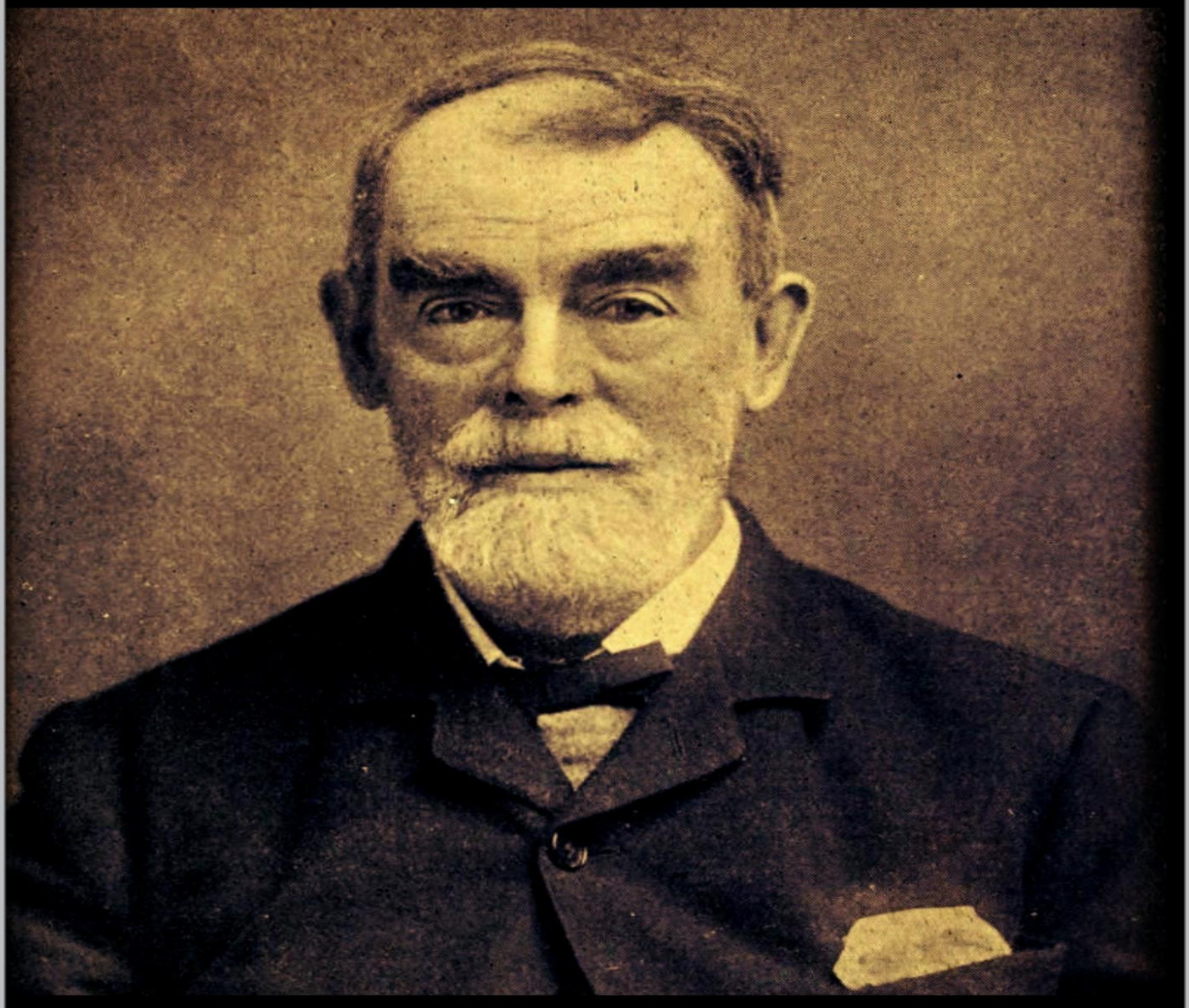
Unconscious Memory

Samuel Butler



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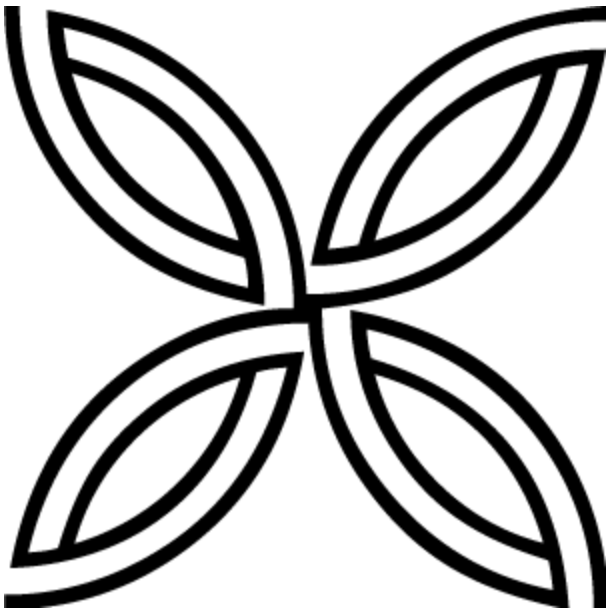

Note

For many years a link in the chain of Samuel Butler's biological works has been missing. "Unconscious Memory" was originally published thirty years ago, but for fully half that period it has been out of print, owing to the destruction of a large number of the unbound sheets in a fire at the premises of the printers some years ago. The present reprint comes, I think, at a peculiarly fortunate moment, since the attention of the general public has of late been drawn to Butler's biological theories in a marked manner by several distinguished men of science, notably by Dr. Francis Darwin, who, in his presidential address to the British Association in 1908, quoted from the translation of Hering's address on "Memory as a Universal Function of Original Matter," which Butler incorporated into "Unconscious Memory," and spoke in the highest terms of Butler himself. It is not necessary for me to do more than refer to the changed attitude of scientific authorities with regard to Butler and his theories, since Professor Marcus Hartog has most kindly consented to contribute an introduction to the present edition of "Unconscious Memory," summarising Butler's views upon biology, and defining his position in the world of science. A word must be said as to the controversy between Butler and Darwin, with which Chapter IV is concerned. I have been told that in reissuing the book at all I am committing a grievous error of taste, that the world is no longer interested in these "old, unhappy far-off things and battles long ago," and that Butler himself, by refraining from republishing "Unconscious Memory," tacitly admitted that he wished the controversy to be consigned to oblivion. This last suggestion, at any rate, has no foundation in fact. Butler desired nothing less than that his vindication of himself

against what he considered unfair treatment should be forgotten. He would have republished "Unconscious Memory" himself, had not the latter years of his life been devoted to all-engrossing work in other fields. In issuing the present edition I am fulfilling a wish that he expressed to me shortly before his death.
R. A. Streatfeild.

Introduction

By Marcus Hartog

