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Modernism, Technology, and the Life Sciences

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"Oh, my God," he said, "we shall know each other now, shan't we? We shall know each other now."

D. H. Lawrence, "The Blind Man"¹

The "Life Sciences" is a loose disciplinary construction, only commonly used since the 1960s, to describe the various sciences applicable to living organisms and the systems that pertain to them: biology, genetics, medicine, environmental studies and other sub-fields. It is, nevertheless, a useful term to apply to the period of modernism, not least because *The Science of Life* (1929-30), the popular synthesis by H. G. Wells, Julian Huxley and G. P. Wells, is one point of origin for the term.² The period saw major developments and debates in many of the fields involved, as well as a growing understanding of the complexity of living systems. What Huxley in 1942 called the "modern synthesis" in evolutionary studies was one outcome of that understanding, but developments in ecology and biochemistry also contributed to knowledge of the internal and external systems governing human and animal life.³

Where biology stood out from the other sciences was in offering the promise of major intervention in human relations, making it a driving force in what we understand as modernity. In *Daedalus, or Science and the Future* (1923), the book which launched the *Today and Tomorrow* series and set the keynote of many futurological debates, J. B. S. Haldane wrote that "the biologist is the most romantic figure on earth at the present day" before imagining a future of abolished disease and medical enhancement.⁴ Julian Huxley commented the same year that "the extension of control in biology will *inter alia* mean the alteration of the modes of man's experience itself."⁵ When his brother Aldous Huxley discussed the impact of biological discovery in his BBC talk on "Science and Civilization" almost a decade later, he focussed on two areas that Haldane had singled out: eugenics and endocrinology, that is, the external management of populations by direct bodily

control and by management of reproduction.⁶ *Brave New World* (1932) is of course a response to those possibilities, yoking them to technologies of distraction and surveillance.

Huxley's relation to science was particularly intimate: he boarded at Haldane's house in Oxford. Much literary understanding of the life sciences, as in the case of physics and mathematics, was more patchy, intermittent and driven by local passions; manifesting itself into both treatments of science in literature and moments where science informs literary *techné*. Partially because of the rapidity of development, this was a field in which there were many popularizer synthesizers, working against the grain of the increasing specialism of scientific practice. There was also a tradition of experts – Haldane, Julian Huxley, Arthur Keith, Joseph Needham and many others – reflecting on the general implications of their specialisms, crossing what was only later seen as a barrier between “two cultures.” Moreover the question of “life” itself – of the inheritance of Vitalism, of the values of the body and its drives, its relation to human civilization – was central to many modernist discourses and their reform modes, often producing what could be called a “biological style,” associated (in different ways) with D. H. Lawrence, William Carlos Williams, and Marianne Moore; with a number of young writers in Cambridge around 1930; and with other groupings which we would be less inclined to call “modernist.”⁷

The Birth of Complexity

It could be argued that it was the new awareness of the complexity of life forms, both internally and in relation to their environment, that gradually edged out the last adherents of Vitalism – the idea that life itself was separate from the rest of creation, expressed in a “soul” or other entity. As one summary put it in 1929, “In biology we do not analyse the complex into the simple, we are continually bringing to life greater complexity.”⁸ Georges Canguilhem calls this the “devitalizing” of life, linking it (in a slightly broader period) to “the intersection of a wide range of techniques: of microextraction and microdissection, or combinatorial algebra, or statistics, or electron microscopy, or enzyme chemistry.”⁹ A defensive campaign in support of Vitalism would be waged – Eugenio Rignano would publish *Man Not a Machine* (1926) in the *Today & Tomorrow* series, espousing his version of Lamarckism – but as in many cases, the series itself provided a reply, Joseph Needham's *Man a Machine* (1927), and by the 1930s materialist explanations of the body were the norm.¹⁰

If the nineteenth-century conception of the animal or human body was largely mechanical and electrical, and tended to yoke it to disciplinary regimes such as Taylorism and various forms of biomechanics, the period after between the wars was marked by a stress on the role of biochemical transmitters. The body had a “postal as well as a telegraphic system,” sending messages via the blood, as Sir Arthur Keith put it.¹¹ For Keith, this is an older and more primitive system than the nerves. The

hormones, as they were christened by Ernest Starling of University College London in 1905, were gradually isolated: thyroid hormone in 1915, insulin in 1921; oestrin, progesterone, androgens and testosterone by mid-century.¹² Otto Loewi's experiments on the frog's heart in 1921 identified "Vagusstoff" (acetylcholine), establishing the existence of neurotransmitters, a chemical component of nerve activity. The notion of "homeostasis," developed by Walter B. Cannon to describe the neuro-endocrine system in 1926, was linked to an emerging understanding of the body as a complex set of interrelated nervous and chemical systems.¹³ In embryology, a focus on the problems of development and differentiation produced major research. The development of tissue culture after Jacques Loeb's 1902 breakthrough (by 1911 clotted plasma could be used as a medium for maintaining cell growth indefinitely) was an added stimulus to biochemistry: life itself, it seemed, could be treated in the laboratory.

Nowhere is complexity more apparent than in genetics. Darwin's depiction of natural selection operating on random changes had produced a major challenge both to man's central place in the order of things and ideas of a directional evolution. What Peter J. Bowler calls the "Eclipse of Darwinism" had produced, by 1900, a number of competing neo-Lamarckian theories, many of them attempting to hold on to a residue of purpose in evolution against the "new materialism."¹⁴ With the rediscovery and dissemination of Mendel's work in 1900 the direction of genetics was set – T. H. Morgan's 1910-15 work on the *Drosophila* gene rapidly produced a sense of the parameters of Mendelian inheritance, for example.

