Эпистемология и философия науки
2021. Т. 58. № 3. С. 171–187
УДК 167.7

Epistemology & Philosophy of Science
2021, vol. 58, no. 3, pp. 171–187
DOI: https://doi.org/10.5840/eps202158351

The Baconian Background of Hogben's Scientific Humanism

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This essay examines the impact of Baconian utilitarianism on Lancelot Thomas Hogben (1895–1975), a biologist whose view of science was heavily intertwined with his support of socialist planning. Like Bacon and Marx, Hogben considered science to be a collective tool of utmost importance for empowering people and improving life conditions through a conscious and methodical intervention on our surroundings. Convinced by the fundamentally applied nature of science, Hogben successfully used the principles of the emerging Marxist historiography of science in his popular science books to teach abstract ideas through their origins in practical life. Furthermore, he extended the view of science as planning from biology and economics to linguistics by designing the international language Interglossa that would also serve to enhance scientific literacy in the lay public.

Keywords: Lancelot Thomas Hogben, Francis Bacon, scientific humanism, baconian utilitarianism, social relations of science, Interglossa (language), science popularization, Marxist history of science, international auxiliary language

Бэконовские основания научного гуманизма Л.Т. Хогбена

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В данной работе рассматривается влияние бэконовского утилитаризма на Ланселота Томаса Хогбена (1895–1975), биолога, чьи взгляды на науку тесно переплетались с его поддержкой социалистического планирования. Как Бэкон и Маркс, Хогбен считал науку коллективным предприятием, имеющим огромное значение для расширения человеческих возможностей и для улучшения условий жизни посредством осознанного и методичного воздействия на окружающую среду. Убежденный в прикладном характере науки, Хогбен успешно использовал принципы зарождающейся марксистской историографии науки в своих научно-популярных книгах, чтобы представить абстрактные идеи через их происхождение в практике. Он также распространил взгляд на науку как на планирование с биологии и экономики на лингвистику, разработав международный язык Interglossa, который также должен был послужить повышению научной грамотности населения.

Ключевые слова: Ланселот Томас Хогбен, Фрэнсис Бэкон, научный гуманизм, бэконовский утилитаризм, социальная роль науки, Интерглосса (язык), популяризация науки, марксистская история науки

Introduction

This essay examines the Baconian background of Lancelot Thomas Hogben's works in popular science and linguistics. Hogben (1895–1975)[1] was a British biologist known for his contributions to genetics and population statistics. After studies in Cambridge, Hogben started his career as a lecturer in zoology at Birkbeck College (London). With J.B.S. Haldane, J.S. Huxley and F.A.E. Crew, he founded the *Journal of Experimental Biology* and the Society for Experimental Biology [Erlingsson, 2013; Erlingsson, 2016]. In 1917, he married Enid Charles, a mathematician who later pursued her activity in the field of demography. The couple studied fertility and underpopulation together and supported natalism against Malthusian tendencies that were popular in the British scientific milieu of their time. Hogben spent the second half of the 1920s in Montreal and Cape Town before returning to London as a research professor of social biology at London School of Economics. From 1930, he used his chair to combat scientific racism inside the eugenics movement. Starting from the 1940s, his professional interests shifted towards medical statistics. His interest in language planning coincides with this period.

The Baconian idea of radically transforming human life and overcoming the limitations imposed on us by nature constitutes the backbone of Hogben's scientific humanism through the lens of which he interprets the history of science and imagines future applications of science in all areas of life, from population control to international communication. For Francis Bacon, the very raison d'être of science is the mastery of the natural world: "The true and lawful goal of the sciences is simply this, that human life be enriched by new discoveries and powers" [Bacon, 1999, p. 117]. Understanding of nature and successful production being intimately linked to each other, the latter has nevertheless priority over the former – science is mainly a means to the end of controlling nature: "Now the empire of man over things depends wholly on the arts and sciences. For we cannot command nature except by obeying her" [Bacon, 1999, p. 147]. That being said, practical applications of knowledge as new powers obtained to enhance human life are more than the genuine objective of scientific research. Considering the metaphysical inclinations of the human mind as one of the major obstacles before knowledge (classified by Bacon among the idols of the tribe), they also keep the scientist from getting lost in the pure domain of abstractions, losing track of the real world of continuous interaction between nature and man. Bacon

