DARWINISM AND WHAT IT IMPLIES

THE FORUM SERIES

No. 1.—THE STREAM OF LIFE. By Professor JULIAN S. HUXLEY.

No. 2.—THE RELIGION OF AN ARTIST. By the Hon. JOHN COLLIER.

No. 3.—MR. BELLOC OBJECTS TO "THE OUTLINE OF HISTORY." By H. G. WELLS.

No. 4.—THE GOODNESS OF GODS. By EDWARD WESTERMARCK, Lecturer on Sociology at the University of Finland, Helsingfors.

No. 5.—CONCERNING MAN'S ORIGIN. (Presidential Address at British Association, August 31, 1927; with additions.) By Professor SIR ARTHUR KEITH.

No. 6.—THE EARTH: ITS NATURE AND HISTORY. By EDWARD GREENLY, D.Sc., F.G.S.

No. 7.—CRAFTSMANSHIP AND SCIENCE. (Presidential Address at British Association, September 5, 1928; with additions.) By SIR WILLIAM H. BRAGG, K.B.E., D.Sc., D.C.L., LL.D., F.R.S.

No. 8.—DARWINISM AND WHAT IT IMPLIES. By Professor SIR ARTHUR KEITH.

No. 9.—WHAT IS EUGENICS? By MAJOR LEONARD DARWIN.

No. 10.—THE MEANING OF LIFE AS SHOWN IN THE PROCESS OF EVOLUTION. By C. E. M. JOAD.

The Forum Series.—No. 8

DARWINISM AND WHAT IT IMPLIES

BY

PROF. SIR ARTHUR KEITH

M.D., D.Sc., LL.D., F.R.S.

HUNTERIAN PROFESSOR AND CONSERVATOR OF MUSEUM,
ROYAL COLLEGE OF SURGEONS OF ENGLAND

LONDON:

WATTS & CO.,

JOHNSON'S COURT, FLEET STREET, E.C.4.

1928

It should be clearly understood that each writer in this series of little books is alone responsible for the opinions expressed.

FIRST PUBLISHED . . . . . SEPTEMBER, 1928

PRINTED IN GREAT BRITAIN FOR THE RATIONALIST PRESS ASSOCIATION LIMITED
BY WATTS & CO., JOHNSON'S COURT, FLEET STREET, LONDON, E.C.4

PREFACE

A YEAR ago I contributed a volume to the Forum Series entitled "Concerning Man's Origin." It contained the Presidential Address which was given to the British Association when it met in Leeds in 1927, and certain essays which dealt with various aspects of the problem of Man's Origin. The present volume may be regarded as a sequel; it concerns the "Implications of Darwinism"—the application of Darwin's theory to the interpretation of the things of every-day life. The first chapter was given as the Ludwig Mond Lecture in the University of Manchester; therein I have applied Darwinism to the interpretation of the basal elements of man's mental nature. The interpretation given here, which is the commonplace of professional circles, has been fiercely criticised or condemned out of hand by the majority of those who write for the public press. And yet I am convinced that if we professional students knew the art of compelling our printed sentences to reflect our years of toil, and could impart to the millions who supply us with the means of sustenance a tithe of what our eyes have seen and our minds have proved, the popular verdict would be quickly reversed. For we speak truth, and abiding happiness will come to no man until he has faced and assimilated the real facts of life.

The second and third chapters are devoted to other implications of the theory of evolution. As our

knowledge grows and our experience ripens the more clearly do we perceive that Darwin has given us a new interpretation of things material and spiritual. The substance of these chapters has appeared in various periodicals and newspapers—in the *Nineteenth Century and Afterwards*, *English Review*, and *New York Times*, to the editors of which I am indebted for permission to reproduce here such parts as have appeared in their pages.

ARTHUR KEITH.

CONTENTS

CHAPTER I

Implications of Darwinism

ON the last day of August, 1927, I gave an address to the British Association on "Darwin's Theory of Man's Origin." My object was to make clear to all thoughtful men and women that we whose business it is to study the body of man were Darwinists by compulsion; unless the theory of evolution was accepted as a truth it was impossible to give any satisfying or intelligent explanation of the anatomy of the human body.

The law of evolution holds true for the dead human body and dissecting-room, but what of the outside world where live men and women are pulsating with hopes, fears, and the tenderest of aspirations? The dissecting-room subject is entirely passive; it has no susceptibilities; the anatomist may speak his mind freely as he demonstrates its parts. Outside the dissecting-room is the world of the quick. When the anatomist, human as he may be, emerges into the thoroughfares of life and seeks to apply Darwin's theory to the behaviour of his fellow men and women he finds himself encompassed by a sea of resentment so angry that, if he seeks peace rather than truth, he keeps the secrets of the dissecting-room, of the physiological laboratory, and of the clinical ward to himself and lets the world wag as it will. But if he believes, as I do, that men do desire to know themselves and the world in which they live, and that truth is the

harbinger of an abiding hope, then silence becomes incompatible with peace. Every one of us is a missionary at heart.

Hence it came about, when I was invited by the University of Manchester in May, 1928, to give a lecture under the Ludwig Mond Foundation, I proceeded to apply Darwin's doctrine to the human mind; for, if his body has evolved, then that combination of mental qualities known as human nature must also have had a similar origin. The Mond lecture on the "Implications of Darwinism" is reprinted here. The reception it met with demonstrated very clearly that most of us accept Darwinism only in theory and reject it totally in practice. And yet if we are to see the world of humanity aright we must learn to see it through Darwin's eyes.

* * * * * *

Man differs from all apes and from every kind of living being by his desire to understand and explain the nature of things. He seeks to explain the heaven above, the earth beneath, and every kind of thing which waxes and wanes, whether it be dead or alive. Above all, he desires to explain himself, to know how he has come into being, and why his limited lease of life is so sharply circumscribed by the events of birth and death, and how sin, sorrow, and disease came into the world. Never has he been so restless and so inquisitive in his desire to probe into these matters as in the last seventy years. His search in this period has not been an idle quest, merely to satisfy an uneasy curiosity, but has been prosecuted primarily from motives of utility. He has marshalled in dissecting-rooms, laboratories, and sick wards the whole artillery of modern inquiry, and directed it upon his own body with a view of so understanding its structure and its

workings that he must, in the course of time, discover the means of conquering its disorders and diseases. Hundreds of years of study and of speculation lie behind him; thousands of years of inquiry still lie in front of him; nevertheless, he makes, and will continue to make, marvellous progress in knowledge. In the course of their more recent inquiries medical men have formed a very definite conception of the living organization of man's body. My object is to apply this newer conception to the interpretation and explanation of that combination of mental qualities known familiarly as " human nature."