One implication of the new biology was a displacing of the human into what might be called context. In "Philosophic Ants: A Biological Fantasy," a paper read to the Cambridge Heretics in 1922, Julian Huxley argued for a "biological relativity" in which perception and being are related to environment; to think in these terms means to "quit our anthropocentricity."¹⁵ That "context" might be the human's own natural history; it is surely no coincidence that arguably the most enthusiastic interwar popularizer of Freud's ideas in the UK was Sir Arthur Tansley, the eminent ecologist. In *The New Psychology and Its Relation to Life* (1920) he wrote:

The human mind, then, is an organism, which like all organisms is continuously expressing the life that is in it by the discharge of energy. The form and direction which the discharges take are determined absolutely by the structures of the organism – in the case of the mind by the complexes which are developed as the result of the interaction of the instincts with one another and with the whole mental environment.¹⁶

The "complexes" are themselves an internal version of biological complexity. In Tansley's own field, the influential concepts of "biological succession" and "climax community" espoused by the American ecologist Frederic Clements in the early

1900s – involving a form of ontogenetic thinking, a directionality directed at an ideal stable state – was gradually displaced by an ecology in which change is ever-present, and in which the pressures of modernity create a need to intervene in natural processes.¹⁷

What are the literary correlatives of “complexity” and the new biological thinking? The self “expressing the life that is in it by the discharge of energy” (as Tansley put it) is everywhere apparent in Lawrence, seen against the background of environments that nurture or hinder the self’s exfoliation.¹⁸ Lawrence’s writings assert a fundamental biological reality which might be grasped, whether the life of a horse, or the influence of the sun on a naked body; or the chemistry of desire. Maurice, inserting Bertie’s fingers into his empty eye-sockets in Lawrence’s “The Blind Man,” says, “Oh, my God . . . we shall know each other now, shan’t we? We shall know each other now.”¹⁹ Maurice’s knowledge, in Lawrence’s text, is not knowledge of Bertie’s rationalizations and intellectual values, which Maurice rather despises; it is knowledge gained in the dark, among his animals, linked to touch, the blood and the genitals rather than to sight and science. For W. B. Yeats too “generation” is a “blind” force which must ultimately be accepted and affirmed:

I am content to live it all again
And yet again, if it be life to pitch
Into the frog-spawn of a blind man’s ditch,
A blind man battering blind men.²⁰

As Ronan McDonald argues, “A Dialogue of Self and Soul” is “enmeshed in biological struggle and the physical world,” exemplifying a Darwinism at odds with Yeats’s official opposition to the Darwinian and mechanistic worldview.²¹ For Yeats, the “mere complexities” or “complexities of mire or blood” of “Byzantium” are, McDonald suggests, an index of the inescapably biological; the soul’s desire for unity is pitted against complexity but can only be extracted from it via a posthumous untangling.²² The essentially occult nature of Yeats’s reaction to the science of his time – his replacement of its diverse forms of knowledge with the simplified structures of *A Vision* – testifies, among other things, to the difficulties of synthesis involved.

In such accounts the biological is not simply a category that includes the human; it in some senses obviates or undermines the values of consciousness and even language; true bodily knowledge becomes a plunge into the animal. In contrast, “complexity” for many writers may include an understanding of biology that locates it more firmly within the world of human knowledge, or at least an analysis of human existence that might inform literature. An example is Marianne Moore, who sustained an interest in natural history and evolution across her career, reading extremely widely from Humbolt and Darwin to Haldane and Robert Yerkes, attending lectures on the subject at the Brooklyn Institute and American Natural History

Museum, and of course writing many poems on exotic and occasionally less-exotic creatures. Moore's Darwinism informs her attitude to poetic evolution, including her sense of the exposure of her unauthorized first volume of poems, like Darwin's "naked pigeon," in the harsh environment of modernism; her own tendency to cut superfluous or non-functional, as she saw it, sections of her exfoliating poems, or perhaps simply to keep them evolving, for better or worse, like "Poetry" in its drift from 30 to three lines between 1919 and 1967.²³ And finally, there is her tendency to see the syllabic stanza-form as akin to a self-replicating genotype might be seen in terms of her concern with form as acted on by the "instinct" of the poet.²⁴

Moore's letters provide examples of involved forms of biological thinking. A 1921 letter to Bryher moves from the feel of a snake's skin and muscles, "like the complicated orderly appearance of the ropes by which a ship's sails are tethered to the mast" to a comment on anachronism in literary form ("a great many trashy old time novels are being written today . . . and the form annoys one along with the content"); followed by a comment on Dostoyevsky's experimentation; and finally on to marriage ("in Turkey, monogomy is gaining as it is everywhere else").²⁵ What unites these observations is a mode of thought in which form and its mode of reproduction are considered across different fields. Consider the opening of "Virginia Britannia" (1935):

Pale sand edges England's Old
 Dominion. The air is soft, warm, hot
 above the cedar-dotted emerald shore
 known to the red-bird, the red-coated musketeer,
 the trumpet-flower, the cavalier,
 the parson, and the wild parishioner. A deer-
 track in a church-floor
 brick, and a fine pavement tomb with engraved top, remain.²⁶

Here there is a balance of environment (the New World) and inhabitants, with no real distinction between human, plant and animal; between nature and making. The poem describes a complex hybridization, a field through which the poet advances cautiously, as she watches a culture evolve.