[1] The major (auto)biographic resources are [Hogben, 1940] and [Hogben, 1998] (posthumous autobiography based on his sketches, edited by his children). An account of the Lancelot Thomas Hogben Papers, part of the Special Collections at the University of Birmingham, can be found in [Tabery, 2006]. Wells 1978 is a comprehensive biography written by one of Hogben's students. Finally, [Werskey, 1978] contains a considerable amount of biographic information about Hogben, alongside other left-wing scientists with whom he was affiliated.

considers the Aristotelean disconnection between speculative knowledge and active practice sterile and misleading. The Baconian alternative to the Aristotelean knowledge leaves a central place to transformative human action over nature, paving the way to the wide-scale industrial transformation of the world we inhabit. The valuation of material production over speculation was spotted by Edgar Zilsel as a major factor behind the emergence of modern science [Zilsel, 2003][2].

Like his socialist peers such as J.D. Bernal and J.B.S. Haldane, Hogben amalgamated Baconian utilitarianism with a Marxist theory of planning. Hogben's abundant work in science popularization makes ample use of the principles of Marxist historiography of science, with a strong pragmatic focus on both the material origins of scientific discoveries and their potential applications for the benefit of all. Hogben not only supported the collective use of rational planning for social welfare, but also believed in the necessity of planning for the fulfilment of science in the long run. In the following we detail the origins of the neo-Baconian vision of science popular among left-wing scientists in the interwar Britain (including Hogben) and discuss its impacts on Hogben's science popularization. Materialist history of science imported from Soviet scientists lies in the background of Hogben's scientific humanism and earned him a massive readership of popular science. In his self-educators, Hogben made use of materialism to make abstract science approachable and interesting to non-specialists. Furthermore, he used these books to vocalize his convictions on the necessity of collective planning in all areas of life. Finally, Hogben's support for planning extended into the field of language, leading him to design Interglossa, a constructed international language in the service of a global culture based on scientific literacy.

Materialist History of Science

If the union of material production and theoretical investigation in Hogben's scientific humanism can be traced back to Bacon's "humanitarian ideal" [Farrington, 1951, p. 4], it also owes to the Marxist historiography of science that was being formed around Hessen's and Bukharin's works at his time. Hogben's narrative of science as a material process emerging from social needs is an outcome of his contact with Soviet Marxism due mainly to the sensational participation of a Soviet Delegation (led by

[2] Gaukroger states that this attitude was commonplace in the early modern scientific scene in Europe: "The concern with practical knowledge and the practical benefits of knowledge was especially marked in sixteenth century England. Scholastic disputation was rejected in part because it was considered to be of no benefit to anyone, and there was a tendency among the English humanists of the sixteenth century to consider the practical sciences superior to theoretical knowledge" [Gaukroger, 2001, p. 14].

Nikolaj Bukharin, former President of the Comintern Executive Committee, collaborator of Lenin and principal supporter of the New Economic Policy) in the Second International Congress of the History of Science and Technology, that took place in the Science Museum, London (July 1931). This event marked a turning point in the history of the British scientific Left [Werskey, 1978; Mayer, 2002]. The participation of an entire delegation was not originally in the plans, but a change in Stalin's policy towards the Soviet intelligentsia initiated a new direction in the international propaganda, centred in showcasing the advancement of the Soviet science and technology to the West. Bukharin was the head of the Academy of Science's section on the history of science, and the Director of Industrial Research for the Supreme Economic Council. Other participants were N.I. Vavilov (biologist), B. Hessen (historian, physicist), A.F. Joffe (physicist). At the suggestion of Hogben, who was among the congress organizers, it was decided that the addresses of the Soviet delegation would be translated and printed[3].