In reviewing Samuel Butler's works, "Unconscious Memory" gives us an invaluable lead; for it tells us (Chaps. II, III) how the author came to write the Book of the Machines in "Erewhon" (1872), with its foreshadowing of the later theory, "Life and Habit," (1878), "Evolution, Old and New" (1879), as well as "Unconscious Memory" (1880) itself. His fourth book on biological theory was "Luck? or Cunning?" (1887). [0a]
Besides these books, his contributions to biology comprise several essays: "Remarks on Romanes' Mental Evolution in Animals , contained in "Selections from Previous Works" (1884) incorporated into "Luck? or Cunning," "The Deadlock in Darwinism" (Universal Review , April-June, 1890), republished in the posthumous volume of "Essays on Life, Art, and Science" (1904), and, finally, some of the "Extracts from the Notebooks of the late Samuel Butler," edited by Mr. H. Festing Jones, now in course of publication in the New Quarterly Review .

Of all these, "LIFE AND HABIT" (1878) is the most important, the main building to which the other writings are buttresses or, at most, annexes. Its teaching has been summarised in "Unconscious Memory" in four main principles: "(1) the oneness of personality between parent and offspring; (2) memory on the part of the offspring of certain actions which it did when in the persons of its forefathers; (3) the latency of that memory until it is rekindled by a recurrence of the associated ideas; (4) the unconsciousness with which habitual actions come to be performed." To these we must add a fifth: the

purposiveness of the actions of living beings, as of the machines which they make or select.

Butler tells ("Life and Habit," p. 33) that he sometimes hoped "that this book would be regarded as a valuable adjunct to Darwinism." He was bitterly disappointed in the event, for the book, as a whole, was received by professional biologists as a gigantic joke—a joke, moreover, not in the best possible taste. True, its central ideas, largely those of Lamarck, had been presented by Hering in 1870 (as Butler found shortly after his publication); they had been favourably received, developed by Haeckel, expounded and praised by Ray Lankester. Coming from Butler, they met with contumely, even from such men as Romanes, who, as Butler had no difficulty in proving, were unconsciously inspired by the same ideas—" Nur mit ein bischen ander'n Wörter ."

