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RESEARCH ARTICLE

Robert M. Young's *Mind, Brain and Adaptation* revisited

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Abstract

Robert Maxwell Young's first book *Mind, Brain and Adaptation in the Nineteenth Century* (1970), written from 1960 to 1965, still merits reading as a study of the naturalization of mind and its relation to social thought in Victorian Britain. I examine the book from two perspectives that give the volume its unique character: first, Young's interest in psychology, which he considered should be used to inform humane professional practices and be the basis of social reform; second, new approaches to the history of scientific ideas. I trace Young's intellectual interests to the Yale Philosophy Department, the Cambridge Department of Experimental Psychology and a new history and philosophy of science community. Although Young changed his political outlook and historiography radically after 1965, he always remained faithful to ideas about thought and practice described in *Mind, Brain.*

> The application of psychology to social institutions is the only scientific way of dealing with their ethical values in their present unequal distribution, their haphazard execution and their thwarted development.[1]

Robert Maxwell (Bob) Young (1935–2019) was widely known to historians through his Darwinian scholarship and his later contributions to Marxist and psychoanalytical studies. His first book, *Mind, Brain and Adaptation in the Nineteenth Century*, was published in 1970 but was an 'unaltered version' of his PhD thesis of 1965.[2] The book is still an important account of the naturalization of mind in the nervous system and its historicization in evolutionary theory. All of the chapters have probably been surpassed by changing scholarly perspectives and new historical details but his 'big picture' was unique and has not been projected in the same way anywhere else. For any student of Victorian culture, not just scientific culture, it remains essential reading. It is also a text that illuminates the new historiographical perspectives incorporated into the history of science in the early 1960s. It does not stop (or even start) at a simple scientific story but links theories of naturalized mind to, for instance, Benthamism, reform, progressive politics, the technological mentality, professionalization, economic liberalism and population management through science and by medicine. Present-day students of John Stuart Mill or George Eliot will have their understanding enlarged by reading this book. Although an American, Young

[1] John Dewey, 'Psychology and social practice', *Psychological Review* (1900) 7, pp. 105–24, 122.

[2] Robert Maxwell Young, *Mind, Brain, and Adaptation in the Nineteenth Century: Cerebral Localization and Its Biological Context from Gall to Ferrier*, Oxford: Oxford University Press, 1990 (first published 1970), 'New preface', p. xi.

spent nearly all his life in Britain and directly and indirectly stimulated scholars who had a major impact on a wide range of historical studies.

I investigate the book's intellectual origins, linking it with Young's personal history when it intersects with significant institutions and individuals that were acknowledged by him as sources of ideas. Two perspectives give *Mind, Brain* its unusual character. First was Young's interest in psychological knowledge. Although he never studied psychology formally (unlike psychoanalysis), he had a lifelong concern with it as a science that could be used to inform humane professional practices and be the basis of social reform. Second, *Mind, Brain* explores the history of nineteenth-century scientific ideas with approaches which were becoming important in the 1950s and early 1960s.[3] My reconstruction of the 1960–5 period draws on Young's own oral history of his career, as I demonstrate the overlap of Young's intellectual interests with those of the philosophers at Yale and the members of the Cambridge Department of Experimental Psychology, and among practitioners in a new history and philosophy of science (HPS) community.[4] As will become apparent, the approaches and ideas which he uses may seem to come from an obvious direction, but often turn out to have many possible origins.

Although today Young's book is usually cited as a study in the history of scientific ideas, he originally presented it as contribution to neuropsychology. Just as we denounce Whig historians for creating pseudo-traditions by blindness to context in their studies so we must be wary ourselves of doing this to previous scholars we wish to count as members of our own discipline. To incorporate *Mind, Brain* into a linear history of neurology, psychology or naturalization is to do its origins injustice. Young's project was to investigate, make clear and reform fundamental concepts used in the then current discipline of psychology which had been constructed in Britain and America in the nineteenth century. It is for this reason that I pay detailed attention to aspects of the history of psychology that may not at first seem relevant. The 'Conclusion' makes his project clear. It began by stating that he had been concerned with two aspects of psychological investigation. First 'I have emphasized the need for a set of functions which are biologically significant', and second 'the need for a set of analytic terms which can be experimentally investigated throughout the nervous system'. History showed that these two aspects had never been successfully fused and the 'obvious need for the future was the combination of analysis with a biologically significant set of functions'. Only then did he indicate that the 'most difficult historical issue with which I have been concerned' was 'the role of phrenology in both the history of cerebral localization and in the development of psychology as a biological science'.[5] The 'New preface' to the reissue states that the original epigraphs to chapters were chosen to say, 'Don't forget: we are doing philosophy here. How is it appropriate to think about human nature?'[6] Young, it might be said, was construing Karl Marx's eleventh Feuerbach thesis to mean that, in order to change the world, we must understand how philosophers have made it. Young's epigraphs are, in fact, very helpful guides to exploring the book.

[3] Among the many studies of the wider context see David Hollinger, 'Science as a weapon in *Kulturkämpfe* in the United States during and after World War II', *Isis* (1995) 86, pp. 440–54; Jon Agar, 'What happened in the sixties?', *BJHS* (2008) 41, pp. 567–600.

[4] Interview with Robert Young conducted by Anna K. Mayer, 10 February 1998, British Society for the History of Science Oral History Project, transcript in University of Leeds Library Special Collection (hereafter 'Interview'). Sometimes timings and references to possible influences are missing, opaque and occasionally self-contradictory.

[5] Young, op. cit. (2), pp. 249–50.

[6] Young, op. cit. (2), 'New preface', p. viii.

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Yale and Rochester

Young came from a Presbyterian family of modest means in Highland Park, a wealthy suburb of Dallas, Texas. A scholarship took him to Yale University, where he read philosophy and graduated in 1957.[7] Here he was attracted to the history of the behavioural sciences, especially psychology. Likewise, from Yale he derived his fascination with, and ambivalence towards, Descartes: the issue of Cartesian dualism haunts *Mind, Brain*. Young's first academic paper, published in 1966, maintains much intellectual input from his undergraduate days. It focuses on the historiography of psychology as well as possibilities for shaping the science.[8]

The Philosophy Department at Yale in the 1950s was saturated with the legacy of Charles Peirce and the theories of American pragmatism, which remained central to Young's work. Departmental members also valued A.N. Whitehead, whose writings sought to achieve objectives similar to those of the pragmatists, notably ways to escape from Cartesianism. Irwin C. Lieb and Richard Rorty, Young's teachers at Yale, who were two of the three dedicatees of *Mind, Brain*, had been associated with the leading Peirce scholar of the time, Charles Hartshorne, who was editor of the Peirce papers.[9] Rorty was in his mid-twenties when Young was taught by him. Rorty had completed an MA in 1952 with a thesis on Whitehead, supervised by Hartshorne, at Chicago. Soaked in pragmatism from his youth, Rorty grew up on the 'reformist Left in mid-century' and in that circle 'American patriotism, redistributionist economics, anticommunism, and Deweyan pragmatism went together easily and naturally'.[10]

Mind, Brain is a history of a swathe of ideas, mainly British, which were refined in America into functional psychology, which, Young wrote, 'was an outgrowth of the ferment in Cambridge, Massachusetts, in the 1860s and 1870s which led to the philosophical movement of pragmatism'. William James 'proved the most articulate exponent of both views', although it was John Dewey who founded a 'functional school of thought in psychology'. Although functionalism 'flourished only briefly as a recognisable movement', *Mind, Brain* was a plea for the employment (resurrection perhaps) of its fundamental concepts for practical and philosophical purposes. Young considered it was important to 'see what ... [functionalism] can offer to the present' since originally it had relations to 'questions of law, sociology, and philosophy of a democratic society and its educational system'. Philosophically, it was a route to constructing human sciences that transcended Cartesianism, since, 'as Whitehead suggested, the concept of function may be the Achilles heel of dualistic ontology of modern science'.[11]

The functionalism that Young extensively referenced in *Mind, Brain* was principally developed by William James, John Dewey and James R. Angell, who in 1907 described the 'functional psychologist' as someone 'interested in mental activity as part of a larger stream of biological forces'.[12] Young remained committed to the view that psychology must study mental states as participants in the organisms' life in the world. Further,

[7] Roger Smith, 'Robert Maxwell Young, science historian, born 26 September 1935, died 5 July 2019', *The Independent*, 19 August 2019, p. 36.

