BJHS 37(4): 455–464, December 2004. © British Society for the History of Science
DOI: 10.1017/S0007087404006168

Essay review

Deconstructing the bomb: recent perspectives on nuclear history

John Canaday, *The Nuclear Muse: Literature, Physics, and the First Atomic Bombs*. Madison: University of Wisconsin Press, 2000. Pp. xviii + 310. ISBN 0-299-16854-9. £19.50.
Septimus H. Paul, *Nuclear Rivals: Anglo-American Atomic Relations 1941–1952*. Columbus: Ohio State University Press, 2000. Pp. ix + 266. ISBN 0-8142-0852-5. £31.95.
Peter Bacon Hales, *Atomic Spaces: Living on the Manhattan Project*. Urbana and Chicago: University of Illinois Press, 1997. Pp. 448. ISBN 0-252-02296-3. £22.00.

A decade after the end of the Cold War, the culture and technology of nuclear weapons had lost much of the overt sense of dread they once inspired. The decline in international tension following the end of the communist regimes of the Soviet bloc produced a massive shift in the ideology of the nuclear in the 1990s. The de-targeting and dismantling of large numbers of nuclear weapons and the demise of the threat of nuclear annihilation created new conditions both for international security and for the writing of nuclear history. With the declassification and release of large quantities of official documentation from the former adversaries, as well as the fiftieth anniversary of the bombings of Hiroshima and Nagasaki in 1995, a burst of histories of various aspects of the nuclear age have appeared over the last ten years, exploring not just the technopolitics, strategy and operational logistics of the Cold War and the arms race,[1] but the cultural history of the nuclear age,[2] its imagery,[3] its

1 See, for example, S. Twigge and L. Scott, *Planning Armageddon: Britain, the United States and the Command of Western Nuclear Forces, 1945–1964*, Amsterdam, 2000; S. I. Schwartz (ed.), *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons Since 1940*, Washington, DC, 1998; J. G. Mathers, *The Russian Nuclear Shield from Stalin to Yeltsin*, Basingstoke, 2000; C. Craig, *Destroying the Village: Eisenhower and Thermonuclear War*, New York, 1998; J. L. Gaddis, P. H. Gordon, E. R. May and J. Rosenberg (eds.), *Cold War Statesmen Confront the Bomb*, Oxford, 1999.

2 For example: M. Henriksen, *Dr. Strangelove's America: Society and Culture in the Atomic Age*, Berkeley, 1997; A. M. Scott and C. D. Geist, *The Writing on the Cloud: American Culture Confronts the Bomb*, Lanham, MD, 1997; Alan Nadel, *Containment Culture: American Narratives, Postmodernism, and the Atomic Age*, Durham, NC and London, 1995; B. K. Rapaport and K. L. Stayton, *Vital Forms: American Art and Design in the Atomic Age, 1940–1960*, New York, 2001.

3 For example, J. A. Evans, *Celluloid Mushroom Clouds: Hollywood and the Atomic Bomb*, Boulder, CO, 1998; J. F. Shapiro, *Atomic Bomb Cinema*, New York and London, 2002; M. Light, *100 Suns: 1945–1962*, London, 2003. For a photographic exploration of life on the Manhattan Project see R. Fermi and E. Samra, *Picturing the Bomb: Photographs from the Secret World of the Manhattan Project*, New York, 1995.

https://doi.org/10.1017/S0007087404006168 Published online by Cambridge University Press

architecture,[4] its oppositional politics[5] and its effects on the landscape,[6] national and regional economies and cultures[7] and indeed everyday life.[8] At a time of global economic and political uncertainty and the emergent threat of capricious international terrorism and new nuclear proliferation, the apparent certainties of the Cold War now even evoke a certain nostalgia, and its artefacts and structures are being recast as 'heritage'.[9]

Nuclear history has long been dominated by official histories, of course. The recent proliferation of nuclear histories therefore reflects a broad and refreshing disciplinary and analytical diversity. The three books under consideration here – a rich site-specific account of life and labour on the Manhattan Project, a close textual analysis of the literary products of nuclear scientists and a detailed analysis of the high international politics of nuclear policy – illustrate in their different ways the very diverse kinds of nuclear history now being produced and the new insights they offer. Significantly, however, historians of science and technology seem to play only a relatively peripheral role in the emerging nuclear historiography. It seems worthwhile, therefore, to review some of this recent nuclear history and to ask how historians of twentieth-century science can contribute to the emerging discussion in a field that should be central to their concerns.