Bukharin was one of the most notable spokespeople of the 'official' Marxist theory as advertised by the Party. He penned influential textbooks such as *The ABC of Communism* (1919) and *Historical Materialism* (1921), and he contributed to the party theory by reiterating the central ideas found in the works of Marx and Lenin. In his address to the London congress, Bukharin contested the separation of pure and applied science as a division based in the separation of mental and manual labour in capitalist societies. He insisted that the activity of 'pure' scientists, too, was determined by the social conditions of their exercise, no matter how they liked to think about their work. He brought up the importance of planning not only for the economy but also for science. For Bukharin, 'Theory is accumulated and condensed practice' [Bukharin, 1931, p. 13]. The 'unity of theory and practice' [ibid., p. 15], 'the primacy of practice' and 'the practical criterion of truth in the theory of cognition' [ibid.] count among the basics of the communist philosophy of science, as found in Marx and Engels and further repeated by affiliated spokespeople such as Lenin and Bukharin in Soviet Russia, Maurice Cornforth in Great Britain, and Georges Politzer in France. Hogben's own scientific humanism accepts the primacy of practice over theory in a Marxist spirit, as reminded to the British scientists by Bukharin: 'Science is not cosmic prophecy. True science, in the words of Robert Boyle, is such knowledge "as hath a tendency to use". A scientific law embodies a recipe for doing something, and its final validification rests in the domain of action' [Hogben, 1938, p. 1077].

It is not surprising that the Marxist theory of structure and superstructure as found in *The German Ideology* is at the heart of the papers

[3] Hogben relates his role in organizing the congress and his encounter with Bukharin in Hogben 1998 (p. 129).

delivered by the Soviet Delegation in the above-mentioned London congress. Hessen's paper on 'The Social and Economic Roots of Newton's *Principia*' is perhaps the most elaborated example of the Marxist literature on the history of science. J.G. Crowther, a leading popular science journalist and member of the Communist Party of Great Britain (CPGB), notes the pioneering role of Hessen in a tradition of engaged historiography of science[4]. Hessen criticized the mainstream historiography of science for its emphasis on ideas as autonomous phenomena, without regard for their actual motives to be found in material interests. In the case of Newton, the determining material conditions are problems connected with the emergence of imperialistic world conquest (long-distance transportation) as well as the developments in ballistics and mining. In keeping with the anti-individualistic teaching of historical materialism, Hessen subverts the classic studies of Newton as a genius beyond his own time[5], and situates Newton's work in the real social setting in which it appeared. Refuting the idea that 'the subject of history is not the mass of the population, but the personalities of genius' [Hessen, 1931, p. 153], Marxism enables one, says Hessen, to avoid idealistic misconceptions resulting from the view of history as 'the story of great men'[6]. To the mainstream historiography of great men Hessen wanted to bring a more lucid alternative, one that takes into account the underlying socio-economic structure that produced the theoretical achievements of Newton[7]. Hogben was stimulated by Hessen's intervention. The influence of the Marxist historiography of science will later earn his best-selling science popularization books a big readership, proving that it is further adapted for the masses and well-received by them.

4 'The movement, of which Hessen's essay was the most brilliant expression, transformed the history of science from a minor into a major subject. It showed that a knowledge of the history of science was not only of entertaining antiquarian interest, but was essential for the solution of contemporary social problems due to the unorganized growth of a technological society' [Crowther, 1941, p. 617].

5 'Thus the phenomenon of Newton is regarded as due to the kindness of divine providence, and the mighty impulse which his work gave to the development of science and technology is regarded as the result of his personal genius' [Hessen, 1931, p. 151].

6 In 1926, the bourgeois cult of the genius had made the subject of a historical study by Edgar Zilsel, whose later thesis on the emergence of modern science (that came to be known as 'the Zilsel thesis') shares a good deal of similarity with Hessen's methodology used in explaining Newton's Principia. See Zilsel 1926 and Zilsel 2003.

7 'Previous historical theories considered only the intellectual motives of the historical activity of people as such. Consequently they could not reveal the true roots of those motives, and consequently history was justified by the individual intellectual impulses of human beings. Thus the road was closed to any recognition of the objective laws of the historical process' [Hessen, 1931, p. 153].

Socialist Planning

The Baconian maxim 'command nature by obeying her' acquired a new meaning in the framework of 'scientific socialism', starting from Engels. With Engels' formulation of 'scientific socialism' and the subsequent economic construction efforts in the USSR, the socialist planning theories emerge as a new form of Baconianism – an attempt to enhance the human condition by extending "man's dominion over nature" to the collective mastery of an optimal socio-economic organization. In the British left-wing scene Hogben belongs to, this focus on the positive role of science on social development becomes prominent. The Marxist legacy adds to Bacon's utilitarianism a new scope, extending the field of man's rational control from the handling of natural phenomena to the handling of socio-economic phenomena.

