



BOOK REVIEW

Juggernaut

Review of ‘A dominant character. The radical science and restless politics of J. B. S. Haldane’

Samanth Subramanian (Simon and Schuster, India) 2019, 379 pgs

Reviewed by VEENA RAO* and VIDYANAND NANJUNDIAH*

Centre for Human Genetics, Electronic City, Bengaluru 560 100, India

*For correspondence. E-mail: Veena Rao, aneev52@yahoo.co.uk; Vidyanand Nanjundiah, vidyan@alumni.iisc.ac.in.

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Who was J. B. S. Haldane? For geneticists, he identified linkage, pioneered biochemical and human genetics, and was one of the founders of population genetics. Of particular interest here, he is the longest-serving editor of *Journal of Genetics*,ⁱ and—thanks both to his own articles and his ability to attract papers of quality—the person who made it preeminent in its field. Evolutionists acclaim him as an architect of the Modern Synthesis who remained alert to instances when the effectiveness of natural selection was overshadowed by other forces. For biochemists, he gave the correct quantitative explanation of enzyme kinetics. To students, he was a demanding and caring teacher. For the general public, he was a vocal proponent of Marxist philosophy and an advocate of rationality. He was a peerless expounder of science in the broadest sense, not only biology. Readers of his popular essays were as likely to learn about the latest developments as to be introduced to original, path-breaking ideas. They could be exposed to futuristic speculations or treated to quotations from ancient works in Greek and Latin. He excelled at using algebra, thinking in terms of molecules and writing simply. To bureaucrats and administrators, he was a nuisance, quick to take offence and often overbearing. He was a polymath, restless, prickly, delighted in controversy, and prone to support a view just because it was unconventional. Almost anything he said was guaranteed to be quotable. He has been called ‘the last man who might know all there was to be known’ⁱⁱ and ‘one of the most fascinating, perplexing and troublesome figures in the history of science’.ⁱⁱⁱ No wonder he keeps attracting biographers. Ronald W. Clark’s *J.B.S.: the life and work of J. B. S.*

Haldane came out in 1968; his former student K. R. Dronamaraju wrote two books^{iv} and edited two others, one containing appraisals of Haldane by his contemporaries, and the other a selection of his papers dealing with genetics. Recently this journal brought out a special issue to mark the 125th anniversary of his birth.^v Over the years, many who knew him personally have put down their reminiscences; others, the present reviewers among them, have discussed his life and science. Samanth Subramanian is the latest to join the list.

Given that, it is fair to begin by asking whether the book under review has anything new to offer. The answer is yes and no. Inevitably, there is a great deal of overlap with earlier work, above all with Clark’s biography, which continues to retain its standing as an insightful study of Haldane’s life. The strong point of *A dominant character* is how much it tells us regarding Haldane the person; or better, Haldane the character. Its weak point is that it falls short with regard to his technical writings (though a surprising amount does get through). Overall, it makes for an enjoyable read. For someone new to Haldane, this may be the most entertaining account of his life available. The title is apt, combining as it does a characteristic term from genetics with Haldane’s personality.^{vi} Incidents from his public life take up a lot of space. Even when they are well-known, details that are newly unearthed make what happened come alive. That is especially the case with regard to three matters: the tortuous course of Haldane’s affiliation with the Communist Party, notably when it came to his behaviour during the Lysenko episode; related to that, the surveillance kept on

him by the United Kingdom's domestic counter-intelligence agency; and his investigation of the physiological causes behind the deaths of submariners in an accident just before the onset of the second world war^{vii}. *A dominant character* is made up of seven unevenly sized chapters. They are crowded with facts and incidents, and deal with more than one theme, not necessarily in chronological order, making it difficult to keep track of them. Events follow one another at a rapid-fire pace, and are narrated vividly, occasionally with accompanying dialogue. The absence of citations to original sources in several places, as well as the lack of an index, detract from the value of the book.