[8] Robert M. Young, 'Scholarship and the history of the behavioural sciences', *History of Science* (1966) 5, pp. 2–51.

[9] Charles Hartshorne and Paul Weiss (eds.), *The Collected Papers of Charles Sanders Peirce*, 6 vols., Cambridge, MA: Harvard University Press, 1931–58; Irwin C. Lieb and Charles Hartshorne, 'An interview by Irwin C. Lieb: Charles Hartshorne's recollections of editing the Peirce papers', *Transactions of the Charles S. Peirce Society* (1970) 6, pp. 149–59.

[10] Richard Rorty, *Stanford Encyclopedia of Philosophy*, at https://plato.stanford.edu/entries/rorty, accessed 9 December 2020.

[11] Young, op. cit. (8), pp. 26–9.

[12] James R. Angell, 'The province of functional psychology', *Psychological Review* (1907) 14, pp. 61–91, 68. All the functionalist papers cited here are used in *Mind, Brain*.

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because of its biological purposiveness, consciousness was to be understood as an agent in evolution. Roger Smith notes that James considered that in the higher animals 'the fact of survival occurring, becomes an object of [conscious] interest or purposeful regard'.[13] Evolution could then work on this; conscious adaptations to the environment gradually became unconscious habits. Angell stated that 'consciousness is constantly at work building up habits out of coordinations imperfectly under control; and that as speedily as control is gained the mental direction tends to subside and give way to a condition approximating physiological automatism'.[14] The bodily basis of these possibilities lay in the reflex and, wrote Young, 'Dewey's article on "The reflex [arc] concept in psychology" is usually considered the starting point of the functional movement'.[15] Dewey claimed that the reflex could be interpreted in terms of its functional sensori-motor parts but cautioned not to see these in terms of 'metaphysical dualism … according to which the sensation is an ambiguous dweller on the border land of soul and body'. In fact, 'stimulus and response are not distinctions of existence, but teleological distinctions, that is, distinctions of function, or part played, with reference to reaching or maintaining an end'. It was necessary to see that 'the principle underlying the idea of the reflex arc as the fundamental psychical unity shall react into and determine the values of its constitutive factors'.[16]

Mind, Brain was intended to explore the historical and current problems besetting 'functional or purposive explanations within the context of Cartesian mind–body dualism'.[17] Properly reformed, functionalist psychology opened up the possibilities of transcending dualism in the human sciences.[18] The book's focus was on the British background to American functionalism and the fact that the 'pragmatic approach which influenced James's early thinking had its origins in Darwin, Spencer, J.S. Mill and Bain as interpreted through Peirce, Chauncey Wright, and Nicholas St. John Green at the meetings of the "Metaphysical Club"' in Cambridge, Massachusetts.[19] Young emphasized the American debt owed to Alexander Bain. Historians, he wrote, 'have failed to relate Bain's influence on pragmatism with the assumptions of functional psychology', and he cited Peirce's words that 'I am disposed to think of him [Bain] as the grandfather of pragmatism'.[20]

After Yale, Young said, he 'decided to become a psychiatrist, and I went to Medical School at the University of Rochester, which had very good psychoanalysis'.[21] There, he was taught by Wilbur K. Smith, the third dedicatee of *Mind, Brain*, a neuroanatomist with a particular interest in the neurological evidence of child abuse.[22] While there, Young spent time at 'Arizona State Hospital which was one of the old-fashioned bins

[13] Roger Smith, *Free Will and the Human Sciences in Britain, 1870–1910*, London: Pickering & Chatto, 2013, p. 31.

[14] Angell, op. cit. (12), p. 72.

[15] Young, op. cit. (8), p. 27; he omitted 'arc' from Dewey's title.

[16] John Dewey, 'The reflex arc concept in psychology', *Psychological Review* (1896) 3, pp. 357–70, 365, 358.

[17] Young, op. cit. (2), p. viii. Whitehead's designation of the cluster of concepts surrounding 'life' as the 'Achilles heel' of Cartesianism is an epigraph to the Introduction.

[18] On Young and functionalist psychology and Whitehead's non-dualistic ontology see Smith, op. cit. (13), pp. 171–80.

[19] Young, op. cit. (8), pp. 26–7. See Louis Menand, *The Metaphysical Club: A Story of Ideas in America*, New York: Farrar, Straus & Giroux, 2001.

[20] Young, op. cit. (8), p. 12; and Young, op. cit. (2), p. 133, where the grandfather quote is taken from Philip P. Wiener, *Evolution and the Founders of Pragmatism*, Cambridge, MA: Harvard University Press, 1949, p. 19; Wiener was a major source for Young in tracing this tradition. He impressed this on Roger Smith when he was Young's student in 1966–70. Smith, personal communication.

[21] Interview, op. cit. (4).

[22] Young presumably learned his neuroanatomy in the Department of Anatomy where Wilbur Smith had an appointment.

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like the movie The Snake Pit'.[23] According to the account given in *Mind, Brain*, 'at medical school [Young] was overwhelmed by the confusion in current attempts to relate the concepts used in the explanation of normal and abnormal behaviour to the physiology of organisms'. It was then, he said, that he 'felt' that 'the history of various concepts of function *is* the history of psychology'.[24]

Cambridge

At Rochester Young gained a scholarship to study in England, eventually choosing King's College, Cambridge.[25] He arrived in 1960 and became a fellow in 1965. A year before his arrival, C.P. Snow had delivered his two-cultures lecture, which, Young recalled, defined 'very much the atmosphere into which I came'.[26] His PhD supervisor was Oliver Zangwill, fellow of King's, and professor of experimental psychology. Young found many features of Zangwill's Experimental Psychology department attractive, especially its stress, like Dewey's psychology, on the social settings of belief. Notable in this connection was a respect for cultural anthropology which owed much to Zangwill's predecessor, Frederick Bartlett, appointed to a new chair of experimental psychology in 1931, who 'continued to preside over the affairs of Psychology in Cambridge until his retirement in 1952'. Much of *Mind, Brain* chimes with Bartlett's understanding that an 'experimental approach to individual behaviour cannot afford to disregard the social factors by which it is so largely determined'. Bartlett's 'interest in social anthropology', Zangwill noted, 'went right back to the early influence of [W.H.R.] Rivers', who famously collaborated with Henry Head on research into sensation. Bartlett's best-known work was *Remembering: A Study in Experimental and Social Psychology* (1932), which 'marked a clean break with the German tradition which had hitherto dominated instruction in the Psychological Laboratory … [and] adumbrated methods for the study of higher mental processes without recourse to introspection'. Young's view of experiments, even at this time, echoes Bartlett's suspicions of Wundt and German psychologists who 'made use of the results of experiment largely to buttress preconceived theory'.[27]

Zangwill came from a distinguished literary background, had immense breadth of learning and elite contacts in the scientific and artistic world. He was a 'gentleman scholar, deeply involved in history and literature'. At his home, a 'large house in

[23] Kurt Jacobsen, 'An interview with Bob Young', *Free Associations: Psychoanalysis and Culture, Media, Groups, Politics* (2020) 80, pp. 1–10, 3, at http://freeassociations.org.uk/FA_New/OJS/index.php/fa, accessed 9 December 2020.