The first significant signs of a critical cultural historiography of the nuclear emerged in the context of the 'second Cold War' in the 1980s. Where Richard Rhodes's 1987 book *The Making of the Atomic Bomb* – a best-seller and Pulitzer Prize-winner, and doubtless on many history of science reading lists – stayed close to official histories of the wartime atomic bomb project and relied heavily on anecdotal and often self-serving accounts, Paul Boyer's ground-breaking 1985 book *By the Bomb's Early Light* and Spencer Weart's classic 1988 study *Nuclear Fear* both offered detailed contextual analyses of the post-war impact of nuclear weapons and of the development of nuclear culture.[10] Largely unnoticed by historians, the 1980s also saw the development

4 For example, N. J. McCamley, *Cold War Secret Nuclear Bunkers*, Barnsley, 2002; T. Vanderbilt, *Survival City: Adventures among the Ruins of Atomic America*, New York, 2002.

5 For example, L. S. Wittner, *One World or None: A History of the World Nuclear Disarmament Movement Through 1953*, Stanford, 1993; *idem, Resisting the Bomb: A History of the World Disarmament Movement, 1954–1970*, Stanford, 1997; *idem, Toward Nuclear Abolition: A History of the World Disarmament Movement, 1971–Present*, Stanford, 2003; C. Gallagher, *American Ground Zero: The Secret Nuclear War*, Cambridge, MA, 1993; A. Rojecki, *Silencing the Opposition: Antinuclear Movements and the Media in the Cold War*, Urbana and Chicago, 1999.

6 P. Goin, *Nuclear Landscapes*, Baltimore, 1991.

7 For example, B. Hevly and J. M. Findlay, *The Atomic West*, Seattle, 1998; G. Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II*, Cambridge, MA, 1998; P. R. Josephson, *Red Atom: Russia's Nuclear Power Program from Stalin to Today*, New York, 2000.

8 For example, G. Oakes, *The Imaginary War: Civil Defense and American Cold War Culture*, New York, 1994; L. McEnaney, *Civil Defense Begins at Home: Militarization Meets Everyday Life in the Fifties*, Princeton, 2000; F. Zonabend, *The Nuclear Peninsula*, Cambridge, 1993.

9 On the 'heritage' of the Cold War see W. D. Cocroft and R. J. C. Thomas, *Cold War: Building for Nuclear Confrontation* (ed. P. S. Barnwell), Swindon, 2003.

10 R. Rhodes, *The Making of the Atomic Bomb*, New York, 1987; P. Boyer, *By the Bomb's Early Light: American Thought and Culture at the Dawn of the Atomic Age*, New York, 1985; S. Weart, *Nuclear Fear: A History of Images*, Cambridge, MA, 1988. For a useful critique of Rhodes see B. Bernstein, 'An analysis of "two cultures": writing about the making and the using of the atomic bombs', *Public Historian* (1990), **12**, 83–107.

https://doi.org/10.1017/S0007087404006168 Published online by Cambridge University Press

of 'nuclear criticism' – a school of literary criticism that sought to apply the tools of deconstruction to nuclear discourse, partly in an attempt to make a political virtue of academic analysis in the face of a renewed arms race.[11] Following Derrida's observation that nuclear war is 'fabulously textual', literary critic and poet John Canaday argues that 'atomic weapons are useful because of the stories people tell about them, the fears those stories inspire, and the actions by which people respond to those fears' (p. 6). Canaday therefore aims in *The Nuclear Muse* to apply 'the tools and techniques of literary criticism to uncover the uses of literature in the development and deployment of nuclear weapons and the physics on which they most overtly depend' (p. 24).[12]

