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Jacob Bronowski: a humanist intellectual for an atomic age, 1946–1956

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Abstract. Jacob ('Bruno') Bronowski (1908–1974), on the basis of having examined the effects of the atomic bombing of Japan in late 1945, became one of Britain's most vocal and best-known scientific intellectuals engaged in the cultural politics of the early atomic era. Witnessing Hiroshima helped transform him from pure mathematician–poet to scientific administrator; from obscurity to fame on the BBC airwaves and in print; and, crucially, from literary intellectual who promoted the superior truthfulness of poetry and poets to scientific humanist insisting that science and scientists were the standard-bearers of truth. A cornerstone of Bronowski's humanist ideology was that Hiroshima and the bomb had become symbols of the public's distrust of science, whereas, in reality, science was merely a scapegoat for society's loss of moral compass; more correctly, he stressed, science and scientists epitomized positive moral values. When discussing atomic energy, especially after 1949, Bronowski not only downplayed the bomb's significance but was deliberately vague regarding Britain's atomic weapon development programme; this lack of candour was compounded by Bronowski's evasiveness regarding his own prior involvement with wartime bombing. The net effect was a substantial contribution to British scientific intellectuals' influential yet frequently misleading accounts of the relations between science and war in the early atomic era.

Historians have long recognized the important roles played by scientific émigrés in mid-twentieth-century British nuclear culture.[1] Jacob ('Bruno') Bronowski, the Polish-born polymath, does not figure in this historiography – perhaps because, unlike most others, he was neither a refugee from fascist dictatorships nor a scientist involved in wartime atomic bomb development.[2] Yet Bronowski, on the basis of having examined the effects of the atomic bombs on Hiroshima and Nagasaki in late 1945, soon established himself

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1 See Sabine Lee (ed.), *Sir Rudolf Peierls: Selected Private and Scientific Correspondence*, 2 vols., London: Imperial College Press, 2008, vol. 2; Robert Chadwell Williams, *Klaus Fuchs, Atom Spy*, London: Harvard University Press, 1987; Reiner Braun *et al.* (eds.), *Joseph Rotblat: Visionary for Peace*, Chichester: John Wiley, 2007; and Simone Turchetti, 'Atomic secrets and government lies: nuclear science, politics and security in the Pontecorvo case', *BJHS* (2003) 36, pp. 389–416.

2 Most historiography pertaining to Bronowski addresses his impact on American cultural concerns. For representative scholarship see Marie Novak, 'Science: dilemma and opportunity for Christian ethics: Jacob Bronowski, a case study', PhD dissertation, University of Iowa, 1976; and Robert Joseph Emmitt, 'Scientific humanism and liberal education: the philosophy of Jacob Bronowski', PhD dissertation, UCLA, 1982. Bronowski has drawn limited attention by British historians. Noel Annan incorrectly associated Bronowski with C.P. Snow, claiming that Bronowski 'enjoyed *contrasting* the scientific with the humanist mind'. Annan, *Our Age: The Generation that Made Post-war Britain*, London: Weidenfeld and Nicolson, 1990, p. 382, added emphasis. Stefan Collini more accurately associated Bronowski with scientific intellectuals like C.H. Waddington, who addressed specialization as a subject in its own right. Stefan Collini, *Absent Minds: Intellectuals in Britain*, Oxford: Oxford University Press, 2006, p. 457.

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as one of Britain's most vocal and best-known scientific intellectuals engaged in the cultural politics of the early atomic era. Steven Shapin singled out Bronowski as 'the influential English populariser' who argued, post-Hiroshima, for the moral superiority of science, when scientists' 'moral equivalence' had instead become a commonplace.[3] David Edgerton, in an article highlighting the great disparity between actual relations of science and war and the historiographically influential accounts of British scientific intellectuals, castigated Bronowski for his especially dubious account of the atomic bomb in his famed *Ascent of Man* television series of 1973.[4] As this paper demonstrates, Bronowski's misleading stories concerning the bomb long pre-dated *Ascent*; moreover, they were given credence by virtue of the authority which Bronowski both invoked and reaped as witness to the effects of the first atomic bombs.

This paper shows how Bronowski's participation in the British mission to examine the atomic bombing effects on Japan was key to his transformation from pure mathematician–poet to scientific administrator; from obscurity to fame on the BBC airwaves and in print; and, crucially, from literary intellectual who promoted the superior truthfulness of poetry and poets to scientific humanist insisting that science and scientists were the standard-bearers of truth. Its principal argument is that truthfulness in relation to the bomb was a crucial, yet highly problematic, feature of Bronowski's scientific humanism. A cornerstone of Bronowski's humanist ideology was that Hiroshima and the bomb had become symbols of the public's distrust of science, whereas, in reality, science was merely a scapegoat for society's loss of moral compass; he argued that science and scientists epitomized positive moral values, notably truthfulness. Yet when discussing atomic energy, especially after 1949, Bronowski not only downplayed the bomb's significance in atomic power generation but was profoundly misleading about the British bomb project; this lack of candour was compounded by Bronowski's sustained evasiveness regarding his own prior personal involvement with wartime bombing.

By examining Bronowski's specific interventions in nuclear culture, this paper also sheds light on several more general aspects of Cold War cultural history. Bronowski's repeated promotion, notably on the BBC, of atomic energy's peaceful uses contributed to a consensus on atomic energy in Britain while simultaneously countering Soviet propaganda efforts abroad.[5] Bronowski's humanist philosophy, directed in part against critics of science, stressed a unity between the arts and sciences; it was one of many cases

3 Steven Shapin, *The Scientific Life: A Moral History of a Late Modern Vocation*, Chicago: The University of Chicago Press, 2008, p. 75.

4 David Edgerton, 'British scientific intellectuals and the relations of science, technology, and war', in Paul Forman and José M. Sánchez-Ron (eds.), *National Military Establishments and the Advancement of Science and Technology: Studies in 20th-Century History*, London: Kluwer Academic, 1996, pp. 1–35, 22–23. See also Edgerton, *Warfare State: Britain, 1920–1970*, Cambridge: Cambridge University Press, 2006, Chapter 8.

5 For BBC collaboration with the Foreign Office Information Research Department see Alban Webb, 'Auntie goes to war again: the BBC External Services, the Foreign Office and the early Cold War', *Media History* (2006) 12, pp. 117–132.

