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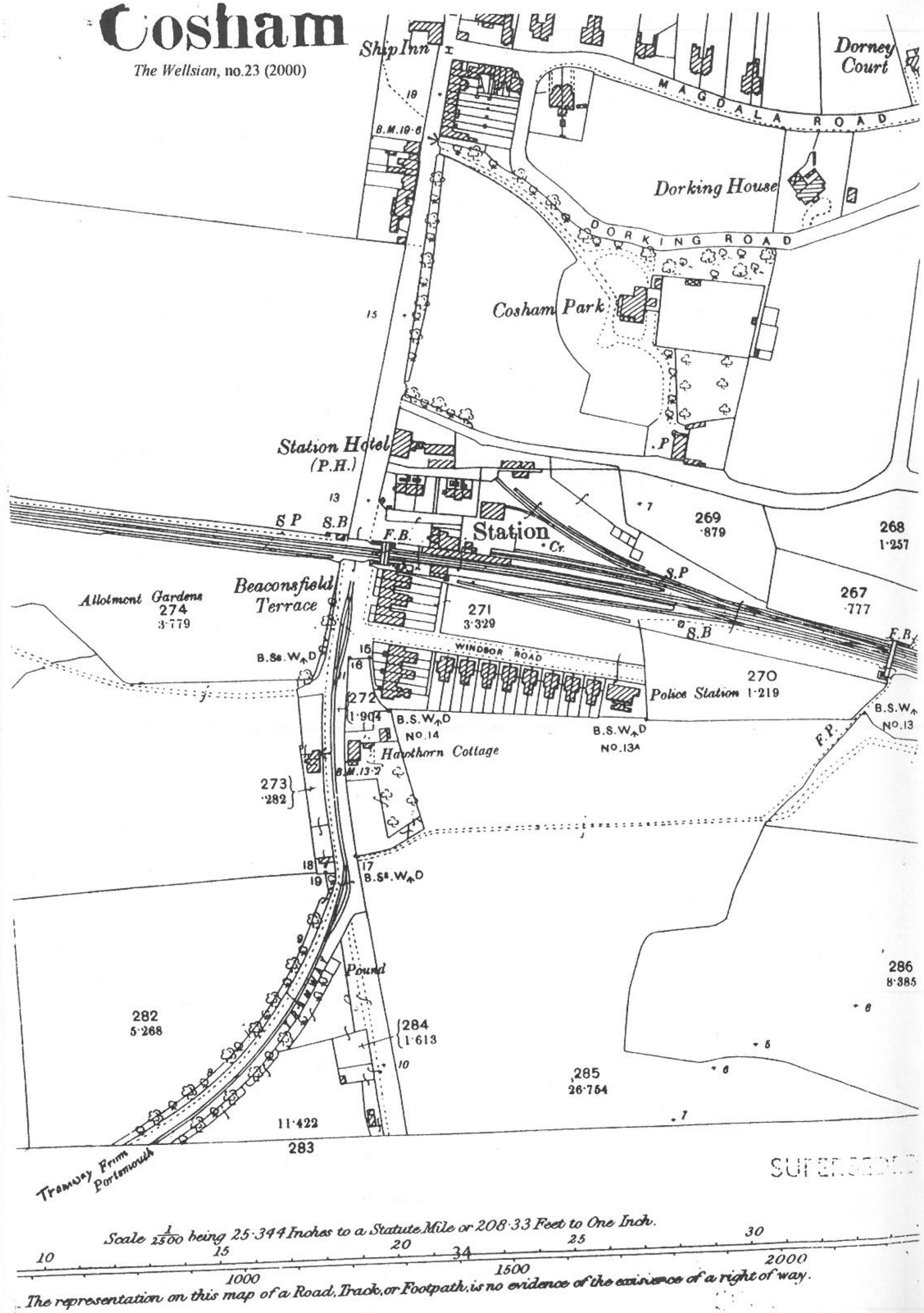