The final word on writing as process akin to natural law can be provided by Lorine Niedecker's late-modernist poems of process and observation, and the formal adhesion to biology registered in her poem "Darwin." Its stanzas like Moore's are a template-shape thrusting forward with subtle variation, registering persons, creatures and their environments:

the universe
 not built by brute force

but designed by laws
The details left

to the working of chance
“Let each man hope
and believe
what he can”²⁷

In the universe of uncertainty depicted by Neidecker, the poem’s gappy field is itself a form of environmental mapping; a place of dynamic interactions and a response to the human position between totality and local knowledge.

Bio-politics and World-Planning

If the embodied creative process of the individual was one focus for biological and environmental thinking, another was society more generally. J. B. S. Haldane wrote in 1927 that

one gets the very strong impression that from the quantitative study of animal and plant associations some laws of a very unsuspected and fundamental character are emerging; laws of which much that we know of human history and economics only constitute special and rather complicated cases. When we see human history and sociology against a background of such simpler phenomena, it is hard to doubt that we shall understand ourselves and one another more clearly.²⁸

Applying biological ideas to the “social organism” had been commonplace since Herbert Spencer, and despite early attacks on Spencer’s metaphors from T. H. Huxley and cautions from leading scientists like H. S. Jennings about the incomplete state of knowledge, the study of animal behaviour was readily applied to popular understandings of human societies between the wars, whether it was Pavlov’s experiments with animal conditioning, the “totalitarian” hierarchy of primates at “Monkey Hill” in London Zoo, or the study of the behaviour of ticks – all examples which suggested the potential malleability of human populations.²⁹ A number of writers, notably William Empson, were to follow Julian Huxley in exploring ant and termite societies as reflections of the human.³⁰

The focus on bio-politics was related in turn to the fantasy of intervention. The Eugenics movement had, from its inception, proposed state intervention in human populations, and was supported by a range of writers on the left and right from George Bernard Shaw to W. B. Yeats.³¹ Chemical enhancements of performance

began with experiments on troops in World War I. Experiments in hormone therapy and gender reassignment date from the same period.

The greatest stimulus to such thinking was provided by H. G. Wells, who inspired many scientists to popularize their fields and speculate on human futures. In chapter 9 of *An Experiment in Autobiography* (1934), “A Planned World,” he wrote of the chairs he would like to endow:

From the biological point of view my Professors would be human ecologists; indeed Human Ecology would be a good alternative name for this new history as I conceive it. . . . My new men and the students under them would be working out strands of biological, intellectual, economic consequences. Periods, nations and races they would consider only in so far as these provided them with material facts. They would be related to the older school of historians much as vegetable physiologists ecologists and morphologists are related to the old plant-flattening, specimen-hunting, stamen-counting botanists. The end of all intelligent analysis is to clear the way for synthesis. The clearer their new history became the nearer they would be to efficient world-planning. All this is very obvious to-day but it was by no means clear in 1900.

This is the Wells who berated Aldous Huxley for his parody of planning in *Brave New World*. In fact, Wells’s ideas were in the mainstream in the 1930s, where the pressure of economic and political crisis pushed many towards notions of a rationally planned society: Julian Huxley became convinced of the need for an “organic” planned economy in the 1930s, and organizations as different as the American Technocracy movement and Mosley’s British Union of Fascists proposed social, biological and economic “engineering.”³²

These ideas were not unopposed: eugenics in particular became less popular as the Nazi party applied it brutally in Germany. *Brave New World* is broad in its comedy, and it is, as David Bradshaw points out, ambivalent about the need for control of human societies – certainly Huxley was one of the many drawn to forms of Technocracy and eugenics in the early 1930s, as civilization seemed to stutter, and the novel’s world-controller is in the end a more self-conscious figure than the flawed rebels. But what seems to me most original in Huxley’s satire is less the manipulation of test-tube babies than the stress on repressive desublimation: the control of the sexualised body via total expression of the body’s needs; the attack on repression and any idealization of the sexual object, desire reduced to a comic and stereotyped pneumatics and an ant-like chemical feeding. Huxley’s world is in fact one where the complexity of genetics and social action continues to throw up dissatisfaction; where control can only ever be a general scattering of biological energy.

Along with Wells, literary scientific writers who moved fluidly between real reputations in science, popular journalism and fiction include Edward Herron-Allen and Morley Roberts. The former (discussed briefly in the next section) was translator of Omar Khayyam, expert on the biological order of *foraminifera*, and (as Christopher Blayre) a writer of fantasy and science fiction. The latter was a man of letters as well as a writer of biological syntheses who forged close links with the anatomist Sir Arthur Keith. Keith in turn was part of a group of eminent scientists for whom the values attached to literature were important in sustaining a holistic view of biology and society, including E. Ray Lankester and Walter Langdon-Brown.³³ Langdon-Brown's specialism was endocrinology and the sympathetic nervous system. He was drawn to it, Christopher Lawrence argues, because of a holism which enabled parallels between society and the body as integrated and balanced (or, in contrast, subject to pathological imbalances): "Brown used the endocrine system to bring together mind and body, individual and society, man and animal, and past and present and to integrate all these into a single biological domain."³⁴ Thus he could write on the "biology of social life," and explore, in his essays, a range of topics linking medicine and culture.³⁵

