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Nuclear Deterrence: The Wohlstetter-Blackett Debate Re-visited

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ABSTRACT

The Cold War debate between Albert Wohlstetter and Patrick Blackett over the requirements of effective deterrence is of profound relevance half a century later. The two thinkers offered systematic arguments for their maximalist (Wohlstetter) and minimalist (Blackett) positions. How we conceive of these requirements shapes the kinds of nuclear weapons doctrines, forces and postures we adopt. Whereas the Wohlstetter-Blackett debate was based largely on deductive logic, the opposing arguments can today be assessed on the basis of evidence drawing from nearly seven decades of strategic behaviour between nuclear rivals. An analysis of major confrontations in five nuclear dyads – United States-Soviet Union, United States-China, Soviet Union-China, India-Pakistan, and United States-North Korea – clearly offers much stronger support for Blackett's minimalist case than for Wohlstetter's maximalist one. Effective deterrence does not require second-strike capability as defined by Wohlstetter and the nuclear balance has no effect on a state's capacity to deter. Consequently, the central tenets of orthodox nuclear deterrence theory and doctrine are shown to be without foundation. For policymakers, the optimal forces and postures required for effective deterrence are therefore less demanding and the hurdles in the path of arms control and at least partial disarmament less difficult to cross.

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Nuclear Deterrence: The Wohlstetter-Blackett Debate Re-visited

The end of the Cold War era marked the end, too, of the heyday of nuclear strategy. Many experts and scholars moved on to the policy issue of the day – non-proliferation – and, with the advent of new nuclear powers like North Korea, India and Pakistan, to motivation, issues of stability/instability, crisis management, and nuclear/radiological terrorism. Most of the literature that emerged was expressed in the lexicon of non-proliferation, and relatively little attention was paid to questions of nuclear strategy. The advent of missile defence produced considerable debate, but there seemed to be an almost unquestioning acceptance that strategy was no longer relevant. Indeed, the very need for missile defence was underscored by the common notion that new nuclear actors, be they states or non-state entities, were not subject to the old norms and rules of deterrence. Moreover, the renewed interest in disarmament fuelled by former Cold Warriors, with the turn of the millennium, was surprisingly lacking in discussion about how nuclear strategy would fit into the scheme of things if numbers went down as was widely anticipated. It was almost as if strategy had been forgotten.

This paper rests on the assumption that strategy cannot and should not be neglected since, whether explicitly or otherwise (and it appears to be largely otherwise today), nuclear weapons cannot be separated from it. For those interested in downsizing, strategic questions of sufficiency – ‘how low dare we go?’ – and balance remain vital. The same has to be said for those favouring total nuclear disarmament since the lowering of numbers comes first. In weighing the impact of missile defence on strategic relationships, the problem of what effect the acquisition of defensive capabilities might have has to be confronted and it invariably boils down to whether the balance of deterrence capabilities is affected. And, of course, for states that are building their nuclear arsenals, the question ‘how much is enough?’ is closely bound up with the strategies they adopt. In short, strategy is not dead, even if those responsible for its formulation are – so to speak – asleep at the wheel. In fact, much strategic thought remains deeply embedded in the thinking of planners and practitioners. And no one better represents the embedded thought of the great majority of strategic thinkers today than Albert Wohlstetter. Many contemporary strategists may never have read his writings, but most to varying degree think like him. This is evident from the ubiquity today of the vocabulary of deterrence central to Wohlstetter’s thinking: ‘assured destruction,’ ‘second-strike capability,’ ‘credibility,’ ‘vulnerability,’ and ‘survivability.’ Even in states which profess a minimalist form of nuclear deterrence, these terms are in constant everyday use.

That these ideas remain widely prevalent half a century after they became the reigning orthodoxy and nearly a quarter century after the end of the Cold War reflects Wohlstetter’s ‘victory’ in his heated debate with another powerful intellect over the proper formulation of nuclear strategy: Sir Patrick Blackett. Their differences are profoundly meaningful today, for adherence to the one or the other determines a panoply of preferences that go into the making of a state’s nuclear forces and posture. Wohlstetter was a maximalist, Blackett a minimalist. For Wohlstetter, a stronger and larger force was essential to ensure deterrence; for Blackett, a small force was good enough. The two attacked each other in a debate that, years later, remains of vital significance. Even as the Cold War was winding

down, Michael Howard noted with no little prescience that the debate 'is not settled yet.'¹ The Wohlstetter-Blackett debate was by no means the only one between the two conflicting points of view, but it is the most systematic representation of the contest between the maximalist and minimalist positions on nuclear weapons.² And it did not fade away even after Blackett's death in 1974, for other like-minded intellectuals took up cudgels on his behalf, notably Solly Zuckerman a decade later.³ More recently, a related debate has drawn attention, with scholars differing on whether states with stronger nuclear arsenals enjoy an advantage in being able to coerce relatively weak ones.⁴

Below, I make an effort to address the Wohlstetter-Blackett debate. Wohlstetter and Blackett had scarcely any evidence to draw from in making their arguments, for the world had little experience with nuclear weapons generally, and certainly none with nuclear war. The latter remains true today, of course, but we have accumulated considerable evidence now of how nuclear-armed states behave while confronting each other. In the 'second round,' if you will, of the debate, the works just cited above draw on this evidence. I do not engage at length with that debate. There are some significant problems with the way evidence is marshalled, which I shall touch upon later. Besides, the focus of these works is on coercion or compellence, whereas mine reflects the concerns of Wohlstetter and Blackett on the requirements of effective deterrence. The point here is that the debate between Wohlstetter and Blackett is still alive and worth assessing, for on it depends our understanding of how interactions between hostile states with nuclear weapons play out. This in turn affects decisions with regard to (i) the kinds of doctrines nuclear powers adopt (or sensibly ought to); (ii) the numbers and types of weapons they feel the need for; (iii) the postures they deem it necessary to assume; and (iv) the facility or otherwise with which they pursue arms control and disarmament measures.

In the next section, I begin by highlighting the key arguments made by Wohlstetter and Blackett and the implications they have for the kinds of decisions noted above. In the section that follows, I go on to assess the empirical evidence of state behaviour in confrontations involving five pairs of nuclear-armed states: the United States and the Soviet Union, the United States and China, the Soviet Union and China, India and Pakistan, and the United States and North Korea. In the concluding section, I highlight the finding of this paper: that the evidence refutes Wohlstetter's assumptions and deductive logic, and supports the argument made by Blackett. I end with a brief assessment of what these findings mean for nuclear deterrence theory and doctrine and for policymaking with respect to nuclear weapons.