Charles De Paolo

Herakleophorbia IV/Somatrem: H.G. Wells's Speculations upon Endocrinology

The Food of the Gods, and How It Came to Earth (serialized 1903; published 1904) has received sporadic attention from Wellsians interested in its scientific implications.[1] A reading of the novel against the background of contemporary research, however, provides a coherent understanding of its biomedical content. *The Food of the Gods* appeared at a time when scientists, such as Sir Victor Horsley (1857-1916) and Dr. Serge Vornoff (1886-1951), were conducting groundbreaking studies in endocrinology. H.G. Wells was certainly aware of this work, as Ingvald Raknem has suggested.[2] The scientific protagonists of the novel, Bensington and Redwood, can be situated in this milieu; and their work on growth hormone, related to actual events. "Herakleophorbia IV" [H.IV],[3] popularly known as "Boomfood," is Wells's analogue to the growth hormone contemporary scientists had hoped to synthesize, and the story anticipates by a

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[1] I think that Robert M. Philmus understates the case when he notes that, in the novel, Wells makes "some slight concession to scientific plausibility" [Robert M. Philmus, *Into the Unknown: The Evolution of Science Fiction from Francis Godwin to H.G. Wells* (Berkeley, Los Angeles and London: University of California Press, 1970), p.153n.]. Frank McConnell seems to credit Bensington, Redwood, and Cossar unduly; he sees them, not as narrow-minded bunglers, but as "utopian planners," whose careers and sensibilities are the real focus of the story [Frank McConnell, *The Science Fiction of H.G. Wells* (New York: Oxford University Press, 1981), pp.167 & 170]. John Huntington believes that Wells transforms gianthood from a monstrosity to a "virtue;" the smaller people persecute the giants for their moral and intellectual integrity [John Huntington, *The Logic of Fantasy: H.G. Wells and Science Fiction* (New York: Columbia University Press, 1982), p.129]. The giants' plan to exterminate their smaller forebears can hardly be called virtuous (although it is biologically sensible): the giants, armed with the H.IV contaminant, contrive a plan for biological warfare and for mass murder. For Roslynn D. Haynes, Bensington and Redwood are little more than caricatures working outside the biomedical mainstream. Engaged in "esoteric research" on "apparently irrelevant topics," they "stumble" upon their discovery [Roslynn D. Haynes, *H.G. Wells: Discoverer of the Future; The Influence of Science on His Thought* (New York and London: New York University Press, 1980), p.208]. A more logical assumption, in my view, is that they successfully synthesized the somatotropic hormone but were unable to complete the testing and developmental phases of the experiment. Their growth-hormone research – which correlates to the work of Horsley, of Vornoff, and of others at the turn of the century – cannot, in my judgment, be called either "esoteric" or "apparently irrelevant." Peter Kemp's reading – that H.IV turns from a disaster to a "boon" for mankind [Peter Kemp, *H.G. Wells and the Culminating Ape* (New York: St Martin's, 1982), p.71] – seems to hinge on the meaning of "mankind": if, by "mankind," he means the giants, he is correct; for them, H.IV mutagenesis is a means of adaptation; for the smaller sub-species, however, it is an extinctive agent. John R. Reed credits Bensington and Redwood for producing H.IV but criticizes them for being unable to control this substance (John R. Reed, The Natural History of H.G. Wells (Athens, OH: Ohio University Press, 1982), pp.97 & 115). I concur with Reed, whose interpretation is my starting point.

[2] Ingvald Raknem, *H.G. Wells and His Critics* (New York: Humanities, 1962), p.410.

[3] H.G. Wells, *The Food of the Gods, And How It Came to Earth*, in *Seven Science Fiction Novels* (New York: Dover, 1934), p.627 [All further references are contained in the text].

half century the achievement of Drs. H.M. Evans and Choh Hao Li who isolated the natural hormone, somatotropin (1945); in 1966-1970, Dr. Li synthesized "somatrem", a biochemical equivalent to the natural substance. *The Food of the Gods* dramatizes Wells's concern that the lack of government support for research, along with the need for improved public education in science, forced scientists to rely on their own resources or to leave Britain altogether for countries more willing to support their work. This trend threatened national security and destabilized the international community.