Morley Roberts is a particularly interesting case, not least because he received a warmer welcome from scientists seeking synthesis than he did from literary culture. Julian Huxley for example cites Roberts approvingly in *Essays of a Biologist* (1923), as an author who attempts to link sociology and biology, and in 1934 five scientists wrote to the *Times* pointing out the importance of his *Malignancy and Evolution* to the study of cancer.³⁶ Roberts shared a version of qualified Lamarckism with Rignano and other theorists of "emergent evolution."³⁷ In the 1930s he developed a "Political Ecology" expressed in such texts as *Bio-politics: An Essay in the Physiology, Pathology and Politics of the Social and Somatic Organism* (1938) and *The Behavior of Nations: An Essay on the Conduct of National Organisms in the Nutritional Field* (1941). In his texts, societies are dynamic organisms comprised of competing specialized parts and nations similarly struggle for resources in an anarchic world.³⁸

In Roberts's case, we are at some distance from the fantasies of planned intervention promoted by Wells: the situation is one of perpetual struggle. The novelistic equivalence of this world-view is provided by an author like Theodore Dreiser, who was strongly influenced by Jacques Loeb's mechanistic world-view. Dreiser declared in a 1936 interview that he was interested in "speculative biology."³⁹ His characters struggle blindly in the present, uninterested in the past, and are driven by passions they barely comprehend. This is from *The Stoic* (1947), the last volume of his Cowperwood trilogy. The aging financier and his lover Berenice are visiting Canterbury, where she becomes engrossed in the tombs in the cathedral:

Cowperwood, who saw things in the large, could scarcely endure this minutae. He was but little interested in the affairs of bygone men and women, being so

intensely engaged with the living present. And after a time he slipped outside, preferring the wide sweep of gardens, with their flower-lined walks and views of the cathedral. Its arches and towers and stained-glass windows, this whole carefully executed shrine, still held glamor, but all because of the hands and brains, aspirations and dreams of selfish and self-preserving creatures like himself. . . . Was any man noble? Had there ever been such a thing as an indubitably noble soul? He was scarcely prepared to believe it. Men killed to live – all of them – and wallowed in lust in order to reproduce themselves. In fact, wars, vanities, pretenses, cruelties, greeds, lusts, murder, spelled their true history, with only the weak running to a mythical saviour or god for aid.⁴⁰

The lack of interest in the past; the struggle in a new environment – Cowperwood has moved to London to invest in the underground system – are the keynotes.

But one should also note that one result of evolutionary thinking, and of the kind of futurology promoted by the *Today and Tomorrow* series edited by C. K. Ogden, was an expansion of *uncertainty*. Evolution was, Darwin implied, a catalogue of destruction; even humankind would pass away. Before that happened, radical changes might occur; biology might wander down unanticipated pathways; human populations and environment might shift radically. That too was canvassed by science fiction: Well's own pessimistic projections of degeneration in *The Time Machine* haunt his desire for planning. Katharine Burdekin's *Proud Man* (1934), to take another example, describes a time-traveller (the "person") from a future society in which there is no gender and people are self-fertilizing mind-readers; the same writer's *The End of this Day's Business* – published many years after it was written – describes an inverted future society ruled by woman in a kind of benign fascism, in which men are regarded as the hapless weaker sex. Closer to the period's present, the Harlem Renaissance author George S. Schuyler's *Black No More: Being an Account of the Strange and Wonderful Workings of Science in the Land of the Free, AD 1933-1940* (1931) describes an African-American scientist who invents a process for turning black people into white, with hilarious consequences, not least an inability to identify "race" biologically or culturally. Inherited certainties of gender and race were unfixed, and world-planning in that context seeks to stabilize that which is dangerously contingent.

Engineering Bodies: Bottled Babies and Pickled Glands

Despite the uncertainties described above, a purposive Lamarkism often persisted in the analysis of technology as it applied to the body. In such texts as J. D. Bernal's *The World, Flesh and the Devil*, the body is refigured in terms of its technological extensions. Responding to this in his critique of scientific and technological modernity in *The Art of Being Ruled* (1926), Wyndham Lewis attacked what he called "biologic transformation" – the idea of the extension of human capacities which he

saw in the Futurists and in Haldane's *Daedalus* – as unhelpful in human terms, pointing out (after Locke) that hearing a thousand times more acutely would only mean we existed in a roar of distraction.⁴¹ The question of to what extent the human might be reconfigured by medical technologies remained open.

Hormones, as we have already noted, were central to notions of social-biological engineering, suggesting a direct access to human emotions at a primitive level. Charles Duff's play *Mind Products Limited: A Melodrama of the Future* (1932) satirises the notion of social control primed by endocrines; as does *Brave New World* the same year. Experimentation with the individual application of hormone therapy was common: the Steinach Operation undertaken by Freud and Yeats in the interests of rejuvenation is perhaps the best known example. Novels of the 1920s like Gertrude Atherton's *Black Oxen* (1923) show a lively interest in rejuvenation technologies, but by the end of the decade glandular extracts were as likely to be depicted as quackery. Angus McLaren lists a succession of novels that deal with rejuvenation techniques, increasingly the vehicle for satire: C. P. Snow's *New Lives for Old* (1933), M. E. Mitchell's *Yet in My Flesh* (1933), John Gloag's *Winter's Youth* (1934), and Huxley (again) in *After Many a Summer* (1939).⁴² In the latter, deferred aging is investigated by the scientist Dr Obispo. When he tracks down the pioneering Earl of Gonister, who has treated himself with raw carp intestines, he finds a 200-year old ape hidden in caverns beneath his ancestral home: the end-result predicted by the theory of neotony, in which evolutionary progress is achieved by the deferring of adult characteristics (so the human is a "foetal ape" that normally dies before maturity).⁴³