It is easy, looking back, to see why "Life and Habit" so missed its mark. Charles Darwin's presentation of the evolution theory had, for the first time, rendered it possible for a "sound naturalist" to accept the doctrine of common descent with divergence; and so given a real meaning to the term "natural relationship," which had forced itself upon the older naturalists, despite their belief in special and independent creations. The immediate aim of the naturalists of the day was now to fill up the gaps in their knowledge, so as to strengthen the fabric of a unified biology. For this purpose they found their actual scientific equipment so inadequate that they were fully occupied in inventing fresh technique, and working therewith at facts—save a few critics, such as St. George Mivart, who was regarded as negligible, since he evidently held a brief for a party standing outside the scientific world.

Butler introduced himself as what we now call "The Man in the Street," far too bare of scientific clothing to satisfy the Mrs. Grundy of the domain: lacking all recognised tools of science and all sense of the difficulties in his way, he

proceeded to tackle the problems of science with little save the deft pen of the literary expert in his hand. His very failure to appreciate the difficulties gave greater power to his work—much as Tartarin of Tarascon ascended the Jungfrau and faced successfully all dangers of Alpine travel, so long as he believed them to be the mere "blagues de réclame" of the wily Swiss host. His brilliant qualities of style and irony themselves told heavily against him. Was he not already known for having written the most trenchant satire that had appeared since "Gulliver's Travels"? Had he not sneered therein at the very foundations of society, and followed up its success by a pseudo-biography that had taken in the "Record" and the "Rock"? In "Life and Habit," at the very start, he goes out of his way to heap scorn at the respected names of Marcus Aurelius, Lord Bacon, Goethe, Arnold of Rugby, and Dr. W. B. Carpenter. He expressed the lowest opinion of the Fellows of the Royal Society. To him the professional man of science, with self-conscious knowledge for his ideal and aim, was a medicine-man, priest, augur—useful, perhaps, in his way, but to be carefully watched by all who value freedom of thought and person, lest with opportunity he develop into a persecutor of the worst type. Not content with blackguarding the audience to whom his work should most appeal, he went on to depreciate that work itself and its author in his finest vein of irony. Having argued that our best and highest knowledge is that of whose possession we are most ignorant, he proceeds: "Above all, let no unwary reader do me the injustice of believing in me. In that I write at all I am among the damned."

His writing of "EVOLUTION, OLD AND NEW" (1879) was due to his conviction that scant justice had been done by Charles Darwin and Alfred Wallace and their admirers to the pioneering work of Buffon, Erasmus Darwin, and Lamarck. To repair this he gives a brilliant exposition of

what seemed to him the most valuable portion of their teachings on evolution. His analysis of Buffon's true meaning, veiled by the reticences due to the conditions under which he wrote, is as masterly as the English in which he develops it. His sense of wounded justice explains the vigorous polemic which here, as in all his later writings, he carries to the extreme.

As a matter of fact, he never realised Charles Darwin's utter lack of sympathetic understanding of the work of his French precursors, let alone his own grandfather, Erasmus. Yet this practical ignorance, which to Butler was so strange as to transcend belief, was altogether genuine, and easy to realise when we recall the position of Natural Science in the early thirties in Darwin's student days at Cambridge, and for a decade or two later. Catastropharianism was the tenet of the day: to the last it commended itself to his Professors of Botany and Geology,—for whom Darwin held the fervent allegiance of the Indian scholar, or chela , to his guru . As Geikie has recently pointed out, it was only later, when Lyell had shown that the breaks in the succession of the rocks were only partial and local, without involving the universal catastrophes that destroyed all life and rendered fresh creations thereof necessary, that any general acceptance of a descent theory could be expected. We may be very sure that Darwin must have received many solemn warnings against the dangerous speculations of the "French Revolutionary School." He himself was far too busy at the time with the reception and assimilation of new facts to be awake to the deeper interest of far-reaching theories.