Canaday is self-consciously interdisciplinary, situating his work between literary criticism and physics, with nods to history and philosophy of science, cultural studies, sociology of science, linguistics and rhetorical analysis. He ranges widely across sources in his exploration of events before, during and after the Manhattan Project. Beginning with nuclear pioneer Otto Frisch's 1965 book *Working with Atoms*, he analyses the uses of metaphor in the popularization of the atomic and nuclear theory. This is followed by a rather forced analysis of Niels Bohr's rhetorical strategies in the formulation of his principle of complementarity, and of the 'quantum witchcraft' of the 'Blegdamsvej Faust' – a skit written and performed by the physicists attending the 1932 spring conference at Bohr's Institute for Theoretical Physics in Copenhagen. Though Canaday here offers an interesting close reading of the play and its symbolism of the confusion within parts of the theoretical physics community in the early 1930s, his focus leads him to miss or ignore important elements of the context – not least the changing dynamics of the relationship between nuclear theoreticians and experimentalists in this period.[13]

The central chapters, and intellectual core, of *The Nuclear Muse* jump forward to the uses of literature in constituting and framing the work of the wartime nuclear weapons laboratory at Los Alamos. Canaday begins with an analysis of the *Los Alamos Primer* – the informal nuclear physics textbook written by physicists Robert Serber and Ed Condon to induct newcomers into the lab. Linking the title rather obviously to educational and religious primers, he explores the rhetoric and 'dominant fictions' (p. 126) of the *Primer* and argues that it 'played an important role in helping to construct Los Alamos as a community capable of meeting the scientific challenges of the first atomic weapons in the context of the social ramifications of that project' (p. 117). Moving from text to context, Canaday then attempts to 'decode' life at Los Alamos through an analysis of the language of exploration and discovery used to 'exert control over unsettled and frightening circumstances' (p. 142) – though he plays down the long history of geographical rhetoric in science and the direct continuities with pre-war scientific discourse.

11 K. Ruthven, *Nuclear Criticism*, Melbourne, 1993.

12 J. Derrida, 'No apocalypse, not now (full speed ahead, seven missiles, seven missives)', *Diacritics* (1984), **14**, 20–31, 23.

13 See, for example, J. Hughes, '"Modernists with a vengeance": changing cultures of theory in nuclear science, 1920–1930', *Studies in History and Philosophy of Modern Physics* (1998), **29**, 339–67.

https://doi.org/10.1017/S0007087404006168 Published online by Cambridge University Press

More promisingly, Canaday argues – though almost in passing – that this rhetoric of exploration and discovery allowed scientists to objectify and reify the 'nature' constituted in and through their work, with the result that 'nature itself effectively exonerates the Los Alamites from moral culpability in their construction of atomic weapons' (p. 167). Similarly, contemporary and post-war accounts of the first nuclear explosion at Alamogordo in July 1945 were often couched in religious rhetoric – most famously Oppenheimer's much-cited (and much later) quotation from the *Bhagavad Gita*, 'Now I am become Death, the destroyer of worlds' (cited on p. 183). This meant that '[t]heir reactions came to dwell on a sense of metaphysical awe in the presence of the bomb rather than on the fear of its awful, earthly destructive power' (p. 202) – with important consequences, because subsequent generations 'have inherited the Los Alamites' representations, and at every level they permeate not only our understanding of nuclear weapons but also the ways in which we use them' (p. 203).

Herein lies the chief strength of Canaday's project. In arguing, with Derrida, that '[d]espite their physical substance, since World War II nuclear weapons have exercised their power in the purely literary form of their fictional use in the future' (p. 223), he shows us how these uses of literature helped 'influence the ways in which atomic weapons have been incorporated into the structures of individual, institutional, and international relations' (p. 20). This is not entirely new, of course, for nuclear criticism made the same point. And his chosen examples of post-war nuclear fiction – Leo Szilard's tract *Voice of the Dolphins* and Russell Hoban's brilliant 1980 novel *Riddley Walker* – do not really map well onto the arguments developed earlier in the book. Nevertheless, Canaday usefully reminds us of the power of discourse in shaping initial reactions to, and later understandings of, nuclear weapons. But these strengths are simultaneously the weaknesses of Canaday's work. By starting with texts and working outwards to elucidate them, the close textual readings around which Canaday organizes his analysis miss important elements of the context. More significantly, by persistently identifying physics as theoretical physics, Canaday's analysis also exhibits a deep essentialism and teleological nature; consider, for example, the inherent retrospection in the remark that Bohr's complementarity principle 'played a decisive role in resolving the uncertainty over the role of metaphorical language in quantum mechanical descriptions of subatomic phenomena, in laying to rest the apparent conflict between the wave and particle metaphors, and, thereby, *in helping to prepare the way for the development of atomic weapons*' (p. 53, my emphasis).