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which suggest the limits of C.P. Snow's unbridgeable 'two-cultures' model of post-war British intellectual life.[6]

Mathematician, Marxist and modernist: early biographical background

Born in Łódź, Poland, in 1908, Jacob Bronowski had moved with his family to Germany during the First World War, and then to London in 1920, where he learned English. Mathematically gifted, he gained a scholarship to Jesus College, Cambridge (1928), and was awarded a PhD (1935) in pure mathematics (topology).[7] In 1934 Bronowski took on a mathematics assistant lectureship at University College Hull, where he taught until 1943.[8]

Two aspects of Bronowski's intellectual trajectory during his Cambridge and Hull years are noteworthy in light of his future public-intellectual career. First, as a staunch anti-fascist from 1933 onwards,[9] Bronowski grew increasingly active in the radical left movement at Hull, where he lectured on Marxism to the college's Socialist Group.[10] He was widely regarded as a pro-Soviet sympathizer and from January 1940 onwards was repeatedly investigated by Britain's Security Service as a possible Communist Party member.[11] His continuing commitment to the left is evident in his 1944 book on William Blake, which garnered accolades from John Strachey, W.H. Auden, E.P. Thompson and A.L. Morton; the art historian Anthony Blunt privately expressed his admiration.[12] Bronowski appears to have shed his political radicalism by war's end, although he remained under MI5 scrutiny until 1958.[13] The second aspect is that Bronowski was not a scientist, but an academic mathematician with a secondary career in literary criticism

6 Guy Ortolano, *The Two Cultures Controversy: Science, Literature, and Cultural Politics in Postwar Britain*, Cambridge: Cambridge University Press, 2009. See also Edgerton, *Warfare State*, op. cit. (4), pp. 197–202. These and related points serve to underscore the particular value of individual case studies of scientific intellectuals as a means of refining national Cold War cultural histories; see, for example, Cathryn Carson, *Heisenberg in the Atomic Age: Science and the Public Sphere*, Cambridge: Cambridge University Press, 2010.

7 Bronowski to Pars, 24 March 1933, L.A. Pars Papers, Modern Records, Jesus College, Cambridge.

8 Bronowski to Meggitt, 23 June 1934 and 18 July 1934, 'Bronowski file', Hull University Archives, Brynmor Jones Library, University of Hull (hereafter HULL).

9 Bronowski, 'Hitlerism', *Granta*, 26 April 1933, in J. Philip *et al.* (eds.), *Best of* Granta *1889–1996*, London: Secker & Warburg, 1967, pp. 85–91.

10 'Socialist group', *The Torch* (December 1941) 4(2), p. 37.

11 Jacob Bronowski, Personal File, UK National Archives, Public Record Office, Kew (hereafter TNA), KV 2/3523–3524. Considered 'a Communist in everything but name' during the war, MI5 advised the Home Office not to employ Bronowski 'on any secret or confidential job' (Serial nos 25–29).

12 Bronowski, *William Blake, 1757–1827: A Man without a Mask*, Harmondsworth: Penguin Books, 1944. For Strachey see Senhouse to Bronowski, 13 July 1944, Jacob Bronowski Papers, Manuscript Collections, Thomas Fisher Rare Book Library, University of Toronto (hereafter BRONOWSKI), Box 133. W.H. Auden, 'Mystic – and prophet', *New York Times Book Review*, 14 December 1947, pp. 4, 27; E.P. Thompson, *Witness against the Beast: William Blake and the Moral Law*, Cambridge: Cambridge University Press, 1993, p. x; A.L. Morton, *The Everlasting Gospel: A Study in the Sources of William Blake*, London: Lawrence & Wishart, 1958, pp. 9, 86; Blunt to Bronowski, 5 March 1943, BRONOWSKI, Box 133.

13 In the post-war era, although MI5 came to learn that his mother and sister were Communist Party members (Serial no 79a), one MI5 interviewee maintained that his political views were merely those of 'an unconventional but determined Socialist' (Serial no 137). Bronowski, Personal File, TNA KV 2/3523–3524.

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extolling the truth-telling virtues of poetry. Moreover, while some fellow students in his Cambridge literary circle had been inspired by I.A. Richards's science-informed literary theories, Bronowski eschewed scientific content and method entirely.[14] Instead, as Bronowski claimed in his first major published work, *The Poet's Defence*,

> I hope that this book makes plain that I believe in one worth only: Truth. I defend poetry because I think it tells the truth. In science, that is truth which can be checked ... by mass measurement ... But I believe that there is truth which is not reached by these means ... The mind of man has a knowledge of truth beyond the near-truths of science and society. I believe that poetry tells this truth.[15]

Bronowski's wartime experiences and early post-war journey to Hiroshima would transform this position. He was to become a civil servant rather than an academic, a scientist–administrator rather than a mathematician, and an intellectual apologist not for poetry but for science.

The making of a scientist and public intellectual

In early 1943 Bronowski was seconded from his Hull lectureship to work in the statistical section (R.E.8) of the Ministry of Home Security's Research and Experiments Department; he became a section head a year later.[16] Located at the Princes Risborough research station near Oxford, this section had been formed under the direction of the physicist J.D. Bernal in November 1941 'to assess the general effect of air attack on structures'.[17] For Bronowski, this entailed statistical research to optimize incendiary and high-explosive bomb ratios for the destruction of German industrial targets, the details of which will be addressed later in this paper. On 22 August 1945, a fortnight after the atomic bombing of Hiroshima and Nagasaki, one of Bronowski's R.E.8 colleagues prepared a memorandum recommending that a team of 'expert R.E.8. personnel ... undertake a ground survey of these incidents whilst the evidence is still fresh'. Both cities contained 'sufficient modern buildings ... to estimate reliably the effectiveness of the [atomic] weapon against this type of structure'.[18] Following discussions between British chiefs of staff and the Home Office – the latter 'anxious to obtain data which may affect civil defence organisation generally and air raid design in particular' – a fifteen-man survey team was formed. Comprising both civilian scientists and engineers and armed

14 Bronowski, 'Postscript', *Experiment 5* (February 1930), p. 35; Bronowski and James Reeves, 'Towards a theory of poetry', *Experiment 4* (November 1929), p. 20.

15 Bronowski, *The Poet's Defence*, Cambridge: Cambridge University Press, 1939, pp. 10–11.

16 Bronowski to Nicholson, 5 June 1946, HULL.

17 'R.E.8 was expanded in July 1942, to provide data of use not only to the Air Ministry, but also to the War Office and the Admiralty ... In its expanded form the work of R.E.8 covered essentially the production ... of scientific advice on certain aspects of operational technique – particularly for Air Staff work.' A.R. Astbury, 'History of the Research and Experiments Department, Ministry of Home Security 1939–1945', TNA HO 191/203, p. 46.