Imagination of experiments with gender are a particularly fertile area, though they take predictably gendered lines. As McLaren points out, the role of female hormones was a particularly important area in the 1920s.⁴⁴ Christopher Blayre's *The Cheetah-Girl* appeared only in a privately-printed edition of 25 in 1923, understandably given its sex with a thirteen year-old, lesbianism, as well as the inter-species procreation hinted at in the title. Referencing E. Ray Lankester's classic experiments on parthenogenesis in sea-urchins, it explores the idea that "the action of the spermatozoon is primarily mechanicity, it merely perforates and excites the ovum and 'sets it going,' so to speak, and may therefore be replaced by artificial and mechanical means."⁴⁵ If this is the case, "why should there be any limits to the possibility of miscegenation?" (249). Thus the cheetah-human cross: "[t]he serum of the one accommodated the corpuscles of the other without any trace of haemolysis" (284). The result is a being at once sexy and shocking, the wife (and experimental animal) whom at novel's end the narrator promises to kill.

If the feminine is the field of experiment, masculine accounts – as in Yeats's Steinach Operation – tend to focus on the extension of personal power. Masculine glands are explored by the Harlem Renaissance writer, Rudolph Fisher in his detective novel *The Conjure-Man Dies* (1932). Fisher, who gained an MA in biology at

Brown and graduated from Harvard Medical School, describes the African prince and scientist Frimbo, who can seemingly read the future and declares that “Psychology is really a branch of biology.”⁴⁶ He and the African-American doctor Archer, who declares himself insufficiently up on endocrines, discuss “the hopelessness of applying physio-chemical methods to psychological problems” (127). Nevertheless Frimbo keeps “male glands” in jars, and what enables him to lift himself out of “the common order of things” and transcend causality is the secret “rite of the gonad.” As he explains,

The germplasm, of which the gonad is the only existing sample, is the unbroken heritage of the past. It is protoplasm which has been continuously maintained throughout thousands of generations . . . It is therefore the only matter which brings into the present every influence which the past has imprinted upon life. He who can learn its use can be master of his past. And he who can master his past, that man is free. (159)

Here he sounds something like Propter, Huxley’s version of the science writer and philosopher Gerald Heard in *After Many a Summer* (1939), setting the determined past against an eternity of possibility. Freedom, in the novel, includes the freedom to walk towards a death produced by Frimbo’s own (adulterous) bodily urges.

Equally fascinating was the idea that the production of humans could be directly engineered, as they are in Huxley’s novel; that reproduction could become production. John Hargrave’s *The Imitation Man* (1931) is one of a range of novels on test-tube babies published in the interwar period, initiated perhaps by the “rows upon rows of gravid bottles” in “vast state incubators” predicted in Aldous Huxley’s *Crome Yellow* (1921).⁴⁷ Hargrave, as leader of the eccentric group known as the Kindred of the Kibbo Kift, may be the original of Webley in Huxley’s *Point Counter Point* – in which case it is interesting to speculate whether Huxley was aware of *The Imitation Man* as he wrote *Brave New World*.⁴⁸ The imitation man is Charles Chapman, a homunculus created in a bottle buried in a pile of horse dung by the chemist Harold Chater. He feeds off pure energy (“actinic rays”) and quickly grows into splendid manhood, then is exploited by the biologist Mostyn, who combines with the financier Sir Betram Emmet and uses Chapman’s extreme empathetic power – effectively mind-reading – to take over much of the world’s business. But Chapman eventually outgrows his sponsors and becomes a virtual dictator. Finally, when he marries his first love, Chater’s sister Ella, he is burned up in the “act of love,” returning to “elemental salts.”

The most marked feature of Chapman is mimesis: he imitates others, enacting their desires – blurting out Chater’s obsession with a shop-girl and wooing her; ordering luxuries dreamed of by the housekeeper. He learns language in a manner akin to that later described in B. F. Skinner’s *Verbal Behavior* (1957), absorbing cues.

This can produce wildly inappropriate responses – initially random; later poorly judged, as when he uses the brutal language of a working class couple with Ella: “I knew what yew was after all along.”⁴⁹ But eventually he has assimilated so many people that he comes to approach the status of everyman; his discourse ceases to be random and is smoothed like a pebble. This produces a simulacrum of free will:

At first he had no mind of his own, and so unknowingly took on the mental mechanics of others. He had no feelings of his own, but received the sensations of others. He had no will of his own, but by degrees the wills of others engraved within him an average will. The will of one person would counterbalance or cancel out the will of someone else . . . But all the time one general quality was being stamped into Mr. Chapman. He began, at last, to feel that he was “himself.” He was nothing of the sort, of course. He was everybody else, but never himself. (206-7)

This is akin to the self elicited by compulsory intersubjectivity in *Brave New World*. Chapman is at the same time a perfect emblem of democracy and a parody of that democracy; a leader who can absorb the will of the crowd but who has nothing to add to its views; whose self-assertion is without content. He merely *is* the situation rather than intervening in it. It is significant that his demise is linked to sexual passion – he cannot incorporate “nature’s increase,” as Ezra Pound would have put it; nothing grows from him.⁵⁰ The constructed human is merely a statistical person rather than an extension of the human.

The Uses of Pathology

Oscar Wilde, while still at Oxford in the late 1870s, noted that the “science of society . . . rests on the science of life: sociology on Biology,” before moving on to note “the increased differentiation of function and structure’ in evolution.”⁵¹ *The Picture of Dorian Gray* can be read as an illustration of August Weismann’s distinction between unchanging germ-cell and time-bound soma.⁵² But it also is an illustration of a pathology: in producing himself as artwork, Dorian has interrupted the dynamic process of evolution. Indeed, Wilde’s work and its reception reflects the shift in conceptions of “genius” that took place in the work of Nietzsche, Max Nordau and others, in which rather than representing the “central” human, the genius is “sick,” living close to madness and exclusion.