The Nature of Mind

Medical men have paid particular attention to the human brain; they find its structure intricate beyond belief, and its mode of working involved and hard to discover. Nevertheless, the broad fact stands out beyond question that its complexity of structure and powers of action go hand in hand. Mind has a material basis. From birth to adolescence the brain is seen to grow in size and in complexity, and with each increase comes an extension of its capacity or powers of action. Arrest may overtake the brain at any stage of its growth, and according to the point at which it halts is the resultant degree of mental deficiency. We see disease destroy this part of the brain or that, and according to the part ruined is the functional failure which follows. Encephalitis will attack the brain of a school child and produce a profound and permanent change in character—a change never for the better, but always for the worse. Sanity is possible only when the brain is normal in structure and healthy in its action. We can drug the brain so as to exalt the powers of certain parts and depress those of others, and thus alter the

mentality and behaviour of any man or woman. We can, at will, obliterate consciousness or exalt it. In short, the brain is a piece of living machinery; it consumes fuel and transmutes energy into feeling, thought, and memory. If we withhold the supply of oxygen or fuel, the sources of its energy, the brain ceases to act, just as certainly as a fire ceases to burn when its supply of air or fuel is shut off. Medical men can find no grounds for believing that the brain is a dual organ—a compound of substance and of spirit. Every fact known to them compels the inference that mind, spirit, soul are the manifestations of a living brain, just as flame is the manifest spirit of a burning candle. At the moment of extinction both flame and spirit cease to have a separate or individual existence. However much this mode of explaining man's mentality may run counter to long and deeply cherished beliefs, medical men cannot think otherwise if they are to believe the evidence of their senses. It is only when they accept a physiological interpretation of man's mentality that they can diagnose and understand the nature of man's mental ailments and take effective steps for the prevention and for the relief of the disasters which so often overtake modern humanity.

Pre-history of the Human Brain

In the course of their prolonged inquiries medical men have come into the possession of many facts which throw light on the history of man's brain. This evidence is all against the idea that it came into being, with every part complete, at one single creational step. An organ with such a range in size, complexity, and functional power must be one which has been, and still is, in the throes of evolutionary change. It is true we cannot yet explain, with any degree of precision,

its variations in mass in terms of mental capacity; that is because of our present ignorance. Yet the facts of comparative anatomy are clear; in the order of animals, of which man is a member, increase of brain is accompanied by an enlarged range of mental reaction. Then there are the historical facts of embryology; the infinite myriads of living cells which make up the adult brain of man are the progeny of a simple single cell. Every human brain arises thus within the womb; embryologists have followed every stage in the transmutation of a microscopic mass of protoplasm, fashioned as the lowest forms of life are fashioned, into the completed child with its elaborately organized nervous system. It is a miracle which happens millions of times every year.

Then there is also another source of historical evidence bearing on the brain—the fossil remains of various kinds of men which have long since ceased to exist on the earth. In numerous cases we have been able to take impressions of the interior of their skulls, and thus reproduce and examine the convolutionary patterns of the brains which guided these remote ancestral types through the perplexities of life. The farther back we go in time, the more imperfect do we find the human brain to be—the nearer to that of the anthropoid ape. The human brain, we thus see, has had a prolonged exodus. Could we summon back to the world of to-day all the extinct kinds of man and ape which have flourished and passed away during the three last great geological ages, and marshal them in serried ranks according to the respective periods at which they lived, we should have under our eyes an unbroken series of forms linking the brain of the lowest ape to that of the highest man. Nowhere should we find any interruption, break, or sudden jump. Nowhere should we

be able to draw a sharp line and say, here the brain of ape ceases and there the brain of man begins. All the evidence which we have gathered so far urges us to believe that man's brain appeared by a process of continued evolution—a process not a whit more marvellous than that which produces a brain in every developing child. The brain which began in the humble service of an ape became, in the fullness of time, the master organ of man's body. We do not yet understand how this miracle was wrought, but we can explain the things we have seen and found in no other way than by accepting evolution as a truth. When we do accept this historical explanation of man's brain, we can no longer look upon " human nature " with the eyes of our grandfathers. How, then, does the Darwinist interpret human nature ?

Foundations of Human Nature

Writers of fiction and authors of Utopias often forget that man is an animal subject to the imperative demands of hunger and of thirst. The author of Genesis did not make this omission; he realized that an explanation had to be given of why man is compelled to labour. He explained labour as a curse—one imposed on mankind for Adam's lapse in a moment of weakness. " In the sweat of thy face shalt thou eat bread, till thou return unto the ground " is not, to our newer way of thinking, a capricious sentence, but a blessing of the utmost value which has come to man by way of natural inheritance. It is a birthright from the ape. Every living thing is compelled to earn a livelihood or die. Far from being a curse, the fulfilment of this essential condition of life brings to organized beings their highest enjoyment. In the case of man it is not eating which gives the maximum of

pleasure, but the labour and excitement which the chase entails. How deeply rooted are the food-searching impulses implanted in human nature, and how much man enjoys their exercise, may be noted from the fortunes paid by the wealthy for the privilege of labouring as fishers and hunters. We see manifest herein man's primitive lust for blood. Every sane son of civilization condemns wanton cruelty, but the real dangers which beset the future of civilization are not excesses in cruelty but excesses in sentimentality—the sentimentality which denies man's right to take life in any form. We could become too refined for life in a mortal world. Civilization can warp human nature.

The Impulse of Hunger

Philosophers have dreamt of a golden age when man had but to open his mouth and the fruits of the earth fell into it. Believe me, there never was such an age. Read the accounts given by men who have lived among native peoples, such as the Norwegian naturalist, Knut Dahl. This is what he noted and set down concerning the daily routine in the life of a tribe in North Australia :

> During the greater part of the year the tribes were split up into families, which moved and flitted in accordance with the seasonal flourishing of the flora and fauna upon which they depended for a living. They needed plenty of room, for any particular spot could yield them sufficient food only for a short time. . . . As soon as they feel hungry they begin the day's work of procuring food. If the hunting-ground is good, and a stay has been decided on, their few belongings are left in the camp and the people distribute themselves through the bush looking for food. Men

walk by themselves; small children and girls follow the women; the elder boys follow the men.