18 R.B. Fisher, 'Memorandum on the future of RE8', 22 August 1945, TNA AIR 20/5369.

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services' representatives, it would be jointly led by Professor W.N. Thomas (honorary group captain) and Jacob Bronowski (honorary wing commander).[19]

After a brief stint in Washington to liaise with their American counterparts, the team spent the month of November 1945 in Nagasaki and Hiroshima. At the latter site, in correspondence with the principal of Hull University College – where he planned to resume his teaching career on return – Bronowski wrote, 'I found these two places unutterably more horrible than even I could have foreseen . . . I shall come to talk only in hyperboles'.[20] The ensuing official survey report, written by Bronowski in the early months of 1946, was necessarily more prosaic: 'The figure of 50,000 dead from one atomic bomb in average British urban conditions is probably the most important which this report contains. It shows that much the most serious effect of the atomic bomb is in producing casualties.'[21]

Bronowski would stay in government service, having resigned his Hull mathematics lectureship in July 1946. He was appointed senior principal scientific officer, effective January 1947, at the Ministry of Works, where he led mathematical and statistical investigations applied to the building industries.[22] In the interim, he had been considered for a scientific position with the Directorate of Atomic Energy, and in December 1947 was a candidate for 'a senior appointment in a very secret and confidential post' in the Air Ministry.[23] In May 1950 Bronowski left the civil service to become director of the Coal Board's central research establishment at Stoke Orchard, near Cheltenham;[24] during his fourteen-year stint Bronowski's chief responsibilities were to increase fuel efficiency through development and production of economically viable smokeless coal 'briquettes'.[25] Bronowski's stature as a leading scientific administrator in a major nationalized industry facilitated his access to elite circles, including the upper reaches of the Labour Party,[26] while also affording him opportunities to participate in debates on Britain's future energy requirements – especially the role of atomic energy.

Bronowski's prior involvement with the bomb was to be equally crucial in his career as a public intellectual. In June 1946 the British Broadcasting Corporation (BBC) had learned that the Home Office was planning to release Bronowski's report on Hiroshima

19 'Examination of the effects of the bombing of Japan. Note by the Air Ministry', 25 August 1945, TNA AIR 20/5369.

20 Bronowski to Nicholson, 12 November 1945, HULL.

21 Bronowski, *The Effects of the Atomic Bombs at Hiroshima and Nagasaki: Report of the British Mission to Japan*, London: His Majesty's Stationery Office, 1946, p. 19.

22 Bronowski to Nicholson, 25 July 1946, HULL. 'Scientific Civil Service: Promotion of individual research workers', *Nature*, 159, 5 April 1947, p. 464.

23 In both cases, Bronowski failed to pass the vetting process, with MI5 citing his earlier involvement in radical left politics. Bronowski, Personal File, Serials 51–54 and 59–62, TNA KV 2/3523.

24 'Research in the coal industry: the Board's Central Research Establishment', TNA COAL 33/29.

25 For a chronology of this project see Ralph Desmarais, 'Science, scientific intellectuals and British culture in the early Atomic Age, 1945–1956: a case study of George Orwell, Jacob Bronowski, J.G. Crowther and P.M.S. Blackett', PhD dissertation, Imperial College London, 2010, p. 70 n. 66. ProQuest order number U521038.

26 For Bronowski's involvement with the Labour Party's 'Gaitskell Group' see David Horner, 'The road to Scarborough: Wilson, Labour and the Scientific Revolution', in Richard Coopey *et al.* (eds.), *The Wilson Governments 1964–1970*, London: Pinter Publishers, 1993, pp. 48–71.

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and Nagasaki to the mass media,[27] and accepted their offer to have Bronowski 'give a descriptive eye-witness talk', on the condition that he 'proved suitable as a broadcaster'.[28] In the event, Bronowski's broadcast – aired live on the night of Sunday, 30 June 1946 – was regarded by BBC management as 'one of the most interesting and best delivered talks'.[29] Over the next few years the BBC invited Bronowski to participate in a succession of radio talks and features in which he repeatedly warned of atomic energy's uniquely destructive capacity. Representative examples include his contribution to the BBC's celebrated factual series *Atomic Energy Week* (March 1947),[30] and his radio play *Journey to Japan* (1948).[31]

The most remarkable instance of Bronowski's broadcast warnings, however, was his harshly critical review of P.M.S. Blackett's 1948 book *Military and Political Consequences of Atomic Energy*.[32] Blackett, the 1948 Nobel physics laureate, had argued that Western analysts were wrong in believing that future atomic bombing would be more militarily decisive than conventional bombing campaigns had been during the war. In his estimation, the political consequences of their exaggerated fear of atomic weapons were twofold: their inability to reach agreement with the Soviet Union on international control of atomic energy, and the likelihood that the United States would soon launch a 'preventive' nuclear attack against the Soviets, thereby sparking a war between the superpowers. Initially reluctant to address Blackett's book, since 'the scientific points at issue are not only technical but concern the technique of war', Bronowski relented after reading David Bradley's best-selling work on the 1946 Operation Crossroads nuclear test.[33] The BBC consented to his proposal to review both works together, and Bronowski's talk – *Bikini or Bluff? What Is the Truth about the Dangers of Atomic Bombing* – was aired on the Third Programme on 17 March 1949.[34] Introducing Blackett as 'after all, a man with a dramatic turn of mind', Bronowski chose to ignore his political arguments, 'because you would still have only the opinions of two amateurs'. Instead, since 'the nature of an atomic war [is] the subject on which I think my opinion is worth having', Bronowski presented a predictable series of technical counterarguments: the atomic weapon is uniquely destructive since it 'holds a power against the industrial life of a country which no collection of small bombs ever had', it

27 Rendall to Barnes, 22 June 1946, BBC Written Archives Centre, Caversham (hereafter BBCWAC), RCONT 1 ('Bronowski, Talks 1946–1949'), 'Hiroshima Talk'. The report's release, timed to coincide with the American 'Operations Crossroads' test, aimed to assist the UNO in securing atomic energy control. 'Effects of two atom bombs British survey in Japan, a "sombre" picture', *The Times*, 1 July 1946.

28 Rendall to Barnes, 22 June 1946, BBCWAC, RCONT 1 ('Bronowski, Talks 1946–1949'), 'Hiroshima Talk'.

29 Barnes to Bronowski, 3 July 1946, BBCWAC, op. cit. (27).

30 Bronowski, *The Military Uses* (of atomic energy), broadcast 4 March 1947 on the Home Service, repeated on the Third Programme, BBCWAC, R51/33 Talks (Atomic Energy File 1). Bronowski, 'The effects of the atomic bombs, Proposed Script for 4 March 1947', TNA HO 196/30.

31 Bronowski, *The Inward Eye: 2 – Journey to Japan*, broadcast 5 December 1948, BBC Third Programme.

32 P.M.S. Blackett, *Military and Political Consequences of Atomic Energy*, London: Turnstile Press, 1948.

33 David Bradley, *No Place to Hide*, London: Hodder & Stoughton, 1948. Bronowski to Clow, 1 January 1949 and 5 December 1948, 'Bronowski correspondence file', BBCWAC.