It is the more unfortunate that Butler's lack of appreciation on these points should have led to the enormous proportion of bitter personal controversy that we find in the remainder of his biological writings. Possibly, as suggested by George Bernard Shaw, his acquaintance and admirer, he was also swayed by philosophical resentment at that banishment of

mind from the organic universe, which was generally thought to have been achieved by Charles Darwin's theory. Still, we must remember that this mindless view is not implicit in Charles Darwin's presentment of his own theory, nor was it accepted by him as it has been by so many of his professed disciples.

" UNCONSCIOUS MEMORY" (1880).—We have already alluded to an anticipation of Butler's main theses. In 1870 Dr. Ewald Hering, one of the most eminent physiologists of the day, Professor at Vienna, gave an Inaugural Address to the Imperial Royal Academy of Sciences: "Das Gedächtniss als allgemeine Funktion der organisirter Substanz" ("Memory as a Universal Function of Organised Matter"). When "Life and Habit" was well advanced, Francis Darwin, at the time a frequent visitor, called Butler's attention to this essay, which he himself only knew from an article in "Nature." Herein Professor E. Ray Lankester had referred to it with admiring sympathy in connection with its further development by Haeckel in a pamphlet entitled "Die Perigenese der Plastidule." We may note, however, that in his collected Essays, "The Advancement of Science" (1890), Sir Ray Lankester, while including this Essay, inserts on the blank page [0b] —we had almost written "the white sheet"—at the back of it an apology for having ever advocated the possibility of the transmission of acquired characters.
" Unconscious Memory" was largely written to show the relation of Butler's views to Hering's, and contains an exquisitely written translation of the Address. Hering does, indeed, anticipate Butler, and that in language far more suitable to the persuasion of the scientific public. It contains a subsidiary hypothesis that memory has for its mechanism special vibrations of the protoplasm, and the acquired capacity to respond to such vibrations once felt upon their repetition. I do not think that the theory gains

anything by the introduction of this even as a mere formal hypothesis; and there is no evidence for its being anything more. Butler, however, gives it a warm, nay, enthusiastic, reception in Chapter V (Introduction to Professor Hering's lecture), and in his notes to the translation of the Address, which bulks so large in this book, but points out that he was "not committed to this hypothesis, though inclined to accept it on a prima facie view." Later on, as we shall see, he attached more importance to it.

The Hering Address is followed in "Unconscious Memory" by translations of selected passages from Von Hartmann's "Philosophy of the Unconscious," and annotations to explain the difference from this personification of " The Unconscious " as a mighty all-ruling, all-creating personality, and his own scientific recognition of the great part played by unconscious processes in the region of mind and memory.

These are the essentials of the book as a contribution to biological philosophy. The closing chapters contain a lucid statement of objections to his theory as they might be put by a rigid necessitarian, and a refutation of that interpretation as applied to human action.

But in the second chapter Butler states his recession from the strong logical position he had hitherto developed in his writings from "Erewhon" onwards; so far he had not only distinguished the living from the non-living, but distinguished among the latter machines or tools from things at large . [0c] Machines or tools are the external organs of living beings, as organs are their internal machines: they are fashioned, assembled, or selected by the beings for a purposes so they have a future purpose , as well as a past history . "Things at large" have a past history, but no purpose (so long as some being does not convert them into tools and give them a purpose): Machines have a Why? as well as a How?: "things at large" have a How?

only.
In “Unconscious Memory” the allurements of unitary or monistic views have gained the upper hand, and Butler writes (p. 23):—
“ The only thing of which I am sure is, that the distinction between the organic and inorganic is arbitrary; that it is more coherent with our other ideas, and therefore more acceptable, to start with every molecule as a living thing, and then deduce death as the breaking up of an association or corporation, than to start with inanimate molecules and smuggle life into them; and that, therefore, what we call the inorganic world must be regarded as up to a certain point living, and instinct, within certain limits, with consciousness, volition, and power of concerted action. It is only of late , however , that I have come to this opinion .”
I have italicised the last sentence, to show that Butler was more or less conscious of its irreconcilability with much of his most characteristic doctrine. Again, in the closing chapter, Butler writes (p. 275):—
“ We should endeavour to see the so-called inorganic as living in respect of the qualities it has in common with the organic, rather than the organic as non-living in respect of the qualities it has in common with the inorganic.”
We conclude our survey of this book by mentioning the literary controversial part chiefly to be found in Chapter IV, but cropping up elsewhere. It refers to interpolations made in the authorised translation of Krause’s “Life of Erasmus Darwin.” Only one side is presented; and we are not called upon, here or elsewhere, to discuss the merits of the question.