In his collective biography of J.D. Bernal, J.B.S. Haldane, H. Levy, J. Needham and Hogben, Werskey explains the growing political organization of scientific workers in the early 1930s by the fact that CPGB changed its policy to be more inclusive of intellectuals and students and succeeded in forming a united front against fascism, to the point that 'When the Second World War commenced, the British Left was effectively led by the Communists and numbered at least 60,000 supporters' [Werskey, 1978, p. 136][8]. This new emphasis on the role of scientists in the political causes is correlated with a greater acceptance of the public authority of science. The Party considered that the Left ought to ensure to have science on its side through the adhesion of notable scholars and their integration into prestigious institutions such as Royal Society (Hogben, himself, became a fellow in 1936)[9]. Scientists who adhered to the Popular Front became interested in the scientific practice in the Soviet Union, some even travelling there to come back with very positive accounts, claiming that the socialist model should lead the way for the organization

[8] This number was contested by Noreen Branson [1997, p. 252], who gives the party membership in December 1941 as between 22 and 23 thousand.

[9] Crowther is specifically clear in his insistence on the proper role of scientists in the Left's struggles, i.e. by doing their job, above all. He heavily criticized scientists who leave their profession to dedicate themselves to full-time political activity. For him, the professional authority of science was too valuable to lose for the credibility of the Marxist movement: 'The scientist who abandons professional work is liable to perform two disservices. By failing to remain at the frontier of knowledge, he loses the capacity to appeal to the technical knowledge of his colleagues, and he loses his authority as a scientist with the non-professional public. His colleagues no longer pay so much attention to his political suggestions because they come from an outsider, and the public ignores them because he does not possess conventional scientific authority' [Crowther, 1941, p. 645].

of the scientific work in Britain as well.[10] Julian Huxley, for instance, claimed that science-based policy helped the USSR into social advancement. Likewise, H.G. Wells lauded the purportedly scientific spirit with which the Soviet Union was being governed: 'Contact with reality… has obliged communist socialism to become progressive and scientific in method' [Wells, 1934, pp. 265-266, qtd. Werskey, 1978, p. 241]. As attested by the reporting of Benjamin Farrington [Werskey, 1978, p. 250], science and socialism were indeed considered to be intimately linked by the British Marxists.[11]

The most emblematic figure of the British scientific Left during the 1930s was without a doubt Bernal, whose specific brand of scientific humanism combined Baconian utilitarianism with Marxism and its application by the Soviet Union. For Bernal, the scientific relevance of socialism came firstly from the necessity of a good knowledge of hard facts for pursuing the revolutionary struggle: 'Facts cannot be forced to our desires, and freedom comes by admitting this necessity and not by pretending to ignore it' [Bernal, 1939, p. 416]. Bernal not only viewed in communism the optimal social setting for an emancipated science, but went so far as identifying communism with science, based on their common vocation for planning and regulating. The famous final paragraph of his influential book, quoted by Hogben in *Science for the Citizen,* states this conviction eloquently:

> Already we have in the practice of science the prototype for all human common action. The task which the scientists have undertaken – the understanding and control of nature and of man himself – is merely the conscious expression of the task of human society. The methods by which this task is attempted, however imperfectly they are realized, are the methods by which humanity is most likely to secure its own future. In its endeavour, science is communism [Bernal, 2010, p. 415].

Science was considered a natural ally for socialism starting from the pioneers Marx and Engels who based their propaganda heavily on the acclaimed scientific status of socialism. Starting from the October Revolution, the concept of planning acquired a new relevance [Ellman, 2014]. Against the forecast of Marx and Engels, the socialist revolution had

[10] Wood notes 'the widely growing regard for the Soviet Union' among Western intellectuals during the 1930s due to the massive outcomes of the Five-Year Plan and the elimination of unemployment [Wood, 1959, p. 42]. Alongside economic reasons and the threat of an upcoming war in the West, McGucken cites the big budget granted to science in Soviet economy among the reasons of British left-wing scientists' increasing enthusiasm for Soviet Union [McGucken, 1984, pp. 74–75].

