 34.

68 . Ibid., p. 232.

69 . Ibid., p. 34. Incentives for, and impediments to, the transcultural diffusion of military ideas in the middle ages are discussed briefly in David Nicolle, 'Medieval Warfare: The Unfriendly Interface', *Journal of Military History*, 63, 3 (July 1999), pp. 579–600.

70 . 'I argue…that the sources and consequences of European international conflict differ radically from one era to another, and that they can be understood only in the context of contemporary European domestic and international politics': David Kaiser, *Politics and War: European Conflict from Philip II to Hitler* (Cambridge, MA: Harvard University Press, 1990), p. 1.

71 . France, *Western Warfare in the Age of the Crusades*, p. 1.

72 . Cyril Falls, *A Hundred Years of War* (London: Gerald Duckworth, 1953). For the inspiration, see J. Colin, *The Transformations of War*, trans. L.H.R.Pope-Hennessy (London: Hugh Rees, 1912).

73 . Recall the parallel charge levelled by Bernard Brodie against the more social scientific of his former colleagues at RAND: *War and Politics* (New York: Macmillan, 1973), p. 475.

74 . Cyril Falls as military historian is considered in the context of his professional life and his times in Hew Strachan, '"The Real War": Liddell Hart, Cruttwell and Falls', in Brian Bond (ed.), *The First World War and British Military History* (Oxford: Clarendon Press, 1991), pp. 61–7. In addition to *A Hundred Years of War*, divisional, battle, and campaign histories of the First World War, a biography of Marshal Foch, and a history of the Second World War, Falls wrote: *War Books: An Annotated Bibliography of Books about the Great War* (London: Greenhill Books, 1989 [1930]), and *The Great War, 1914–1918* (New York: Perigee Books, 1959). Writing in 1991, Strachan allows that Falls' '*War Books*…makes judgements which stand up well today and which are remarkable for their wisdom so close to the event [i.e. 1930]': '"Real War"', p. 63. John Keegan, *The First World War* (London: Hutchinson, 1998), finds Falls' *Great War*, 'incisive and compact' (p. 480). In addition to *A Hundred Years of War*, Falls wrote several other popular general books on war which offer a rich vein of strategic and tactical wisdom. See Cyril Falls: *The Nature of Modern Warfare* (London: Methuen, 1941); *Ordeal by Battle* (London: Methuen, 1943); and *The Art of War* (London: Oxford University Press, 1961).

75 . Falls, *Hundred Years of War*, pp. 12–13.

76 . Murray, 'Thinking About Revolutions in Military Affairs', p. 70 (emphasis in original).

77 . Falls, *Hundred Years of War*, p. 13 (emphasis added).

78 . 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).

79 . Falls, *Hundred Years of War*, p. 11.

80 . Ibid., pp. 15–16.

81 . See James Joll, *1914: The Unspoken Assumptions* (London: Weidenfeld & Nicolson, 1968).

82 . See Torbjorn L.Knutsen, *The Rise and Fall of World Orders* (Manchester: Manchester University Press, 1999), esp. p. 6. On cycles in history, see K.R.Dark, *The Waves of Time: Long-term Change and International Relations* (London: Pinter, 1998). The most obvious parent of the thesis that modern warfare on the grandest of scales has appeared in waves was the diplomatic historian, R.B.Mowat. See his *History of European Diplomacy, 1815 to 1914: The European States-System* (London: Edward Arnold, 1928), esp. p. 1.

83 . Michael J.Vickers, ‘The Revolution in Military Affairs and Military Capabilities’, in Robert L. Pfaltzgraff, Jr and Richard H.Shultz, Jr (eds), *War in the Information Age: New Challenges for US Security Policy* (Washington, DC: Brassey’s, 1997), p. 30 (emphasis added). I am grateful to Steven Metz of the US Army War College for drawing my attention to Vickers’ work.

84 . Ibid., p. 45 n1.

85 . RMA theorists should be troubled when they find historians doubting that the changes in armament and technique in early-modern Europe ‘amounted to a “military revolution”’. The historian just quoted proceeds to explain: ‘For one thing, it is in many ways the continuity in the nature and practice of early-modern warfare when compared to that of the Middle Ages which is striking, rather than the differences’: Frank Tallett, *War and Society in Early- Modern Europe, 1495–1715* (London: Routledge, 1997), pp. 65–6.

86 . Falls, *Nature of Modern Warfare*, pp. 37–8.

87 . Ibid., p. 101.

88 . The charge pervades Van Riper and Hoffman, ‘Pursuing the Real RMA’. The debate is joined and re-joined in James R.Blaker, ‘Revolution(s) in Military Affairs: Why the Critique?’ and F.G.Hoffman, ‘Why the Critique? An Author’s Response’, *National Security Studies Quarterly*, 5, 1 (Winter 1999), pp. 83–9, 89–91.