As stated, its strength lies in its account of Haldane's life outside academic research. Here is a quick overview. The first chapter, titled 'The scientific method', describes Haldane's attitude towards scientific research—namely, that its methods and outcomes must be explained to the public^{viii}—, and a visit to the Soviet Union in the company of his first wife Charlotte. The latter story leads to a description of the rise of Lysenko, the suppression of genetics research on account of his anti-Mendelian views, and Haldane's ambiguous stand over those developments. The tragic death of the distinguished plant geneticist Nikolai Ivanovich Vavilov, with whom Haldane was acquainted, was traceable to his opposition to Lysenko, but Haldane's reaction was equivocal. 'The deep end' goes back to his birth in 1892 and a precocious childhood. We see him growing up in an unusual family whose head used him as an experimental subject for carrying out potentially life-threatening physiological experiments. The reader learns of Haldane's first exposure to genetics, followed by the discovery of genetic linkage in mice, made via experimental crosses carried out at home in collaboration with Naomi, his sister and life-long friend. Also covered in the same chapter are his life as a student of mathematics and the humanities—not natural science—in Oxford, an exuberant embrace of fighting in the first world war, and getting wounded and being sent to recuperate in India, from when his fondness for the country dated. 'Synthesis' leads us into Haldane's life as an academic. It begins with self-experiments on blood acidity—once again, verging on the dangerous; once again, carried out in the company of his father. It continues with a short period in Oxford followed by a Readership in biochemistry at Cambridge, and tells of his blossoming into an enzymologist, biochemical geneticist, and evolutionary theorist. There is a discussion of the eugenics movement and Haldane's thoughts on eugenics. The chapter also touches on his speculations concerning scientific progress as described in the book *Daedalus*. Its publication led to his meeting with an already-married Charlotte, her divorce, the scandal that ensued and the farcical events that accompanied it. The next chapter, 'Red Haldane', is, together with 'The deep end', the longest in the book. It goes into a range of themes: Haldane's continuing activity as a science communicator, his socialist inclinations, an entangled involvement with the Communist Party, the resulting surveillance by the secret police, the break with Charlotte—partly triggered by her disappointment with what

she had seen in the USSR—, and his involvement with the much younger Helen Spurway, leading to their marriage. Haldane's participation as a volunteer with anti-Franco forces during the Spanish civil war gets lengthy treatment. 'The war at home' is concerned with Haldane's efforts at improving the standard of air-raid shelters during the period of World War II, and his investigation into the *Thetis* submarine accident in which many seamen died of carbon dioxide poisoning combined with high atmospheric pressure. Subramanian suggests that Haldane's stand on Lysenko's claims, not to speak of what they led to, was false to the values he had stood for, all the more so in the context of what happened to Vavilov.^{ix} The chapter ends with Haldane's less than formal break with the Communist Party of Great Britain. The penultimate chapter, 'India', treats the period 1957–1964. It is mostly a repetition of a phase of Haldane and Spurway's life that has been described before in more than one place, but is retold here engagingly. It begins with Haldane's growing disenchantment with life in England, his acquaintance with Jawaharlal Nehru, S. Radhakrishnan and P. C. Mahalanobis, the decision to emigrate, in which Helen Spurway backed him, and describes the Indian Statistical Institute in Calcutta, the place where he was hosted. An initial phase of exhilaration preceded the almost predictable falling out on account of, among other things, miscommunication with Mahalanobis, perceived indignities inflicted by a mindless bureaucracy, and a disastrous though mercifully brief interlude with the Council of Scientific and Industrial Research (CSIR).^x Eventually, thanks to the intervention of Biju Patnaik, the resourceful chief minister of Orissa, it became possible for the Haldanes to move to another institution, this time in Bhubaneswar, where he died in December 1964.

The final chapter, 'Ten thousand years', is also the shortest, and in some ways the best. In it, Subramanian muses about what made Haldane who he was. The chapter begins with a CIBA foundation symposium held in 1962 during which several luminaries attempted to forecast the future of biology and *Homo sapiens*—in other words, indulge in the sort of speculative thinking Haldane revelled in. In the course of asking whether the picture of evolution built up after Darwin needs to be extended in essential aspects, Subramanian informs the reader that there is no obvious way of relating phenotypes to genotypes, reflects on the enduring attraction of eugenics and the urgency of dealing with eugenic ideas in these days of gene editing, and expresses disappointment at the extent to which scientists have retreated from involvement in public affairs. Behind that attitude, he says, is the fact that scientists have cut themselves off from the humanities; in consequence, they are no longer skilled at conveying the implications of scientific discoveries to lay people. Haldane stood out in both respects: 'He didn't just want to tell his readers *what* to think; he wanted to show them *how* to think'. The chapter returns to eugenics and Haldane's feelings about it.

As this overview makes apparent, the overall effect is impressionistic, comparable to viewing a large painting

crammed with details. One can imagine a movie producer going through this book and speculating on the prospects of a film, hoping to repeat the success of *A beautiful mind*—with the added advantage of a lead character who is flamboyant, not introverted or self-effacing.