This teleology and failure to contextualize the nuclear, particularly before the bomb, leads to some significant problems of interpretation – as, for example, in his assertion that even in 1932, 'physicists were getting a taste of the social recognition and status that would bring them billions of dollars during World War II for projects ranging from radar to the construction of nuclear weapons' (p. 101). His inattention to chronology and changing context also mean that he ignores the critical distinction between pre- and post-Hiroshima and the complex politics of justification that emerged after the horrific consequences of the atomic bombings of Japan became known, as well as the distinction between atomic bombs and the subsequent creation of thermonuclear weapons thousands of times larger than the bombs that destroyed Hiroshima and

https://doi.org/10.1017/S0007087404006168 Published online by Cambridge University Press

Nagasaki.[14] Canaday's own rhetoric also sometimes runs away with him, as he asserts in a metaphor too far that in 1932, 'Suddenly, scientists found themselves forced out of the objective shadows into an unfamiliar role as actors on the stage of nature' (p. 83). Part of the reason for this is that Canaday (in common with many other writers on Los Alamos) tends to be in thrall to the nuclear scientists (he describes them as 'exemplary human beings' (p. 137)) and the apparent novelty of the setting, rather than to the important continuities with pre-war scientific discourse and organization. His lumping together of the 'Los Alamites' begs many questions, and his textual focus inevitably both reifies the history of the bomb as the history of nuclear theory and leads to an uncritical acceptance of the nuclear scientists' own reconstructions of the wartime project and its consequences.

Where Canaday takes a few representative texts and elaborates fine-drawn skeins of meaning around them without really challenging the scientists' versions of events, art and architecture historian Peter Hales takes a very different approach to the building of the bomb. Observing that official histories of the Manhattan Project 'tend to begin with scientific discovery and military necessity', he explores instead the actual construction and operation of the various sites of the Manhattan Project through the social history and material practices of those who worked on them: 'a history of land and people', focusing on 'what disappears from military history' (p. 10). Such a project is not entirely new; Robert de Tredici's 1987 book *At Work in the Fields of the Bomb* offered a photographic journey through the contemporary American nuclear complex, documenting landscapes and work practices.[15] But Hales goes back to the origins of those practices. Drawing extensively on archival sources, his richly illustrated social and cultural geography portrays the Manhattan Project as 'somewhere between an army base and a utopian social experiment' (p. 3). Many of the architects hired to design and construct the Project's various sites had been involved with large-scale planning schemes in the 1930s (not least the Tennessee Valley Authority), and these acted as important precedents for the wartime project. Industrial technoscience, too, provided models of organization both for the various sites (the organization of Los Alamos was based on that of Bell Labs) and in actually administering the project: the Metallurgical Laboratory at Chicago, for example, became 'something close to a regional subsidiary of Du Pont' (p. 41).

Hales begins with the acquisition of the various Manhattan Project sites – the plutonium production complex at Hanford in Washington State, the uranium isotope separation plant at Oak Ridge, Tennessee and the bomb design laboratory at Los Alamos, New Mexico – and the conflicts between landowners and Project officials over valuation and compensation in compulsory land purchases. These legal processes, and the labour camp-like construction sites that followed, constituted the Project's 'first large-scale foray into the American landscape' (p. 49). Indeed, as the programme grew, the Project became a powerful and complex bureaucracy: 'an elaborate web of interconnected corporations, contracts, projects, and subprojects, all presided over by a

14 For an introduction to these issues see J. S. Walker, *Prompt and Utter Destruction: Truman and the Use of Atomic Bombs against Japan*, Chapel Hill and London, 1997; M. J. Hogan (ed.), *Hiroshima in History and Memory*, Cambridge, 1996.