And if the skies become brazen and the rains fail—what then? Certainly not a golden age, but one of unremitting labour, with the fear of starvation always hovering near. If we consult the accounts given by travellers of the kind of life led by gorillas and chimpanzees in the forests of equatorial Africa, we find a picture not unlike that given to us by Mr. Dahl from North Australia. After the sun has warmed the morning air an old male gorilla, the leader of a local band, begins to bestir himself and rises from the "shake-down" of branches which has served him as bed. The female members of his band and the children, which have spent the night in the branches of trees in the vicinity of the old gentleman's bed—a massive fellow weighing 25 to 30 stones, and of great physical strength—come down to join him, and the band sets out on its round of toil. It proceeds leisurely but watchfully, the elders examining every thicket of bamboo for food, culling such young shoots and buds as appeal to their appetites. They are careless of the mischief wrought in their search for food; they break ruthlessly and tread under foot what they do not need. And so the band wanders on, feeding as it goes until nightfall, when a new "camp" is chosen, one only a few miles distant from that of the night before. The gorilla is a gross feeder; he prefers quantity to quality, whereas his smaller cousin—the chimpanzee—is more delicate in his choice, and thus has to search harder and use his ingenuity more freely to come by what he most desires. The lot which falls to the African anthropoids is a round of toil, wet day and fine. Their chief

pleasures of life centre round their search for food. The same lot falls to every tribe of native peoples; their greater brains enhance enormously, not only their powers of obtaining a supply, but also the enjoyment which the exercise of these powers confers upon them.

It may seem that the instances I have cited from the African jungle and the Australian bush are far removed from our mode of life, and yet the evidence is complete that every one of us comes of ancestors who only a few thousand years ago wrung a living from moor and fen, just as those Australian natives continue to do. We have inherited the mental outfit of hunters and of fishers; their instincts are still ours.

It is a common mistake to regard the human brain as devoted solely to the offices of intelligence and reason. Much of it has nought to do with these faculties, but is concerned with subjective feelings, the reception of sensory impressions and the registering of sensory memories. It is these great sensory additions to man's brain which have made conscious life worth living. In man's case the old animal instincts, manifested in the search for food, have become buried—buried in a mass of embroideries which the enhanced cerebral endowments of the human brain have stitched round them. Hunger and thirst demand an imperious but not an unpleasant service from every one of us.

Leisure as a Factor in Mental Evolution

I have spoken as if every individual ape and man were compelled by instinct to search for a living. This is not strictly true; even among apes there is a leisured class—the very young. They depend for a subsistence on another inherited impulse—the inborn desires which compel the mother ape to suckle and

protect her young. The young gorilla learns to climb at seven months of age, and in his second year has to seek for his own livelihood. Humanity has also inherited these maternal instincts; among the Australian natives mother-love has become much more enduring than in the ape-world; their children are a capital charge on the maternal instinct and paternal care until they reach six or eight years of age. In the human brain these inherited modes of action have become broadened in their manifestations; and, as they rise to the level of full consciousness, give increased pleasures and pains—the reward man receives and the price he pays for his bigger brain. The exercise of these primitive instincts in the human "breast" excites some of its most poignant moments of feeling.

Civilization has not suppressed these inherited modes of feeling and acting towards the young. The opposite has happened; such instincts, originally confined to the suckling mother, have spread in civilized communities, until every member of a family—father, brother, and sister—inherits qualities of mind which were originally the monopoly of the nursing mother. With the growth of the human brain these primitive impulses came more and more within the jurisdiction of conscious reason. Therein lies one of the dangers of civilization, for reason may come under the instigation of selfish motives; a human mother may voluntarily suppress an instinct over which an ape has no control. Nature has bound the ape to instinctive obedience, but man she has left with a limited power of choice. We do not hesitate to designate men and women who neglect or ill-treat their children as inhuman, thereby recognizing that these instincts are a necessary part of man's mental constitution.

Undue Extension of the Paternal Instinct

Let us look for a moment at the dominion which such instincts, inherited from a simian ancestry, have obtained over the emotions, feelings, and ideals of the highly civilized brain. We ourselves have enacted that parental care shall endure until our children have reached the age of fourteen; if we can afford it, we give our instinctive impulses a longer lease of life, and fend for our children until they have become grown men and women. How far this extension has been brought about by an exercise of reason, and how far by that driving power which we call " class pride," I will not attempt to decide; but the latter feeling is certainly not a negligible factor. Nay, under our capitalistic system it has become quite a common thing for a man to accumulate a sufficiency of wealth to provide not only for himself but also for his descendants of many succeeding generations, thus rendering it optional for his children to exercise or not their instincts for toil. I believe most sincerely that a father can do a son no greater injury than that of depriving him of the exercise of the best of his inborn instincts; and yet, I admit, it is an injury that few of us, if it threatened us in our youth, would struggle to avoid. Capitalism provides our inherited instincts with their best opportunities and also with their worst. Under our system of accumulated wealth civilized life was rendered possible, because, as human communities became larger and denser, those inborn feelings which we call sympathy or fellow-feeling became ever more urgent in their manifestation. The older selfish Adam gave place more and more to his newer, higher, and more altruistic children. Warm feelings will always master cool reason. There can be no greater mistake than to think that man evolves towards the realms of pure rationality.

Repression the Normal Means of Human Progress

I am still discussing the influence in modern life of the instincts we have inherited from food-gathering ancestors. Suppose, for a moment, that our places in civilization were suddenly taken by beings with the bodies of men but with the brains of anthropoids, and that our unlimited supplies of meat and drink were freely at their disposal. They would allow their appetites the fullest licence until satiation gave place to nausea, and in a brief space of time would have killed themselves by indulgence unless supplies came to a speedy end and they were driven back to the verge of starvation—the state for which their appetites are fitted. We have many records of the saturnalia which ensue when native peoples are plunged into the midst of plenty; their primitive appetites enslave their reason. Our higher civilization exposes millions of us to the grave temptations of wild living; but, as the exposure has come about gradually and has been spread over many generations, there has been time for the evolution of large classes which have their natural appetites under conscious control. Most of us discover, sooner or later, that if pleasure is to continue moderation must be practised. Let not those who have gained this victory pride themselves overmuch on their own efforts; had not their brains undergone that evolutionary expansion which has placed lower centres under the control of higher, their state would have been no better than that of our anthropoid ancestors. I will not stay now to debate whether or not repression of natural instincts conduces to health of mind or body; the fact is patent to every one—we cannot have civilization without repression. The act of self-repression, far from being an evil, is the major part of human education.