[24] Young, op. cit. (2), p. x, original emphasis.

[25] The intention seems to have been to return to Rochester and become a psychiatrist. It is not clear if he came to England to study experimental psychology and then took the opportunity do history or whether he 'left medical school in order to work as an historian'. Interview, op. cit. (4); Young, op. cit. (2), p. x. Possibly it was not until 1964 that he considered history of science as a career. He recalled around that time, 'I was not in my own mind, by profession, a history and philosophy of science person. I was in my own mind, somebody who was trying to figure out the mind/body problem'. Interview, op. cit. (4).

[26] Raymond Williams, fellow of Jesus College, who had returned to Cambridge in 1961, was involved. Young came to know him and always recommended Williams's work. How far Williams was important for Young before 1965 I cannot determine. See Guy Ortolano, *The Two Cultures Controversy: Science, Literature and Cultural Politics in Postwar Britain*, Cambridge: Cambridge University Press, 2009, pp. 93, 148–50.

[27] O.L. Zangwill, 'Obituary notice: Sir Frederic Bartlett (1886–1969)', *Quarterly Journal of Experimental Psychology* (1970) 22, pp. 77–81; Bartlett gets approving mention in Young, op. cit. (8), p. 12; David Bloor, 'Remember the strong program?', *Science, Technology, & Human Values* (1997) 22, pp. 373–85, describes Bartlett as an intellectual precursor of the strong programme.

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Maid's [*sic*] Causeway', Zangwill and his wife 'entertained members of the department and visitors from Europe, America and Russia, with great generosity'.[28] The ethos rubbed off on Young, who recalled, 'I've always asked large questions, but … the idea that … Newton lived just down the road, and that E.M. Forster was in residence at King's, and that Keynes had been the Bursar, and you sort of felt, in a way that I don't think you do feel at the University of Sheffield'.[29] Zangwill's department was styled 'eclectic', a favourite term then for describing psychology which was not aligned to a specific school. His interests spanned experimental psychology, defects after brain injury, ageing, intelligence testing, information theory, primate brain studies and human perception. Problems 'of localizing brain function continued to fascinate Oliver for the rest of his life'.[30] He was, Young argued in 1990, 'a life-long proponent of psychology as a biological science'.[31] However, apart from the ritual thanking of his supervisor, Young made little mention of Zangwill and the department later in his career.[32]

Nevertheless, aside from hostility to psychoanalysis, the department's aims, methods, ideas and traditions chimed with Young's interests: functionality and the higher operations of the nervous system, localization, the centrality of experiment and its pitfalls and psychology as a key to education and the basis of therapy for brain damage.[33] Historical neurophysiological concepts were integral to departmental thinking, especially those found in the works of John Hughlings Jackson and Henry Head. Zangwill stressed the importance of investigating the cognitive dimensions of animal behaviour. The behaviorism of J.B. Watson was anathema. Zangwill called it 'brash'.[34] Discussing Watson's programme, Young said that to 'deny any significance to consciousness and mental variables' was 'philosophic nonsense'.[35] Clinical care of the brain-injured patient was a long-standing interest of Zangwill's, who 'thought adequate theoretical models of brain function, related to psychology, were needed for classifying psychological problems for diagnosis and therapy'.[36]

History of science

Young's first published work in Britain appeared in 1960, the same year he arrived in Cambridge. He 'was approached by an aspiring criminologist, Roger Hood, to write for

[28] Richard L. Gregory, 'Oliver Louis Zangwill 29 October 1913–12 October 1987', *Biographical Memoirs of Fellows of the Royal Society of London* (2001) 47, pp. 515–24, 521, 519, 522, at https//royalsocietypublishing.org/doi/pdf/10.1098/rsbm.2001.0031, accessed 9 December 2020.

[29] Interview, op. cit. (4).

[30] Gregory, op. cit. (28), pp. 520, 521, 519, 522.

[31] Young, op. cit. (2), 'New preface', p. ix.

[32] When he did, accounts are conflicting. For Zangwill's 'gratifying interest in the progress of my work' and his 'initial encouragement and continuing support' see Young, op. cit. (2), p. xi. But see also Interview, op. cit. (4): 'how did I get from Zangwill to the history and philosophy of science? The answer is, this Department of Experimental Psychology was relentlessly experimental, and if I wanted to do a historical thesis, he wasn't willing to have it in his Department'.

[33] Bartlett was 'out of sympathy with most of the schools and movements of his period, not least psychoanalysis'. Zangwill, op. cit. (27), p. 80. Young said Zangwill's 'views were certainly an important reason why I kept quiet about the psychoanalytic origins of my enquiries and relegated Freud to footnotes'. Young op. cit. (2), 'New preface', p. ix; see John Forrester and Laura Cameron *Freud in Cambridge*, Cambridge: Cambridge University Press, 2017.

[34] Gregory, op. cit. (28), pp. 520, 519.

[35] Young, op. cit. (8), p. 28.

[36] Gregory, op. cit. (28), pp. 520, 519. Zangwill's clinical work continues in the Oliver Zangwill Centre for Neuropsychological Rehabilitation, in the Princess of Wales Hospital at Ely. See www.ozc.nhs.uk, accessed 9 December 2020.

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a local journal, a special issue of which he was editing'.[37] The result was an essay review of two texts on social pathology and criminology. Young found that the 'central concerns' of one of the books were 'the danger of concealing moral judgments in the neutral language of the science of medicine'.[38] The next five years were spent on the PhD thesis, 'Cerebral localisation and its biological context from Gall to Ferrier', presented in the Faculty of Moral Sciences. During those years Young made contact with Mary Hesse and Gerd Buchdahl, who had academic posts in HPS, which at this point was not yet a department but existed under the auspices of a committee.[39] Young had no formal history training but much of his Yale background prepared him for the new approaches that were beginning to dominate the historiography of science in the early 1960s.

In Young's case specifically, but also more generally, historians using new approaches were explicitly indebted philosophically to Edwin Burtt and A.N. Whitehead. But the historiographical studies that exemplified the new interpretive directions are most closely identified with the work of Alexandre Koyré and those historians who recognized him as a leader in transforming the discipline. This group rejected the narrow positivist models, associated with George Sarton in North America and Charles Singer in Britain, for the much broader conception of the past that characterized Koyréan history, as it has been termed.[40] Describing the 'late 1950s and early 1960s', Young noted that the 'classics' on the 'history of ideas in the context of philosophy' which 'came to one's attention' and 'probed further than most' were those authored by Whitehead, Burtt, Koyré and also A.O. Lovejoy, for whose *The Great Chain of Being* he had special reverence.[41] Young valued Burtt and Whitehead for the ways in which they had explored Cartesian dualism and the obstacles it presented to the creation of human sciences.[42] Young, as noted, was introduced to Whitehead at Yale, and no doubt Burtt, whose work was created within the pragmatic tradition.[43]

[37] Roger Hood, then a postgraduate at Downing College, became founding director of the Centre for Criminology at the University of Oxford. See www.psychoanalysis-and-therapy.com/human_nature/papers/paper73.html, accessed 9 December 2020.