15 R. del Tredici, *At Work in the Fields of the Bomb*, London, 1987.

https://doi.org/10.1017/S0007087404006168 Published online by Cambridge University Press

military bureaucracy that mixed a rigid organizational system with a peculiarly indeterminate system of command' (p. 35). The effects of this bureaucracy were felt on fragile local economies and ecologies through vast construction programmes and the importation of thousands of tenant workers. Hales points out that the growth of the Project's various sites (as well as the military and industrial bureaucracies) spiralled to almost uncontrollable proportions as the magnitude of the task of producing fissile materials for the bombs became clear: from an initial projected population of 265, the Project ultimately employed about 150,000 people at more than a hundred sites. Hanford and Oak Ridge became like company towns, and Los Alamos was the exception, rather than the rule, in that the elaborate security arrangements there sought to keep people in, rather than out.

Against this account of bureaucratic domination and control, Hales also pitches a counter-history of resistance, revolt and contested spaces. Working conditions on the Project reflected those prevailing elsewhere in American society and industry, with racial segregation and gender and class discrimination, quotas and the rest. Like Canaday, Hales argues that control of language was crucial to both 'official' and oppositional politics. But where Canaday has his Los Alamites rubbing friendly shoulders with the native Indians of New Mexico, Hales highlights the very different treatments meted out to white and non-white workers elsewhere on the Project, for example in the allocation of housing, and takes a less benign view of the cultural tourism of the residents of the 'Hill'. In the face of labour problems such as absenteeism, and losses to other wartime programmes, Project officials co-opted the large labour unions with the promise of post-war organizing rights, so that the unions effectively became labour subcontractors and managers for the Project. At the same time, the underestimation of the social consequences of such a large programme led to serious problems of discipline: 'As plans became realities and blueprints turned into communities, the messy stuff of American life – everything from noisy town meetings at Los Alamos to strikes, rapes, and murders at Hanford and Oak Ridge – came increasingly to dominate the attention of District officials and occupants alike' (pp. 112–13). Project managers sought to control sexual discipline among workers, with male sexuality seen as a health issue and female sexuality as a moral one. Ultimately, in seeking control over workers and communities, the Project 'developed into a bureaucracy for the management of human lives and human minds' (p. 221).

In his account of the Trinity test in July 1945, Hales goes where few previous histories have, in reconstructing exactly what the scientists knew of the likelihood of fallout from the first nuclear explosion. Here there are links to the 'downwinder' literature on the passive, often unknowing victims of the American nuclear testing programme.[16] Hales also elaborates the scientists' post-war mythification of the first test itself. He goes beyond Canaday in suggesting that 'the experience of the explosion itself became the prize in an increasingly intense struggle to own, in memory, in reminiscence, and in published account, the nature and significance – the power – of the first atomic blast' (p. 323). He charts the continuation of the Manhattan Project into the post-war period

16 Gallagher, op. cit. (5).

https://doi.org/10.1017/S0007087404006168 Published online by Cambridge University Press

and its managers' careful crafting of history, portraying the bomb as 'the product of a brilliant cooperative triad: science, corporate capitalism, and the military' (p. 349) and its sites as ideal American communities. But in charting this 'apotheosis of modernity and its unspoken ends: progress, practicality, efficiency' (p. 362), Project officials carefully played down or concealed the new additions to their atomic empire: Hiroshima and Nagasaki.

Hales's insightful study is representative of a strain in recent American scholarship that focuses on the relationship between technoscience and questions of place, region and landscape.[17] It offers powerful new ways of thinking about the organization of the wartime bomb project and the post-war nuclear complex. His attention to the language of documents and photographs is no less detailed than Canaday's but he conveys a much richer sense of the social, cultural and political context in which the first bombs were made, and offers resources for a much deeper understanding of nuclear institutions as they developed after the war. He is more sceptical of the scientists' claims, and largely escapes the teleology and essentialism inherent in Canaday's more circumscribed analysis. Where Canaday hedges on the issue, Hales displays a deep sense of morality about the organization of the Manhattan Project and its outcomes. This sometimes takes the form of moralizing on the authoritarian, anti-democratic and coercive nature of the Project, but in many ways this is a refreshing antidote to the uncritical, or even apologetic, line taken in accounts that stay close to official histories.