“ LUCK, OR CUNNING, as the Main Means of Organic Modification? an Attempt to throw Additional Light upon the late Mr. Charles Darwin’s Theory of Natural Selection” (1887), completes the series of biological books. This is mainly a book of strenuous polemic. It brings out still more

forcibly the Hering-Butler doctrine of continued personality from generation to generation, and of the working of unconscious memory throughout; and points out that, while this is implicit in much of the teaching of Herbert Spencer, Romanes, and others, it was nowhere—even after the appearance of "Life and Habit"—explicitly recognised by them, but, on the contrary, masked by inconsistent statements and teaching. Not Luck but Cunning, not the uninspired weeding out by Natural Selection but the intelligent striving of the organism, is at the bottom of the useful variety of organic life. And the parallel is drawn that not the happy accident of time and place, but the Machiavellian cunning of Charles Darwin, succeeded in imposing, as entirely his own, on the civilised world an uninspired and inadequate theory of evolution wherein luck played the leading part; while the more inspired and inspiring views of the older evolutionists had failed by the inferiority of their luck. On this controversy I am bound to say that I do not in the very least share Butler's opinions; and I must ascribe them to his lack of personal familiarity with the biologists of the day and their modes of thought and of work. Butler everywhere undervalues the important work of elimination played by Natural Selection in its widest sense.

The "Conclusion" of "Luck, or Cunning?" shows a strong advance in monistic views, and a yet more marked development in the vibration hypothesis of memory given by Hering and only adopted with the greatest reserve in "Unconscious Memory."

" Our conception, then, concerning the nature of any matter depends solely upon its kind and degree of unrest, that is to say, on the characteristics of the vibrations that are going on within it. The exterior object vibrating in a certain way imparts some of its vibrations to our brain; but if the state of the thing itself depends upon its vibrations, it [the thing] must be considered as to all intents and

purposes the vibrations themselves—plus, of course, the underlying substance that is vibrating. . . . The same vibrations, therefore, form the substance remembered, introduce an infinitesimal dose of it within the brain, modify the substance remembering, and, in the course of time, create and further modify the mechanism of both the sensory and the motor nerves. Thought and thing are one. " I commend these two last speculations to the reader's charitable consideration, as feeling that I am here travelling beyond the ground on which I can safely venture. . . . I believe they are both substantially true."

In 1885 he had written an abstract of these ideas in his notebooks (see New Quarterly Review , 1910, p. 116), and as in "Luck, or Cunning?" associated them vaguely with the unitary conceptions introduced into chemistry by Newlands and Mendelejeff. Judging himself as an outsider, the author of "Life and Habit" would certainly have considered the mild expression of faith, "I believe they are both substantially true," equivalent to one of extreme doubt. Thus "the fact of the Archbishop's recognising this as among the number of his beliefs is conclusive evidence, with those who have devoted attention to the laws of thought, that his mind is not yet clear" on the matter of the belief avowed (see "Life and Habit," pp. 24, 25).

To sum up: Butler's fundamental attitude to the vibration hypothesis was all through that taken in "Unconscious Memory"; he played with it as a pretty pet, and fancied it more and more as time went on; but instead of backing it for all he was worth, like the main theses of "Life and Habit," he put a big stake on it—and then hedged.

The last of Butler's biological writings is the Essay, "THE DEADLOCK IN DARWINISM," containing much valuable criticism on Wallace and Weismann. It is in allusion to the misnomer of Wallace's book, "Darwinism," that he

introduces the term "Wallaceism" [0d] for a theory of descent that excludes the transmission of acquired characters. This was, indeed, the chief factor that led Charles Darwin to invent his hypothesis of pangenesis, which, unacceptable as it has proved, had far more to recommend it as a formal hypothesis than the equally formal germ-plasm hypothesis of Weismann.