Research in Endocrinology, 1871-1998

Sir Victor Horsley (1857-1916), surgeon, neurologist, and one of the founders of endocrinology, in 1883, proved what earlier researchers such as Lovani (1871) had suspected: that lack of thyroid secretion causes growth disorders.[4] Studying the effects of thyroid and parathyroid removal in animals, Horsley, in 1884 experiments on monkeys, showed that the loss of thyroid function causes disorders, such as cretinism or myxedema, which presents with swelling of the skin, slowed speech, impaired mental awareness, deepened voice, intolerance to cold, fatigue, weakness, and cardio-vascular abnormalities.[5] Another endocrinologist, whom Wells cites on several occasions in *The Science of Life* (1931), is Dr. Serge Vornoff (1866-1951), the renowned Russian physiologist who had been working on glandular transplantation for the purpose of rejuvenation.[6] Whereas Horsley was interested in establishing the physiological mechanisms of hormone secretion, along with its role in metabolism, Vornoff explored ways in which this knowledge could be applied clinically. His research on longevity, at the College de France and later in Switzerland, determined ways of using glandular tissue and secretions to help geriatric patients. Like Horsley, he experimented on animals and actually placed animal glands into human beings. Vornoff's work, like that of his

[4] Charles Coulston Gillispie, ed., *Dictionary of Scientific Biography*, 18 vols. (New York: Scribner's, 1980), I, 518-9 (pp.518-9); Sarah Jenkins-Jones, ed., *Random House Webster's Dictionary of Scientists* (New York and London: Random House, 1997), pp.242-3; Gerald Messadie, 'Hormones: The Body's Messengers', in *Great Modern Discoveries* ['Chambers Encyclopedic Guides'] (New York, Edinburgh and Toronto: Chambers, 1991) 96-100 (p.98).

[5] A.R. Currie, 'Pituitary Gland', in *Pathology*, ed. by W.A.D. Anderson, 2 vols, 6th edtn (St. Louis, MO: Mosby, 1971), II, 1403-30 (pp.1421-4).

[6] Jenkins-Jones, ed., p.495.

contemporary, Dr. Eugen Steinach (whom Wells also cites),[7] tested the interstitial tissues of the reproductive glands, which replenish these hormones. Whereas, according to Wells, Steinach was trying to reanimate "declining tissue" surgically, Vornoff was undertaking more revolutionary experiments, grafting "new tissues taken from young apes in the effective region."[8] Both researchers extracted the secretions of ductless glands, such as the pituitary, to produce "some remarkable rejuvenescences," although "distinct failures and disappointments" occurred.[9] Opponents of this work exaggerated these failures. The press, guilty in this regard, sensationalized the subject of "gland-grafting," misinformed the public, and even ridiculed Vornoff.[10]

Vornoff's critics ignored the inestimable therapeutic implications of pituitary research. For children, the growth hormone, somatotropin, which the pituitary manufactures, is essential to proper development: an insufficiency caused dwarfism; an excess, gigantism. With acromegaly, a related disorder, the onset of excessive growth hormone occurs after puberty, when the linear development of the bones is complete. Although these children do not grow to be giants, their skulls and bones thicken, and their small bones, feet, and soft tissue enlarge.[11]

In 1903-4, Wells was aware of developments in endocrinological research. In fact, it is reasonable to suggest that H.IV foreshadowed the synthesis of somatrem. In 1921 Herbert McLean Evans discovered that the anterior lobe of the pituitary secreted a growth hormone and, in 1944-5, isolated it with the help of his collaborator and student, Choh Hao Li (b.1913), an achievement bringing the pioneering work of Horsley, Vornoff, and others to fruition.[12] In the period, 1966-1970, Li genetically-synthesized the hormone, calling it "somatrem." The U.S. Food and Drug Administration, in October 1985, approved the marketing and sale of somatrem, the second drug, after insulin, manufactured through genetic engineering. It is interesting to observe that, as late as

[7] H.G. Wells, Julian S. Huxley and G.P. Wells, *The Science of Life* (Stark, KS: De Young, 1997), p.142.

[8] Wells, Huxley & Wells, p.142.

[9] Wells, Huxley & Wells, p.142.

[10] Wells, Huxley & Wells, p.142.

[11] Currie, pp.1421-2.

[12] John K. Young, *Hormones: Molecular Messengers* (New York and London: Franklin Watts, 1994), p.68; Jenkins-Jones, ed., p.297; Alexander Hellemans and Bryan Bunch, *The Timetables of Science: A Chronology of the Most Important People and Events in the History of Science* (New York and London: Simon & Schuster, 1991), p.564; Messadie, p.98.