For both Hales and Canaday, the bomb is as American as apple pie. Though Canaday explores the European roots of the science that spawned it and frolics with the physicists in Copenhagen, the actual development of nuclear weapons was for him, as for most bomb historiography, a thoroughly and unproblematically American enterprise.[18] Yet, as Septimus Paul reminds us, much of the early work on the possibility of nuclear weapons was done in Britain. Britain passed details of this work to the United States in 1940, and for a time the two countries ran independent nuclear projects. With the exigencies of the war, however, the projects were pooled in 1942; and though America was clearly the senior partner, providing the organization and the industrial muscle, British scientists played a small but significant role in the Manhattan Project.[19] Reassessing key themes of the official histories of the British and American nuclear projects, Paul – a professor of history at the College of Lake County in Illinois – draws on recently declassified sources to explore the complex nature of the nuclear relationship between the United States and the United Kingdom as it developed in the wartime and post-war years.

Paul's approach to nuclear history is more conventional than that of either Hales or Canaday; his canvas is populated by presidents, prime ministers and senior advisers and officials, and his analysis is of high-level politics and diplomacy. Nor is his topic entirely original; historians of international relations have long been interested in the Anglo-American nuclear alliance, among them John Simpson, Ian Clark and John

17 For another excellent example see Hevly and Findlay, op. cit. (7).

18 On canonical nuclear historiography see J. Hughes, 'Radioactivity and nuclear physics', in *The Cambridge History of Science*, *Vol. V*: *The Modern Physical and Mathematical Sciences* (ed. M. J. Nye), Cambridge, 2002, 350–74.

19 F. M. Szasz, *British Scientists and the Manhattan Project*, Basingstoke, 1992.

https://doi.org/10.1017/S0007087404006168 Published online by Cambridge University Press

Baylis.[20] Nevertheless, while this 'special relationship' has been (and is) much touted by politicians and pundits, Paul shows convincingly that from the beginning it was beset by conflict, deception and mistrust in the face of the dogged pursuit of national self-interest by both parties. Despite the close working relationship that eventually developed between the UK and the US during the war, marked by the integration of British scientists into the Manhattan Project and the establishment of secret informal agreements between Roosevelt and Churchill as to the wartime use and post-war development of nuclear weapons and nuclear energy, Paul shows clearly how British expectations for continuing post-war collaboration were frustrated after the war by American politicians and bureaucrats anxious to protect the 'secret' of the bomb. In this context he explores the politics of the 1946 McMahon Act, which forbade the sharing of US atomic information with other countries, leading Britain to embark upon its own nuclear weapons programme in 1947.

In some ways Paul picks up where Hales leaves off – with the creation of the US Atomic Energy Commission in 1947. 'From the inception of the Anglo-American atomic energy debate', he argues, 'the intrusion of bureaucrats, more than the influence of government leaders, charted the course of atomic policies' (p. 4). Exploring the increasingly complex institutional landscape of post-war US atomic bureaucracy and diplomacy – the Atomic Energy Commission, the State Department, the Defense Department, the various armed services and the Joint Committee on Atomic Energy, as well as the executive itself – Paul shows how the need for supplies of uranium, the crucial raw material for the production of nuclear weapons, ultimately shaped the US's attitude to nuclear cooperation with the UK, not least in the 1948 'modus vivendi' which reintroduced a limited (and short-lived) collaboration between the two allies when the UK seemed to have the upper hand in uranium supplies.