Problems of Sex

The ancient philosophers of the East had to explain not only why man had to labour, but also how it had come about that there were two quite distinct kinds of human beings—men and women. Every one knows the explanation that was current in early Biblical times. Woman was explained as an afterthought; she was wrought out of Adam's rib. Modern biologists give quite a different explanation of this problem; sexual division, they hold, is almost as ancient as life itself; it is a fundamental fact in the constitution of the higher primates, and man inherited their constitution with all its accessory conditions. We explain sex on evolutionary grounds; it is a biological, not a human problem. There is, however, one matter connected with sex which deserves a passing notice because it has occupied the thoughts of men since very remote times. Why should the sentence have been passed on woman: "In sorrow thou shalt bring forth children"? All of us know the explanation which is accepted by Eastern peoples. Has the modern anthropologist any better reason to give? Quite recently certain material facts have come into our possession bearing on this problem. Anthropoid apes know nothing of the pains of childbirth. Although the adult male gorilla may weigh as much as three lusty men, it is at birth only half the weight of a new-born child. Apparently human evolution was attended by a great increase in the size of the young at birth—particularly in the size of the head. With the adaptation of the pelvis to our mode of walking, the birth passages had to undergo a restriction. The explanation which the evolutionist thus gives of birth-pains is mainly anatomical in its nature, but not wholly. There are other and more hidden factors. Why should our cultured women suffer infinitely more

than their primitive sisters? The explanation is psychological rather than anatomical. The powers of feeling possessed by the human brain surpass infinitely those of anthropoid apes; the more cultured the human brain, the wider is the field of consciousness into which the pangs of the body rise and the more acute are the reactions produced. A woman in the throes of child-birth is paying part of the price of man's evolutionary advancement. Nature has seen to it, for her own ends, that the tortures of child-birth fall lightly on a mother's memory. In this and in many other ways we see how marvellously the nervous system of women has been modified to soften the blows of Nature, and even so to react as to cast a glamour over the duties of reproduction.

The Dominance and Repression of Sex Instincts

We have considered the instincts implanted in the human brain to compel man to search for food; the life of the individual is thus safeguarded. Even more marvellous and urgent are the instinctive reactions which have been implanted for the continuation of the race. In most animals these instincts are subdued or latent during certain periods of the year, wakening into activity only at fixed seasons. We know that the timing machinery, which wakens the reflex centres of sex into activity, is resident in the glands of generation. If these are removed, then the sexual instincts remain in abeyance altogether. If they are left in the body and pass into a process of ripening, then the instincts and impulses of sex take complete control of the animal's brain; an animal in heat is dominated by uncontrollable desires; it is seized by a monomania. How far anthropoid apes are subject to this seasonal madness when living in their natives jungles we do not

know, but it is certain that when kept in captivity they become as men—seasonless—at least, so far as males are concerned. Man has inherited in all their strength the sex instincts of his jungle ancestry; but as his brain expanded, and the light of consciousness burned ever more brightly, the higher centres began to take the lower under their control. Sex ceased to be seasonal in evolving man, but it never was quiescent at any stage of his progress.

In no system of the animal body has Nature been so prodigal of her ingenuity as that by which she secures the continuation of a race. We see how she has lavished her artistry in the feathers of the peacock's tail; but this is as nothing compared to the ingenuity she has displayed in rendering man's nervous system subservient to her main objective. Round the sexual instincts implanted in the human brain she has elaborated the powerful instruments of passion and emotion; sex impulses seem to rise into the atmosphere of human consciousness free from earthly dross and made rarely beautiful. Man's humble instincts are lodged in the older parts of his brain, but they have free access to all the newer and more spacious rooms of his cerebral palace. They can set the most wonderful trains in motion within the chambers of its imagination, and can bring under easy subjection the seats of reason and resolution. In no brain have the sex instincts such a powerful staff at their command as that lodged in the human brain.

Although there has been no golden age in man's long history, yet in the lifetime of every man and woman there comes one golden spell at least, sometimes more. So cunningly has Nature done her work that the subjects of her spell reject with scorn the explanation which medical men have to offer of their delicious delirium.

A Vital Problem has to be Solved

Our train of reasoning has brought us to grips with the most urgent and fateful of problems which concern the future of higher humanity. We have on the one hand the Scylla of total control, of total abstinence, of complete repression of sexual impulses; and we have on the other hand the Charybdis of unregulated license. To become abstinent angels leads to speedy extinction; to give license means a return to the state of beasts. There is no other way than the road civilization has already chosen—one which conducts us between the two extremes. Of all the mental and moral struggles men and women have to face, that with their inherited sexual impulses is the hardest. Psycho-analysts have much to say of the deep scars which this struggle leaves in human nature; but against such scars we must set the unmeasurable evils of unlicensed indulgence. We must have civilization; but we cannot have it unless the higher centres are placed in control. And yet the race which is to survive must retain its primal instincts unimpaired; the dictates of reason are insufficient to guarantee Nature's chief objective—the continuation of the race. This part of the beast has to be kept alive in us. The day man becomes a perfectly rational being marks his end.

Other Inherited Impulses

I have been seeking to demonstrate that although, in the course of evolution, man's brain has become three

times the size of that of the largest anthropoid, and has augmented its functional capacity to a ten-fold extent or more, yet its springs of action, the compelling appetites, instincts, or temperamental moods, are just those which served the needs of our anthropoid ancestry. To illustrate my thesis I have cited only two of the inherited mechanisms which lie at the very foundation of man's mental constitutions—that which compels a man to find food and that which compels him to find a mate; but, if time had permitted, I might have called your attention to many other pertinent instances. Love of life, fear of bodily injury and of death, are deeply implanted in human nature, yet under certain circumstances we do subdue them. Self-sacrifice is not a human prerogative; many animals, including the gorilla, can claim it. Read accounts by recent travellers of native hunters, armed with matchlock guns, lying in ambush, watching the movements of an old male gorilla as he covers the retreat of his band. The old male scents danger, and, coming in search of it, is wounded. His instinctive reaction is not to flee but to mobilize his passionate strength and to set forwards to secure the destruction of his enemies. They (the hunters) in turn mobilize their resolution and ingenuity and save their own lives. Another shot lays the leader of the anthropoid band dead at their feet. Such an encounter gives us an opportunity of measuring the extent of the sacrifice made by the gorilla against that which the native hunters were willing to make. The same compelling desire moved both of them—the instinct of self-protection—but in the case of the hunters there was this difference: The gorilla's brain, limited in size and very restricted in capacity and outlook, could not measure the risks and dangers to which he was exposing himself; he fought blindly. The hunters trembled with

excitement; their powers of anticipation and recollection filled their imagination with the imminence of danger and their minds with black fear. Man's sufferings are mental, and in poignancy are far beyond those known to any animal; evolution, if it has brought man unprecedented pains, has also rewarded him with moments of tense pleasure, such as were never experienced by living things before. Man's great brain gave him powers of feeling as well as of understanding.