[38] Review of Barbara Wootton, assisted by Vera G. Seal and Rosalind Chambers, *Social Science and Social Pathology*, London: George Allen & Unwin Ltd, 1959; and George B. Vold, *Theoretical Criminology*, New York: Oxford University Press, 1958, *Cambridge Opinion, Criminology* (1960) 23, pp. 38–40.

[39] Young's accounts of the timings of his relations with HPS are unclear. Robert Young, 'The historiographic and ideological contexts of the nineteenth-century debate on man's place in nature', in Mikuláš Teich and Robert Young (eds.), *Changing Perspectives in the History of Science: Essays in Honour of Joseph Needham*, London: Heinemann, 1973, pp. 344–438, 352–3; Interview, op. cit. (4).

[40] Among the massive literature on this see Arnold Thackray and Robert K. Merton, 'On discipline building: the paradoxes of George Sarton', *Isis* (1972) 63, pp. 472–95; Geoffrey Cantor, 'Charles Singer and the founding of the British Society for the History of Science', *BJHS* (1997) 30, pp. 5–23; A.K. Mayer, 'When things don't talk: knowledge and belief in the inter-war humanism of Charles Singer (1876–1960)', *BJHS* (2005) 38, pp. 325–47.

[41] Young, op. cit. (39), p. 355.

[42] In an essay on Young's intellectual heroes, Roger Smith explained, Burtt considered 'whatever the success of physical science, the [Scientific] Revolution was a disaster for philosophy and civilized culture. The new way of thought, he argued, made it impossible for there to be systematic knowledge, or true science, of the mental world'. Roger Smith, 'The quest for humane relations: the trajectory of an intellectual life', *Free Associations: Psychoanalysis and Culture, Media, Groups, Politics* (2020) 80, pp. 11–26, 12, at http://freeassociations.org.uk/FA_New/OJS/index.php/fa, accessed 9 December 2020.

[43] 'Originally, *The Metaphysical Foundations* was Burtt's Ph.D. dissertation, written at Columbia University, which was the seat of American pragmatism and naturalism in the 1920s'. Diane Davis Villemaire, 'Introduction', in Villemaire (ed.), *E.A. Burtt, Historian and Philosopher: A Study of the Author of The Metaphysical Foundations of Modern Physical Science*, Dordrecht: Springer, 2002, pp. 1–6, 1; 'Although unacknowledged by Burtt, it is Dewey's reconstructed philosophy ... which stands behind *The Metaphysical Foundations of Modern Physical Science*'. Villemaire, 'Columbia University in the 1920: the young radical philosophers', in Villemaire, *E.A. Burtt*, op. cit., pp. 7–14, 7.

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It is important to note the significance of Koyréan history for understanding the approaches and authors cited (or implicitly present) in *Mind, Brain*. Burtt and Whitehead appealed to Young's conviction that the history of philosophy revealed deep intellectual structures underlying modern science. Koyré provided historiographical case studies which were models for showing how these structural ideas were the basis of actual science. Charles Gillispie observed that Koyré 'exercised a formative influence upon an entire generation of historians of science'.[44] Young studied the writings of this generation and *Mind, Body* bears that stamp. It should be noted that Koyré said that, so far as he knew, aside from himself, only Burtt had 'drawn at least some of the consequences of the fact that metaphysical views had been absolutely indispensable for bringing about the Scientific Revolution'.[45] Although Koyré celebrated modern science, he could also turn to the Cartesian dark side. Modern science, he wrote, substituted

> for our world of quality and sense-perception, the world in which we live, and love, and die, another world – the world of quantity, or reified geometry, a world in which, though there is a place for everything there is no place for man ... science ... became estranged and utterly divorced from the world of life ... This is the tragedy of the modern mind.[46]

Central to Koyré's historical project was the primacy of ideas and their underlying presumptions, hypotheses and metaphysics. He had nothing but scorn for 'historiography infected by the virus of the empiricist and positivist epistemology which caused, and still causes, so many ravages among historians of scientific thought'.[47] Discussing Kepler, Koyré observed, 'One cannot truly understand the work of the astronomer or of the mathematician, if one does not see it as imbued with the thought of the philosopher or of the theologian'.[48] Of relevance here, as Yehuda Elkana reads it, is that 'the ideas to which Koyré attributes the greatest importance ... are all ideas about knowledge and not ideas about the world'.[49] In historical practice, Jardine notes, Koyré's 'interpretative strength' was based on 'his extraordinary ability to "suss out" from textual hints and niceties of phrasing the hidden assumptions that underlie and structure thought and discourse'.[50] As a corollary to this stress on deep ideas, and to the annoyance of some of his followers, Koyré downplayed the importance of experiment and observation, considering them always to be dependent on explicit or implicit theory.[51] The search for 'assumptions' and ideas about knowledge (rather than substantial knowledge itself) are key features of *Mind, Brain*.

The impact of Koyré's writings on Young's generation is indisputable. Rupert Hall observed of Koyré in 1963, 'Among the younger historians of science ... his has been

[44] Charles C. Gillispie, 'Alexandre Koyré', in Gillispie (editor in chief), *Dictionary of Scientific Biography*, 16 vols., New York: Charles Scribner's Sons, 1970–80, vol. 7, pp. 482–90, 482.

[45] Cited in H. Floris Cohen, *The Scientific Revolution: A Historiographical Inquiry*, Chicago: The University of Chicago Press, 1994, p. 86; see p. 101 for Koyré's ambivalence with regard to Burtt's importance.

[46] Alexandre Koyré, 'The significance of the Newtonian synthesis', *Journal of General Education* (1950) 4, pp. 256–68, 268.

[47] Cited in and translated by Cohen, op. cit. (45), p. 85.

[48] Cited in Nick Jardine, 'Koyré's Kepler/Kepler's Koyré', *History of Science* (2000) 28, pp. 364–76, 364.

[49] Yehuda Elkana, 'Alexandre Koyré: between the history of ideas and sociology of disembodied knowledge', *History and Technology* (1987) 4, pp. 115–48, 118.

[50] Jardine, op. cit. (48), p. 371.

[51] Notably Marie Boas Hall. See Frank A.J.L. James, 'Alfred Rupert Hall 1920–2009 and Marie Boas Hall 1919–2009', *Biographical Memoirs of Fellows of the British Academy* (2012) 11, pp. 353–408. Alistair Crombie was another.

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the dominant influence through the last ten or fifteen years'.[52] Any list is selective, but those who paid tribute to Koyré included I.B. Cohen, Marshall Clagett, Charles Gillispie, Henry Guerlac and Richard Westfall. A notable but critical follower in Britain, besides Rupert Hall, was Alistair Crombie, and, among younger historians of the life sciences, Robert Olby.[53] Young recalled the early years at Cambridge as ones where 'the standard texts to which ... [the student] was exposed were all concerned with intellectual history'. These included Hall's *The Scientific Revolution* and Alistair Crombie's *Augustine to Galileo*, 'one of a ... small number of works read by students ... which had not been written by someone ... on the teaching staff ... in Cambridge'. Young clearly liked Crombie's text.[54] Crombie was an appreciative but critical follower of Koyré who, Crombie wrote, 'showed the enlightenment that can be gained only by looking beneath the surface of immediate scientific results and by seeking to identify the intellectual assumptions and the technical capabilities that made certain discoveries possible and explanations acceptable to a particular generation or group'.[55]