The chief difficulty in accepting the main theses of Butler and Hering is one familiar to every biologist, and not at all difficult to understand by the layman. Everyone knows that the complicated beings that we term "Animals" and "Plants," consist of a number of more or less individualised units, the cells, each analogous to a simpler being, a Protist —save in so far as the character of the cell unit of the Higher being is modified in accordance with the part it plays in that complex being as a whole. Most people, too, are familiar with the fact that the complex being starts as a single cell, separated from its parent; or, where bisexual reproduction occurs, from a cell due to the fusion of two cells, each detached from its parent. Such cells are called "Germ-cells." The germ-cell, whether of single or of dual origin, starts by dividing repeatedly, so as to form the primary embryonic cells , a complex mass of cells, at first essentially similar, which, however, as they go on multiplying, undergo differentiations and migrations, losing their simplicity as they do so. Those cells that are modified to take part in the proper work of the whole are called tissue-cells. In virtue of their activities, their growth and reproductive power are limited—much more in Animals than in Plants, in Higher than in Lower beings. It is these tissues, or some of them, that receive the impressions from the outside which leave the imprint of memory. Other cells, which may be closely associated into a continuous organ, or more or less surrounded by tissue-cells, whose part it is to

nourish them, are called “secondary embryonic cells,” or “germ-cells.” The germ-cells may be differentiated in the young organism at a very early stage, but in Plants they are separated at a much later date from the less isolated embryonic regions that provide for the Plant’s branching; in all cases we find embryonic and germ-cells screened from the life processes of the complex organism, or taking no very obvious part in it, save to form new tissues or new organs, notably in Plants.

Again, in ourselves, and to a greater or less extent in all Animals, we find a system of special tissues set apart for the reception and storage of impressions from the outer world, and for guiding the other organs in their appropriate responses—the “Nervous System”; and when this system is ill-developed or out of gear the remaining organs work badly from lack of proper skilled guidance and co-ordination. How can we, then, speak of “memory” in a germ-cell which has been screened from the experiences of the organism, which is too simple in structure to realise them if it were exposed to them? My own answer is that we cannot form any theory on the subject, the only question is whether we have any right to infer this “memory” from the behaviour of living beings; and Butler, like Hering, Haeckel, and some more modern authors, has shown that the inference is a very strong presumption. Again, it is easy to over-value such complex instruments as we possess. The possessor of an up-to-date camera, well instructed in the function and manipulation of every part, but ignorant of all optics save a hand-to-mouth knowledge of the properties of his own lens, might say that a priori no picture could be taken with a cigar-box perforated by a pin-hole; and our ignorance of the mechanism of the Psychology of any organism is greater by many times than that of my supposed photographer. We know that Plants are able to do many things that can only be accounted for by ascribing to them a “psyche,” and these co-ordinated enough to satisfy

their needs; and yet they possess no central organ comparable to the brain, no highly specialised system for intercommunication like our nerve trunks and fibres. As Oscar Hertwig says, we are as ignorant of the mechanism of the development of the individual as we are of that of hereditary transmission of acquired characters, and the absence of such mechanism in either case is no reason for rejecting the proven fact.

However, the relations of germ and body just described led Jäger, Nussbaum, Galton, Lankester, and, above all, Weismann, to the view that the germ-cells or "stirp" (Galton) were in the body, but not of it. Indeed, in the body and out of it, whether as reproductive cells set free, or in the developing embryo, they are regarded as forming one continuous homogeneity, in contrast to the differentiation of the body; and it is to these cells, regarded as a continuum, that the terms stirp, germ-plasm, are especially applied. Yet on this view, so eagerly advocated by its supporters, we have to substitute for the hypothesis of memory, which they declare to have no real meaning here, the far more fantastic hypotheses of Weismann: by these they explain the process of differentiation in the young embryo into new germ and body; and in the young body the differentiation of its cells, each in due time and place, into the varied tissue cells and organs. Such views might perhaps be acceptable if it could be shown that over each cell-division there presided a wise all-guiding genie of transcending intellect, to which Clerk-Maxwell's sorting demons were mere infants. Yet these views have so enchanted many distinguished biologists, that in dealing with the subject they have actually ignored the existence of equally able workers who hesitate to share the extremest of their views. The phenomenon is one well known in hypnotic practice. So long as the non-Weismannians deal with matters outside this discussion, their existence and their work is rated at its just value; but any work of theirs on this

point so affects the orthodox Weismannite (whether he accept this label or reject it does not matter), that for the time being their existence and the good work they have done are alike non-existent. [0e]

Butler founded no school, and wished to found none. He desired that what was true in his work should prevail, and he looked forward calmly to the time when the recognition of that truth and of his share in advancing it should give him in the lives of others that immortality for which alone he craved.