1998, the contraindications of this drug had not been definitively established;[13] thus, health care professionals who administer somatrem must follow strict guidelines for its use, since it is so potent, spoils easily, and can be administered inaccurately. All of this contrasts sharply with Wells's portrayal of the H.IV animal trials at Hickleybrow Farm.

During the 1980s, scientists explored the possibility of stimulating the growth of somatotropin through transplantation between species, which is the approach Horsley and Vornoff had pioneered. Unlike Horsley, however, modern researchers have been working on the genetic level, an approach Wells anticipated in the novel. In 1982, the rat somatotropin gene was successfully transplanted into mice, some of which doubled in size because of the additional hormone they had begun producing. Chinese scientists, in 1989, went far beyond rat-to-mice genetic transplantation. After inserting human growth hormone into goldfish and loach, the fish grew up to four times as fast as normal. Since somatrem has become more readily available through genetic engineering, scientists are now more able to determine its benefits for patients. In a 1990 study, for example, it helped older people regain lost muscle and enlarged atrophying organs.[14] Marketed under the name "Serostim," the drug is now indicated for the treatment of AIDS wasting or cachexia and has been shown to augment body mass and improve physical performance.[15]

H.IV, and How it Came About

Wells introduces Bensington as a Fellow of the Royal Society and as former President of the Chemical Society, and Redwood as a professor of physiology at the Bond Street College of the London University. Both are prominent and well educated. We can infer that Redwood had been conducting experiments using animals, inasmuch as he had been "grossly libelled by the anti-vivisectionists time after time" [*FG* 623].[16] The narrator

[13] 'Protropin (Somatrem [rDNA Origin] for injection)', in *Physicians' Desk Reference*, ed. by Gregory J. Westley, et al, 52 edtn (Montvale, NJ: Medical Economics Data Production, 1998) 992 (p.992).

[14] Hellemans & Bunch, p.612.

[15] 'Serostim (Somatropin [rDNA origin] for injection', *New York Times Magazine*, vol.158 (11 April 1999), 51-2 (pp.51-2).

[16] James C. Whorton, 'Animal Research: Historical Aspects', in *Encyclopedia of Bioethics*, rev. edtn, 5 vols, ed-in-chief, Warren Thomas Reich, assoc. ed, Stephen G. Post (New York and London: Simon & Schuster Macmillan, 1995), I, 143-7 (p.143-7).

then indicts "scientists" as a class for being elitist and insular. "Great" scientists, he says, annoy their colleagues and perplex the public [*FG* 625]. Although a reclusive scientist can be a problem, historians lay the blame for the marginalizing of scientific research, in late-Victorian and Edwardian times, not on the solitary researcher, but on social and national attitudes. Some contend that late-Victorian (1880-1901) and Edwardian (1901-1910) society was insensitive to the importance of science to national affairs. A.R. Ubbelohde, for one, points out that, in the development of the pure and applied sciences (despite promising beginnings), the British scientific establishment fell behind foreign competitors.[17] While the ruling classes ignored their responsibility to provide social incentives for scientific development, the tradition of privately-funded research, such as that of the fourth Lord Rayleigh (1875-1947), was rapidly declining and was thought the province of an eccentric, wealthy nobility. Ubbelohde reminds us that these conditions did not mean great scientific minds did not exist. By and large, the scientists of the day were intellectually eminent; rather, it was the milieu itself that was "socially weak." Because the public was uneducated, and because governmental and private resources were insufficient, the scientific community's influence on national policy was inadequate. Up until 1914, Douglas McKie observes, the sponsoring of scientific research and of its industrial application had not sufficiently impressed the government with its importance.[18] While the First World War was in progress, however, Great Britain reacted against the prewar neglect of science; an example of this reaction was the institution of the Department of Scientific and Industrial Research. Britain realized, in time, that German science was the force behind the military. It became evident that Germany was able to draw upon its "highly-developed science-based industries for a whole range of goods, including synthetic ammonia and nitrates, both for offensive operations and for maintenance of the home front."[19]

Inadequate training in higher education, some suggest, was chiefly responsible for Britain's disadvantage in scientific and industrial development. At the turn of the

[17] A.R. Ubbelohde, 'Science', in *Edwardian England, 1901-1914*, ed. by Simon Nowell-Smith (London and New York: Oxford University Press, 1964), 213-50 (p.220-3).