So much for Haldane the person. What about his technical contributions, the things that have ensured that his name will be long remembered in the history of science? Here too, Subramanian manages to tell us a lot, and does so in arresting language. We learn of Haldane's correction (together with Briggs) of the Michaelis-Menten explanation for enzyme kinetics, of the series of path-breaking papers in which he developed a mathematical theory of evolution, his calculation of a mutation rate in humans, the researches on biochemical genetics, the realisation that in interspecies crosses, if one sex is absent, rare, or sterile, it is the heterogametic sex ('Haldane's Rule'), and many other findings. However, probably because he devotes so much attention to the public and more newsworthy activities, he fails to do justice to some contributions and does not mention others. He states that Haldane was sufficiently open-minded to acknowledge that natural selection could be one among several factors that moulded evolutionary change, but falls into a common error by saying that his position 'landed roughly between the positions of Fisher and Wright'. The implied gradation in views is incorrect. In fact, Fisher independently worked out how a gene could be fixed via drift, and Wright repeatedly stressed the centrality of natural selection. Haldane showed that the principles of genetics as worked out by Mendel, and later by Morgan and his school, could give a quantitative account of evolution by natural selection. Along with that, he kept reiterating that evolutionary change could take place through other routes too.^{xi} Wright's arguments were centred largely around natural selection and population structure; and Fisher's, around natural selection and panmixia. Fisher highlighted the difference in viewpoints in an interesting way. He said that whereas others (including Haldane) were asking how genetic mechanisms led to evolutionary phenomena, his own interest was rather in the evolutionary causes behind genetical phenomena.^{xii} On the question whether evolution can result in characters that are individually disadvantageous but socially beneficial, Haldane offered two distinct answers. One re-emerged later in the language of inclusive fitness developed by W. D. Hamilton, and is known as the theory of Kin Selection. The other, apparently less plausible, falls under the general category of what is known today as Group Selection. It holds that a trait that lowers the fitness of an individual can nevertheless spread, if it raises the fitness of the group of which the individual is a part.^{xiii} Long disputed, an analogous process has been shown to work in a laboratory situation involving bacteria.^{xiv} Undoubtedly Haldane had an open mind regarding the factors responsible for evolutionary change (as did Darwin, a fact that tends to be ignored), but it is going too far to say, as Subramanian does, that Haldane 'anticipated the theory of punctuated equilibrium'. He also gave examples of traits that evolve unusually rapidly, even

abruptly, pointed out circumstances in which they could do so, and drew attention to the importance of behaviour and social learning as agents of evolutionary change.^{xv} Sarkar has argued that Haldane's *The causes of evolution* was 'the most important founding document' in the post-Darwinian consensus in evolutionary theory; and that its stress on a material basis (namely, chromosomes) of the quantitative rules discovered by Mendel was central for forging the consensus.^{xvi}

There are major omissions in the *India* chapter. For a start, to call 'The cost of natural selection', which Haldane completed just before the move to India, 'his last significant paper', is to downplay the importance of a large body of work carried out later. Included in that would be contributions to statistics, the demonstration (with Suresh Jayakar) that selection in different directions could sustain a stable polymorphism, and the working out of conditions for equilibrium at a sex-linked locus. Haldane's published talks, where he made explicit his open-mindedness as to the mechanisms of evolution, are also missed out. In them he asserted once more that natural selection was only one of many alternatives, and added that it was more likely a means for maintaining equilibrium than causing change. *A defense of beanbag genetics*, acknowledged today as a classic, is not cited. It contains Haldane's justifications for the simplifications that he, Fisher and Wright had made in creating the theory of population genetics, and is a forceful argument in support of mathematical modelling in biology.^{xvii} In a glaring omission, no mention is made of the names or contributions of all but one of Haldane's Indian associates. Among those unnamed, Jayakar and P. Meera Khan not only carried out significant work under the guidance of Haldane, but went on to build international reputations on their own, in population genetics and human genetics respectively.^{xviii} A photograph of Haldane with M. Siniscalco is provided, but with no hint of what it refers to: it was taken at a location in rural Andhra Pradesh where, under the guidance of Haldane and others, Meera Khan and associates were carrying out one of the first population-wide surveys in India for human genetic disorders related to haemoglobin. Further, testifying to his commitment to students, the research was partially funded by Haldane himself, even though it was supposedly a WHO project.^{xix} Also, a curious reader would want to know what Helen Spurway, who was to outlive her husband by 14 years, did during that period. After all, through her work on problems of development and behaviour, she had made a name for herself.

N. W. Pirie's words while summing up a survey of Haldane's work apply equally to *A dominant character*: 'In spite of its defects, this is a book in which anyone interested in Haldane will learn something. There are new facts in it, and pungent quotations from relatively inaccessible publications' (here, from archival sources as well).^{xx} Pirie advised in the same review: '... he had so many facets of character, and contributed to so many aspects of science, that biographies of him should be written from several points of view'. Clark's *life and work* 50 years ago, and Subramanian's *A dominant character* now, illustrate the validity of those words. Perhaps

future biographers will show us Haldane from yet other perspectives, and so enable us to build up a fuller picture of him. During the approximately two years left to him after the move to Orissa, he seemed to have found peace, at least until cancer struck. The word juggernaut, deriving from the name of the god Jagannātha of the famous temple in that state, may come close to describing this brilliant and complex personality.^{xxi}

Notes

ⁱJointly with R.C. Punnett from 1933 to 1946, and on his own from 1946 until his death in 1964.