Contemporary popular biology reinforced this view that the pathological may be productive. Morley Roberts emphasized accident, mistake, and stress in evolution, with many evolutionary developments being triggered, in his view, by a response to a pathological development: the nervous system, for example, was produced by a cellular invasion from outside the body.⁵³ His work finds an echo in C. P. Donnison’s

Civilization and Disease (1937), with an introduction by Langdon-Brown, which depicts civilization as a permanent state of excess in “the kinetic system, in which the brain, thyroid gland, adrenal glands and the sympathetic nervous system have become hyper-active.”⁵⁴ Roberts concurred, seeing the body in terms of perpetual internal glandular warfare rather than a well-integrated homeostasis.

Haldane was also willing to understand the evolution of literature as paralleling that of biology in its move towards complexity and over-elaboration:

To my mind the closest analogy to the evolution of a given group is the history of art and literature of a civilization. The clumsy primitive forms are replaced by a great variety of types. Different schools arise and decline more or less rapidly. Finally, a period of decline sets in, characterized by archaism like that of the last ammonites. And it is difficult not to compare some of the fantastic animals of the declining periods of a race with the work of Miss Sitwell, or the clumsy but impressive with that of Epstein.⁵⁵

For Walter Langdon-Brown, the childishness of modern writing is evidence of neotony, or an extended childhood.⁵⁶ As he noted in a 1931 in a study of anorexia, referencing Keith, “the tendency to carry youthful characters into adult life has played a large part in the evolution of human races.” While this is seen as detrimental in the anorexic’s refusal of adulthood, the payoff is “a plasticity out of which higher characteristics can be moulded.”⁵⁷ Biological openness finds its correlative in literary experiment.

A final example of productive pathology can be provided. William Carlos Williams in *A Novelette* (1932), writes the flu epidemic of 1929 into his prose, weaving sickness-as-inspiration and botany into a poetics of plant life in which, say, the great mullein is an emblem of noble ruin. Williams describes the epidemic itself as both a distraction and the re-assignment and re-focusing of attention. He even finds a physiological basis for the equation of epidemic and the release of static constellations of knowledge, noting that the strong toxins of flu create a state of useful fatigue:

After the flu a weakness persists that is out of all proportion to the coincident anatomical changes, proving the effects of an evanescent poison of great intensity. Also proving that all the information that is static in the liberal arts and sciences can, by intelligent understanding, be made active – loosed from a cupboard of dullness – Thus fatigue, so called, dulls the perception. It is hard to keep on a basis of actuality.

Sycamore trees shed their bark differently from most others, by patches, leaving a green of yellow freshness for the beginning year. Nijinski’s tights.⁵⁸

In this text Surrealism is an “epidemic” that will infect America, renewing the word; it is a rebirth and a collision with the modern world (literally, in the text, a car crash). William’s style, with its disconnected observations, figured as a response to (and indeed an anticipation of) that epidemic.

This chapter has necessarily ranged over a number of loosely-connected examples, seeking points of entry into a confluence of science and literature that has barely been defined, and in which more work is needed. What unites the examples, it seems to me, is a sense of the contingency and malleability of the human; both an uncertainty about the complex possibilities raised by science and a desire to grasp those possibilities. The Life Sciences were building, in the period, a dominant role in the understanding of human beings, but the syntheses on offer were less certain. Literature’s relation to these debates ranges from the productivity of styles interpenetrated by medical or evolutionary ideas (Moore, Williams and others) to the speculative, and often pessimistic, description of possible worlds transformed by science (Huxley, Burdekin and others). This in turn reflects a fundamental uncertainty in the face of scientific hegemony, which both threatened a cultural dominance and offered exciting possibilities of cultural change, as well as new forms of knowledge and *praxis*.

In this sense, the period of what we call modernism (albeit a disparate and conflicted body or writing) is one of openness to possible futures, as signalled by the rise of Science Fiction in the period from 1926. In the post-war world, biology and genetic research become more specialized and distant from literary culture, and the study of the human more influenced by cybernetics and systems theory of the kind developed at MIT by the mathematician Norbert Weiner – himself a Harvard acquaintance of Eliot who worked in Cambridge in the 1920s. The world which the life sciences posited became more distinct and defined by disciplinary needs, and speculation rarer. Science continues to give rise to utopian forms of thinking – on forms of chemical enhancement, genetic manipulation and body-extension; on technology and the post-human; on networked groupings – but it is a notable fact of recent more dystopian texts, by William Gibson, David Mitchell, or Gary Shteyngart, say, that they deal with near futures which are closely and consciously modelled on our own time and preoccupied with state and corporate control. That bespeaks, perhaps, a relative pessimism about the potential of technology and biology which reflects a more closed cultural field.

NOTES

¹ D. H. Lawrence, "The Blind Man," in *England, My England and Other Stories*, ed. Bruce Steele (Cambridge: Cambridge University Press, 1990), 62.

² See H. G. Wells, Julian Huxley, and G. P. Wells, *The Science of Life: A Summary of Contemporary Knowledge about Life and its Possibilities*, 3 vols. (London: Amalgamated Press, 1929-30).

³ See Julian Huxley, *Evolution: The Modern Synthesis* (London: George Allen and Unwin, 1942). The 'Modern Synthesis' involved the integration of Darwinian and Mendelian thought within a scientific paradigm involving genetics, statistics, the study of populations, embryology, biology and paleontology.