¹ Michael Howard, 'P. M. S. Blackett,' in John Baylis and John Garnett, eds. *Makers of Nuclear Strategy* (London: Pinter, 1991), p. 161.

² Bernard Brodie was a better-known critic, at least in the United States. See Michael Howard, 'Brodie, Wohlstetter, and American Nuclear Strategy,' *Survival*, 34, 2 (Summer 1992), pp. 107-16. But his arguments were far less sharp and focused than those put forward by Blackett.

³ See the sharp exchange between Wohlstetter and Zuckerman in ' "Counsels of War"; an Exchange,' *New York Review of Books*, November 21, 1985 <<http://www.nybooks.com/articles/archives/1985/nov21/counsels-of-war-an-exchange/#fn1--202664172>> (accessed June 1, 2010).

⁴ For the view that sees such an advantage, see Kyle Beardsley, and Victor Asal, 'Winning with the Bomb,' *Journal of Conflict Resolution* 53, 2 (April 2009), pp. 278-301; and Matthew Kroenig, 'Nuclear Superiority and the Balance of Resolve: Explaining Nuclear Crisis Outcomes,' *International Organization*, 67 (Winter 2013), pp. 141-71. For the view that it does not, see Todd S. Sechser, 'Militarized Compellent Threats, 1918-2001,' *Conflict Management and Peace Science*, 28, 4 (2011), pp. 377- 401; and Todd S. Sechser and Matthew Fuhrmann, 'Crisis Bargaining and Nuclear Blackmail,' *International Organization*, 67 (Winter 2013), pp. 173-95.

The Debate and Its Centrality Today

I will not detain the reader with details of the lives and work of Wohlstetter and Blackett. There is a substantial body of work on these already, much of it not directly germane to the present analysis.⁵ A pertinent facet of the two men that one might begin with is the recognition that both were practical and systematic thinkers, though they came from very different backgrounds. Wohlstetter was a mathematician and systems analyst who worked with RAND on defence issues. Blackett was a scientist (he won the Nobel Prize for physics in 1948) who played a substantial wartime role as defence adviser to the British government during and after the Second World War, though he was side-lined on nuclear matters after he opposed British acquisition of the bomb. A major difference between them was that Wohlstetter remained faithful to his credo as a meticulous man of numbers, whereas Blackett, himself a pioneer of operational analysis, was sceptical of scientific precision in the messiness of war. As he put it, “however ingenious a theoretical model might be, it could seldom resemble a real operation enough to give any confidence in any deductions from it.”⁶ Even so, a careful reading of their numerous writings shows that there were many issues on which they agreed, such as the necessity of nuclear deterrence (after Blackett dropped his early preference for disarmament), the inutility of limited war, and the limitations of missile defence. But their fundamental differences on the requirements of nuclear deterrence remained and these are central to the live question of what deters best and all that their divergent answers imply.

The chief differences between them and the practical implications that follow from their views are outlined below.

Surprise attack: Wohlstetter was deeply influenced by Pearl Harbor, on which his wife Roberta had written a major study.⁷ The entire edifice of his carefully structured views about deterrence rested on his concern about the risk of a surprise nuclear attack. He rejected the opinion of observers on both sides of the Atlantic (specifically referring to Blackett as well as others) that deterrence is “automatic” once two adversaries have nuclear weapons.⁸ In his view, a nuclear Pearl Harbor was possible because (i) an adversary might judge that, notwithstanding the high costs associated with a first strike, the cost of attacking first would be higher than the cost of not doing so; and because (ii) the

⁵ On Wohlstetter, see, e.g. Richard Rosecrance, ‘Albert Wohlstetter,’ in Baylis and Garnett, eds. *Makers of Nuclear Strategy*; Andrew 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); Robert Zarate and Henry Sokolski, eds. *Nuclear Heuristics: Selected Writings of Albert and Roberta Wohlstetter*, Strategic Studies Institute, U.S. Army War College, January 2009

<<http://www.strategicstudiesinstitute.army.mil/pdf/PUB893.pdf> > (accessed September 21, 2013) – which contains substantial contributions by a number of commentators as well; and, for a wider critique of Wohlstetter and like-minded strategists, Khurram Husain, ‘Neocons: the Men behind the Curtain,’ *Bulletin of the Atomic Scientists*, 59, 6 (November/December 2003), pp. 62-71 <<http://thebulletin.org/2003/november/neocons-men-behind-curtain>> (accessed 21 September 2013). On Blackett, major works include Peter Hore, ed. *Patrick Blackett: Sailor, Scientist and Socialist* (London: Frank Cass, 2003); Howard, ‘P. M. S. Blackett’; Sir Bernard Lovell, ‘Blackett in War and Peace,’ The Blackett Memorial Lecture, *Journal of the Operational Research Society*, 39, 3 (1988), pp. 221-33; and Mary Joe Nye, ed. *Blackett: Physics, War and Politics in the Twentieth Century* (Cambridge, MA: Harvard University Press, 2004).

⁶ Patrick Blackett, ‘Operational Research and Nuclear Weapons,’ typed manuscript, March 22, 1961, p. 7, Document No. PB/4/7/2/13, Royal Society Archives, London.

⁷ Roberta Wohlstetter, *Pearl Harbor: Warning and Decision* (Stanford: Stanford University Press, 1962).

⁸ Albert Wohlstetter, *The Delicate Balance of Terror*, revised, Document No. P-1472, Santa Monica, CA: RAND, December 1958. I refer to this document throughout rather than to the slightly abbreviated and more well-known version published with the same title in *Foreign Affairs* the following year. See Albert Wohlstetter, ‘The Delicate Balance of Terror,’ *Foreign Affairs*, 37, 2 (January 1959), pp. 211-234.

target state might suffer from intelligence failure, thus making it vulnerable to a surprise strike.⁹ The authoritarian Soviet system, in his view, had the advantage of secrecy compared to the open and democratic American one.¹⁰ Blackett, on the other hand, downplayed the risk of a potential surprise attack. He believed that the scope for such an attack would be significantly reduced by the numerous signals that would inevitably appear during the course of preparations for what would have to be a very large-scale attack in order to minimise the adversary's capacity to retaliate. The Soviet Union, he asserted, could not be confident that American intelligence would have no inkling of such preparations, for instance the actions of civil defence authorities preparing to defend against a counterattack.¹¹

The scale of damage required to deter: Wohlstetter believed that the Soviet Union, which had survived twenty million deaths in the Second World War, would be willing to absorb high levels of damage in a nuclear conflict, particularly if they were confident of limiting damages to less than this number.¹² It followed that the Soviet Union could only be deterred by the prospect of catastrophic damage. Blackett's rejoinder asserted that Russia had a history of defending against attack rather than aggression and that 'any country which has experienced the horror of losing twenty million people in one war is very unlikely to take any avoidable risk of it happening again.'¹³ In his view, the Soviet Union – and states generally – could be deterred by much lower levels of damage than those envisaged as necessary by Wohlstetter.