34 *Bikini or Bluff?* was rebroadcast on the BBC Home Service, 22 June 1949; published in *The Listener* and in *Civil Defence* (April 1949) 49.

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kills more people than conventional weapons, and (invoking Bradley's book) its radioactive fallout constitutes an unprecedented lethal peril. Blackett and *Consequences* would endure far harsher and more abusive criticism,[35] but it is noteworthy that Bronowski, a man of the left like Blackett, was apparently unmoved by the latter's ultimate concern that a 'preventive war' would result in Britain's loss of political independence and all hopes for its democratic socialist future.

Bronowski's inaugural 'Hiroshima' broadcast also resulted in his being asked to take part in programmes of many other types. In October 1946 Bronowski first appeared on the BBC's famed *Brains Trust* radio programme, with his expertise identified as 'mathematics and literature';[36] within six months he was ranked higher in popularity than its regular panellist, the philosopher Cyril Joad.[37] Bronowski was soon presenting radio talks ranging from *How Does the Scientist Know?* (1951), dealing with the scientific method's philosophical implications, to a literary analysis of William Blake's prophetic books (1951). Meanwhile, the elite Third Programme service produced his award-winning play *The Face of Violence* (1950) and his radio 'opera' sequel *My Brother Died* (1954).[38] Bronowski's popularity with BBC management and radio audiences extended beyond his frequent broadcasts on the BBC's domestic services, for he also delivered over eighty talks between 1950 and 1956 on the BBC's foreign radio services. From 1951 onwards, moreover, he made regular appearances on BBC television, including his seven-part series *Science in the Making* (1954),[39] and as panel member of the weekly televised *Brains Trust* programme (1955–1961); as Stefan Collini has remarked, Bronowski was 'almost the public face of science on British television' in this period.[40]

Bronowski's humanist philosophy

Bronowski was Britain's foremost expositor of scientific humanism. This ethos, frequently directed against critics of science and scientists, warrants particular attention in light of his concurrent interventions in early atomic culture (taken up in the section below). His 'Hiroshima' producer invited Bronowski to develop a series of talks for the BBC's newly created Third Programme service 'on the synthesis of mathematics and the humanities'.[41] Instead, Bronowski proposed 'to talk about the unity of the humanities & science, based on the flexibility of science, & centred on actual people or events'; the resulting *Invention and Imagination* series of talks were broadcast in late 1946.[42]

35 Desmarais, op. cit. (25), pp. 109–143.

36 'Any Questions 1941–46', R51/23–5, undated, BBCWAC, p. 6.

37 BBC Listener Research Report LR/47/397, 22 March 1947, BBCWAC.

38 Bronowski, *My Brother Died*, BBC Third Programme, broadcast 27 April 1954, repeated 19 September 1955.

39 Bronowski, *Science in the Making*, produced by Dr G. Noordhof, BBC TV broadcast series, 14 August 1953 to 14 June 1954.

40 Stefan Collini, *Absent Minds*, op. cit. (2), p. 442.

41 Norman Luker to Anna Kallin, 'Third Programme', 23 July 1946, BBCWAC.

42 Letter, Bronowski to Anna Kallin, 12 August 1946, BBCWAC, RCONT 1 ('Bronowski, Talks 1946–1949').

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Two years later Bronowski developed these ideas more fully in his five-part series of talks *The Common Sense of Science* – aired in the spring of 1948.[43] Following four talks arguing that scientific practice is a form of culture, Bronowski's concluding piece – 'Science, the creator or destroyer' – was a sustained defence against critics who blamed science for its role in wartime devastation.[44] Maintaining that 'for some time scientists have been a favourite scapegoat', he conceded that 'science has obviously multiplied the power of the war-makers', but nevertheless insisted that 'warlike science is no more than a by-product of a warlike society'. 'Science has merely provided the means for good or ill; and society has seized it for ill.' He argued that society instead must 'grow familiar with the large ideas of science [which] calls for patience and an effort of attention'. 'For two hundred years, these ideas have been applied to technical needs; and they have made our world anew … We may not think that is much to put against the eighty thousand dead in Hiroshima, or we may.' Noting that the sixty thousand killed by German bombs in Britain during the war equated to a mere fortnight in the average life span of her population, Bronowski contrasted this statistic with England's average lifespan increase of twenty years over the past century: 'That is the price of science, take it or leave it.' The ideas of science, he insisted, 'have created life'. In conclusion, Bronowski proposed that science can 'heal the spiritual cleft which two wars have uncovered'. Science, he said, 'can create values and will create them precisely as literature does, by looking into the human personality; by discovering what divides and cements it'.[45]

In 1951, soon after taking up his post at the Coal Board, Bronowski published these *Common Sense of Science* talks in expanded book form.[46] One particularly salient new chapter, 'Truth and value', elaborated on his theme of scientific values, introducing what would become his recurring leitmotif: the intrinsic truthfulness of science. Bronowski began by stressing that when science 'throws out some unavoidable challenge, such as in our time has been set by the atomic bomb', it is blamed for what really amounts to 'a deeper division between the social habits of our schooldays and new habits of thought'. This deeper division, he argued, stemmed from a sense that social change had been accompanied by a loss of morality, and that science had become society's scapegoat for this loss. But unjustly so: 'For whatever else may be held against science, this cannot be denied, that *it takes for ultimate judgement one criterion alone, that it shall be truthful*.' No other system 'can claim a more fanatical regard for truth'.[47]

Bronowski reiterated his 'scientific truthfulness' theme in 1953 in three lectures delivered at the Massachusetts Institute of Technology, first published as 'Science and

43 *Common Sense of Science* Third Programme talks were first broadcast in April 1948, repeated on BBC Home Service (shortened to fifteen-minute talks) in June and July 1948, and on the BBC European Service in November 1948.