[11] Roberts reports the central role of scientists among them, stating that "the radical scientist had become the archetypical British Marxist intellectual almost at the dawn of the 1930s" [Roberts, 2005, p. 533] and discusses the impact of the Lysenko affair on the scientific Left in Britain.

taken place for the first time in a country industrially lagging behind the large powers of Europe. Therefore, ensuring the viability of socialism in an underindustrialized, mostly rural country was the main concern of Lenin in the aftermath of the revolution. In *The ABC of Communism*, Bukharin talks of economic planning as a main requirement for the functioning of a communist society[12]. At the birth of the USSR, communism was a young economic system faced with a considerable risk of failure in a relatively backward economy. To argue successfully for its efficiency, it was important to convince the public of its seriousness and feasibility. The idea of planning popularized in the early decades of the Soviet Union is best understood in the light of its policy oriented towards a rapid economic development, using the proven credibility of modern science. When the first Five Year Plan was implemented in the USSR, rational planning had started to colour the futuristic fantasies of left-wing scientists such as Wells and Haldane. An early formulation of the 20th century left-wing scientific humanism is found in Wells' *New Worlds for Old*: 'In place of disorderly individual effort, each man doing what he pleases, the Socialist wants organized effort and a plan. And while the scientific man seeks to make an orderly map of the half-explored wilderness of fact, the Socialist seeks to make an orderly plan for the half-conceived wilderness of human effort' [Wells, 1912, p. 27]. Wells' insights into previously unconceivable possibilities for the future facilitated by science inspired the left-wing movement of his time and earned him the praises of Crowther for his mind-opening anticipations. In the Cambridge circle, other left-wing scientists such as Bernal and Haldane produced anticipations, with neo-Baconian themes such as radical terraforming and genetic engineering [Haldane, 1923; Bernal, 1929].

For Hogben, science and socialism are dependent on each other from yet another aspect. Like Bernal, Hogben takes socialism for the prerequisite of a free science able to realize itself through social achievements, because 'no system in which credit and industry are privately owned can take the fullest advantage of new scientific knowledge for the satisfaction of common needs' [Hogben, 1939a, p. 13]. Hogben stressed the importance of bridging the gap between scientists and the lay public not only for endowing the latter with the advantages that come from the knowledge of modern science, but also for the advancement of science itself.

[12] '[…] society will be transformed into a huge working organisation for cooperative production. There will then be neither disintegration of production nor anarchy of production. In such a social order, production will be organised. No longer will one enterprise compete with another; the factories, workshops, mines, and other productive institutions will all be subdivisions, as it were, of one vast people's workshop, which will embrace the entire national economy of production. It is obvious that so comprehensive an organisation presupposes a general plan of production' [Bukharin & Preobrazhensky, 1919, p. 70].

'The further progress of science depends on how far the scientific worker and his fellow citizens co-operate with one another in applying scientific knowledge to the satisfaction of the common needs of mankind' [Hogben, 1938, p. 1077]. At the same time as defining science in Baconian terms of control over life conditions and advocating its extension to the wider scope of social planning, Hogben also points to the necessity of developing a self-conscious and lucid view of science in its social function for ensuring the optimal organisation of human life. He calls his position 'scientific humanism', slightly differing from his earlier self-identification as a socialist ('If I had been asked to give a label to my creed, when I was starting in my profession as a scientific worker, I should have called it Socialism. That was twenty-five years ago. To-day I prefer to call it scientific humanism' [Hogben 1939a, p. 13]). Unlike his Marxist peers, Hogben criticized the teaching of dialectical materialism as idealistic metaphysics. Moreover, he stood openly against Lysenkoism and saw in it an intellectual repression incompatible with free science. To him, scientific humanism means active participation of citizens in social life through a collective understanding of a science turned towards social issues, in a collective effort to improve life conditions for all. Hogben gives two major examples – poverty and war – as avoidable social evils, comparable in controllability to their biological counterparts such as smallpox, malaria, or yellow fever. For Hogben, humanity's achievements in the control of diseases shows the way to the control of problems initiating in the social organization, such as poverty, over- or underpopulation, and war. Hogben notes that this central tenet of scientific humanism has already gained acceptance. Continuing the early modern social contract theories, he appeals for a 'new social contract' of scientific humanism, that is a further extension of modernity by the collective administration of social and economic life using the transformative power of science:

> The social contract of scientific humanism is the recognition that the sufficient basis for rational co-operation between citizens is scientific investigation of the common needs of mankind, a scientific inventory of resources available for satisfying them, and a realistic survey of how modern social institutions contribute to or militate against the use of such resources for the satisfaction of fundamental human needs [Hogben, 1938, p. 1089].