Lamarckian views have never lacked defenders here and in America. Of the English, Herbert Spencer, who however, was averse to the vitalistic attitude, Vines and Henslow among botanists, Cunningham among zoologists, have always resisted Weismannism; but, I think, none of these was distinctly influenced by Hering and Butler. In America the majority of the great school of palæontologists have been strong Lamarckians, notably Cope, who has pointed out, moreover, that the transformations of energy in living beings are peculiar to them.

We have already adverted to Haeckel's acceptance and development of Hering's ideas in his "Perigenese der Plastidule." Oscar Hertwig has been a consistent Lamarckian, like Yves Delage of the Sorbonne, and these occupy pre-eminent positions not only as observers, but as discriminating theorists and historians of the recent progress of biology. We may also cite as a Lamarckian—of a sort—Felix Le Dantec, the leader of the chemico-physical school of the present day.

But we must seek elsewhere for special attention to the points which Butler regarded as the essentials of "Life and Habit." In 1893 Henry P. Orr, Professor of Biology in the University of Louisiana, published a little book entitled "A Theory of Heredity." Herein he insists on the nervous control of the whole body, and on the transmission to the

reproductive cells of such stimuli, received by the body, as will guide them on their path until they shall have acquired adequate experience of their own in the new body they have formed. I have found the name of neither Butler nor Hering, but the treatment is essentially on their lines, and is both clear and interesting.

In 1896 I wrote an essay on "The Fundamental Principles of Heredity," primarily directed to the man in the street. This, after being held over for more than a year by one leading review, was "declined with regret," and again after some weeks met the same fate from another editor. It appeared in the pages of "Natural Science" for October, 1897, and in the "Biologisches Centralblatt" for the same year. I reproduce its closing paragraph:—

" This theory [Hering-Butler's] has, indeed, a tentative character, and lacks symmetrical completeness, but is the more welcome as not aiming at the impossible. A whole series of phenomena in organic beings are correlated under the term of memory , conscious and unconscious , patent and latent . . . . Of the order of unconscious memory, latent till the arrival of the appropriate stimulus, is all the co-operative growth and work of the organism, including its development from the reproductive cells. Concerning the modus operandi we know nothing: the phenomena may be due, as Hering suggests, to molecular vibrations, which must be at least as distinct from ordinary physical disturbances as Röntgen's rays are from ordinary light; or it may be correlated, as we ourselves are inclined to think, with complex chemical changes in an intricate but orderly succession. For the present, at least, the problem of heredity can only be elucidated by the light of mental, and not material processes."

It will be seen that I express doubts as to the validity of Hering's invocation of molecular vibrations as the mechanism of memory, and suggest as an alternative rhythmic chemical changes. This view has recently been

put forth in detail by J. J. Cunningham in his essay on the "Hormone [0f] Theory of Heredity," in the Archiv für Entwicklungsmechanik (1909), but I have failed to note any direct effect of my essay on the trend of biological thought. Among post-Darwinian controversies the one that has latterly assumed the greatest prominence is that of the relative importance of small variations in the way of more or less "fluctuations," and of "discontinuous variations," or "mutations," as De Vries has called them. Darwin, in the first four editions of the "Origin of Species," attached more importance to the latter than in subsequent editions; he was swayed in his attitude, as is well known, by an article of the physicist, Fleeming Jenkin, which appeared in the North British Review . The mathematics of this article were unimpeachable, but they were founded on the assumption that exceptional variations would only occur in single individuals, which is, indeed, often the case among those domesticated races on which Darwin especially studied the phenomena of variation. Darwin was no mathematician or physicist, and we are told in his biography that he regarded every tool-shop rule or optician's thermometer as an instrument of precision: so he appears to have regarded Fleeming Jenkin's demonstration as a mathematical deduction which he was bound to accept without criticism. Mr. William Bateson, late Professor of Biology in the University of Cambridge, as early as 1894 laid great stress on the importance of discontinuous variations, collecting and collating the known facts in his "Materials for the Study of Variations"; but this important work, now become rare and valuable, at the time excited so little interest as to be 'remaindered' within a very few years after publication. In 1901 Hugo De Vries, Professor of Botany in the University of Amsterdam, published "Die Mutationstheorie," wherein he showed that mutations or discontinuous variations in various directions may appear

simultaneously in many individuals, and in various directions. In the gardener's phrase, the species may take to sporting in various directions at the same time, and each sport may be represented by numerous specimens.