44 Bronowski, 'Science, the Creator or Destroyer', broadcast 19 April 1948. Radio script, 10 pp., BBCWAC.

45 Bronowski, op. cit. (44), pp. 5, 8A, 10.

46 Bronowski, *The Common Sense of Science*, London: Heinemann, 1951; reissued in 1960, 1962 and 1969.

47 Bronowski, op. cit. (46), pp. 125–128 *passim*, emphasis added.

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human values' (1956) in British and American journals.[48] These essays garnered considerable praise from leading atomic physicists who had participated in the Manhattan Project. J. Robert Oppenheimer read it 'with great interest, pleasure and frequent assent', and Phillip Morrison wrote,

> There is no one else so clear in his ideas of the humane worth of science . . . While Dr Bronowski walked . . . about the wreck of Nagasaki, I spent damp nights in the ashes of Hiroshima. We have fashioned from that autumn a common faith that . . . not in terror but in unity and growth will science remake our world.[49]

Published many times later in book form,[50] Bronowski's essays also emphasized practising scientists' own innate truthfulness. In the concluding piece, 'The sense of human dignity', Bronowski examined 'the conditions for the success of science'. He invoked the recollection of Georges-Louis Buffon, the eighteenth-century French naturalist and mathematician who, on first encountering 'the grave men of the Royal Society, heirs to Newton', had found them 'a community of scientists seeking the truth together with dignity and humanity. It was, it is, a discovery to form a man's life'. Today, Bronowski maintained, 'In the society of scientists each man, by the process of exploring for the truth, has earned a dignity more profound than his doctrine.'[51] Science, he concluded,

> has created the values of our intellectual life and, with the arts, has taught them to our civilization. Science has nothing to be ashamed of even in the ruins of Nagasaki. The shame is theirs who appeal to other values than the human imaginative values which science has evolved.[52]

The 'values' of atomic energy

Beginning in early 1950, Bronowski virtually abandoned his earlier dire warnings about the bomb's uniquely destructive power in favour of stressing the peaceful benefits which atomic energy promised. The earliest instance of this shift was his BBC Far Eastern Service talk, 'Atomic energy and peace', broadcast in February 1950, when he complied with the producer's request to 'develop [the idea] . . . that atomic energy need not necessarily be used for destructive purposes but can, in fact, help to save life and build a

48 Bronowski, 'Science and human values', *Universities Quarterly* (May 1956) 10, pp. 247–259; *Universities Quarterly* (1956) 10, pp. 324–338; and *Universities Quarterly* (1956) 11, pp. 26–42. See also *The Nation*, 183, 29 December 1956, pp. 550–566. Earlier published versions included Bronowski, 'Science and values', *Ideas of Today* (1952) 2(2), pp. 37–42; and *Ideas of Today, Adult Education* (1952) 25(2), pp. 98–99.

49 'Letters', *The Nation*, 184, 19 January 1957. C.P. Snow, reviewing it later, wrote, 'The habit of truth, on which science depends as no other human activity does, is in itself a moral habit . . . It is from this foundation that Bronowski has built a structure of values . . . with poetic feeling and a passionate identification with the human future. The result is at the same time convincing to the intellect, and curiously moving.' C.P. Snow, 'The habit of truth', *New Republic*, 18 August 1958; and *New Statesman*, 21 April 1961.

50 Bronowski, *Science and Human Values*, New York: Harper and Row, 1958, reprinted London: Hutchinson, 1961, Harmondsworth: Penguin, 1964, and New York: Harper & Row, 1972.

51 Bronowski, 'Science and human values' (1956), op. cit. (48), p. 36.

52 Bronowski, 'Science and human values' (1956), op. cit. (48), p. 42.

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securer and better future'.[53] It is salient that Bronowski adopted an even more politically activist role in promoting peaceful atomic energy soon after joining the Coal Board a few months later – a stance possibly explained by his concern that Britain's diminishing coal reserves threatened her industrial competitiveness: it was imperative, he argued, that atomic energy be immediately exploited for industrial power – with coal research confined to home heating, his chief responsibility.[54] This move was accompanied by an increasing lack of candour about Britain's own bomb development programme, which contrasted sharply with the 'truthfulness' claims underpinning his scientific humanism.

Bronowski's stress on the peaceful uses of atomic energy began in November 1950 in a *Times* letter calling for international cooperation to equip undeveloped nations with peaceful atomic energy – an effort he continued for the next six years. Nations, he argued, should 'cooperate to plan and build, in one of the world's underdeveloped areas, a station to make atomic power on a massive scale in order to irrigate or develop that area'.[55] Bronowski soon elaborated the political significance of his plan in the concluding article of a *Daily Herald* series in which 'five eminent men' were invited 'to make constructive suggestions for avoiding war'. For the inhabitants of these underdeveloped nations, he maintained, 'Communism ... is not a denial but ... a just aspiration [since] it expresses ... the same human urge for equality and decent living which Socialism and the Welfare State mean to us.' Bronowski's plan would 'prove that we have something to give to mankind which did not die, but was born over Hiroshima five years ago'.[56]

In parallel with these international proposals, Bronowski repeatedly promoted Britain's domestic atomic energy research programme. Astonishingly, by his accounts, Britain's programme did not involve nuclear weapons development – even though, widely reported in the press, such a programme had been confirmed by the minister of defence in the House of Commons in May 1948.[57] In a 1951 *Observer* article, Bronowski wrote,

> I speak for many scientists when I say that it is disquieting to find how little others know of the work on the peaceful uses of atomic energy. Today the atomic pile and its products have three uses: in research, in medical treatment and as a source of power.[58]

He failed, however, to note that the primary purpose of the Windscale piles located in Cumbria, north-west England, was to produce plutonium for Britain's atomic bomb

53 Stapley to Bronowski, 23 February 1950, BBCWAC. Later similar Persian Service talks included *Britain Is Planning to Make Full Use of Atomic Energy by 1956* (1954) and *If the World's Oil Supply Suddenly Came to an End?* (1954).

54 Bronowski, 'Research of Household Fuels', Proceedings, Convention of the Coal Utilisation Council, Harrogate, 14–15 October 1953, pp. 14–15. 'National Coal Board reports', BRONOWSKI, Box 139. See also Bronowski, 'Atomic energy and the future of the mining industry', Lecture, 28 October 1955, TNA COAL 97/1.

55 Bronowski, 'Atomic peace', *The Times*, 30 November 1950.

56 Bronowski, 'My plan for peace', *Daily Herald*, 10 January 1951.

57 MoD: 'all types of weapons, including atomic weapons, are being developed'. House of Commons Debates, *Hansard*, vol. 450, col. 2117.