Second-strike capability: Taken together, the possibility of a nuclear bolt from the blue and his belief in the Soviet Union's high tolerance of damage led Wohlstetter to assert that 'to deter an attack means being able to strike back in spite of it. It means, in other words, a capability to strike second.'¹⁴ A second-strike capability, he held, involved the ability to survive a first attack, to 'make and communicate the decision to retaliate,' and to reach and destroy enemy targets after penetrating enemy defences.¹⁵ And, of course, the damage inflicted would have to be of great magnitude if deterrence was to be ensured. Blackett retorted that a state contemplating aggression could not afford to assume that it could knock out all enemy forces in a first strike and that, given the massive destructive power of atomic weapons, there would always be the risk of millions of fatalities arising from a relatively small counter-strike.¹⁶ Since he believed that the Soviet Union did not have a high tolerance of casualties, he held that deterrence was already in place.

The problem of imbalance: A key implication arising from the debate relates to the question of balance. Wohlstetter's belief that an effective second-strike capability meant the capacity to inflict large-scale damage on an adversary led inevitably to the preference for an advantage in the balance of nuclear forces. If the forces were equal in capability, the side striking first would have the capacity

⁹ Rosecrance, 'Albert Wohlstetter,' p. 61.

¹⁰ Wohlstetter, *Delicate Balance of Terror*, p. 8.

¹¹ P. M. S. Blackett, 'Critique of Some Contemporary Defence Thinking,' *Encounter* (April 1961), pp. 9-17, at p. 11-12.

¹² Wohlstetter, *Delicate Balance of Terror*, p. 16. See also his general belief that totalitarian states are more tolerant of uncertainties regarding damage in Albert Wohlstetter, 'Nuclear Sharing: NATO and the N+1 Country,' *Foreign Affairs*, 39, 3 (April 1961), pp. 355-87, at p. 366.

¹³ Blackett, 'Critique of Some Contemporary Defence Thinking,' p. 12.

¹⁴ Wohlstetter, *Delicate Balance of Terror*, p. 3.

¹⁵ Wohlstetter, *Delicate Balance of Terror*, p. 7.

¹⁶ Blackett, 'Critique of Some Contemporary Defence Thinking,' pp. 10-11.

to inflict much greater damage. This would by inference apply even if the United States strengthened its forces by reducing their vulnerability since the adversary could do the same. Indeed, Wohlstetter specifically argued that 'an effective system of retaliation must meet changing demands placed upon it by the aggressor' and that this inevitably meant the need to bear high costs.¹⁷ It followed that small forces would be unable to deter large ones effectively.¹⁸ Blackett, because he believed the damage requirement for deterrence was not very large, averred that an attacker five times stronger than the defender would still be deterred since the cost imposed on the former by the latter's retaliation would remain unacceptably high.¹⁹ It followed that 'no country could make use of even a substantial degree of nuclear superiority by staging a first strike without incurring a high probability of very heavy destruction.'²⁰

The debate has an important bearing on how states determine their nuclear doctrines and postures. The practical implications of the two arguments, summarised briefly in Table 1, diverge considerably for decision-makers seeking optimal allocation of resources. The table shows how very different deterrence doctrines and postures are shaped by the Wohlstetter and Blackett models. The contrasting models may also be labelled 'assured destruction' and 'minimum deterrence' models respectively. These are, of course, ideal types, but they do clearly approximate the contrasting doctrines and postures adopted by the United States and the Soviet Union/Russia on one hand and by China, India and Pakistan on the other. The Wohlstetter model presses in the direction of maximalism, the Blackett model in the direction of minimalism. The two models shape proclivities with respect to force acquisitions, postures, the degree of arms competition, and approaches to arms control and disarmament.

¹⁷ Wohlstetter, 'Nuclear Sharing,' p. 364.

¹⁸ Wohlstetter, 'Nuclear Sharing,' pp. 363-4. This is the general tenor of the article as a whole, which argues against sharing nuclear forces with smaller allies.

¹⁹ Blackett, 'Critique of Some Contemporary Defence Thinking,' p. 11.

²⁰ Blackett, 'Critique of Some Contemporary Defence Thinking,' p. 12.

Table 1: Practical implications of the debate

	Wohlstetter	Blackett
Basis of deterrence	Certainty of damage	Risk of damage
Required damage levels	Very high	Not very high
Warheads and Delivery vehicles	Large and varied arsenals desirable; favourable balance preferred	Sufficiency easily achieved with small numbers; balance unimportant
Survivability of forces (by implication, desirability of a triad)	Imperative	Necessary, but not a major concern
Accuracy of delivery	Vital (for maximum damage)	Not vital (the adversary must assume accuracy)
Missile defence	Affects deterrence because it affects the balance	Does not affect deterrence because the balance is irrelevant
Arms racing	Virtually inevitable (assuming affordability)	Avoidable
Posture	Hair-trigger alert	Relaxed
Arms control and disarmament	Difficult – involves precise calculation to prevent imbalance	Not difficult since balance does not matter

But there is in the present context considerable lack of clarity in the actual behaviour of states. Thus, for instance, the disarmament negotiations between the big two appear not to rest firmly on a clearly articulated and consistent model of deterrence and its requirements. On the other side, the smaller forces appear to be shifting away from Blackett's model in the direction of Wohlstetter's model.²¹

For the debate to be settled, an empirical study of the validity of the two models is essential. The section that follows attempts such an inquiry.

²¹ Rajesh Basrur, 'China, India and Pakistan: Models for an Intermediate Stage toward Disarmament?' *Australian Journal of International Affairs*, 67, 2 (2013), pp. 176-89.