De Vries shows the probability that species go on for long periods showing only fluctuations, and then suddenly take to sporting in the way described, short periods of mutation alternating with long intervals of relative constancy. It is to mutations that De Vries and his school, as well as Luther Burbank, the great former of new fruit- and flower-plants, look for those variations which form the material of Natural Selection. In "God the Known and God the Unknown," which appeared in the Examiner (May, June, and July), 1879, but though then revised was only published posthumously in 1909, Butler anticipates this distinction:—

" Under these circumstances organism must act in one or other of these two ways: it must either change slowly and continuously with the surroundings, paying cash for everything, meeting the smallest change with a corresponding modification, so far as is found convenient, or it must put off change as long as possible, and then make larger and more sweeping changes.

" Both these courses are the same in principle, the difference being one of scale, and the one being a miniature of the other, as a ripple is an Atlantic wave in little; both have their advantages and disadvantages, so that most organisms will take the one course for one set of things and the other for another. They will deal promptly with things which they can get at easily, and which lie more upon the surface; those , however , which are more troublesome to reach , and lie deeper , will be handled upon more cataclysmic principles , being allowed longer periods of repose followed by short periods of greater activity . . . it may be questioned whether what is called a sport is not the organic expression of discontent which has been long felt, but which has not been attended to, nor

been met step by step by as much small remedial modification as was found practicable: so that when a change does come it comes by way of revolution. Or, again (only that it comes to much the same thing), it may be compared to one of those happy thoughts which sometimes come to us unbidden after we have been thinking for a long time what to do, or how to arrange our ideas, and have yet been unable to come to any conclusion" (pp. 14, 15). [0g]

We come to another order of mind in Hans Driesch. At the time he began his work biologists were largely busy in a region indicated by Darwin, and roughly mapped out by Haeckel—that of phylogeny. From the facts of development of the individual, from the comparison of fossils in successive strata, they set to work at the construction of pedigrees, and strove to bring into line the principles of classification with the more or less hypothetical "stemtrees." Driesch considered this futile, since we never could reconstruct from such evidence anything certain in the history of the past. He therefore asserted that a more complete knowledge of the physics and chemistry of the organic world might give a scientific explanation of the phenomena, and maintained that the proper work of the biologist was to deepen our knowledge in these respects. He embodied his views, seeking the explanation on this track, filling up gaps and tracing projected roads along lines of probable truth in his "Analytische Theorie der organische Entwicklung." But his own work convinced him of the hopelessness of the task he had undertaken, and he has become as strenuous a vitalist as Butler. The most complete statement of his present views is to be found in "The Philosophy of Life" (1908–9), being the Giffold Lectures for 1907–8. Herein he postulates a quality ("psychoid") in all living beings, directing energy and matter for the purpose of the organism, and to this he applies the Aristotelian designation "Entelechy." The

question of the transmission of acquired characters is regarded as doubtful, and he does not emphasise—if he accepts—the doctrine of continuous personality. His early youthful impatience with descent theories and hypotheses has, however, disappeared.

In the next work the influence of Hering and Butler is definitely present and recognised. In 1906 Signor Eugenio Rignano, an engineer keenly interested in all branches of science, and a little later the founder of the international review, Rivistà di Scienza (now simply called Scientia), published in French a volume entitled "Sur la transmissibilité des Caractères acquis—Hypothèse d'un Centro-épigenèse." Into the details of the author's work we will not enter fully. Suffice it to know that he accepts the Hering-Butler theory, and makes a distinct advance on Hering's rather crude hypothesis of persistent vibrations by suggesting that the remembering centres store slightly different forms of energy, to give out energy of the same kind as they have received, like electrical accumulators. The last chapter, "Le Phénomène mnémonique et le Phénomène vital," is frankly based on Hering.

In "The Lesson of Evolution" (1907, posthumous, and only published for private circulation) Frederick Wollaston Hutton, F.R.S., late Professor of Biology and Geology, first at Dunedin and after at Christchurch, New Zealand, puts forward a strongly vitalistic view, and adopts Hering's teaching. After stating this he adds, "The same idea of heredity being due to unconscious memory was advocated by Mr. Samuel Butler in his "Life and Habit."

Dr. James Mark Baldwin, Stuart Professor of Psychology in Princeton University, U.S.A., called attention early in the 90's to a reaction characteristic of all living beings, which