⁴ J. B. S. Haldane, *Daedalus, or Science and the Future* (London: Kegan Paul, Trench & Trubner, 1923), 77. The Today & Tomorrow series – a combination of futurology and provocative essay – was published by Kegan Paul (and E. P. Dutton in the U.S.A.) between 1923 and 1931, developed by the linguist and philosopher C. K. Ogden, who was central to the Cambridge dialogue between the arts and science, and was later responsible for the development of Basic English.

⁵ Julian Huxley, *Essays of a Biologist* (London: Chatto & Windus, 1923), viii.

⁶ Aldous Huxley, "Science and Civilization," *The Hidden Huxley*, ed. David Bradshaw (London: Faber & Faber, 1994), 105-114.

⁷ On Cambridge, see kitt price [Katy Price], "Finite but Unbounded: *Experiment Magazine*, Cambridge, England, 1928-31," *Jacket* 20, <http://jacketmagazine.com/20/orice-expe.html>.

⁸ Herbert Wildon Carr, "Life and Matter," *The Realist* 2:2 (1929): 196.

⁹ Georges Canguilhem, "On the History of the Life Sciences since Darwin," in *Ideology and Rationality in the History of the Life Sciences*, trans. Arthur Goldhammer (Cambridge, MA: MIT Press, 1988), 117.

¹⁰ Lamarkism, the belief derived from the French biologist Jean-Baptiste Lamarck that acquired characteristics may be transmitted to offspring, enjoyed a resurgence in the early twentieth-century: see Peter J. Bowler, *The Eclipse of Darwinism: Anti-Darwinian Evolution Theories in the Decades Around 1900* (Baltimore: Johns Hopkins University Press, 1992). The idea that evolution may be purposive or teleological similarly appealed to many writers, often linked to versions of Orthogenesis: the idea that evolution represents a linear infolding according to some inner force or principal of design.

¹¹ Arthur Keith, *Engines of the Human Body*, 2nd ed. (London: Williams & Norgate, 1925), 222.

¹² A. F. Hughes, "A History of Endocrinology," *Journal of the History of Medicine and Allied Sciences*, 32 (1977): 292-313.

¹³ V. C. Medvei, *The History of Clinical Endocrinology: A Comprehensive Account of Endocrinology from Earliest Times to the Present Day*, rev. ed. (Carnforth: Parthenon Press, 1993), 415.

¹⁴ Peter J. Bowler *Science for All: The Popularisation of Science in Early Twentieth-Century Britain* (Chicago: University of Chicago Press, 2009), 50.

¹⁵ Huxley, *Essays of a Biologist*, 200-1.

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- ¹⁶ Arthur G. Tansley, *The New Psychology and Its Relation to Life* (London: Allen & Unwin, 1920), 71.
- ¹⁷ See Peder Anker, *Imperial Ecology: Environmental Order in the British Empire, 1895–1945* (Cambridge: Harvard University Press, 2001).
- ¹⁸ On Lawrence's "bio-centrism," see Margot Norris, *Beasts of the Modern Imagination: Darwin, Nietzsche, Kafka, Ernst, & Lawrence* (Baltimore: Johns Hopkins University Press, 1985).
- ¹⁹ Lawrence, "The Blind Man," 62.
- ²⁰ W. B. Yeats, "A Dialogue of Self and Soul," in *The Collected Works of W. B. Yeats, Vol. I: The Poems*, 2nd edn, ed. Richard J. Finneran (New York: Scribner, 1997), 236.
- ²¹ Ronan McDonald, "Darwinian Traces in Yeats's Poetry," in *Science in Modern Poetry*, 160.
- ²² Yeats, *Poems*, 252.
- ²³ See, for example, Susan McCabe, "Survival of the Queerly Fit: Darwin, Marianne Moore, and Elizabeth Bishop," *Twentieth-Century Literature* 55:4 (2009): 547-571; Robin G. Schulze, "Textual Darwinism: Marianne Moore, the Text of Evolution, and the Evolving Text," *Text* 11 (1998): 270-305.
- ²⁴ See Robin G. Schulze, *The Degenerate Muse: American Nature, Modernist Poetry, and the Problem of National Hygiene* (New York: Oxford University Press, 2013), 171-78. Moore's stanza-patterns often involve a syllabic grid that is replicated – an almost mathematical pattern that is independent of the traditional arrangements of stress or rhyme.
- ²⁵ Moore to Bryher, August 31, 1921, in *The Selected Letters of Marianne Moore*, ed. Bonnie Costello, Celeste Goodridge and Cristanne Miller (New York: Alfred A. Knopf, 1997), 176-77.
- ²⁶ *The Poems of Marianne Moore*, ed. Grace Schulman (New York: Viking, 2003), 212.
- ²⁷ Lorine Niedecker, "Darwin", *Collected Works*, ed. Jenny Penberthy (Berkeley: University of California Press, 2002), 299.
- ²⁸ J. B. S. Haldane, "The Future of Biology," in *Possible Worlds* (London: Evergreen, 1940), 137.
- ²⁹ See Jonathan Burt, "Violent Health and the Moving Image: London Zoo and Monkey Hill," in *Animals in Human Histories: The Mirror of Nature and Culture*, ed. Mary J. Henninger-Voss (Rochester: University of Rochester Press, 2002), 258-94; Charlotte Sleight, *Six Legs Better: A Cultural History of Myrmecology* (Baltimore: Johns Hopkins University Press, 2007).
- ³⁰ See Kitt Price [Katy Price], "William Empson, Ants and Aliens," in *Science in Modern Poetry: New Directions*, ed. John Holmes (Liverpool: Liverpool University Press, 2012), 116-29, as well as Price's essay in the present volume; and Tim Armstrong, "The Human Animal: Biological Tropes in Interwar Poetry," in *Science in Modern Poetry*, 101-15.
- ³¹ See Donald J. Childs, *Modernism and Eugenics: Woolf, Eliot, Yeats and the Culture of Degeneration* (Cambridge: Cambridge University Press, 2001).
- ³² On Huxley, see Peder Anker, *Imperial Ecology*, 204-8; on the United States, Edwin T. Layton, *The Revolt of the Engineers*, 2nd ed. (Baltimore: Johns Hopkins University Press, 1986).