The Spirit of Competition

I might have cited the maternal instinct, not only as manifested by a mother's desire to suckle, to feed, and to protect her young, but also when it appears in its most tragic form, compelling her, if need be, to sacrifice her life to save that of her infant. We cannot claim such behaviour as the prerogative of humanity; it is a moving force in the lives of all warm-blooded animals. But man differs from all of them in this respect: in him this instinctive mechanism has come under the sway of the more recently evolved centres of the brain. The beast reacts with its eyes shut; man reacts with the eye of reason open. A woman may bring her higher centres to bear on her inherited instincts, and therein lies another of the dangers which beset the future of civilized races.

I might also have cited, if time had permitted, as an example of man's anthropoid inheritance, that inborn impulse which impels boys and girls, men and women, to compete against each other, wherever competition is possible. In its manifestations the spirit of competition takes a myriad of forms—in examinations, in sport, in cross-word puzzles, in racing, wealth, dress, and worldly position. Competition is not confined to human rivalries and struggles; it pervades the whole kingdom

of life; it is the basis of Darwin's doctrine of evolution; it has been, and ever will be, the means of progressive evolution. Man's competitive instinct differs from that of all other animals in this respect. His rivalries, ambitions, jealousies, and his desire to excel have risen into the field of conscious recognition, and can be controlled, modified, repressed, or even extirpated, under the influence of his reason and will. To extinguish the spirit of competition is to seek for racial suicide.

Some Other Implications

I have been attempting to place before my readers, in its baldest outline, the conclusions which followers of Darwin have formulated concerning man's mental nature. Evolution is true; the actions of the human brain depend on deeply-seated impulses inherited from a purely animal ancestry; but in the human brain these ancient impulses find at their disposal an instrument which surpasses that of the anthropoid, as much as a cathedral organ does the shepherd's reed. These basal instincts find that they are no longer unregulated and free; a mechanism has appeared in the human brain for their control. Clearly such a doctrine has a very direct bearing on the art and science of education. A child is born with all of the old animal reflexes, instincts, and impulses in command of its brain; every year it should bring, by instruction, example, or compulsion, these old and necessary impulses more and more under the control of its higher centres. Education consists in bringing our inherited machinery of emotions, feelings, passions, impulses, and wild desires under the control of reason. England has instinctively discerned what education really is: it is self-discipline; the formation of character in making man's higher centres masters of his cerebral establishments. It is

only by such a proceeding that we can become units of social communities. Our aim should not be to eradicate the animal propensities within us, but to bend them so as to serve best the interests of both individual and of country. I would not, for example, break the spirit of competition; that spirit has lifted us from savagedom, and our hopes of the future are bound in it.

The Impossibility of a Universal Utopia

Our conception of man's mental nature has a very direct bearing on the possibility of making the whole world a human Utopia. There is not a shadow of doubt that human nature could be changed. Wild instincts have been bred out of dog, sheep, ox, horse, and many other beasts and birds; we have been less successful with pigs and cats. But in all those instances we have substituted man's protection and guidance for the machinery of self-protection and self-preservation which we have selfishly taken away. Who is to play the part of protector and legislator for mankind when it has become thoroughly domesticated? For in such a state of domesticity humanity will have had eradicated all its wild inheritance—its love of struggle, its passion for freedom and for success, its desire for wealth, its loves and its passions, its fears, its anxieties, its courage, its patriotism. When we have rid man of all these "vices" we shall have, indeed, domesticated him, and at the same time deprived him of the powers which impel him onwards. Human life under such circumstances becomes a tame, unmanly, and uninspired existence. Man lives only when he lives dangerously. Rather than submit to such a fate most of us will desire to take our courage and our future in our own hands and play the great game of life after the manner which Nature has always practised.

CHAPTER II

Concerning the Nature of Man's Brain

THE previous chapter was given as a lecture in the University of Manchester. At its close a reporter who was present drew my attention to an early passage wherein it is declared that " medical men can find no grounds for believing that the brain is a dual organ—a compound of substance and of spirit." He appeared alarmed and asked me to reaffirm the statement—one which for me seemed beyond question. For it is the verdict of every physiologist who has experimented on the living brain; brain surgeons base their operations on its truth, and physicians accept it as their guide, when they have to treat those who suffer from disorders of the mind. That " mind " or " soul " is a manifestation of the living brain is an accepted commonplace in medicine. To make this conception of modern medicine perfectly clear I employed the time-worn simile of the burning candle, for there is more than a superficial likeness between the processes of combustion and those of life.

Those who contribute papers to scientific societies are often disappointed with the debate which follows. Some incidental point is seized upon by the debaters, and the main argument of the principal speaker is wholly overlooked. This was my experience at Manchester; my lecture was a plea for the application of Darwin's theory to the interpretation of human nature, but the Press transformed it into an attack on religion.

It was said that I had denied the existence of the human soul, whereas all I had done was merely to outline the conception held by all competent medical men concerning the constitution of the living human brain.

Before proceeding further it will be well to ascertain what medical men mean when they speak of *soul*. We cannot do better than begin with Galen, the great Greek physician who lived and taught in the second century of our era, and whose word remained law in medicine until the seventeenth century, when William Harvey initiated a new phase in the history of his profession. What his predecessors had ascribed to spirit he proved to be caused by forces which could be seen and measured. Galen's conception of the soul is of particular value because it reflects the best professional opinion prevalent in the Eastern world in early Christian times. In the first paragraph of his book on "The Natural Faculties" he writes: "And if there be any one who allows a share of soul to plants as well as to animals, and separates the two kinds of soul, naming the plant soul *vegetative* and the animal soul *sensory*, this person is not saying anything out of the way, although his language is unusual. . . . We employ these terms in their customary sense and say that in animals there are manifestations of soul and of vital processes, and that in plants those are only of the latter sort, for growth and nutrition are carried on by vitality, not by soul." In another passage Galen permits us to see that he regards "feeling and voluntary motion" as the outward manifestations of an inward soul. In higher animals feeling and volitions are attributes of the nervous system, of which system the brain stands as the master-organ. The soul, then, in terms of modern medicine, is that which

gives us power to feel, to reason, to remember, to will, and to do. Now, these are the faculties which we have the best of reasons for attributing to that multi-millioned mass of living nerve cells—the brain.