The Evidence: Five Nuclear Rivalries

I begin by considering the implications of recent studies that gauge the weight of nuclear superiority in determining outcomes when two nuclear-armed powers confront each other.²² The focus of these works is somewhat different from that of the present paper in that they are interested in assessing whether compellence works and whether, in cases of compellence, nuclear superiority determines the probability of victory. My paper looks at deterrence rather than compellence. But the compellence argument is directly – if partially – relevant because, if a nuclear power is able to coerce another nuclear power, the latter's capabilities will not have deterred the former. In short, there may be occasions in which compellence overrides deterrence and in which, if the 'winner' possesses superior firepower, it has not been deterred from pressing home its advantage. The implication in such an instance would be that Wohlstetter was right. Perhaps not quite in the way that he argued, but the implication is consistent with his position that, between nuclear-armed states, balances matter.

However, the compellence debate has its limitations in the present context, particularly because deterrence may operate without a crisis, and indeed may preclude a crisis as is shown below in the U.S.-China and U.S.-North Korea cases. There are other limitations in the methodology that is used by the analyses just cited. First, there is the choice of data. Are all crises between nuclear-armed powers the same? I would suggest that they are not. I find it hard, for instance, to equate, as Kroenig does, the Cuban or Berlin crises with the Congo crisis or the War of Attrition in the Middle East. Second, some crises are not mentioned at all. A notable absence in both studies is the 1994 crisis between the United States and North Korea. While no one is sure if Pyongyang had by then acquired the bomb, there is also no certainty that it had not. Sechser and Fuhrmann leave out the crises between China and India in 1987 and the much-written-about India-Pakistan crises of 1986-1987, 1990 and 1999. Third, compellence under the nuclear shadow in confrontations which do not involve explicit threats but which bring nuclear powers into potential head-on confrontation are left out, notable examples being the American proxy war involving Afghan mujahideen against the Soviet Union in Afghanistan during the 1980s and Pakistan's use of the same strategy in backing jihadi groups against India from the 1990s. Fourth, compellence is not always simply bilateral; it regularly involves the use (or attempted use) of third parties – states or non-state actors – to put pressure on the adversary. Apart from the two instances just cited, the Kargil and 2001-2002 crises between India and Pakistan were initiated primarily to induce intervention by the United States, the first by Pakistan and the second by India. Fifth, compellence success is hard to measure. In the 1969 Sino-Soviet and 2001-2002 Indo-Pakistani crises, the 'losers' China and Pakistan respectively backed away quickly from commitments they made during the crises and reverted to opposite strategies.²³ Again, India appeared to have 'won' the Kargil crisis by forcing Pakistan to withdraw its troops, but General Musharraf could and did make the valid claim that he had succeeded in his objective of compelling India to come to the negotiating table. Taken together, these limitations open up space for a more

²² I focus particularly on two very recent works: Kroenig, 'Nuclear Superiority and the Balance of Resolve'; and Sechser and Fuhrmann, 'Crisis Bargaining and Nuclear Blackmail.'

²³ On the Sino-Soviet crisis, see Thomas W. Robinson, 'The Sino-Soviet Border Conflict,' in Stephen S. Kaplan, ed., *Diplomacy and Power: Soviet Armed Forces as a Political Instrument* (Washington, DC: Brookings Institution, 1981). On the Indo-Pakistani crisis, see Rajesh M. Basur, *Minimum Deterrence and India's Nuclear Security* (Stanford, CA: Stanford University Press, 2006).

detailed investigation of the question of nuclear balances and their role in shaping outcomes relating to compellence and deterrence.

In this paper, I take a closer though necessarily brief look at five pairs of nuclear rivals and their hostile interaction to consider what the outcomes imply for the debate. Rather than looking generally at all instances of confrontation, I focus on cases where the possibility of combat was either partially realised or came close to being realised. The instances of such interaction are not equally distributed among the five pairs: there are two each involving the United States and the Soviet Union, the United States and China, and India and Pakistan; and one each involving the Soviet Union and China, and the United States and North Korea.

The key aspects of the Wohlstetter-Blackett debate are borne in mind in the discussion that follows. The three questions that are particularly central are:

1. Was the outcome shaped by the prospect of large-scale damage (Wohlstetter) or of relatively small-scale damage (Blackett)?
2. Did the existence of an assured second-strike capability affect the outcome? Wohlstetter would have expected it to, Blackett would not.
3. Did the nuclear balance determine outcomes? From Wohlstetter's standpoint, it should have; from Blackett's, not necessarily.

United States vs. Soviet Union

In the Berlin Crisis of 1961, The Soviet Union and East Germany decided to construct the Berlin Wall and to block access to East Berlin for the United States and its allies. As the wall came up, pressure was put on the latter's officials when they tried to cross into East Berlin. The United States stationed tanks in a demonstration of force and the Soviets responded symmetrically. The two forces confronted each other with only about 150 meters separating them.

President Kennedy actually discussed the prospects for war, including the feasibility of a nuclear first strike, but drew back because there was no certainty that it could be controlled and prevented from escalating to the level of a full-scale nuclear exchange.²⁴ The decision was taken not to risk nuclear war in spite of the knowledge that American forces were far greater in quantity and quality than those of the Soviet Union. Kennedy also initiated direct backchannel efforts (bypassing the U.S. and Soviet bureaucracies) to defuse the crisis and both sides agreed to withdraw the forces that were in eyeball-to-eyeball confrontation in Berlin.²⁵ Was this a 'victory' for the United States? In a sense yes, for American pressure did compel the Soviet Union to abandon the idea of denying the United States and its allies access to East Berlin. But the more relevant point here is that deterrence worked in the opposite direction. Despite its vastly bigger arsenal, the United States did not have the confidence to

²⁴ Fred Kaplan, 'JFK's First Strike Plan,' *Atlantic Monthly* (October 2001), pp. 81-86.

²⁵ Raymond L. Garthoff, 'Berlin 1961: The Record Corrected,' *Foreign Policy*, 84 (Fall 1984), pp. 142-156.

either directly launch a major first strike or – the more seriously considered option – a conventional attack that could have escalated and crossed the nuclear threshold.