A significant moment in historiography of science was the symposium on scientific change organized by Crombie in 1961, a sequel to a meeting with a similar intellectual tone and many of the same participants held at the University of Wisconsin in 1957.[56] Central to the Oxford conference were commentary and discussion of papers.[57] Leading names in the history and philosophy of physical science were present and participants in the life sciences' session included Georges Canguilhem and Owsei Temkin. Koyré commented on a paper by Henry Guerlac on 'Some historical assumptions of the history of science'. Guerlac accounted that the 'keenest minds [in the subject] – men like Burtt and Koyré' – have 'demonstrated the close relationship ... between science and philosophy, and science and religion', but, Guerlac said, they write with a 'strong flavour of idealism and super-rationalism'.[58] Guerlac's paper was interpreted by Koyré as a plea for a wider understanding of the origin of scientific ideas in relation to applied science and technology. However, he considered the 'interaction between theory and practice ... an essentially modern phenomenon' and that explanations of science in terms of 'social structures' were 'futile'.[59]

It is notable that the conference included a paper on the history of psychology and the nervous system by R.C. ('Carolus') Oldfield, professor of psychology at Oxford.[60] Curiously, Young does not cite Oldfield's presentation in *Mind, Brain*, yet the paper contained insights pertinent to Young's story. Even more noteworthy is that Oldfield was Young's external examiner and 'a lifelong friend' of Zangwill.[61] Zangwill and Oldfield had published jointly

[52] A. Rupert Hall, 'Merton revisited or science and society in the seventeenth century', *History of Science* (1963) 2, pp. 2–16, 11. See also his 'Alexandre Koyré and the scientific revolution', *History and Technology* (1987) 4, pp. 485–96.

[53] Robert Olby, 'A retrospect on the history of the life sciences', in J.D. North and J.J. Roche (eds.), *The Light of Nature: Essays in the History and Philosophy of Science*, Dordrecht: Martinus Nijhoff, 1985, pp. 95–109.

[54] Young, op. cit. (39), pp. 352–3.

[55] Alistair C. Crombie, 'Alexandre Koyré and Great Britain: Galileo and Mersenne', *History and Technology* (1987) 4, pp. 81–92.

[56] Marshall Clagett (ed.), *Critical Problems in the History of Science: Proceedings of the Institute for the History of Science at the University of Wisconsin, September 1–11, 1957*, Madison: University of Wisconsin Press, 1959.

[57] A.C. Crombie (ed.), *Scientific Change: Historical Studies in the Intellectual, Social and Technical Conditions for Scientific Discovery and Technical Invention, from Antiquity to the Present*, New York: Heinemann, 1963.

[58] Henry Guerlac, 'Some historical assumptions of the history of science', in Crombie, op. cit. (57), pp. 797–812, 809.

[59] Alexander Koyré, 'Commentaries', in Crombie, op. cit. (57), pp. 847–57, 853, 856.

[60] R.C. Oldfield, 'Scientific approaches to psychology: changing views of behaviour mechanisms', in Crombie, op. cit. (57), pp. 577–89; See O.L. Zangwill, 'R.C. Oldfield's contribution to neuropsychology', *Neuropsychologia* (1973) 1, pp. 373–6.

[61] Gregory, op. cit. (28), p. 519.

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in the 1940s on the theory of 'schema' originating with Henry Head and Frederic Bartlett.[62] Young possibly took his interest in Henry Head from the Zangwill–Oldfield nexus and had surely met Oldfield before his thesis was presented.[63]

Mind, Brain and Adaptation

Throughout *Mind, Brain* are the long-standing Anglo-American concerns over the 'constraints' of Cartesian dualism on the development of human sciences.[64] More narrowly it is a prehistory of the branch of twentieth-century psychology which studied behaviour and cognition from an evolutionary perspective. It paid particular notice to the cerebral localization of sensori-motor activity and the ways that this was related to psychological phenomena. Young's story is, for the most part, a British one. 'In calling this a work in the history of biology', he writes, 'I am assuming ... that research in the history of psychology should be viewed as a development away from philosophy and toward general biology', a move from 'epistemological enquiry to a study of the adaptations of organisms to their environments'. He described how, by the mid-nineteenth century, this project was well recognized although not always applauded. Young approvingly cited George Henry Lewes, who said that Franz Joseph Gall had a 'vision of Psychology as a branch of Biology' and had 'rescued ... the problem of mental functions from Metaphysics'.[65]

The bones of the story which Young told were familiar to the British psychological and neurological traditions. Yet he described as 'bleak', a little unfairly perhaps, the scholarship pertaining to '[m]y field of interest'.[66] Neurologists, whose technical ideas of brain function continued to carry a great deal of the evidence of their past, had a particularly distinguished tradition of historical enquiry. In this respect Young pointed to Henry Head, whose studies on language sprawled across the theoretical and experimental territory covering mind and brain.[67] Among historians specifically interested in the history of biological ideas he noted Lovejoy, Erwin Ackerknecht and, most importantly, Owsei Temkin. By the late 1940s Temkin was producing sparkling essays on the history of biological ideas. He had written two papers on the importance of Gall's neurology that barely mentioned phrenology.[68] Oddly, John C. Greene, whose works were seminal to ways of connecting biology and social thought, did not get special mention in *Mind, Brain*, although appearing in the bibliography.[69]

Central to *Mind, Brain* is the discussion of how biological psychology in the nineteenth century grew by developing 'functional analyses'; that is, the study of domains that were both mental and corporeal, united by concepts such as sensibility, irritability, sensorium commune, reflex, adaptation, inhibition, degeneration, etc. In Britain a naturalistic

[62] R.C. Oldfield and O.L. Zangwill, 'Head's concept of the schema and its application in contemporary British psychology', *British Journal of Psychology* (1942) 32, pp. 267–86. This was the first of several papers on the subject.

[63] Zangwill, op. cit. (27), p. 78.

[64] Young, op. cit. (2), p. viii. Young paid no attention to attempts within German philosophy to create the human sciences on a new epistemological basis.

[65] Young, op. cit. (2), pp. vii, 4. The term 'function' entered psychology from phrenology via Lewes. K.M. Dallenbach, 'The history and derivation of the word "function" as a systematic term in psychology', *American Journal of Psychology* (1915) 26, pp. 473–84.

[66] Young, op. cit. (2), p. xi.

[67] On Head see L.S. Jacyna, *Medicine and Modernism: A Biography of Sir Henry Head*, London: Pickering & Chatto, 2008.

[68] Owsei Temkin, 'Gall and the phrenological movement', *Bulletin of the History of Medicine* (1947) 21, pp. 275–321; Temkin, 'Remarks on the neurology of Gall and Spurtzheim', in E. Ashworth Underwood (ed.), *Science, Medicine and History: Essays in the Evolution of Scientific Thought and Medical Practice Written in Honour of Charles Singer*, 2 vols., London: Oxford University Press, 1953, vol. 2, pp. 282–9.

[69] John C. Greene, *The Death of Adam: Evolution and Its Impact on Western Thought*, Ames: Iowa State University Press, 1959, is recognized as an important contribution to historiographical debates over Darwinism.

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psychology was created by using the term 'sensori-motor' to serve as the bridge between neurophysiological investigation and the philosophical tradition based on the association of ideas.[70] Curiously, rather than being given a chapter to itself, it is only at the end of the second chapter, on French neurophysiology, that associationist philosophy is explained as the theory of mind stemming from John Locke and developed most notably by David Hartley and then James and John Stuart Mill.

Mind, Brain has a conventional organization. It is a history of ideas based on the study of a dozen or so nineteenth-century thinkers. Tellingly, the epigraph to the whole book is from Plato's *Republic*, when the slaves make their journey from the cave to waking reality and realize they need to question their 'unexamined' 'hypotheses' or 'assumptions'.