Medical men, then, regard soul as resident in and inseparable from the highly organized living nervous matrix of the brain. This opinion is not accepted by an eminent group of non-medical but scientific men, many of whom are justly renowned for discoveries which carry us towards a better understanding of the ultimate structure of matter and are giving us a new conception of the relationship which exists between energy and matter. My friend Sir Oliver Lodge is the most eminent member of this group. As far as the human brain is concerned he is a convinced dualist: the brain, in his opinion, is but the instrument of an immaterial entity—the soul; the soul, in his opinion, is just as distinct from the brain as a musician is from the instrument on which he plays. It is only by making such an assumption that it is possible for Sir Oliver to explain the multitude of facts known and accepted in the world of spiritualistic enquiry. Spiritualists believe that the mind or soul comes out of space, seizes upon ordinary matter, turns it into living protoplasm, fashions this protoplasm into a living body, uses that body as the vehicle of its manifestation, and sooner or later discards its material garb and again flits out into space. In brief, the modern biologist presumes that the material body or candle comes first, the spirit or flame afterwards; whereas the spiritualist reverses the order of events.

An enterprising newspaper submitted my Manchester lecture to Sir Oliver Lodge and obtained from him an article in which he stated the reasons which compel him to regard the human spirit as a separable and immortal entity. In turn his article was submitted to

me for a reply. This chapter, which was my answer, sets out the conception held, tacitly or openly, by the leaders of Medicine regarding the nature of human personality. It should be observed that Sir Oliver Lodge and the writer approach the problem as men trained in the ways of science, and that both of us accept evolution as a truth.[1]

My friend Sir Oliver Lodge and I are of a like mind concerning Life after Death: we both believe in immortality. We have both come by our beliefs in the same way—namely, by keeping our eyes awake for facts and applying a training in Science to their explanation. Although we have pursued the same methods of enquiry, we have come to opposite conclusions as to the manner in which Life conquers and outlasts Death.

The Immortality of Life

For me life is a web and is immortal. Sir Oliver and I are infinitesimal specks in that colossal web, as are also the 1,800,000,000 other human beings who keep us company on this earth. The web of humanity, now on the loom of time, is but the end of the immeasurable sheet which recedes into the abysm of the Past and the beginning of one to which we can see no end. It is true that men who have studied the sun assure us that a time will come when our planet will be unfit for life, but as that calamity lies millions of centuries ahead we may reasonably call the period assured to humanity as an immortal lease. It is in this material sense that the biologist regards man as an immortal being; we survive, if we survive at all, only in the

[1] *See* "Why I Believe in Personal Immortality," by Sir Oliver Lodge. June, 1928.

lives of our children and of their descendants. Every man and woman are born with the seeds of immortality within their bodies.

Sir Oliver is a general in that magnificent army which attacks and wins the secrets of the Universe; I am but a non-commissioned officer in that still larger army which the world has enlisted for the study and conquest of disease. We cannot hope to succeed in our campaign except by the study of life—the processes of life which we find at work within the body and brain of man. While we must give due attention to the evidence of men who have enquired into the constitution of matter, we must give especial consideration to those who have studied the organization of living matter. No court which enquires into the nature of man can be regarded as properly constituted which rejects the evidence of those best fitted to give it—medical men.

The Nature of Death

Before we discuss what life is and the possibilities of its survival, let us see what medical men know concerning death. When a physician finds that his patient's heart has ceased to beat and his breath to ebb and flow, he concludes death has taken place. For all practical purposes the patient is dead, but not really so. Could the physician instantly set up an apparatus by which he could circulate fresh blood, containing oxygen, through the vessels of the dead man's head, consciousness would return; memory and thought would revive; mind would be restored, just so long as an artificial circulation was continued. But let the circulation and the supply of oxygen cease for ten minutes, and the living units of the brain, in their serried millions, pass into a state of irretrievable death.

The heart itself survives much longer than the brain. Two hours, four hours, or even more, after a certificate of death has been properly signed, the heart may be cut from the "dead" body and by artificial means revived so that it will again beat and continue beating for a long time if proper precautions are taken. Forty hours after a man is legally dead the coats of his arteries may still manifest signs of life. The human body is made up of an infinite number of microscopic living units; medical men have removed some of these from a dead child and kept them alive and growing in their laboratories when the rest of the body was crumbling to dust.

Death is not an affair of an instant. The human body dies by a process of attenuation, as does the starved population of a beleaguered city; the weaklings go first, and then the rest in the order of their strength and endurance. If death is due, as is supposed by Sir Oliver Lodge, to the escape of an immaterial spirit, we should expect the exodus to be instantaneous, whereas we find it to be a process of piecemeal. And if the living essence of man's body is an immaterial spirit, how comes it that it requires such material things as air, food, and water for its maintenance? If a ghost enters my house by night and I find in the morning that it has eaten my food, drank my wine, and stolen my money, I conclude that it was material, not immaterial. This is exactly how the biologist argues concerning the living spirit of the human body: he finds it requires a material sustenance; to exist it must consume matter and transform energy. Consciousness, feeling, memory, will—all that we count mind—disappear from the living brain the moment we withhold its supply of oxygen. Life as we know it has always a material basis; a physiologist cannot

imagine how life could be possible apart from matter. If our minds are to survive, our bodies must bear them company.

The Living Body

The dead body is an extinguished candle; what do we know of the burning candle—the body glowing with health and life? We know how the candle of a human life is lit; only the flame from another candle will start it into being. How quickly our knowledge has progressed! Only a century has elapsed since the eye of man saw for the first time the speck of protoplasm—the ovum—in which every human life takes its beginning. And now we know every stage in that wonderful miracle which transforms a particle of living matter—smaller than the head of the finest pin—into grown men and women. We have followed in the womb every change which carries the human body up the scale of life from the simplest beginnings to the most elaborate endings. We begin as a microscopic unit of protoplasm and we end as a multi-millioned colony of living cells. We see great battalions of these cells marshalled to carry on the work of the nervous system, we see cousin battalions arranged to form muscular engines; others are specialized to serve the lowly purpose of living bone levers. We see the elaboration of these delicate living instruments—the eye and the ear. Even in the life of the body there is death; certain units are ever in process of birth, others in process of death. Every day the human body lives and dies. Every hour it is giving off the spirit or energy of life in the form of good actions and of bad ones. If philosophers are right, nothing is really lost; only changed.

Evolution and Spirit

How are we to explain the elaborate and miraculous changes which transform a simple unit of living matter into an adult human body? Is it true, as Sir Oliver Lodge believes, that an ethereal entity, a human spirit, has entered into this speck of protoplasm, seized its atoms, and caused them to pass through the elaborate turmoils of development simply to secure an uncertain and at the best temporary terrestrial lodging? No sooner has it fashioned its home than decay sets in and sooner or later loses all its labour. Nay, it is easier, and more satisfying to our reason, to explain the known facts of life as material processes than to attribute them to the workings of a mysterious and immaterial entity such as is postulated by Sir Oliver Lodge.