58 Bronowski, 'Atomic Energy in Daily Life', *The Observer*, 11 February 1951.

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development programme. Bronowski compounded this omission with explicit denial. In a late 1951 radio play he wrote for transmission on the BBC's North American Service,[59] Bronowski acted the part of 'Narrator', who discusses atomic energy with two fictional friends. At one point, 'Narrator' remarks, 'Ah! That's the 64-dollar question . . . *We don't even make any atomic bombs in England*; our atomic stations do more work for peace than for War; but does the public know? They are still just saying what they said 5 years ago – "Scientists – I'd like to drown the lot!".'[60] Bronowski repeated this false claim on 13 May 1952 in a commissioned script to the BBC Persian Service: 'Why has not Britain manufactured atom bombs, in spite of the great number of scientists this country possesses?'[61] The following day Downing Street confirmed Operation Hurricane, Britain's long-planned first nuclear test.[62]

Detonated off the Monte Bello islands on 10 October 1952, Operation Hurricane drew little public reaction; somewhat more attention was paid to the American thermonuclear explosion a month later, and to the Soviet hydrogen bomb test in August 1953. But it was the US hydrogen bomb test at Bikini atoll in March 1954, and the subsequent news of Japanese fishermen killed by radiation poisoning, that aroused serious public outcry. Organized opposition to the bomb in Britain soon followed: by the late 1950s increasing calls for unilateral disarmament would precipitate divisions within the opposition Labour Party, and help launch the Campaign for Nuclear Disarmament (CND).[63] Bronowski's responses to these events took several forms, all indicative of his reluctance to join these opposition voices. From December 1953, for example, when making frequent guest appearances on Birmingham-based *Behind the News* radio broadcasts, Bronowski again repeatedly stressed the peaceful uses of atomic energy.[64] And in February 1955, following the British government's announced decision to develop the hydrogen bomb, he declined to discuss its political ramifications: 'My first choice [for a topic] remains the peaceful atomic future, and its implications for world-enrichment.'[65] Two years later Bronowski declined to join National Committee for the Abolition of Nuclear Weapons Tests, the precursor to CND, claiming that 'he could voice his opposition "more effectively on informal occasions than at a formal public meeting".'[66]

During these early years of increasing public opposition to nuclear tests, Bronowski's second form of intervention was to argue – repeatedly – that instead of turning scientists into scapegoats, the lay public ought to take fuller responsibility for scientists' research

59 Bronowski, *Atoms for Peace*, broadcast 12 September 1951, BBC North American Service.

60 Bronowski, *Atoms for Peace* tss, 1 September 1951, p. 5, BRONOWSKI, Box 120, emphasis added.

61 'BBC Talks Script Booking Slip', 13 May 1952, BBCWAC.

62 See also Brian Cathcart, *Test of Greatness: Britain's Struggle for the Atom Bomb*, London: John Murray, 1994.

63 James Hinton, *Protests and Visions: Peace Politics in 20th Century Britain*, London: Hutchinson Radius, 1989.

64 For example, Bronowski to Bryson, 14 February 1954 and 16 May 1954, BBCWAC.

65 Bronowski to Bryson, 20 February 1955, BBCWAC.

66 Richard Taylor, *Against the Bomb: The British Peace Movement, 1958–1965*, Oxford: Clarendon Press, 1988, p. 9.

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activities.[67] Yet, as one revealingly representative *Observer* article by him demonstrates, Bronowski's arguments were enmeshed in a maze of historical half-truths, self-contradictions and special pleading. In 'Scientists and bombs' (1954), Bronowski began by recalling the July 1945 Trinity Test, when 'many . . . deeply distressed' scientists 'sent a round robin to President Truman, urging that the scale and implications of the bomb were too grave, and should be demonstrated in some less deadly way' – but 'their scruples were overruled'. Today, he argued, the spectre of Hiroshima 'vents itself on the figure of the scientist, powerful yet fragile, a scapegoat for a world that fears and conspires its own doom'. The 'crux of the matter' is that 'the responsibility for having research done on uranium or hydrogen, the responsibility for having research done on death, is a communal responsibility'. But, Bronowski maintained, it is not the communal responsibility of the scientist, whose 'choice is individual' and who 'does our bidding as the soldier does'; rather, it is voters who must 'accept their responsibility . . . to listen, to weigh, and then to make their own choice'. The only 'deep responsibility of the nuclear scientist . . . is to illuminate for all men the choice which his work offers them . . . and it is the only democratic responsibility that the scientist can take'. For Bronowski, the scientist's sole alternative was the one taken by the convicted atomic spy Klaus Fuchs, who had decided 'single-handed[ly] what should be done with the work his fellow citizens have asked of him . . . [thereby] arrogantly betraying his fellows'.[68]

Bronowski continued to invoke this dichotomy between the scientist's individual conscience and the community's collective responsibility, even though leading scientific intellectuals had themselves begun to take collective, organized action against the bomb. On 9 July 1955, Bertrand Russell had announced his petition (the later famous 'Russell–Einstein Manifesto') inviting all scientists to call on governments to find ways to avert world war.[69] On that same day, Bronowski addressed a London audience organized by the Atomic Scientists' Association on 'The responsibilities of scientists and public'. Given wide press coverage, Bronowski's remarks – stressing the public's greater duty – echoed those of a year earlier, including his castigation of Klaus Fuchs.[70]

Bronowski repeated these and similar arguments throughout 1955–1956,[71] but by the late 1950s his views had become wholly out of step with members and supporters of the CND and Pugwash movements. During the 1960s he would continue to espouse a

67 Compare with Bronowski, 'The educated man in 1984', *The Advancement of Science* (1955) 12/301, reprinted in *Science*, 123, 27 April 1956, pp. 710–712.

68 Bronowski, 'Scientists and bombs', *The Observer*, 9 May 1954.

69 The signatories to Russell's petition, announced 9 July 1955 during a World Conference of Scientists in London, included six Nobel laureates. Amongst them were Percy Bridgeman, Max Born, Frédéric Joliot-Curie, Linus Pauling and C.F. Powell. Press coverage was massive.

70 'The scientist's duty', *The Observer*, 10 July 1955; 'The dilemma of Klaus Fuchs', *Sunday Express*, 10 July 1955; and 'Dr. Bronowski on duty of scientists', *The Times*, 11 July 1955. Bronowski's castigation of Fuchs drew a strong rebuke from the historian A.J.P. Taylor, who maintained that Fuchs had, in fact, prevented the Third World War. A.J.P. Taylor, 'I say what I please', *Daily Herald*, 13 July 1955; and Bronowski, 'Bronowski answers Alan Taylor', *Daily Herald*, 19 July 1955.