> But never can they behold the waking reality so long as they leave the hypotheses which they use unexamined ... For when a man knows not his own first principle and intermediate steps are also constructed out of he knows not what, how can he imagine that such a fabric of convention can ever become science?[71]

The introduction begins with quotations from Whitehead and Burtt. Chapter 1 is devoted to Gall and phrenology. Neither Temkin nor Ackerknecht devoted much space to phrenology but both had an appreciation of Gall's neuroanatomy and his broader project of creating a science of man. Young follows them in these respects. So although Young explains Gall's phrenological and cranioscopic theories at length and takes the generous view that Gall's phrenological practices were of their time, he is not very interested in them. There is certainly no anticipation here of the work of Roger Cooter and Steven Shapin that situates phrenology in its Victorian social context.[72]

Young explains that Gall rejected Locke's theory of the *tabula rasa* and claimed that human faculties were innate and localized on the surface of the brain.[73] Gall viewed mental faculties and their localization in the same way that all other functions were localized or represented in the nervous system. As Temkin explained, in an article that Young cites, for Gall the nervous system was 'like a Parliament ... the nervous integration of the whole body was affected by individual representatives of higher and lower estates'.[74] The consequence of this view, Young says, was Gall's insistence on 'the unity of man with the rest of nature'. The mind is adapted to its natural environment and not, as philosophers insisted, constructed as an instrument to understand it. A related consequence derives from Gall's teaching that faculties are differently distributed in different species. Thus comparative anatomy and physiology have a central role in the study of the mind as a natural object. Object and method are mutually defining. Just as Haller created a new world of enquiry by defining irritability and sensibility in experimental terms, so in Gall's programme, mental-behavioural functions are defined by the methods that he advocates for their

[70] Young's formal and informal students studied these functional concepts. The reflex was the focus in Roger Smith, 'The background of physiological psychology in natural philosophy', *History of Science* (1973) 11, pp. 75–123; and the sensorium commune in Karl Figlio, 'Theories of perception and the physiology of mind in the late eighteenth century', *History of Science* (1975) 12, pp. 177–212.

[71] Plato, *The Republic*, Book VII. The quote is from Benjamin Jowett's translation (1st edn 1894), but 'assumptions' is in H.D.P. Lee, *Plato: The Republic*, Harmondsworth: Penguin, 1955, p. 302. None of Young's epigraphs have bibliographical details other than an author and a date, which has created considerable problems.

[72] Roger Cooter, *The Cultural Meaning of Popular Science: Phrenology and the Organization of Consent in Nineteenth-Century Britain*, New York: Cambridge University Press, 1985; Steven Shapin, 'Phrenological knowledge and the social structure of early nineteenth-century Edinburgh', *Annals of Science* (1975) 32, pp. 219–43. Indeed, at this time Young considered phrenology a 'pseudo-science': Young, op. cit. (2), p. 243.

[73] Young op. cit. (2), pp. 23, 18, 38.

[74] Temkin in Underwood, op. cit. (68), p. 285.

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investigation. Gall's 'application of a consistent naturalism to man', Young concludes, was 'a new approach in the first quarter of the nineteenth century'.[75] In Gall's propositions Young saw an outline of the concepts that underlie modern biology regardless of the fact that Gall's comparative anatomy and naturalism rested on the great chain of being, not on evolutionism.

The following chapter concentrates on Jean-Pierre-Marie Flourens and François Magendie and explores the ways in which their animal experiments transformed understandings of the nervous system. Anatomical studies were at the core of Gall's philosophy and Young approved the claims made by Flourens and Magendie that vivisection generated a new sort physiological knowledge. Magendie's 'methods, assumptions, and approach' contrasted with that of phrenology and he 'soon showed something could be learned about the functions of the nerves by the experimental method'. Animal experiments in Magendie's formulation gave access to law-like physiological phenomena. Indeed, once again invoking Haller, method and object were one. Law-likeness was a product of animal experiment. Substantively, Magendie's work is significant for his presentation of experimental evidence that sensori-motor difference was the basic building block of nervous anatomy and physiology. His claim that the spinal nerves had separate motor and sensory roots shows, Young writes, 'just how far and how rapidly the methods and assumptions of physiological research were moving away from Gall's approach'. None the less, the generosity of Young's understanding of Gall, which was also a tribute to George Henry Lewes, was not fully extended to Magendie, who gets a ticking off for 'having nothing original to say about the higher functions'.[76]

Notable is the manner in which Young addressed Flourens. Here he employed the history of ideas to excavate the philosophical and religious assumptions in Flourens's scientific conclusions. Young described Flourens's experimental techniques and, under the title 'Flourens' assumptions', explored what lay below his views of brain function. These assumptions Young clearly regarded as having set back the cause of biological psychology. Flourens's experiments could have been interpreted as supporting the case for cerebral localization, but because 'he considered the hemispheres a unitary organ' he did not grasp the opportunity to draw this conclusion. This latter point was well known to positivist historiographers but Young took the matter further. He related Flourens's interpretations to 'Cartesian dualism and the doctrine of the unity of the soul'. In a book explicitly dedicated to the memory of Descartes, Flourens defended the uniqueness of the soul, its indivisibility and its investigation by introspection; the mind could be the object of philosophical enquiry only. It was Flourens's deep conservative, dualist assumptions which determined his experimental interpretations. Heading this chapter is a passage from Koyré in a work on Descartes that Young had almost certainly read at Yale:

> Pure empiricism does not lead us anywhere – not even to experience; much less, of course, to experiment. An experiment, indeed, is a question we put to nature. It presupposes, therefore, a language in which we formulate our questions; in other words experiment is not the basis of theory, but only a way of testing it. Science does not result from an accumulation of facts; there are no facts that do not imply concepts.[77]

[75] Young, op. cit. (2), p. 16,

[76] Young, op. cit. (2), pp. 88, 81, 80, 87.

[77] Young, op. cit. (2), pp. 69, 72, 54. Alexandre Koyré, 'Introduction', in René Descartes, *Descartes' Philosophical Writings: A Selection* (ed. and tr. Elizabeth Anscombe and Peter Thomas Geach), London: Nelson, 1954, p. xiii. This was a text for students. It seems a reasonable supposition that it was used at Yale.

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The next chapter, devoted to Alexander Bain, has two epigraphs. The first, taken from Ernst Gombrich, asserted, 'There is no neutral naturalism. The artist, no less than the writer, needs a vocabulary before he can embark on a "copy" of reality'.[78] The second was attributed to Alistair Crombie on changing ideas about questions and satisfactory answers in scientific research.[79] Bain was important in the history of localization because he brought the idea of movement and the feeling of movement to the forefront of associationist psychology.[80] Previously, although motion had equality with sensation in studies of the nervous system, it played little part in theories of mental development. 'Bain', notes Young, 'showed that knowing was the result of experiences *consequent on doing*'.[81] The introduction of the feeling of motion becomes important when considering animal learning since it made possible a biological theory of adaptation of animals to their environments.