[18] Douglas McKie, 'Science and Technology', vol.xii, 2nd edtn: 'The Shifting Balance of World Forces, 1898-1945', ed by C.L. Mowat, in *The New Cambridge Modern History*, 14 vols, ed. by G.N. Clark, et al (Adv. Committee) (Cambridge: The University Press, 1968), xii, 87-111 (p.108).

[19] D.E.M. Edgerton, 'Science and War', in *Companion to the History of Modern Science*, ed by R.C. Olby, G.N. Cantor, J.R.R. Christie and M.J.S. Hodge (London and New York: Routledge, ?), 934-45 (p.943).

century, opportunities for science undergraduates were limited. The typical case, which McKie sketches, was for an undergraduate, supported by scholarship, to work for two years with a professor at home or abroad.[20] But, even if he were to secure a university post after two years, his individual work was rarely funded. The young scientist had no recourse but to work in his spare time and at his own expense. Often, his teaching and other duties would be detached from his research. But after World War One this situation changed, because the government began to appreciate the need for scientific development in industry and for national defense. By the 1920s, a number of research associations appeared – such as the Department of Scientific and Industrial Research and the Medical Research Council – to support experimentation in various fields. In the period after World War One the scientific media, through journals and classified abstracts, communicated findings widely so that researchers could keep abreast of the latest advances in a given field, while more emphasis was placed on research as a "team" effort. Science was gradually becoming a corporate and national undertaking.

The narrator of *The Food of the Gods*, rather than to expound on the issue of government and social responsibility to the scientific community, expresses his disdain for scientists themselves. Thus, the researcher is a "queer, shy, misshapen, grey-headed, self-important little discoverer of great discoveries" [*FG* 625]. He does acknowledge that, despite personal shortcomings, scientists do "great" things. When Bensington discovers the growth hormone, he has a flash of insight, a reckoning of "enormous possibilities"; but, to this vision, according to the narrator, he "resolutely shut his eyes." It is likely that Bensington, biochemist and physiologist, knew precisely how this hormone could be used in pediatric practice, where it was most urgently needed [*FG* 625]. Bensington's bioethical pause dissipates, and the narrator is not surprised. Both he and Redwood, his collaborator, are more concerned with the commercial promise of the drug as a food additive, as a source of nutrition, or as a way of creating strong human beings. Discussing ostentatious names, such as "Titanophorbia" or "Herakleraphorbia," the food of titans or gods, respectively, they are unconcerned about the essential, intermediate steps of animal studies and clinical trials.

Finding an appropriate facility to test H.IV on animals is the first problem they try to solve. Redwood's campus facilities, though limited, would have been a good

[20] McVie, p.110.

choice, had he not already been involved in a experiment on bull-calves, which suggests that endocrinology may have been the focus there as well. Wells was evidently aware that, before World War One, Germany supported scientific research and development more than did Great Britain, and he interpolates this fact into the story. In Germany, complains Bensington, "a man with an idea like his would at once have twenty properly-fitted cubit feet of laboratory placed at his disposal" [*FG* 632]. Redwood reiterates this sentiment: "were it not for the inadequate endowment of science [in Great Britain], he would never, if he could avoid it, work on anything smaller than a whale. But a Public Vivarium on a scale sufficient to render this possible was, he feared, at present, in this country at any rate, a Utopian demand. In Germany – Etc." [*FG* 633].

Bensington knows that his hypothesis – H.IV stimulates linear growth – must be verified, corroborated, and then presented to the appropriate reviewing agency. His practice, however, leaves much to be desired. For laboratory technicians, he hires a couple of illiterate poultry farmers, the Skinners, entrusting the untested drug to them with the instruction to dispense it to chicks. This may seem innocent enough, but it is equivalent to entrusting the Ebola virus to the night janitor. It is unclear if Bensington gives them a dosage schedule or a primer on biological recording. Predictably, the farm disintegrates. Although preliminary reports reveal some success (the chicks increasing to six or seven times their normal size over ten days), the facility is hopelessly insecure. Not only do the Skinners contaminate their own food with H.IV, but they store it in open cans, infecting wasps and rats. Most alarming is the disclosure that Bensington, who is supposedly overseeing the project, "made no unnecessary fuss" over the filthy incubator, the broken fences, the rat-holes, and the wasps in the H.IV gallipot [*FG* 639]. To Bensington, proper scientific procedure is reduced to the mere "details of management" [*FG* 639].