In the Cuban Missile Crisis of 1962, the story was repeated at sea when the United States, having discovered Soviet moves to station missiles in Cuba, organised a naval blockade of the island.²⁶ The result: confrontation, force alerts, war planning, backchannel diplomacy, and compromise. The Cuban Missile Crisis has gone down in nuclear-strategic history as the classic example of new nuclear powers testing the limits of how far they could go without actually tumbling into war. Both sides, looking into the abyss, chose to back away and turned to diplomacy to resolve their differences. In one sense, the United States ‘won’ in Cuba since Khrushchev withdrew his missiles; but Kennedy too compromised in agreeing to withdraw American missiles from Turkey. Simple definitions of victory and loss lose sight of something important: both sides shied away from war and the deliberations showed, if anything, that American strategy was not influenced by the belief that, as the superior nuclear power, it would inevitably prevail. The caution displayed by both countries was a form of tacit cooperation, which was buttressed by negotiations. In the wake of the Cuban crisis, a formal arms control process was set in motion that eventually led to the Strategic Arms Limitation Treaties (SALT-I and II).

During the crises, there was in fact a huge imbalance in the size of their forces. At the simplest level, the disparity in warheads was enormous. In 1961, Soviet warheads, numbering 2,492, constituted just 11.21 per cent of the U.S. total of 22,229 warheads. In 1962, the proportion was marginally larger: Soviet warheads numbered 3,346 and were 13.10 per cent of the American total of 25,540 warheads.²⁷ In Wohlstetter’s terms, the Soviet Union would not have been able to inflict large-scale retaliatory damage in the event of a U.S. first strike, yet Washington was deterred. Only the United States had a ‘second-strike capacity’, and the nuclear balance was heavily skewed in favour of the United States. Yet, the United States not only chose to negotiate its way out of the crisis, but also to enter into negotiations on arms control that would inevitably constrain its putative advantage.

United States vs. China

U.S.-China tensions were considerable in the wake of the Korean War, which the United States could not ‘win’ despite its clear nuclear advantage. As China developed its nuclear capability, tensions grew rapidly. The Chinese were aware of the risk of an American preventive attack and made preparations for a major conflict. As the temperature rose, Premier Zhou Enlai warned that in the event of a U.S. air strike, China would respond on the ground and that once war began, there would be ‘no boundaries’ if war broke out.²⁸ Following China’s first test in October 1964, President Lyndon Johnson kept open the

²⁶ On the Cuban Missile Crisis, see Richard Ned Lebow and Janice Gross Stein, *We All Lost the Cold War* (Princeton, NJ: Princeton University Press, 1994), pp. 110-145; Don Munton and David A. Welch, *The Cuban Missile Crisis: A Concise History* (Oxford: Oxford University Press, 2007). Jim Hershberg, ‘Anatomy of A Controversy: Anatoly F. Dobrynin’s Meeting with Robert F. Kennedy, Saturday, 27 October 1962,’ National Security Archive, George Washington University, n.d. (reproduced from the *Cold War International History Project Bulletin*, Issue 5, Spring 1995) http://www2.gwu.edu/~nsarchiv/nsa/cuba_mis_cri/moment.htm (accessed on September 24, 2013).

²⁷ Robert S. Norris and Hans M. Kristensen, ‘Global Nuclear Inventories, 1945-2013,’ *Bulletin of the Atomic Scientists*, 69, 5 (2013), pp. 75-81, at p. 78, Figure 2.

²⁸ Lyle J. Goldstein, ‘When China was A “Rogue State”: The Impact of China’s Nuclear Weapons Program on US-China Relations during the 1960s,’ *Journal of Contemporary China*, 12, 37 (November 2003), pp. 739-764, at p. 749.

possibility of attacking China's nascent arsenal, but this was no longer a serious option. Lyle Goldstein argued that China's rudimentary arsenal was not a deterrent, but the evidence is thin that Johnson himself viewed it from this angle, since he never came close to a decision to attack.²⁹ In American thinking, there was doubt whether the targets could be destroyed by a single attack. This left open the question about what the Chinese might do with those weapons left undamaged. This might have been discussed if there had been a serious plan to carry out the attack, but there was not, as Goldstein admitted.³⁰ Instead, the President altered the means-end calculation by re-assessing American goals and, in effect, downgraded the idea of a preventive and later a pre-emptive strike.³¹

Soon after China's nuclearisation, the risk of war intensified. The United States, fearful of the Chinese threat, intensified its involvement in Vietnam, sending in an increasing number of combat troops (30,000 by March 1965, steadily growing to 200,000 by the end of the year) and escalating its bombing campaign. China responded by sending in seven divisions of engineering troops in June and two divisions of anti-aircraft batteries in August.³² The total number of Chinese troops in Vietnam was large, peaking at 170,000 in 1967.³³ China also emphasised its nuclear capability by carrying out a second test in May 1965. Though both were cautious, there was considerable testing of limits and brinkmanship. Their forces regularly came into direct violent contact in a third country, and occasionally inside China along its border with Vietnam. Chinese anti-aircraft batteries in Vietnam, according to Chinese records, shot down a large number of American aircraft before they were withdrawn in March 1969.³⁴ Head-to-head air combat occurred from time to time.³⁵ According to Chinese records, between April 1965 and November 1968, their air force shot down twelve American aircraft (not counting unmanned reconnaissance planes) inside China's air space.³⁶

Though there was no 'crisis' in the Sino-American relationship, there was clearly a significant risk of war arising from tensions generated by China's transition to nuclear weapons and later by their rivalry and limited military engagement in Vietnam. Once again, the nuclear balance was tilted heavily in Washington's favour. In 1964, when Kennedy considered the feasibility of a first strike against China's infant nuclear capability, China had no capacity to inflict large-scale damage on the United States. Nor did it have the semblance of a second-strike capability. As late as 1969, China's 50 warheads constituted a tiny 0.18 per cent of the U.S. total of 27, 552 warheads.³⁷ Yet the United States not only refrained from pre-emptive war against China's fledgling arsenal, but tolerated significant combat losses in what was by the end of the 1960s a war in which victory was no longer seen as possible. Once again, a favourable balance had no impact on the conflict. The United States was deterred by

²⁹ Goldstein, 'When China was A "Rogue State," 'pp. 575-760. American sources cited by Goldstein are assessments by the defense and intelligence communities and not from political decision-makers.

³⁰ Goldstein, 'When China was A "Rogue State," 'pp. 752-3.

³¹ William Burr and Jeffrey T. Richelson, 'Whether to Strangle the Baby in the Cradle: The United States and the Chinese Nuclear Program,' *International Security*, 25, 3 (Winter 2000-2001), pp. 54-99, at p. 97.

³² Goldstein, 'When China was A "Rogue State," ' p. 748.