Why should human beings begin as products of the womb? If Sir Oliver Lodge is right in supposing that the living human body is merely the husk of an immaterial spirit, then no explanation is possible. But if we accept evolution as a truth, which we have the best of grounds for doing, then we can explain why man begins as a simple cell and why his developing body ascends the scale of living things. For evolution traces man's history back to the dawn of life on earth; his embryological record points clearly to such a beginning. Biologists therefore regard humanity as part of the web of life whose unknown beginnings lie in the recesses of time. Man is but part of that variegated web; what we postulate of him must also apply to the whole web. If we postulate an immaterial essence to account for the life of man, we cannot withhold the same interpretation from the living amœba. If we grant immortality to the spirit of man's body, how

can we deny it to that of every living thing? We must not shirk the implications of either Immortality or of Evolution. Every one of us must face these problems with the utmost honesty and courage of which we are capable.

Living Matter is Self-Regulating

I have spoken of "life as a web on the loom of time." Who, then, is in charge of the loom? Who is the weaver? As far as biologists can perceive the loom works automatically; the threads spin themselves. The forces concerned can be perceived and measured. The human threads in that web differ from all the other strands within it in one important respect; man alone can alter the spinning and the pattern; according as he spins and designs is the web of the future. Man alone can, by taking thought, alter both warps and woof. The web spun by plants and animals is quick with life, but is not the whole universe really alive? Astronomers tell us that some stars represent worlds coming into being, others passing towards extinction; the process of growth and decay within the universe of matter is regulated automatically. So are the movements of all the heavenly bodies. Stellar regulation is automatic; Newton made his name immortal by giving his fellow men a reasonable explanation of how masses of matter are compelled to behave when swung in space. Now, we who are peering into the behaviour of living matter find just the same automatic laws at work as physicists find to reign in the universe of dead matter; the laws which prevail in living bodies are infinitely complex, but are not beyond the human powers of discovery. Biologists do not know as yet how life began; they have no explanation to offer of its inner significance and ultimate meaning.

Their primary business is to observe happenings and give a truthful record of them. Therein lies the weakness of their philosophy, for man's mind craves for a solution of the great mystery and is restless until it is satisfied as to his place in the great scheme of the universe. And yet the honest biologist cannot accept, as an explanation of what he sees and knows, a dual theory of the living body—be it that of man or of any other animal. For him spirit and body are one and indissoluble.

Primitive Man and Spiritualism

Neither Sir Oliver Lodge nor I will ever persuade an untutored savage that the voice which issues from the box of a gramophone is not that of a spirit. Nor can we blame the savage for interpreting things after his own manner: for him everything that happens is caused by a spirit. The savage believes, just as spiritualists do, that the air around us is swarming with spirits. The heart of man is naturally lazy, and hates the scientific toil entailed by a search into the cause of things; spirits permit him to sit at ease and spin dream-like and, to him, quite satisfying explanations. When modern medicine began its beneficent work it found spirits of many kinds at work in and around the human body. Pasteur discovered that the malignant spirits of disease were for the greater part material organisms; malignant devils which seized men in ancient days became known as "Jacksonian epilepsies"; in modern times the "vital spirits" of the blood were found to be oxygen. Science has driven and is driving spirits from the body more and more. Sooner or later it will expel all of them, for as knowledge increases we find that the "spirits" of our forefathers have a material or biological basis.

If the spirit of truth is the kernel of religion, then men of science are truly religious men. They not only believe in the immortality of man, but they are convinced that this immortality is material. And believing so they work for the betterment of the world and of humanity; that is their religion. But the one thing the man of science insists upon above all others is that his currency must carry on its face the stamp of verifiable truth. Once let the human fancy free to coin as fancy dictates, and the markets of the scientific world will be flooded with debased coin. When a scientific man calls upon spirits, mysterious essences, and uncertain shadows to explain phenomena of the living and of the dead world, he is drawing cheques upon imaginary banks. Science issues no draughts unless she has reserves enough to meet them. Above all, we must be ever mindful of the fallibility of the human brain. Even its most trifling accounts need repeated scrutiny by independent auditors. Nor is this to be wondered at when we remember its history; the human brain was not evolved as a scientific instrument. It has to be made into one. Hence it is that the true man of science is ever mindful of the dog in the fable which mistook appearance for reality. As it crossed a stream with the bone of reality in its mouth it happened to see in the water another dog also with a bone in its mouth, and jumped to seize the shadow bone. That, I suggest, in all humility, is the kind of mistake which Sir Oliver Lodge is now making in regarding the human brain as a compound of substance and shadow.

CHAPTER III

Modern Critics of Evolution

IN the number of the *Nineteenth Century* which appeared on November 1st, 1927, a modern critic wrote: "There is not a shred of conclusive evidence for the animal ancestry of man; the whole structure of its colossal delusion rests upon certain similarities between the physical nature of man and that of the animals—similarities which are easily explainable without postulating any descent of man from the apes." Such a sweeping statement must be made, one would suppose, by a profound biologist—one who has resurveyed the whole field which Darwin had worked over—but as a matter of fact this modern critic of Darwinism, Mr. George H. Bonner, has not made himself acquainted with even the elements of biology. He is under the delusion that modern zoologists would not be surprised to find "that the goldfish which we left in the bowl overnight had become mammalia in the morning." Darwin's fiercest critics are those who know least of what he did and said. I must admit, however, that it is not as a biologist but in the rôle of medieval schoolman that Mr. Bonner shows us the error of Mr. Darwin's ways. He sits in his armchair and once again ticks off on his fingers the list of those barren virgins: "first of all, the final cause," "secondly, the efficient cause," "thirdly, the formal cause," and, lastly, "the material cause." Without these as a guide how could Darwin hope to

reach the truth? Mr. Bonner assures us that "the fundamental fallacy connected with most expositions of the theory of evolution is that they make the lower produce the higher, which is impossible." And yet what Mr. Bonner believes to be impossible is just what most of us are convinced we see happening around us every day: our civilization ever tends to move from the simple to the complex—from the low to the high; the geological records of the rocks proclaim aloud an ever upward move in the scale of life.