71 For his remarks at the World Conference of Scientists (London, 3–5 August 1955), see 'World scientists' unanimous vote. Need to end war', *The Times*, 6 August 1955. For Bronowski's 'Fuchs' speech (Netherlands peace conference, 25 August 1955), see Bronowski, *The Dilemma of the Scientist*, London: National Peace Council, 1955. Addressing the Sixth World Parliamentary Conference on World Government (London, 26 July

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liberal humanist philosophy predicated on scientists' individual conscience and on his trust that scientific knowledge and 'scientific morality' would overcome the threat of atomic bombs. But, at the decade's close, Bronowski's individualist ethos surprisingly gave way to a call for 'the disestablishment of science' – enjoining scientists to act collectively to take control of the funding and direction of all scientific research.[72] It was, in the words of one contemporary historian of science, 'a utopian counsel of despair which . . . is as politically irresponsible as it is impracticable'.[73]

The roots of Bronowski's 'Hiroshima'

Bronowski's study of the effects of atomic bombing at Hiroshima and Nagasaki had been a key feature in every biographical précis accompanying his published works and radio programme listings. Yet these biographies were unfailingly vague concerning his wartime career leading up to Hiroshima: Bronowski 'worked in operational research',[74] 'his training as a mathematician led him into government research during World War II',[75] 'he was asked to study bomb damage and its implications during the war',[76] or he 'forecast the economic effects of bombing'.[77] Even Bronowski's 1974 *Times* obituary merely noted that he had headed 'a number of statistical units dealing with the economic effects of bombing' during the war.[78] Years later, Bronowski's detailed curriculum vitae accompanying a published Festschrift simply stated, 'Government Service (British), 1942–1946'.[79] Bronowski, too, was equally evasive: addressing American audiences on BBC radio in 1951, for example, he said that when war came, 'before I knew where I was, I was studying aerial views of German heavy water plants and poring over smuggled photographs of secret weapons'. And in his final *Ascent of Man* book, although mentioning his Hiroshima visit, Bronowski's only reference to his prior war work was having studied a 'photograph of an explosion' with John von Neumann.[80] Yet in actuality Bronowski's principal wartime tasks had been to help

1956), Bronowski shifted emphasis slightly, proposing that scientists could help living standards and spread information on the essential need for peace. *Science for Peace Bulletin* (1956) p. 10.

72 Bronowski, 'The disestablishment of science', *Encounter* (1971) 37, p. 916.

73 Gary Werskey, 'Communities of sciences', *Nature* (16 July 1971) 232, p. 205. See also Anthony Wedgwood Benn (Britain's minister of science and technology), 'Towards a new dictatorship?', *Encounter* (1971) 37(3), pp. 93–94.

74 Bronowski, *Lessons of Science*, Fabian Autumn Lecture, 3 November 1950, Fabian Society Publication, April 1951.

75 'A note about this issue', *The Nation*, 183, 29 December 1956.

76 Bronowski, *Atomic Challenge: A Symposium*, London: Winchester Publications, 1947.

77 Bronowski and Bruce Mazlish, *The Western Intellectual Tradition*, Harmondsworth: Pelican, 1963.

78 'Dr. Jacob Bronowski: scientist and mathematician', *The Times*, 23 August 1974, p. 15.

79 'Jacob Bronowski: a retrospective', *Leonardo* (1985) 18, pp. 282–287.

80 Bronowski, *The Ascent of Man*, London: BBC, 1973, pp. 370, 435. In the only comprehensive history addressing Bronowski's wartime career, his statistical work is not associated with allied strategic bombing. Bernice Cattanach, 'Jacob Bronowski: a twentieth century pontifex', PhD dissertation, Northern Arizona University, 1980, pp. 21–22. Lisa Jardine gave a more accurate description in *My Father, the Bomb, and Me*, BBC4, first broadcast 9 December 2010; see also Jardine, 'Dad's slide rule armageddon', *The Times*, 28 November 2010.

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maximize the effects of bombing on German and Japanese urban targets; it was this expertise, detailed below, which made him uniquely qualified to co-lead the November 1945 British mission to Japan and to report its findings.

By the time Bronowski was seconded to the Ministry of Home Security in early 1943, its R.E.8 Operations Research Department's role had been redirected from civil defence to supporting Bomber Command's strategic bombing campaigns against German cities.[81] For Bronowski, this entailed research to optimize incendiary and high-explosive bomb ratios for maximum destructive effect on German industrial targets.[82] But Bronowski's work took a crucial turn in the autumn of 1944, when he transferred to London to assist American preparations for their forthcoming Japanese bombing campaign. There he liaised with the Washington-based Joint Target Group (JTG) responsible for 'integrating and coordinating pre-attack and post-attack intelligence analyses of air targets in the war against Japan'.[83] The JTG, lacking extensive information on Japan, would soon rely heavily on British knowledge of bombing Germany; by Bronowski's then-classified account, it was largely from British studies 'that the group devised its recommendations on the mix of high-explosive and incendiary bombs to be dropped [on Japan] and the fuse sensitivities to be considered for each target'.[84] The value of these analyses increased dramatically from early 1945 onwards, when American campaigns shifted from 'precision' daylight bombing of Japanese cities to night-time 'area' bombing – the policy long favoured by British Bomber Command against Germany.[85] By May 1945, however, even this approach (in which hundreds of thousands of Japanese civilians perished) began to experience diminishing returns. As Bronowski explained, 'Incendiary raids on Japanese cities have been successful hitherto only when the ground density over the area burnt out has reached 75 tons per square mile.' His proposed solution, though possibly not adopted, affords a chilling insight to the 'technological fanaticism'[86] to which operations researchers had succumbed:

> As the parts of the target most vulnerable to fire are gutted, future raids are unlikely to show a lower average. At this weight, however, attack with 4,000 lb or larger H.C. [High Capacity] bombs with aluminised fillings *is virtually as profitable, both in damage and casualties*; and is,

81 Maurice W. Kirby, *Operational Research in War and Peace: The British Experience from the 1930s to 1970*, London: Imperial College Press, 2003, Chapters 4–5.

82 Representative research reports are: Bronowski, 'Use of bombs with long delay fuses on raids on industrial cities' (19 May 1943), and Bronowski, 'The attack on railways (I). Bomb specifications' (27 January 1944), TNA, HO 196/19 and 21.

83 John F. Kreis (ed.), *Piercing the Fog: Intelligence and Army Air Forces in Operations in World War II*, Washington, DC: Air Force History and Museums Program, 1996, p. 368.

84 Bronowski, 'The work of the Joint Target Group', July 1945, 142.6601–5, Air Force Historical Research Agency, Maxwell Air Force Base, Alabama; cited in Kreis, op. cit. (83), p. 458 n. 38.

85 For the official British report on bombing effectiveness see *BBSU: The Strategic Air War against Germany 1939–1945: Report of the British Bombing Survey Unit*, London: Frank Cass, 1998. For contrasting historical arguments on bombing effectiveness see Richard J. Overy, *The Air War 1939–1945*, Washington, DC: Potomac Books, 2005; and Adam Tooze, *The Wages of Destruction: The Making and Breaking of the Nazi Economy*, London: Allen Lane, 2006.

86 Michael S. Sherry, *The Rise of American Air Power: The Creation Of Armageddon*, London: Yale University Press, 1987, p. xi.