With his focus on the post-war period, Paul also brings in an important element neglected by both Canaday and Hales: nuclear espionage. He argues that, contrary to the usual understanding, it was not the unveiling of Klaus Fuchs as a Soviet agent in January 1950 that undermined slowly revivifying US–UK collaboration – the US had just made the decision to develop hydrogen bombs, and had too much need of the UK's cooperation to secure uranium supplies. Rather, it was the Burgess–Maclean episode a year and a half later, by which time the US had secured alternative supplies of uranium (for example in a new 'special relationship' with Australia), that allowed them to close down US–UK cooperation again. Pitching all this against the playing out of both the American and British nuclear production programmes, Paul does a nice job in parsing US bureaucratic politics under the Truman administration, though his take is less agonistic and insightful than that of Hales. By the same token, one of his weaknesses lies in his failure to adopt a symmetrical approach to the British administration, of which he seems to have a less sure grasp. Although he points out the splits in Attlee's cabinet over the nuclear issue, for example, because of his close focus on high-level nuclear policy Paul neglects the

20 J. Simpson, *The Independent Nuclear State: The United States, Britain and the Military Atom*, Basingstoke, 1983; I. Clark and N. J. Wheeler, *The British Origins of Nuclear Strategy, 1945–1955*, Oxford, 1989; I. Clark, *Nuclear Diplomacy and the Special Relationship: Britain's Deterrent and America, 1957–62*, Oxford, 1994; J. Baylis (ed.), *Anglo-American Relations Since 1939: The Enduring Alliance*, Manchester, 1997.

https://doi.org/10.1017/S0007087404006168 Published online by Cambridge University Press

particular significance of a socialist post-war British government in US eyes, particularly given US attempts to rein in communist and socialist influence and to shape the political development of Europe in this period, as Simpson pointed out in 1983 and as Francis Stonor Saunders has recently reiterated in the broader context of the ideological Cold War.[21]

In terms of the wider context, Paul also surprisingly neglects the intelligence relationship between the US and UK around and through which the atomic alliance has to be understood – for example the crucially important 1948 UKUSA signals intelligence agreement, and the various agreements over targeting intelligence and other operational matters.[22] As James Bamford, Stephen Twigge and Len Scott have shown, there were extensive informal contacts between US and UK intelligence and military personnel at operational level that worked to ensure some kind of collaboration, whatever official policy was set from above.[23] Nevertheless, in keeping with Hales's analysis, Paul's emphasis on the uranium realpolitik of the UK–US nuclear relationship reminds us that diplomats and politicians, like the nuclear bosses and the scientists, were as much concerned with the material means to make the weapons as with the politics of their control and possible use. At the point of production and proliferation, the bombs were not constituted textually, but by elaborate materials won by political horse-trading. Not so much 'fabulously textual' as 'mundanely material' – but no less powerful for that.

In October 1952 Britain exploded its own atomic bomb at Monte Bello (discussions over the use of a US test site in Nevada came to nothing as UK–US relations went through one of their periodic downturns, forcing the UK to develop a 'special relationship' of its own with Australia).[24] Five years later the UK exploded a thermonuclear weapon at Christmas Island. The UK achieved with relatively limited resources what the combined allied wartime project had taken a huge crash programme and $2 billion to achieve. Yet it is remarkable that, beyond the official histories and one or two popular works, the post-war UK nuclear weapons programme has received nothing like the attention devoted to its US cousin.[25] In particular, the works reviewed here suggest interesting new approaches to this history. An analytical focus on the regional, spatial and labour aspects of the UK programme, for example, would allow its history to be integrated more effectively into the broader social and cultural history of post-war Britain, while a more detailed analysis of the bureaucratic politics of the British military, government departments and nuclear establishment would give fascinating insights both into the role projected for British

21 Simpson, op. cit. (20); F. S. Saunders, *Who Paid the Piper? The CIA and the Cultural Cold War*, London, 1999.

22 For a recent study see R. J. Aldrich, *The Hidden Hand: Britain, America and Cold War Secret Intelligence*, London, 2001.

23 J. Bamford, *Puzzle Palace: America's National Security Agency and its Special Relationship with Britain's GCHQ*, London, 1983; Twigge and Scott, op. cit. (1).