Science Popularization

Starting from the late 1930s, Hogben had a justified reputation as a science popularizer mainly due to *Mathematics for the Million* [1937] and *Science for the Citizen* [1938]. Those were followed by other books on the history of science for adults and children [1949; 1955; 1957; 1959a;

1959b; 1960; 1970; 1973; 1974a; 1974b]. An obituary published in New York Times speaking of him mainly as a "popularizer of science" confirms that "he could write in a way that made his subjects understandable, fun and meaningful to ordinary people, who devoured his books as if they were adventure-thrillers"[13].

In *Mathematics for the Million* and *Science for the Citizen* alike – both international best-sellers – Hogben's explanation follows the historical emergence of various scientific discoveries and inventions to solve specific technical problems (the latter is subtitled *A Self-Educator Based on the Social Background of Scientific Discovery*). *Science for the Citizen*'s cover includes a quotation typical of Baconian utilitarianism: 'Such Philosophy as shall not vanish in the fume of subtle, sublime, or delectable speculation but shall be operative to the endowment and betterment of man's life'. This avowed pragmatic orientation characteristic of the Marxist history of science in the 1930s is at the heart of Hogben's scientific humanism. His popular science publishing follows this principle both in his engagement with the lay public in a non-academic setting and in his treatment of its subject matter chiefly through its relationship with wider human pursuits. For Hogben, being aware of how abstract symbolism and theories ultimately relate to material issues is important for a better understanding of science's potential role in further improving human life on a collective scale. Hogben's self-educators narrate a materialist history of science, based on the practical issues that led to the emergence of each discovery. In his popular writings, Hogben presented science from a humanistic perspective: with an inclusive target audience, he aimed to bring science to the masses (as indicated by titles such as *Mathematics for the Million* and *Science for the Citizen*), for he considered that it held a decisive place in the improvement of life in modern times. His activity of knowledge popularization proceeds from his foresight of a 'new social contract' that would mark the beginning of a much delayed 'age of plenty'. Hogben's scientific humanism required educational reforms to keep up with it (he was active in the British Institute of Adult Education). But, more than an increased accessibility of educational opportunities, Hogben demanded a deeper transformation in the *content* of education, 'a far-reaching reformation in the content of education to endow the pursuit of knowledge with a new sense of social relevance' [Hogben, 1939a, p. 18].

The theme of social relevance of science central to Hogben's popular science books indicates the double influence of Baconianism and Marxist historiography of science. By shifting the focus from the contemplative Aristotelian model of natural philosophy building on the first principles to the continual growth of applied science practiced with the new experimental method, Bacon became an important intellectual forerunner of

[13] New York Times, 23.08.1975. URL: https://www.nytimes.com/1975/08/23/archives/lancelot-hogben-dead-popularizer-of-science.html (accessed on 08.11.2020).

the industrial revolution[14]. In his monography, Benjamin Farrington calls Bacon "the philosopher of industrial science" and credits Marx for granting him his fair place in the history of English materialism. The central idea that guided Bacon's work was "that knowledge ought to bear fruit in works, that science ought to be applicable to industry, that men ought to organize themselves as a sacred duty to improve and transform the conditions of life" [Farrington, 1951, p. 3]. Hogben's historiography of science and educational reform proposals follow this Baconian vision in their insistence on applied science over pure science. Hogben went as far as reducing the latter to a product of class prejudice based on a Platonic social hierarchy that frowns upon manual labour and reserves the contemplative knowledge to the elites[15]. He contested the division between pure and applied science as a result of the separation of the manual and mental labour in capitalist societies and considered it a symptom of alienation: 'The separation of human societies into social classes which enjoy abundant leisure, or are deprived of it, has encouraged a superficial and arbitrary division of science into two branches, *pure* and *applied*' [Hogben, 1938, p. 1077]. On the contrary, for Hogben, 'The only valid distinction between pure and applied research in natural science lies between inquiries concerned with issues which *may eventually* and issues which *already do* arise in the social practice of mankind' [Hogben, 1938, p. 1078]. Rejecting the concept of a 'pure theory', like his Marxist peers, he stood for an educational reform that would raise public awareness on the social purpose of science and the multiple ways in which it can contribute to human well-being: 'The Adult Education Movement has no need for biology courses of the kind which exist in the universities. What it needs are courses on malnutrition, public health policy, and the revolution of agricultural technique made possible by recent biological discoveries' [Hogben, 1939d, p. 155].