³³ Qiang Zhai, 'Reassessing China's Role in the Vietnam War: Some Mysteries Explored,' in Xiaobing Li and Hongshan Li, eds., *China and the United States: A New Cold War History* (Lanham, MD and Oxford: University Press of America, 1998), p. 107.

³⁴ Chen Jian, *Mao's China and the Cold War* (Chapel Hill, NC and London: University of North Carolina Press, 2001), pp. 225-6.

³⁵ John G. Stoessinger, *Nations at Dawn: China, Russia and America* (New York: McGraw-Hill, 1994), pp. 83-4. See also Ralph B. Levering, *The Cold War: A Post-Cold War History*, 2nd ed. (Wheeling, IL: Harlan Davidson, 2005), p. 104.

³⁶ Chen, *Mao's China and the Cold War*, p. 227.

³⁷ Norris and Kristensen, 'Global Nuclear Inventories, 1945-2013.'

an adversary with a much smaller and less technologically sophisticated force. Once again, the evidence supports Blackett rather than Wohlstetter.

Soviet Union vs. China

Sino-Soviet tension, simmering since the 1960 split, intensified after China crossed the nuclear threshold in 1964. The Soviet Union launched a massive arms build-up from 1965, especially in its Far East. China, slowed down by the Cultural Revolution, responded by 1968.³⁸ The Soviet Union deployed more than 150 intermediate-range nuclear missiles, strategic bombers and tactical nuclear weapons; China responded by deploying its small number of DF-4 missiles, which were armed with one-megaton warheads. The border dispute between them became increasingly tense and was marked by regular local confrontations, especially from 1966.³⁹ In February 1967, Chinese Red Guards, unleashed by the Cultural Revolution, laid siege to the Soviet Embassy in Beijing for more than a week. The rising border tension culminated in a series of armed clashes between March and August 1969.⁴⁰ Soviet leaders were so furious that they discussed the possibility of a pre-emptive nuclear strike. Minister of Defence Andrei Grechko is reported to have favoured a massive attack, while others preferred a limited strike against Chinese nuclear targets. But in the end, Brezhnev settled for nuclear deployment and did not go further.⁴¹ The Chinese leadership went to the extent of placing its armed forces, including its nuclear weapons, on full alert, ready for “instant retaliation” on October 18, 1969.⁴²

Like the U.S.-Soviet confrontation over Cuba, the border conflict brought the Soviet Union and China close to the brink, and both chose to hold back. Unlike the other two Cold War dyads discussed above, this one did see direct armed combat on the ground over a period of several months. Yet both sides were careful to keep the conflict local, i.e., along the border, and neither seriously attempted to make deep inroads into the other’s territory, which would have inevitably brought on a larger war. The arms build-up continued till 1972, after which it slowed down as the border became less unstable. There was a revival in the late 1970s as the Soviet Union began to upgrade and re-organise its forces in the east, partly in response to increasing U.S.-China-Japan cooperation.

As in the preceding cases, there is no evidence that the distribution of nuclear capabilities influenced the outcome of the confrontation. The Soviet Union was deterred by China’s minuscule arsenal, which would have caused it relatively little damage. Had the Soviet Union gone through with the proposed first strike, China’s capacity to retaliate would have been limited: it certainly had nothing like the second-strike retaliatory capability that Wohlstetter considered essential. The nuclear balance was

³⁸ Chang, *Friends and Enemies*, pp. 44-5; Lewis and Xue, *China Builds the Bomb*, p. 213.

³⁹ Harry Gelman, *The Soviet Far East Buildup and Soviet-Risk Taking against China*, Santa Monica, CA: RAND, August 1982, p. 26.

⁴⁰ Robinson, ‘The Sino-Soviet Border Conflict’; Thomas Robinson, ‘The Sino-Soviet Border Conflict of 1969: New Evidence Three Decades Later,’ in Mark A. Ryan, David Michael Finkelstein, and Michael A. McDevitt, eds., *Chinese Warfighting: The PLA Experience since 1949* (Armonk, NY: M. E. Sharpe, 2003).

⁴¹ Gordon H. Chang, *Friends and Enemies: The United States, China and the Soviet Union, 1948-1972* (Stanford, CA: Stanford University Press, 1990), pp. 285-6.

⁴² John Wilson Lewis and Xue Litai, *Imagined Enemies: China Prepares for Uncertain War* (Stanford, CA: Stanford University Press, 2006), pp. 51-72.

sharply tilted against Beijing: in 1969, China possessed, as we have seen, just 50 warheads, which amounted to a mere 0.47 per cent of the Soviet total of 10,671 warheads.⁴³

India vs. Pakistan

The India-Pakistan tussle over Kashmir and the rivalry that has endured since their independence in 1947 is a story of pre-nuclear wars (1947-1948, 1965, 1971) and post-nuclear crises (1986-1987, 1990, 1999, 2001-2002, 2008) and simmering tensions at most other times.⁴⁴ As mentioned earlier, I examine two crises here, both of which brought them to the brink of war.⁴⁵ Both were instances of compellence as well as deterrence. In 1999, Pakistani took the initiative when it occupied swathes of territory on the Indian side of the Line of Control (LoC), which separated the two forces. But the resultant backlash from the United States and other countries as well as India's strong (if limited in scale) military response compelled it to withdraw. The most interesting part of the story from the standpoint of this paper's concerns is that though considerable fighting took place along the LoC, both took great pains not to risk a broader war. India accepted a high casualty rate in not permitting its air force from crossing the LoC to counterattack, which would have shortened the conflict. Pakistan accepted heavy losses in retreat, but did not assist its beleaguered troops with additional military support. By tacit agreement, the fighting was kept localised.

In 2001-2002, the crisis was initiated by India after an attack on its parliament which, had it succeeded, would have killed dozens of senior political figures. The source of the attack was believed to be a terrorist group based in Pakistan. India angrily threatened full-scale war unless Pakistan reversed its support for cross-border terrorism. Indian forces mobilised in a big way, to which Pakistan responded with its own mobilisation. This was Berlin magnified many times and the risk of war appeared high. But in the end, the crisis – which lasted all of ten months – dissipated as India had to be content with a partial commitment by Islamabad not to harbour terrorists. India was deterred from carrying out its threat to take some unspecified form of military action by Pakistan's relatively limited nuclear arsenal.