ⁱⁱR. Clark 1968 ‘J.B.S.: the life and times of J.B.S. Haldane’ (Oxford Univ. Press; p. 86).

ⁱⁱⁱM. B. Adams 2000 Last judgment: the visionary biology of J. B. S. Haldane. *J. Hist. Biol.* **33**, 457–491.

^{iv}K. R. Dronamraju (1985 and 2017) *The life and work of JBS Haldane with special reference to India*, Pergamon Press; *Popularizing Science: The life and work of JBS Haldane*. Oxford University Press.

^vHaldane at 125 2017 (ed. P. P. Majumder, V. Nanjundiah and V. Rao) *J. Genet.* **96**, 717–864 (<https://www.ias.ac.in/listing/articles/jgen/096/05>).

^{vi}The explanation for dominance, a phenomenon identified by Mendel, was long disputed. It led to a major dispute between Fisher and Wright; Haldane provided his own answer. He thought both physiology and (as Fisher had said) natural selection were involved. For genes whose enzyme products regulate the flux in multi-step biochemical pathways, Kacser and Burns’s elaboration of Wright’s physiological explanation appears to be the correct one.

^{vii}Haldane insisted that ‘world war’ should be spelt in lower case in order to downplay its importance.

^{viii}Who happen to pay for much of it, as he pointed out.

^{ix}His analysis is harsher on Haldane than that of the science historian W. deJong-Lambert (J. B. S. Haldane and Лысенк, овщина (*Lysenkovschina*), *J. Genet.* **96**, 837–844, 2017).

^xWhich an exasperated Haldane referred to as “Council for the Suppression of Independent Research”.

^{xi}Rao V. and Nanjundiah V. 2017 Haldane’s view of natural selection. *J. Genet.* **96**, 765–772.

^{xii}Fisher said the viewpoint of others amounted to asking ‘Can evolution be explained in terms of present known genetical causes?’. On the other hand, *he* was posing the question ‘Can genetical phenomena be explained in terms of known evolutionary causes?’ (R. A. Fisher (1932). The evolutionary modification of genetic phenomena. In *Proceedings 6th International Congress of Genetics*, volume 1, pp. 165–172). In the same address, Fisher contrasts his ‘inductive and statistical’ approach with that of Haldane and Wright, which he characterises as ‘analytic and deductive’.

^{xiii}A similar hypothesis was explored by Wright, and keeps resurfacing in different guises.

^{xiv}Chuang J. S., Rivoire O. and Leibler S. 2009 Simpson’s paradox in a synthetic microbial system. *Science* **323**, 272–275.

^{xv}See note xi.

^{xvi}S. Sarkar 2017 Haldane’s *The causes of evolution* and the modern synthesis in evolutionary biology. *J. Genet.* **96**, 753–763.

^{xvii}J. B. S. Haldane 1964. ‘A defense of beanbag genetics.’ *Perspect. Biol. Med.* **7**, 343–359. ‘Beanbag’ was the term used by Ernst Mayr to caricature the simplifications that Haldane and others made use of while creating the field of population genetics; specifically, that of treating single genes and their effects in isolation.

^{xviii}Suresh Jayakar (1937-1988) took over as Director of the Genetics and Biometry Laboratory in Bhubaneswar after Haldane’s death. He joined the International Laboratory of Genetics and Biophysics, Pavia, in 1967. While there, he served for a while as Editor, *Journal of Genetics* (B. O. Bengtsson, <https://onlinelibrary.wiley.com/doi/pdf/10.1046/j.1420-9101.1988.1040289.x>). P. Meera Khan (1935-1998) moved to the State University of Leiden in 1966 and later he too was on the Editorial Board of the journal (H.F.A. Vasen, P. Meera Khan (1935-1998), *J. Genet.* **78**, 63–70 1990).

^{xix}V. Rao, ‘J. B. S. Haldane, an Indian scientist of British origin’ (*Curr. Sci.* **109**, 634–638, 2015).

^{xx}N. W. Pirie, 1986. “Haldane as guru”. *Nature* **319**, 630.

^{xxi}Jagannātha, meaning ‘Lord of the Universe’. Haldane thought that in Bhubaneswar, he was living in an earthly paradise; also, he was fond of the name Jagannātha.