[14] Rossi contests this association of Bacon's view of science with inventions and industrial applications – a view that also shapes Hogben's popular science writing: "But Bacon never thought of reducing science to technology and cannot be interpreted as a philosopher of "industrial revolution". The works and the opera do not mean, in Bacon's philosophy, "artefacts or tools" or "technical achievements" like gunpowder or the printing press. Bacon's science is directed toward opera not in the sense of making artefacts, but in searching for "Nature effects, phenomena such as heat, colour, or motion"" [Rossi, 2006, p. 38].

[15] For Hogben, we value "pure" science in the tradition of Plato who considered useless knowledge superior to practical knowledge and we still associate the former with upper classes. Scientists' disdain of applied science is a residue of this thinking combined with the desire of belonging to a distinguished elite that would be above practical mundanities of everyday: "We still follow Plato in a fatuous antithesis between vocational training or useful knowledge and cultural education which is ipso facto useless and at the same time superior, because its very uselessness is the ornament of a leisured class" [Hogben, 1939e, p. 246].

It was Hogben's ultimate objective in his popular writings to introduce his audience to scientific thinking beyond any given theory or invention, leading the path to the popularization of the idea of a rational control over social issues. This strategy is an outcome of his planning-based scientific humanism[16]. In *Science for the Citizen*, the title of each part reflects the practical nature of science, not only in the way it was developed to solve human problems in the past, but also with a vocal Baconian perspective on planning opportunities for the future: 'The Conquest of Time Reckoning and Space Management', 'The Conquest of Substitutes', 'The Conquest of Hunger and Disease', 'The Conquest of Behaviour'. The book ends on a 'socialist vision of science as a process that advances only because it can be applied to practical problems', in the words of Bowler [Bowler, 2009, p. 112]. Hogben's humanistic method of science popularization that consists in explaining scientific theories through their context of emergence and the way they are applied or applicable to human issues was particularly welcome (as the high sales suggest) in mathematics, the 'purest' area of knowledge with no obvious use in practice for non-specialists. This received view of mathematics was, for Hogben, responsible for the avoidance of pupils due to its intimidating effect and perceived lack of connection with the real world of social production[17].

Interlanguage Planning

Hogben's view of an educational reform includes a redesigning of the curriculum in a way that would emphasize the applicability of science in solving social problems. If, in biology (Hogben's own field), this means the teaching of demographics and nutrition science, in the field of languages it would imply the replacement of the study of classic literature by the optimal design and teaching of a neutral interlanguage for world-

[16] Bowler makes a connection between Hogben's science popularization method and his prospects for collective planning in many areas of life: 'He [Hogben] would build their understanding of mathematics and science from the ground up, from the most fundamental conceptual foundations. Only then would people be able to understand not only individual bits of science, but also the whole scientific way of thought – and then realize that if this were to be applied to the management of society, it would entail a social revolution' [Bowler, 2009, p. 107].

[17] 'I attribute the sales of this book [*Mathematics for the Million*, New York: Norton & co, 1937] exclusively to one thing. People who were repelled by a subject which their teachers justified as an end in itself were excited to find it had some relation to the record of human achievement. They had not previously realized that mathematicians are useful, or that they pretend to be useless, only because the affectation of uselessness is the hall-mark of social prosperity' [Hogben, 1939d, p. 146].

wide communication on a fair basis ('the science of language may fulfil its Baconian goal by endowing human life with new powers and inventions' and 'remove barriers opposed to the spread of culture and mutual understanding between nations' [Hogben, 1939b, p. 28]). The late nineteenth and early twentieth centuries witnessed the emergence of the 'international auxiliary language' (also called 'interlanguage') movement that aimed at uniting people of the world across national borders. Beside the famous case of Esperanto with a sizeable community of speakers and a literature of its own, many other projects appeared, with limited success. Although Esperanto's longevity and institutionalization throughout several generations seem to be rather exceptional in the world of interlanguages, popularity of and enthusiasm for these projects, however temporary, indicate a growing ideological trend in Europe toward a cosmopolitanism respectful of all nations. By constructing an artificial idiom not associated with any particular nation, interlinguists (interlanguage constructors) took a stand in favour of fair communication and easy exchange between peoples, in the search of an alternative to the use of one dominant nation's language with varying ease among non-native speakers.