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> of course, much less variable in its return. Indeed, if proximity fuzing proves to be successful, attack with large blast bombs will become more profitable than incendiary attack.[87]

Days after writing this report, Bronowski was assigned to Washington, DC as consultant to the JTG. He remained there throughout the incendiary bombing attacks which continued up to and beyond the atomic bombing of Hiroshima and Nagasaki in August 1945. The JTG was regarded during this period as the prime agency for American air intelligence, providing 'material on hand ... for assessing the prospective targets and preparing for post-attack surveys of the cities bombed'.[88] Significantly, JTG intelligence was used to optimize not only conventional bombing, but atomic bombing as well.

The nearest Bronowski came to publicly acknowledging the foregoing was in a 1960 American magazine article, 'Moral for an age of plenty':[89]

> I spent the war years in operations research on work which was designed to make British and American bombing more destructive. This is how I came to be sent to Japan at the end of the war in order to report on the atomic-bomb damage there.

Bronowski made this belated partial admission to argue that even though he had 'resolved to take no further part in the making of weapons of mass destruction', he did 'not therefore regard [him]self as morally superior to any ... fellow scientists who made a different choice'.[90] To illustrate his 'morality' point Bronowski recounted the tragic story of Louis Slotin,[91] the former Manhattan Project physicist who had suffered a fatal accident while conducting a bomb-making experiment at Los Alamos in May 1946:

> Slotin was nudging toward one another [with a screwdriver] ... several pieces of plutonium ... to make a chain reaction ... The screwdriver slipped, the pieces of plutonium came a fraction too close together, and suddenly ... the assembly was filling the room with radioactivity. *Slotin pulled the pieces of plutonium apart with his bare hands ... virtually an act of suicide, for it exposed him to the largest dose of radioactivity ... Slotin had saved the lives of the seven men working with him by cutting to a minimum the time during which the... plutonium was giving out ... radioactive rays*. He himself died of radiation sickness nine days later.[92]

The lesson Bronowski drew from this episode was that even scientists engaged in atomic weapons development exhibit selfless heroism alongside their 'singleness of mind ... in the pursuit of truth'.[93] Yet this story could have been, and has been, told very differently. Slotin did not commit a virtual 'act of suicide' in order to heroically save others' lives; rather, he was conducting an unnecessary and unnecessarily dangerous demonstration

87 Bronowski, 'Area attack against Japan. Blast bombs more profitable than incendiary attack' (25 May 1945), TNA HO 196/30, emphasis added.

88 Kreis, op. cit. (83), pp. 380–388, 385.

89 Bronowski, 'A moral for an age of plenty', *Saturday Evening Post*, 233, 12 November 1960, pp. 24–25, 70–72.

90 Bronowski, op. cit. (89), p. 24.

91 Contemporary accounts include Ralph E. Lapp, 'The death of Louis Slotin', in H. Shapley *et al.* (eds.), *A Treasury of Science*, New York: Harper, 1958, pp. 729–732; and Stewart Alsop and Ralph E. Lapp, 'The strange death of Louis Slotin', *Saturday Evening Post*, 6 March 1954. A fictionalized version is Dexter Masters, *The Accident*, London: Cassell, 1955.

92 Bronowski, op. cit. (89), p. 72. Emphasis added.

93 Bronowski, op. cit. (89), p. 25.

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that recklessly endangered his fellow scientists and proved fatal to himself.[94] In effect, Bronowski's morality tale, necessitating the brief belated acknowledgement of his wartime role, was one more example of his recurrent mythmaking and ahistorical accounts of the relations between science, scientists and the bomb.

Conclusion

In 1956 Jacob Bronowski wrote that witnessing 'the ruins of Nagasaki' in November 1945 had been the 'universal moment' which prompted his 'Science and human values' essays.[95] This paper has shown that Bronowski's 'moment' triggered his entire post-war rise to scientific intellectual fame; it served to deflect attention from his prior intense involvement with radical left politics and from the wartime career he never fully divulged; and it facilitated his peculiar engagement with the politics of atomic energy. Crucially, it gave him authority to speak about the bomb not as a creator, but as a witness, allowing him more licence to develop his tales of scientific truthfulness and virtue. For many scientific intellectuals, as Edgerton has noted, the bomb constituted 'a breakpoint in the history of science',[96] but neither science nor Bronowski were as innocent before Hiroshima as their accounts made it necessary to believe. Yet Bronowski did not then become a reporter of science's post-bomb fallen state. By promoting peaceful atomic energy while simultaneously downplaying or even denying the existence of Britain's bomb development programme, Bronowski perpetuated his argument that the bomb was an aberration for which scientists were unjustly scapegoated.

A hallmark of Bronowski's scientific humanism was that he presented the bomb as a symbol of society's misplaced condemnation of science; responsibility for inventing this uniquely destructive device lay with a warlike society which ought instead to recognize that the noblest human values – notably truthfulness – are embedded in science and in its practitioners. Bronowski reinforced this ideology with repeated and dubious accounts of atomic scientists. A crucial net result was the erasure of any wider association of science with warfare, notably with the wartime allied 'strategic' bombing campaigns and ongoing weapons development. Bronowski's message was very positively received, not only by BBC management and producers, who fostered and enabled his broadcast media career, but by listening, viewing and reading publics. The conclusion to be drawn is that Bronowski met certain demands for a soothing ideology which could allay public anxieties engendered by the bomb's appearance and by its symbolic association with early Cold War tensions. Yet how might we account for his continuing popularity, and for the fact that Bronowski is more familiar to the general public today than his British scientific intellectual contemporaries like J.D. Bernal, Patrick Blackett or Lancelot

94 D.K. Froman and R.E. Schreiber, 'Report on May 21 accident at Pajarito Laboratory', 28 May 1946, in R.E. Malenfant, 'Lessons learned from early criticality accidents', report submitted to the Nuclear Criticality Technology Safety Project Workshop, Gaithersburg, Maryland, 14–15 May 1996 (online). Scientists then did not realize that it was not Slotin's reaction which had terminated the radiation burst, but the nuclear chain reaction's self-limiting nature.

95 Bronowski, 'The creative mind', *Universities Quarterly* (1956) 10, pp. 247–259, 247.

96 Edgerton, 'British scientific intellectuals', op. cit. (4), p. 20.

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Hogben? One answer, highlighted by the present paper, lies in Bronowski's self-appointed role as a media guru who charismatically and eloquently expounded on broad topics of enduring universal interest (like science, culture, history, society and values), in simplistic yet optimistically consoling terms. However, given the recurring incongruities between Bronowski's utterances and actualities, it is appropriate to recall Robert Young's admonition of twenty-five years ago: 'We must find ways of being fully ambivalent about eminent experts, in whatever field they till.'[97]

97 R.M. Young, 'The scientist as guru: the explainers', *Science as Culture* (1987) pilot issue, p. 140.

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