Notably, Young's pursuit of the assumptions underlying the arguments, so successful in the instance of Flourens, proved problematic in the case of Bain. In a letter to John Stuart Mill of 1851 Bain proclaimed, 'There is nothing I wish more than ... to unite psychology and physiology'.[82] Young suggests that Bain had the ideas and experimental evidence to do this but failed to grasp the opportunity. This failure was diagnosed in a scathing analysis of Bain's later work on character, the emotions and 'the spontaneous energy of the will' in which he is accused of failing to provide even an outline of a science of individual difference. Bain's analysis, Young writes, was composed of 'rambling reflections and anecdotes'. The result was 'a pot-pourri of the psychological, philosophical, and physiological issues of the day'.[83] Here Young is reversing the analytical tool he used on Flourens. While he excavated Flourens's assumptions and conclusions from the context of an early nineteenth-century perspective, he subjected Bain's assumptions and conclusions to the scrutiny of twentieth-century psychology.[84]

A largely descriptive chapter on Paul Broca's localization of the seat of language is notable for an epigraph by Alistair Crombie and extensive references to the work of Henry Head.[85] We then come to one of Young's heroes: Herbert Spencer. The appreciation is clear from the three introductory quotations. Two are eulogies of Spencer by John Stuart Mill and William James. The other is Charles Singer's pronouncement that Spencer's system 'is an object of derision' which spoke to the mid-twentieth-century consensus that Charles Darwin was a scientist and a Spencer an undisciplined speculator. Fault lines were being laid down here. By this time one of the leading champions of

[78] Young, op. cit. (2), p. 101. Young assigns this to E.H. Gombrich, 1962. Seemingly it is from *Art and Illusion: A Study in the Psychology of Pictorial Representation*, New York: Pantheon Books, 1960, p. 75. Misleadingly it has been prefixed with the sentence 'Like art, science is born of itself, not of nature'. This seems to have been added by Young, as does the phrase 'no less than the scientist'.

[79] Young, op. cit. (2), p. 101. Another puzzle. Cited as Crombie, 1963, it presumably refers to Crombie, op. cit. (57). Not discovered, and I am unsure that it sounds like Crombie.

[80] Young had high regard for the L.S. Hearnshaw's explication of Bain. See L.S. Hearnshaw, *A Short History of British Psychology (1840–1940)*, London: Methuen, 1964. Roger Smith, personal communication. See also Roger Smith, *The Sense of Movement: An Intellectual History*, London: Process Press, 2019.

[81] Young, op. cit. (2), p. 120, italics in original.

[82] National Library of Scotland, MS. 3650, ff. 165–6, cited in Young op. cit. (2), p. 103.

[83] Young op. cit. (2), pp. 127, 131, 127.

[84] 'My conclusion about the science of character advocated by Mill and attempted by Bain closely parallels the judgements of Ward and Allport'. Young, op. cit. (2), p. 132 n. 5. James Ward was professor of mental philosophy and logic at Cambridge from 1897. It was from Ward that Bartlett was said to have 'acquired his biological outlook and his feeling for the essential continuity and indivisibility of mental life'. Zangwill, op. cit. (27), p. 77.

[85] The epigraph is from Crombie, op. cit. (57), p. 7.

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Darwin was Sir Gavin de Beer.[86] Darwin appears rarely in *Mind, Brain*, but Young found in Spencer a figure whose works synthesized many dimensions of Victorian thought. When he turned to Darwin, de Beer's works were Young's principal ideological and historiographical target and he used Spencer as evidence that Darwin's work could not be understood in a scientific context alone.[87]

For Young, Spencer's evolutionism united psyche and soma. Learned, adaptive behaviour and mental associations were naturalized in nervous functions which allowed development in complexity over time.[88] In this account psychology becomes a 'biological science of adaptation'. Spencer's conclusions were arrived at within a 'general theory of evolution from homogeneity to heterogeneity' with its 'resulting physiological division of labour'. Cerebral localization was a 'corollary' of that theory. Spencer's system explained the origins and development of the emotions in the animal kingdom and in what he called the 'lower and higher human races'. It also allowed him to account for individual mental growth, an issue which had plagued associationism and Bain in particular. As Spencer put it, by adhering to the view that the mind was a *tabula rasa* we might ask 'why should not a horse be as educable as man'. This is not the case, he says, because through evolution species have developed instincts, emotions and proclivities that are passed on as acquired characteristics. 'Attempts', writes Young, once again with modern psychology in mind, 'at explanation of complex emotions as developments wholly within the life of an individual are absurd'.[89]

Young also saw other insights for modern psychologists in Spencer's works. Spencer's achievements included not only an account of mind as a natural object but also an outline of the means appropriate to studying it. Spencer challenged the 'fundamental assumption' of those who believed that 'philosophical and introspective analyses were adequate methods' for understanding mind and, in particular, the emotions. Victorian and contemporary psychologists had brought together an object of science (emotion) and a method of investigating it (introspection) and had proceeded on the mistaken 'assumption ... that the actual development of emotions, indeed of all psychological phenomena, conforms to the categories and sequences according to which we can interpret them introspectively'. Spencer's 'uniform explanatory principle' prescribed comparative biological studies of the animal kingdom and the developing individual. These 'must precede introspective analysis'.[90]

Spencer's philosophy led Young to the neurologist John Hughlings Jackson, who was so self-proclaimedly indebted to Spencer that he even embarrassed his own admirers.[91] Jackson is important because his view that sensation and motion make up all complex mental phenomena was grounded in a scientifically acknowledged model of the nervous system – but one other feature of this chapter merits attention. At the level of scientific evidence, the debate over cerebral localization in the 1870s turned on the technical details of sub-cortical anatomy. Young explains the controversy using his specialized knowledge of Victorian and modern ideas of deep brain structure. Here he was presenting the sort of

[86] In 1948 Singer opposed Rupert Hall's appointment to a post as a historian of science at Cambridge on the grounds that he was not a scientist. James, op. cit. (51), p. 362.

[87] See Young, op. cit. (39), pp. 363–88, esp. 366–7. On Young's Darwinian scholarship and especially on de Beer see James A. Secord, 'Revolutions in the head: Darwin, Malthus and Robert M. Young', *BJHS*, forthcoming.

[88] In 1959 John C. Greene had published a major paper on Spencer's sociology. John C. Greene, 'Biology and social theory in the nineteenth century: Auguste Comte and Herbert Spencer' in Clagett, op. cit. (56), pp. 419–46, 434. This paper is only mentioned in the final footnote to Chapter 5 of *Mind, Brain* stating that Spencer's role in creating modern sociology 'deserves a full study'. Young, op. cit. (2), p. 196 n. 2.

[89] Young, op. cit. (2), pp. 161, 162, 185, 173, 183.

[90] Young, op. cit. (2), pp. 185, 179, 185.

[91] Young, op. cit. (2), p. 199 n. 2.

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expertise considered necessary in some quarters to be an accredited historian of science. It was analogous to the historian of astronomy explaining the mathematics of epicycles.

Following this we are briefly introduced to the research of the German physicians Gustav Fritsch and Eduard Hitzig and the 'incompatibility' of their 'assumptions' with the associationist tradition. In 1870 they reported what Young called 'a truly epoch-making classical experiment' in which they observed that electrical stimulation of the cortex in experimental animals produced muscular responses. 'The assumption of cerebral localization', Young writes, 'was given its first firm experimental support in this publication'. The notion of 'epoch-making' might seem to hark back to a different historiographical tradition but Young glossed it as meaning 'all subsequent work in cerebral physiology was done with reference to this single experiment'. Clearly not epoch-making at the time, Young commented that even Fritsch and Hitzig acknowledged that their '*assumptions* had, in large measure, determined the results'.[92] That Young was straddling two intellectual approaches here is demonstrated by how clearly he described the extent of further experimental and rhetorical work that was done to transform this 'epoch-making classical experiment' into an established scientific fact.