Hogben placed himself inside a tradition of interlanguage construction, inspired notably by John Wilkins, that he considers as a 'pioneer of scientific humanism'. He dedicated the third book in the collection Primers for the Age of Plenty (the first two being *Mathematics for the Million* and *Science for the Citizen*) to the science of language. *The Loom of Language*, authored by Frederick Bodmer (a lecturer in German that Hogben met in Cape Town in 1939) and edited by Hogben, was published as a self-educator in the spirit of its predecessors, with a vocal scientific humanist perspective. Its chapter XII, 'Language Planning for a New Order', was based on Bodmer's exchange with Hogben, that the latter eventually developed into the project of Interglossa. In line with Hogben's vision of a 'new social contract', Bodmer envisions a bright future for an international auxiliary language, of which the need would arise shortly due to increasing communication between specialists of all disciplines and nations, required for the rational management of social issues. The resulting prosperity is also expected to bring a greater mobility around the world, to be further facilitated with progress in the means of transportation and telecommunication and, not the least, with increased leisure time thanks to an effective collective management of needs[18].

[18] 'In short, the prospects for language planning depend on the extent to which the impulse to international co-operation keeps in step with the new potential of prosperity for all. Socialist planning, that is planning for the common needs of peoples belonging to different nations or cultural units, will bring about incessant contact between medical officers of health, town-planning experts, electrical engineers, social statisticians, trade-union representatives. Increased leisure combined with improved travelling facilities will give to a large floating section of the population opportunities

In Interglossa, the choice of vocabulary reflects Hogben's intention to create a universal culture out of modern science and technology. 'In the simplest possible terms, our task is to assemble a vocabulary based on internationally current roots of which the semantic content is as transparent as that of *geo-*, *aer-*, *tele-*, *phon-*, *graph-*, *micro-*, *phot-*and the like' [Hogben, 1943, p. 15]. More specifically, 'A truly international vocabulary must be the offspring of technology, and technology increasingly turns to Greek rather than to Latin for new material' [ibid., p. 15]. That is the reason why Hogben strongly prefers Greek roots over their Latin counterparts, as the former are generally better known and less obscure (ex: *micro* vs *parvus*). Doing so, Hogben incorporates modern scientific terminology into the vocabulary of Interglossa, making the international language simultaneously a pedagogic tool at the service of boosting scientific literacy: 'Men of science more than others, have at their finger-tips an international vocabulary which is already in existence; and a biologist who looks forward to a health-conscious future cannot fail to recognize how popularization of new health standards is daily adding to the stock-in-trade of internationally current words in daily use' [ibid., p. 9]. Thus, science education and instruction in international auxiliary language would be intertwined as two basic needs feeding each other: 'As the writer has elsewhere pointed out, all the bricks of a minimum vocabulary of world-wide communication are in fact available in the world-wide language of science; and it would now be possible to make every lesson in elementary science a lesson in a constructed auxiliary which the pupil would absorb without additional effort' [Hogben, 1949, p. 280]. Familiarity with scientific terminology and the ability to relate it to everyday life are desirable outcomes of Interglossa, in addition to its primary purpose of providing a neutral medium for international communication. This focus on bringing scientific literacy to the lay public through connections to their everyday life was part of Hogben's agenda of public empowerment through science.

Conclusion

Like other left-wing British scientists in the 1930s, Hogben reappropriated Baconian utilitarianism from a newly emerging Marxist perspective on science. His scientific humanism was informed by the importance that planning had acquired, chiefly in the USSR. His popular science books written in a style uniquely appealing to the masses and his involvement in and advocacy for language engineering are two noteworthy outcomes

to establish new social contacts through the medium of an Interlanguage, and its adoption would find a ready ally in the radio' [Bodmer, 1944, pp. 482–483].

of his Baconianism that provide us with perspectives on the public use of science.

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