Taken together, the two crises demonstrated that deterrence was quite easily established by relatively small forces.⁴⁶ In the Kargil crisis, both sides abjured risk, tolerated high political costs and casualties. In 2001-2002, India could not follow through its threat. Deterrence worked when their nuclear capabilities were small. In 1999, India and Pakistan had an estimated 8 warheads each; in 2001-2002, India had 23 warheads and Pakistan 26.⁴⁷ This is the only dyad where the crises discussed in this paper were between countries with roughly equal arsenals (in terms of warhead numbers). In

⁴³ Norris and Kristensen, 'Global Nuclear Inventories, 1945-2013.'

⁴⁴ Stephen P. Cohen, *Shooting for a Century: the India-Pakistan Conundrum* (Washington DC: Brookings Institution Press), 2013; Sumit Ganguly, *Conflict Unending: India-Pakistan Tensions since 1947* (New Delhi: Oxford University Press, 2002); T. V. Paul, ed., *The India-Pakistan Conflict: An Enduring Rivalry* (Cambridge: Cambridge University Press, 2005). The 1986-1987 case is on the margins: India had a demonstrated capacity to produce nuclear weapons, but apparently did not actually have them, while Pakistan did not have a demonstrated capacity, but apparently (drawing from my conversations with former Pakistani officials in the know) did have them.

⁴⁵ P. R. Chari, Pervaiz Iqbal Cheema and Stephen P. Cohen, *Four Crises and a Peace Process: American Engagement in South Asia* (Washington, DC: Brookings Institution Press, 2007); Sumit Ganguly and Devin T. Hagerty, *Fearful Symmetry: India-Pakistan Crises in the Shadow of Nuclear Weapons* (New Delhi: Oxford University Press, 2005).

⁴⁶ Robert S. Norris and Hans M. Kristensen, 'Global Nuclear Inventories, 1945-2013.'

⁴⁷ Norris and Kristensen, 'Global Nuclear Inventories, 1945-2013.'

2001-2002, India's Defence Minister George Fernandes claimed that India had the advantage because it was a much bigger country, so that, even if Pakistan were to attack first, 'we could take a strike, survive, and then hit back. Pakistan would be finished.'⁴⁸ In practice, this 'favourable' balance was never tested because India did not carry out its threat even though it became clear as the crisis dragged on that its attempt at compellence had not brought the desired result of an end to Pakistan's support for anti-Indian terrorist groups. The outcome of the two crises was not affected by the relatively low capacity of the two countries: both were deterred from taking risks that might have led to full-scale war. Neither had a second-strike capability of the kind that Wohlstetter regarded as essential, yet deterrence worked. And, in this case, because the arsenals were roughly equal, the question of balance did not apply, with the additional point that Pakistan's supposedly greater vulnerability owing to its smaller size did not bring India the advantage claimed by Fernandes.

United States vs. North Korea

The termination of the Cold War played a significant part in the renewal of confrontation in Northeast Asia. With Russia and China gravitating towards the South, North Korea's sense of insecurity was aggravated, invigorating its hunt for the bomb.⁴⁹ The sense of insecurity arising from the American nuclear threat was doubtless deep. That threat had been posed from time to time over the years: during the Korean War, and periodically thereafter.⁵⁰ After a major confrontation in 1994, when Pyongyang may or may not have possessed nuclear weapons or even capability,⁵¹ North Korea signed the Agreed Framework which envisaged the dismantling of its nuclear weapons infrastructure. But relations with the United States deteriorated and North Korea eventually opted out of the Nuclear Non-proliferation Treaty (NPT) and carried out its first nuclear test in 2006.

Despite high rhetoric and mutual threats, the U.S.-North Korean rivalry has followed the precedent of the Cold War dyads discussed above. There has been no imminent threat of intended nuclear use, though the possibility has been raised from time to time. The George W. Bush Administration was unwilling to negotiate with a member of the 'axis of evil,' and considered the possibility of a pre-emptive strike as it feared that North Korea, given time, would become even more dangerous with the accumulation of more nuclear weapons. But nothing happened. Bush has been criticised for his 'strategic muddle' in trying to combine pressure and negotiation.⁵² The key question is: why did the United States, with its enormous military strength, both nuclear and conventional, hold back from a pre-emptive strike?

⁴⁸ "We Could Take A Strike and Survive. Pakistan Won't: Fernandes," *Hindustan Times*, December 30, 2001; cited in P. R. Chari, *Nuclear Crisis, Escalation Control, and Deterrence in South Asia*, Henry L. Stimson Center, Washington, DC, Working Paper, August 2003, p.10 <http://www.stimson.org/images/uploads/research-pdfs/escalation_chari_1.pdf> (accessed on September 24, 2013).

⁴⁹ Robert A. Manning, 'United States-North Korean Relations: From Welfare to Workfare?' in Samuel S. Kim and Tai Hwan Lee, eds., *North Korea and Northeast Asia* (Lanham, MD: Rowman and Littlefield, 2002), pp. 67-9.

⁵⁰ Terence Roehrig, 'Restraining the Hegemon: North Korea, the US and Asymmetrical Deterrence,' in Tae-Hwan Kwak and Seung-Ho Joo, eds., *The United States and the Korean Peninsula in the 21st Century* (Aldershot and Burlington, VT: Ashgate, 2006), pp. 172-3; William J. Perry, 'Proliferation on the Peninsula: Five North Korean Nuclear Crises,' *Annals of the American Academy of Political and Social Sciences*, 607 (September 2006), p. 80.

⁵¹ In December 1993, IAEA Director-General Hans Blix stated that agency could no longer provide 'any meaningful assurances' that North Korea was not producing nuclear weapons. See 'Chronology,' *Frontline*, Public Broadcasting Service, n.d <<http://www.pbs.org/wgbh/pages/frontline/shows/kim/etc/cron.html>> (accessed September 24, 2013).

⁵² Michael J. Mazarr, 'The Long Road to Pyongyang,' *Foreign Affairs* (September/October 2007) <<http://www.foreignaffairs.org/20070901faessay86505/michael-j-mazarr/the-long-road-to-pyongyang.html>>.