H.IV development moves precipitously from animal to human trials, when Redwood exposes his own underweight baby to this agent, against the advice of his protege, Dr. Winkles, and of Bensington himself [*FG* 641-2]. The child grows vigorously [*FG* 661] but also becomes addicted [*FG* 693] to what had been thought a "harmless-looking discovery in chemistry" [*FG* 674]. H.IV proves to be extremely toxic, discontinuation bringing on fatal anemia: "If it was discontinued while growth is still going on, there was first a vague restlessness and distress, then a period of voracity [...] and then the growing creature has a sort of exaggerated anaemia and sickened and died

[...]. This, however, applied only to the growth period" [*FG* 701]. It is interesting to note that, whereas somatrem therapy combats the anemia accompanying growth-hormone deficiency, H.IV dependency actually induces this blood disorder.

To extirpate the gigantic fauna, Bensington burns the farm, but the drug has already infiltrated the food chain. Whereas, for him, H.IV represents a "new element in human history," for Wells's more empirical narrator, it is no more than a "leakage" and an "outbreak." This effect does not escape Dr. Winkles who urges his senior colleagues to publish their findings in the "true scientific method." Redwood, understating that H.IV is subject to "grave abuse," agrees to present their findings to the Royal Society. This hint of legitimacy comes too late. A profiteer, Winkles insists upon developing and marketing H.IV: "I can put the whole thing right. I can make it perfectly clear, that the stuff is controllable, and, secondly, that nothing short of a miracle is needed before anything like that catastrophe at Hickleybrow can possibly happen again. That is just what is wanted, an authoritative assurance" [*FG* 693]. To monopolize rights to the manufacture and distribution of H.IV, Winkles tries to persuade Bensington and Redwood to entrust the formula to a qualified commission having "entire control over its sale." Realizing Winkles's motive, Redwood rebukes his former student who then decides to replicate the formula; however, Winkles's professional judgment is impaired. Foregoing experimentation at an ample laboratory in London, which doubtless would have exposed him to inquiry, he works independently at a private laboratory in Keston [*FG* 706]. Like Bensington, Winkles also fails to appraise the environment, missing a standpipe that drains into the swamp. Once in the water-table, H.IV contamination then spreads beyond England, to America, "all over the continent of Europe, in Japan, in Australia, at last all over the world" [*FG* 715].

H.IV and Biotechnology

The most significant biological element in the story, to which I allude above, and which commentators have virtually ignored or subsumed under the socio-political symbolism, is that gigantism, initially an induced mutation, will enter the gene pool as a dominant, hereditary trait:

> So soon as adolescence was attained [...] the need and appetite for Herakleophorbia diminished, and so soon as the plant or animal was fully adult, it became [...] altogether independent of any further supply of the food [...]. It was so completely established on the new scale that, as the thistles about Hickleybrow and the grass of the down side already demonstrated, its seed produced giant offspring after its kind [*FG* 701].

Once beyond the growth phase, an organism exposed to H.IV, whether plant or animal, outgrows the addiction but bears the mutagenic effects of exposure, and this is how gigantism transforms the ecosystem. John Partington asks whether boomfood withdrawal affects animals and plants in the same way as it does human children.[21] Wells does not answer this question explicitly, but I think it a logical inference that, if all flora ("grass" [*FG* 701], "nettles," and "creepers" [*FG* 742]) and fauna are affected by H.IV metabolically and genetically, each remains vulnerable to withdrawal in the early stages of development. In the case of widespread environmental pollution with H.IV, it is likely that enough organisms would be fully supplied throughout the early developmental stages so as to reach reproductive maturity. This is the giants' strategy for bioengineering a world to suit their kind. If the founding generation of plants and animals is established, the effect of H.IV would then become a genetic reality, and H.IV. would become obsolete.