24 L. Arnold, *A Very Special Relationship: British Atomic Weapons Trials in Australia*, London, 1987.

25 M. Gowing, *Independence and Deterrence: Britain and Atomic Energy 1945–1952, 2 vols., Vol. 1: Policy Making, Vol. 2: Policy Execution*, London, 1974; L. Arnold, *Britain and the H-Bomb*, Basingstoke, 2001; H. Wynn, *RAF Nuclear Deterrent Forces*, London, 1994; B. Cathcart, *Test of Greatness: Britain's Struggle for the Atomic Bomb*, London, 1994; L. Arnold, 'A letter from Oxford: the history of nuclear history in Britain', *Minerva* (2000), **38**, 201–19.

https://doi.org/10.1017/S0007087404006168 Published online by Cambridge University Press

nuclear weapons and into the constitution of the British nuclear state.[26] Such an analysis would add significantly to the comparative analysis of nuclear proliferation already offered by Donald MacKenzie, and it is much to be hoped that historians of science and technology – who are particularly able to deal symmetrically and non-teleologically with both the scientific/technical and broader contextual issues – will take a lead in such projects.[27]

More than many other kinds of history, nuclear history acts as a guide and precedent for thinking about current and future policy.[28] As we see nothing less than a massive reconsideration of the costs and consequences of the first nuclear age, we are witnessing the beginnings of a second; the end of the Soviet Union led to the circulation of significant amounts of fissile material in an international black market, and it is feared that some of this material may have fallen into the hands of terrorists who may be capable of making a 'dirty' radiological weapon, if not a nuclear device.[29] In the context of a 'global war on terror' this new threat of nuclear terrorism, coupled with the new regional nuclearism instantiated by the India–Pakistan stand-off in 1998 and North Korea's continuing nuclear programme, demonstrate that the nuclear has not receded as much as we would like to think. Getting the history right may have important implications for the way we face the nuclear future.[30]

J. HUGHES
Centre for the History of Science, Technology & Medicine,
University of Manchester, UK

26 These projects are, to some extent, under way; see, for example, I. Welsh, *Mobilising Modernity: The Nuclear Moment*, London, 2000; R. Moore, *The Royal Navy and Nuclear Weapons*, London, 2001; M. Mort, *Building the Trident Network: A Study of the Enrollment of People, Knowledge, and Machines*, Cambridge, MA, 2002; J. Hughes, 'The Strath Report: Britain confronts the H-Bomb, 1954–1955', *History and Technology* (2003), **19**, 259–77.

27 D. MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*, Cambridge, MA, 1990; D. MacKenzie and G. Spinardi, 'Tacit knowledge, weapons design, and the uninvention of nuclear weapons', *American Journal of Sociology* (1995), **101**, 44–99.

28 The outstanding example is the Cuban missile crisis; see L. Scott and S. Smith, 'Lessons of October: historians, political scientists, policy-makers and the Cuban missile crisis', *International Affairs* (1994), **70**, 659–84. For other examples, see S. D. Sagan and K. N. Waltz, *The Spread of Nuclear Weapons: A Debate Renewed*, 2nd edn, New York and London, 2003.

29 Schwartz, op. cit. (1); G. T. Allison, O. R. Coté, R. A. Falkenrath and S. E. Miller, *Avoiding Nuclear Anarchy: Containing the Threat of Loose Russian Nuclear Weapons and Fissile Material*, Cambridge, MA, 1996.

30 On nuclear terrorism and recent nuclear proliferation see, for example, W. E. Burrows and R. Windren, *Critical Mass: The Dangerous Race for Superweapons in a Fragmenting World*, New York, 1994; R. A. Falkenrath, R. D. Newman and B. A. Thayer, *America's Achilles Heel: Nuclear, Biological and Chemical Terrorism and Covert Attack*, Cambridge, MA, 1998; J. Stern, *The Ultimate Terrorists*, Cambridge, MA, 1999; P. R. Lavoy, S. D. Sagan and J. R. Wirtz (eds.), *Planning the Unthinkable: How New Powers will use Nuclear, Biological and Chemical Weapons*, Ithaca, 2000; G. Perkovich, *India's Nuclear Bomb: The Impact on Global Proliferation*, Berkeley, 1999; P. Bidwai and A. Vanaik, *New Nukes: India, Pakistan and Global Nuclear Disarmament*, Oxford, 2000.

https://doi.org/10.1017/S0007087404006168 Published online by Cambridge University Press