Lastly, the work of David Ferrier is described as the culmination of localization.[93] Ferrier's experimental studies on animals, notably monkeys, first published in 1873, resulted in a detailed map of the motor area of the cortex. Young noted that a 'great deal of classical work on the cerebral hemispheres' followed Ferrier's studies and that localization 'led directly to the development of modern neurosurgery'. But the nub of the chapter, perhaps of the whole book, was Young's exposition of the consequences of localization for psychological theory. Ferrier considered that physiological understanding of the sensori-motor areas threw light on higher mental operations. There was a price to be paid for this, however, because localization 'cut itself off from the approach to psychology which was the most important aspect of Gall's work'. Following Ferrier, 'Insufficient attention was paid to what the sensory-motor elements should be required to explain'; that is, the 'adaptive biologically significant functions' to which Gall and Spencer had drawn attention. The problems of the rigidity of the localization framework were recognized at the time. Some of these are referred to in the chapter's first epigraph from George Croom Robertson, a Scottish philosopher, associate of Bain and editor of *Mind*, 1876–91, who was supportive of Ferrier's project but deemed it 'very premature' in making any useful connection between physiology and psychology. Young quotes Henry Head, who considered the period of neuropsychology after 1906 as marked by 'chaos'. Young's supervisor got almost the last word in the chapter. Zangwill had said, 'Whatever its role in the production of muscular activity, the motor cortex, cannot be regarded as the seat of any function recognisable to the student of behaviour'.[94]

The crucial issue of laboratory knowledge and its relations to theory and practice runs through the book and was especially prominent in this last chapter. To highlight the problems, and perhaps a way forward, Young drew not on contemporary studies in history and philosophy of science, but on Dewey's reflections on the role of psychology in education, given in his Presidential Address to the American Psychological Association in 1899. Again the key to Young's sympathies is in the epigraph to the chapter, taken from Dewey's lecture: 'Unless our laboratory results are to give us artificialities, mere scientific curiosities, they must be subjected to interpretation by gradual approximation to conditions of life'. For example, in the psychological laboratory 'by excluding the conditions of ordinary

[92] Young, op. cit. (2), pp. 232, 224, 232, 224, 231, italics in original.

[93] See 'the developments which culminated in Ferrier's work' and 'Ferrier's work represents the final extension of the Bell–Magendie paradigm', Young, op. cit. (2), pp. 240, 241.

[94] Young, op. cit. (2), 235, 243, 246–7, 234, 245, 246.

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memory' the use of 'nonsense material' will lead to 'extreme simplifications'. The laboratory 'affords no final refuge that enables us to avoid the ordinary scientific difficulties of forming hypotheses, interpreting results, etc'.[95] The pragmatist psychological tradition had already provided Young with resources to think about laboratory knowledge and its relation to theory and practice and 'the social settings of belief' before his interpretations were enriched by his acquaintance with the Bartlett and Koyré tributaries.

By now the reader has been prepared for the 'Conclusion', which iterates the meagre rewards of localization for psychology and the need for an authentic biological functionalism. The first issue was related to Cartesian dualism and the inadequacy of reductionism and experiment alone to address problems of mind. Young judged localization as a triumph for physiology but as a biological and philosophical failure. Localization theory had been of little use in explaining conscious behaviour in the biological world. It could not methodologically or ontologically unify mind and brain. The failure to develop an authentic biological functionalism was related but had supplementary causes. Modern psychology had stowed within its historical baggage 'the analytical units and categories which the association psychology had inherited from medieval and philosophical psychology'. A return to Gall's most important insight was needed: 'the functional role of mind in life as a guide to the categories of biological analysis according to which psychological investigation should interpret experience and behaviour'.[96]

Although I have suggested that Young's search for 'assumptions' in theories of mind and the interpretation of experimental results might have been encouraged by the new history of science, as always with Young's work other sources were active. The epigraph to the Conclusion is from a Robert B. Livingston essay from 1962. Livingston was an American neuroscientist who, as a naval reserve officer, had earned a Bronze Star during the Second World War. Throughout his post-war career, he was famous as a campaigner against nuclear weapons. Livingston considered that to modify our 'present concepts' we must make 'careful examination of our fundamental assumptions. The assumptions which we accept with least reflection are those common to our intellectual community; they may not even be recognized as assumptions'.[97]

Aftermath

Overall Young's work mirrored and contributed substantially to the striking changes in the historiography of science in the second half of the twentieth century. *Mind, Brain* is a beautiful example of the Koyréan approach that characterized some of the finest work of the early 1960s. Such an approach was foundational to the broader cultural history of science that was soon to follow. And this, in all but name, describes Young's Darwinian scholarship in the ten years or so after *Mind, Brain*.[98] But not only did Koyréan history of ideas germinate cultural history, it also contained the seeds for a very different approach, one that was resisted by many of its practitioners. Koyré, Elkana notes, 'is aware of the existence of two very different kinds of ideas: those in the body of knowledge, and those which are statements about knowledge, and as such are socially determined … Koyré's contextual analysis is a kind of sociology of knowledge'.[99] Thus, for example, where positivists sought to explain Aristotle's physics in

[95] Dewey, op. cit. (1), p. 119. The role of psychology in education was central to the associationist tradition and functionalism.

[96] Young, op. cit. (2), pp. 249–52.

[97] Young, op. cit. (2), pp. 249.

[98] Young, op. cit. (39), pp. 348, 349; see Secord, op. cit. (87).

[99] Elkana, op. cit. (49), p. 114.

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terms of his incorrect scientific method, Koyré found them 'perfectly sound' on the basis of 'Greek cultural assumptions about the nature of social objects and cosmic order'.[100] The potential threat of Koyré's approach to the conventional view of science was identified in the late 1960s by the eminent physicist Clifford Truesdell when he 'denounced Koyré's work as an example of modish conceptions of science as "time-conditioned, social and institutional"'.[101] However described, the historiography of science of the early 1960s was far more easily than the positivist tradition translatable into rich social explanations of science. In the end it lent itself to relativist, social-constructivist and the sort of Marxist analysis that Young later embraced.[102] So in some ways there no was disjunction intellectually between the early and the later Young. He stayed interested in scientific ideas and was ever a historian of them and never stopped seeking new intellectual tools to explain their origins, underlying assumptions, transmission and place in culture. The intellectual approaches and the 'quest for humane relations' found in *Mind, Brain* permeate Young's later work.[103]

I finish, however, with the final epigraph, which is the last words of the text of *Mind, Brain* and presumably the thought Young wanted to leave us with in 1965. The quotation is from the American neurophysiologist and behavioural scientist Ralph Gerard writing in 1949: 'It remains sadly true that most of our present understanding of mind would remain as valid and useful if, for all we knew, the cranium were stuffed with cotton wadding'.[104]

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[100] Jeffrey C. Alexander, *Positivism, Presuppositions, and Current Controversies*, London: Routledge, 1982, p. 22.

[101] Clifford Truesdell, *Essays in the History of Mechanics*, Berlin: Springer 1968, p. 146, cited in Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*, Princeton, NJ: Princeton University Press, 1985, p. xxi. Thanks to Simon Schaffer for this reference.

[102] Interwar Marxist approaches to science now look like versions of positivist historiography. See Gary Werskey on J.D. Bernal's 'scientistic ideology', which 'identifies science as the engine of technological and social transformation', in 'The Marxist critique of capitalist science: a history in three movements?', *Science as Culture* (2007) 16, pp. 397–461, 411. Also A.K. Mayer, 'Fatal mutilations: educationism and the British background to the 1931 International Congress for the History of Science and Technology', *History of Science* (2002) 11, pp. 446–72.

[103] Smith, op. cit. (42).

[104] Young, op. cit. (2), p. 253.

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