This turn of events has sinister implications for the smaller subspecies of *Homo sapiens*. The giants, who will actively disseminate H.IV themselves, are about to engineer a world where the smaller forebears would become increasingly maladapted. To these new conditions, the larger generation, in turn, would become increasingly better suited, inasmuch as the most favorable trait for survival in an up-scaled or gigantic ecosystem is to be in proportion to, and in balance with, that environment. The segregated giants realize, in Darwinian terms, that "a conflict must come" [*FG* 767]. Wells expresses the mechanism of adaptability and variation clearly:

> on the whole the better equipped individuals will grow up and reproduce themselves and the weaker will *as a rule* go under. The latter will be less able to

[21] John S. Partington, 'Letter to C. De Paolo', 28 July 1999, 1 (p.1).

> get food, to fight their enemies and pull through. So that in each generation there is [...] a picking over of a species, a picking out of the most weak or unsuitable and a preference for the strong and suitable. The process is called *Natural Selection* or the *Survival of the Fittest*, though *Survival of the Fitter* would be the more precise expression.[22]

The idea of natural selection, as Wallace (1858)[23] and Darwin (1859)[24] had expounded it, is not equivalent to the adaptive process in the story. On the one hand, natural selection, the means through which random mutations either pass into oblivion or (in the case of useful changes) into the gene pool of a species, enables a population to adapt to environmental changes.[25] Whatever random change helps a species survive will be retained, since the bearers of these traits will live on in sufficient numbers to propagate these mutations. Wells provides a very incisive description of this process in *The Conquest of Time* (1942):

> A vast majority of mutations are immediately detrimental and so are wiped out at once. The abnormal individual is usually, as we say, a monster. But if the particular mutation is not immediately detrimental the individual survives to reproduce itself, and, in a certain (Mendelian) proportion of its offspring, to reproduce the new variation. Over the area of inter-breeding this new variation may spread until it becomes a general characteristic. The value of its contribution to the outlook of the species may vary. It may make for the survival of the

[22] H.G. Wells, *The Outline of History, Being a Plain History of Life and Mankind*, rev. and updated by Raymond Postgate, 2 vols (Garden City, NY: Garden City Books, Doubleday, 1949), I, p.28.

[23] Alfred Russel Wallace, 'On the Tendency of Varieties to Depart Indefinitely from the Original Type', in *Darwin on Evolution: The Development of the Theory of Natural Selection*, ed by Thomas F. Glick and David Kohn (Indianapolis and Cambridge: Hackett, 1996), appendix 2, 335-45 (pp.335-45).

[24] Charles Robert Darwin, *On the Origin of Species*, in *Darwin on Evolution: The Development of the Theory of Natural Selection*, ed by Thomas F. Glick and David Kohn (Indianapolis and Cambridge: Hackett, 1996), 175-215 (p.175-215).

[25] Derry D. Koob and William E. Boggs, *The Nature of Life* (Reading, PA: Addison-Wesley, 1972), p.375.

> species as a whole; it may be detrimental to the survival of the species as a whole; or it may have little or no effect one way or the other.[26]

Some scientists conjecture that, at the present time, the most useful mutations in the human species have already occurred and been incorporated into the gene pool; at present, human mutations range from neutral to lethal.[27] Wells, too, hypothesized that natural selection was not acting on man at this stage in human evolution.[28] If this conjecture has any validity, it would mean that, in a small world, H.IV has induced a lethal mutation; gigantism, therefore, is disadvantageous to human beings so afflicted because it compromises their survival in a world disproportionate to their basic needs. But, as it turns out, the introduction of H.IV into the environment will constitute an extinctive event for the smaller subspecies. The consequences are inescapable: if the giants survive and reproduce in kind genetically, and if they biochemically engineer the environment to suit their needs – they will inherit the Earth. On this point, I agree with John Huntington: the giants, who realize they are the fitter subspecies, propose the survival of the fittest as an evolutionary ethic.[29] Despite the smaller subspecies' greater numbers, it will face mass starvation and extinction [*FG* 812]. Early essays, such as 'On Extinction'[30] (1893) and 'Human Evolution. An artificial process,'[31] (1896) demonstrate Wells's interest in the idea of extinction as a biological phenomenon. His most mature reflections on extinction can be found in *The Science of Life*, where he states that, "Every case of extinction of a species is a failure to provide any variations which could have been used to meet and overcome the circumstances which were leading the species downhill."[32] For the giants, this law is valid – although with a crucial and ironic difference: as the giants alter the ecology to circumvent their own extinction, they will also destroy the competitive subspecies, with whom coexistence is impossible. In a

[26] H.G. Wells, *The Conquest of Time*, intr. by Martin Gardner, 'Great Minds Series' (Amherst, NY: Prometheus, 1995), p.58.