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- ³³ See Joseph Lester, *E. Ray Lankester and the Making of Modern British Biology* (Oxford: British Society for the History of Science, 1995).
- ³⁴ Christopher Lawrence, "A Tale of Two Sciences: Bedside and Bench in Twentieth-century Britain," *Medical History*, 43 (1999): 443.
- ³⁵ See, for example, Sir Walter Langdon-Brown, "The Biology of Social life," in *Thus We are Men* (London: Kegan Paul, Trench, Trubner, 1938).
- ³⁶ Storm Jameson, *Morley Roberts: The Last Eminent Victorian* (London: Unicorn Press, 1961), 36; Christopher Lawrence, "Still Incommunicable: Clinical Holists and Medical Knowledge in Interwar Britain," in *Greater than the Parts: Holism in Biomedicine 1920-1950*, ed. Christopher Lawrence and George Weisz (New York, Oxford University Press, 1998), 94-111; Julian Huxley, *Essays of a Biologist*, 75.
- ³⁷ See C. Lloyd Morgan, *Emergent Evolution* (London: Williams and Norgate, 1923).
- ³⁸ See Rhodri Hayward, "The Biopolitics of Arthur Keith and Morley Roberts," in *Regenerating England: Science, Medicine and Culture in Inter-war Britain*, ed. Christopher Lawrence and Anna-K. Mayer (Amsterdam: Rodopi, 2000), 251-74.
- ³⁹ *Theodore Dreiser Interviews*, ed. Frederic E. Rusch and Donald Pizer (Urbana: University of Illinois Press, 2004), 293.
- ⁴⁰ Theodore Dreiser, *The Stoic* (London: Doubleday, 1947), XXX.
- ⁴¹ Wyndham Lewis, *The Art of Being Ruled*, ed. Reed Way Dasenbrock (Santa Rosa: Black Sparrow Press, 1989), 191.
- ⁴² Angus McLaren, *Reproduction by Design: Sex, Robots, Trees, and Test-tube Babies in Interwar Britain* (Chicago: University of Chicago Press, 2012), 94-9; Susan Merrill Squier, *Babies in Bottles: Twentieth-Century Visions of Reproductive Technology* (New Brunswick: Rutgers University Press, 1994).
- ⁴³ On literary responses to neoteny, see Armstrong, "The Human Animal," 112-15.
- ⁴⁴ McLaren, *Reproduction by Design*, 100.
- ⁴⁵ Christopher Blayre [Edward Herron-Allen], *The Cheetah-Girl* (London: privately printed, 1923), 249.
- ⁴⁶ Rudolph Fisher, *The Conjure-Man Dies: A Mystery Tale of Dark Harlem* (New York: Covici-Friede, 1932), 106.
- ⁴⁷ Aldous Huxley, *Crome Yellow* (1921; London: Chatto & Windus, 1949), 47.
- ⁴⁸ David Bradshaw, "Huxley's 'Tinpot Mussolini' and the KKK's 'White Fox': A New Source for Everard Webley and the Brotherhood of British Freemen in 'Point Counter Point,'" *Aldous Huxley Annual* 2 (2002): 146-59.
- ⁴⁹ John Hargrave, *The Imitation Man* (London: Gollancz, 1931), 129.
- ⁵⁰ "Usury kills the child in the womb / And breaks short the young man's courting / Usury brings age into youth; it lies between the bride / and the bridegroom / Usury is against Nature's increase." *The Cantos of Ezra Pound* (New York: New Directions, 1996), 250.
- ⁵¹ *Oscar Wilde's Oxford Notebooks: A Portrait of Mind in the Making*, ed. Philip E. Smith and Michael S. Helfand (Oxford: Oxford University Press, 1989), 109.

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- ⁵² See Michael Wainwright, *Toward a Sociobiological Hermeneutic* (New York: Palgrave Macmillan, 2012), 25-48.
- ⁵³ Morley Roberts, *Malignancy and Evolution: A Biological Inquiry into the Nature and Causes of Cancer* (London: Eveleigh, Nash & Grayson, 1926) and *The Serpent's Fang: Essays in Biological Criticism* (London: Eveleigh, Nash & Grayson, 1930).
- ⁵⁴ C. P. Donnison, *Civilization and Disease* (London: Ballière, Tindall and Cox, 1937), 77-8.
- ⁵⁵ J. B. S. Haldane, "Darwinism Today," in *Possible Worlds*, 49.
- ⁵⁶ Walter Langdon-Brown, "Myth, Phantasy and Mary Rose," in *Thus We are Men*, 123-51.
- ⁵⁷ *Anorexia Nervosa: A Discussion* (London: W. Daniel, 1931), 17.
- ⁵⁸ William Carlos Williams, *Imaginations*, ed. Webster Schott (London: MacGibbon & Kee, 1970), 296.