In 2002, Defence Secretary Donald Rumsfeld stated that North Korea already had two nuclear weapons. These could in the worst case have been delivered by *No-dong* missiles on targets in South Korea and Japan.⁵³ There was no certainty of success in pre-emption since many North Korean nuclear and missile facilities were widely distributed and were hidden and heavily protected in thick-walled bunkers located deep underground.⁵⁴ In 2006, neo-conservative supporters and even former Clinton officials pressed for pre-emption, but Bush, on consulting the military, found the option unacceptable. Vice President Dick Cheney warned that 'if you're going to launch strikes at another nation, you'd better be prepared to not just fire one shot.'⁵⁵ As an unnamed official put it, 'It sounds good... until you ask yourself the question, what good is a strike if it leaves their nuclear capability untouched?'⁵⁶ The problem is nicely illustrated in a detailed report of a war game conducted in the United States by the *Atlantic Monthly* in 2005.⁵⁷ The participants, mainly former government officials who had been in key policy positions, concluded (with one exception) that the potential cost of a pre-emptive strike against North Korea was unacceptable because it might leave North Korea with some capacity for nuclear retaliation.

The North Korean case is the most extreme one discussed in these pages. In 2006, as mentioned above, Pyongyang was at best in possession of a handful of nuclear weapons. The source cited in all the other cases in this paper notes that there is no confirmation it had any as late as 2013, though it was believed to have accumulated sufficient plutonium for 8-12 bombs.⁵⁸ Hence its capacity to inflict damage on the United States and its allies even with a first strike was at most very limited. Had the United States struck first, Pyongyang's ability to retaliate might well have been severely curtailed. The imbalance between the two forces was huge. If we estimate Pyongyang's arsenal as 8 warheads for the year 2006, likely an overestimation, the percentage of North Korean weapons to those in the U.S. arsenal in 2006 – 7,853 – is only 0.10 per cent.⁵⁹ The immense gap between the two meant that, by the Wohlstetterian argument, North Korea would not have been able to deter the United States and would not have possessed second-strike capability. Pyongyang should have been very vulnerable to American pressure, but it was not. On the contrary, the United States was deterred from drastic action by its very small arsenal – indeed, an arsenal whose existence itself was questionable. It could, of course, be argued that the United States was really deterred by the prospect of a conventional conflict that could have devastated much of Seoul (and the American forces stationed there). But, despite the size and sophistication of U.S. conventional *and* nuclear forces, and despite the high probability that it could have decimated much of North Korea, it was the United States which was deterred. Clearly, neither the nuclear and conventional balance, nor Pyongyang's lack of anything resembling what Wohlstetter would have viewed as "second-strike capability" gave Washington the assurance that it could deter its adversary.

⁵³ Gary Samore, 'The Korean Nuclear Crisis,' *Survival*, 45, 1 (Spring 2003), pp. 7-24, at p. 19.

⁵⁴ Bruce Cumings, 'Wrong Again,' *London Review of Books*, December 4, 2003 <http://www.lrb.co.uk/v25/n23/cumi01_.html>; Thom Shanker and David E. Sanger, 'North Korea Hides New Nuclear Sites, Evidence Suggests,' *New York Times*, July 20, 2003, p. A1.

⁵⁵ David E. Sanger, 'Don't Shoot. We're not Ready,' *New York Times*, August 3, 2006 <http://www.nytimes.com/2006/06/25/weekinreview/25sanger.html?_r=0>.

⁵⁶ David E. Sanger, 'News Analysis: Bush's Vision Collides with Post-Iraq Realities,' *New York Times*, July 10, 2006.

⁵⁷ Scott Stossel, "North Korea: The War Game," *Atlantic Monthly*, July/August 2005 <<http://www.theatlantic.com/doc/200507/stossel>>.

⁵⁸ Norris and Kristensen, 'Global Nuclear Inventories, 1945-2013.'

⁵⁹ We need also to keep in mind that US figures exclude warheads that are stored but intact.

Conclusion

The conclusion is inescapable that Wohlstetter's case is weak, Blackett's much stronger. Regardless of the balance of nuclear capabilities, states faced with the prospect of nuclear war have been deterred from going to war. We have evidence enough of something approaching an 'iron law' of nuclear weapons. This has three components: (i) states possessing nuclear weapons do not wage nuclear war against each other; (ii) states with nuclear weapons also go to great lengths to avoid full-scale conventional war (and have thus far invariably succeeded)⁶⁰, and, consequently; (iii) between nuclear-armed states, nuclear as well as conventional superiority do not carry an advantage. While a case may be (and has been) made that the United States 'won' in two of the crises above (Berlin and Cuba) where war was a serious possibility, it is equally arguable that nobody 'won' in at least five of the seven cases and that even Berlin and Cuba really represented compromises.

What are the policy implications of these findings? First, the implications for deterrence theory and doctrine are powerful. The case for minimum deterrence becomes stronger. The utility of basing deterrence on 'assured destruction' or 'assured retaliation' is seriously undermined. The central concept of Wohlstetter's thinking so widely embraced by deterrence experts even today – 'second-strike capability' – and its derivatives – credibility, survivability and vulnerability – are dispensable. The view of those scholars and practitioners who stress the revolutionary impact of nuclear weapons on the relationship between war and politics is confirmed. Policymakers (and deterrence theorists too, of course) must appreciate that Wohlstetter's thinking took root in the backdrop of a world war in which tens of millions died and from which a devastated society like the Soviet Union could not only recover, but lay claim to 'superpower' status. That sort of assumption and logic has long ceased to be acceptable.

Second, for policymakers, the most immediate and advantageous effects across the board are that the sizes and sophistication of arsenals can be curtailed. Wohlstetter's brilliant logic, taken at the flood, led on to misfortune: to ever higher costs and ever higher risks. The lesson of history is the opposite: it does not take a lot to deter; an 'invulnerable' triad of weapons is not a desirable objective since deterrence does not need its putative benefits in the form of assured second-strike capability; the costs and risks associated with arms racing can be tempered; nuclear forces need not be kept on hair-trigger alert and indeed a case can be made for de-mating warheads or keeping weapons systems unassembled in normal times, and arms control and disarmament negotiations need not be bogged down by the minutiae of finely calculated balances.

In sum, to return to the three main points of contention in the Wohlstetter-Blackett debate, the scale of damage required to deter is relatively small; the absence of second-strike capability does not detract from a state's capacity to deter, and nuclear balances are irrelevant in determining outcomes. Has Blackett, then 'won' the debate? Intellectually, it appears to be so, but that may not easily alter the tendency of many to hold fast to well-embedded habits of mind and behaviour.

⁶⁰ Whether nuclear weapons permit the conduct of 'limited' war is a moot point. The instances of armed conflict between nuclear powers referred to in this paper may be more accurately labelled 'marginal' combat/war.

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