[27] Theodosius Dobzhansky, et al, *Evolution* (San Francisco: Freeman, 1977), pp.65-6 & 102.

[28] Wells, Huxley & Wells, pp.1466-7.

[29] Huntington, p.130.

[30] H.G. Wells, 'On Extinction', *Chamber's Journal*, x (30 September 1893), 623-4.

[31] H.G. Wells, 'Human Evolution. An Artificial Process', *Fortnightly Review*, lx (October 1896), 590-5.

[32] Wells, Huxley & Wells, pp.623-6.

sense, G. K. Chesterton's comment, that "*The Food of the Gods* is the tale of *Jack the Giant-Killer* told from the viewpoint of the giant," is biologically sound.[33] For the smaller subspecies, an extinction scenario gradually comes into view:

> Everywhere the giants will increase and multiply; everywhere they will make and scatter the Food. The grass will grow gigantic in our fields, the weeds in our hedges, and the vermin in the thickets, the rats in the drains. More and more and more. This is only a beginning. The insect world will rise on us, the plant world, the very fishes in the sea will swamp and drown our ships. Tremendous growths will obscure and hide our houses, smother our churches, smash and destroy all the order of our cities, and we shall become no more than a feeble vermin under the heels of a new race. Mankind will be swamped and drowned in things of its own begetting ... [*FG* 761-62].

Unlike naturally occurring mutagenesis, that for which H.IV is responsible is induced. Wells makes this crucial distinction in *The Science of Life*: an induced mutation, arising from environmental, chemical, or radioactive causes, is not a "direct adaptive response" to naturally-occurring variations; biologically speaking, one can justifiably say that the offspring of Cossar, of Redwood, and of others, rather than being successfully-adapted variants, are monstrosities, appearing in a milieu to which they are maladapted, and in which they would likely have perished, had it not been for the fathers who supported their addictions. The ironic turn in the novel is that gigantism, an undesirable mutation, should have doomed those afflicted with it, pre-empting their reproduction. But Wells's insight into biotechnology inverts Darwin's thinking: all living organisms, with the exception of the smaller species of humanity, are varied genetically to accommodate an undesirable mutation and to establish a "new biological order" [*FG* 814]. In effect, the evolutionary process induced in the novel normalizes a pathological variation.

When Wells reflects that "the idea of change in scale" explored in the novel is a subject of "vital importance in human experience,"[34] he is certainly correct. But he

[33] Patrick Parrinder, ed., *H.G. Wells: The Critical Heritage*, 'The Critical Heritage Series', gen. ed. B.C. Southam (London and Boston: Routledge & Kegan Paul, 1972), p.107.

[34] H.G. Wells, *Experiment in Autobiography: Discoveries and Conclusions of a Very Ordinary Brain (Since 1866)* (New York: Macmillan, 1934), p.211.

underestimates the significance of the biomedical content when he describes the beginning of the novel as a "cheerful burlesque" and the end as the symbolic struggle of modern innovators in a reactionary world.[35] On a biomedical level, the novel is far more evocative than this binary description suggests. It is, rather, a cautionary tale on the power of scientific discovery – on its capacity either to serve, to destroy, or radically to transform mankind. From this perspective, Wells appears to be advising the political establishment of his times that research must be supported if diseases are to be conquered, if unregulated experimentation is to be curtailed, and if Britain is to remain internationally competitive. The genetic transformation of mankind into giants is actually a symbol of all that can go wrong with science: H.IV is not used to alleviate growth disorders in children; it is formulated under appalling conditions; and its clandestine and reckless development subverts the natural processes governing human evolution. Bensington and Redwood, though not rounded characters, are important indices to the state of scientific research in prewar Britain. Their great achievement – the synthesis of somatotropin – is worthy of the Nobel Prize for Physiology or Medicine, but in late-Victorian and Edwardian times it is initially ignored, and the outcome is catastrophic. If H.IV/somatrem and similar drugs are to alleviate human suffering, their development, Wells makes clear, requires national support and stringent regulation.

Richard Law

The Narrator in Double Exposure in *The War of the Worlds*

[35] Wells, *Experiment in Autobiography*, p.558.