The editor of the *Nineteenth Century* invited me to answer Mr. Bonner; but, as his arguments had been met and his misconceptions explained so often before, no answer on my part seemed to be called for. It was otherwise when my friend Prof. J. A. Fleming contributed to the January number (1928) an article entitled "Truth and Error in the Doctrine of Evolution." Prof. Fleming is a distinguished and respected man of science; his discoveries have made possible the evolution of our modern system of wireless communication. The fact that he is not a trained or professional biologist in nowise detracts from the strength of his argument; biological truth, if it is to be accepted, must be capable of complete demonstration to the lay mind as well as to the professional. Prof. Fleming holds that, so far as man is concerned, Darwinists have not proved their case, and gives his reasons for this judgment. When, therefore, I was reinvited to take part in the discussion I gladly accepted, and contributed to the February number the arguments reprinted in this chapter.

Darwinism and Religion

Before setting out to defend the theory of evolution as applied to living things and answer objections lodged

against it by Prof. J. A. Fleming, F.R.S., and Mr. George H. Bonner, I should like to make one matter very plain to my readers. In all articles written to defend religion from science there is an underlying presumption that the modern Darwinist is impelled by an anti-religious motive—that the aim of his researches is to prove that the Biblical account of creation is untrue. Such is not the case; men like myself pursue our enquiries into the workings of the human body with a single aim—so to understand it that we may help the more to free it from the disasters of disease. Every year our methods of approach become more exact and carry us deeper into the secrets of the flesh. Our knowledge continues to grow; our control of disease improves. To impugn our motives or to restrict us in our search for truth, even when our findings run counter to ancient and accepted beliefs, would be to kill what is best within us. We cannot know any subject well unless we know its history. Anatomists are convinced that the human body has a long and complicated history.

It is not necessary for me to defend the broad truth of evolution; Prof. Fleming believes that the doctrine of evolution gives the best explanation of the state in which we now find the heaven above and the earth beneath. We are only beginning to know the universe of which our earth forms so small a speck. Prof. Fleming agrees that the state of the universe, as revealed to us by modern telescopes and spectroscopes, proclaims the truth of evolution. He believes that matter undergoes evolutionary changes; the discoveries now being made in our physical laboratories make any other opinion untenable. He also agrees that Darwin's doctrine is applicable to the world of living things—with an important exception, man himself. In brief,

Prof. Fleming is prepared to exclude from the Mosaic category of specially created things—to throw to the ravening wolves of evolution—night and day, heaven and earth, " every herb yielding seed and every living creature that moveth "—all save man. His reasons for excluding man from the law of evolution and retaining him as a singular example of special creation will be examined as I proceed.

Anti-Darwinism

In an early part of his article Mr. Bonner makes the following statement [1]:

> The facts of Evolution are admitted by all but the perverse—namely, that close observation of the phenomena of Nature reveals an ascending series of types, ranging in degree of complexity and intelligence from the very lowest up to man.

From such a statement the reader will infer that Mr. Bonner is an unqualified upholder of the truth of evolution, but doubt on this point will arise when subsequent passages are read in which Mr. Bonner declares that " there is no conclusive evidence in historical times of the change of one species into another "; that an anthropoid ape, " even in the most ideal conditions which a ' Zoo ' can provide," has never been known to change into a human being; that species " have, generally speaking, remained relatively fixed since the beginning of history "; that " there ought to be, not a few, but thousands of examples of the individuals of one species actually changing into another before our eyes "; that " there should not

[1] *Nineteenth Century and After*, November, 1927, p. 584.

be one but hundreds of missing links found in the world to-day." Such statements raise doubts as to the orthodoxy of Mr. Bonner's doctrine of evolution, and when he asserts that "it is a principle inherent in the nature of things, and one which no example has yet disproved, that the lower cannot by itself alone produce the higher," we seem to have a flat denial of the belief that now dominates the expert student of all living things—namely, that low and simple forms of life have, in the course of time, and by natural means, become changed into higher and more complex forms.

Whether or not Mr. Bonner believes, as the records of the rocks so plainly show, that the horse, as we know it to-day, has been evolved from a three-toed ancestor, and that this, in turn, has arisen from one which had five toes, his readers will find difficulty in deciding, but as to his opinion of man's origin he leaves them no manner of doubt.

> If we apply [he writes] the principles outlined to the emergence of man on the physical plane, we are led to the conclusion that man, as man, could not possibly be produced or evolved from anything lower than himself. He must have subsisted, as a principle in the spiritual world, from all eternity. No amount of development can turn an individual ape into a human being, because the ape has not the potentiality of self-consciousness.

I shall deal with the reason which Mr. Bonner gives for denying the possibility of man's evolution from an ape-like animal in due course. In the meantime, it is enough if I have made clear that the present crux in

the theory of evolution lies solely in that part of it which concerns the origin of man. Prof. Fleming, having surveyed the evidence, has come to the conclusion that the evolution of man from an ape-like ancestor is highly improbable. Mr. Bonner, taking his stand on first principles, so beloved of medieval schoolmen, declares such an ancestry to be a sheer impossibility. And men like myself, who have given a lifetime to the study of the evidence at first hand, and find that the acceptance of evolution as a truth has guided us time after time to fresh discoveries, are convinced that Darwin was right; man is but a sprig on the great tree of evolved life. Wherein lies the truth?

Design as an Argument

Searchers for truth do not wilfully misunderstand each other. Antagonists may be separated by mere verbal misinterpretations, or their differences may go deeper and concern fundamental matters—not only the interpretation of evidence, but also its admissibility. In the present instance the differences are fundamental, and to understand their nature and trace their origin we must go back to the time of Archdeacon Paley. Until the appearance of the "Origin of Species" in 1859 his argument from design—that design, purpose, contrivance, so evident in the body of man and in all living forms, proclaimed aloud the existence of a Creator—was regarded by almost all thoughtful Englishmen as unanswerable. The Archdeacon had studied under a very able London anatomist, William Hunter, brother of the more celebrated John; he applied to the knowledge of his time a quick and sure understanding, and set his argument forth in clear, terse English, employing, as is the habit of successful

teachers, pertinent and concrete instances to make his meaning unmistakable. Every one knows that opening paragraph of his "Natural Theology" which begins "In crossing a heath, suppose I pitched my foot against . . . a watch upon the ground," and the subsequent passages in which he argues "nor would any man in his senses think the existence of the watch, with its various machinery, accounted for by being told that it was one of the possible combinations of material forms"; that there existed in things a principle "of order which had disposed that parts of the watch into their present form and situation"; "that the watch in his hand was nothing more than the result of the laws of metallic nature." Then come the sentences which affirm that "there cannot be design without a designer, contrivance without a contriver. . . . Arrangement, disposition of parts, subserviency of means to an end, relation of instruments to use, imply the presence of an intelligence and mind." Finally, he sums his argument up thus:

> The conclusion which the first examination of the watch, of its works, construction, and movements, suggested, was that it must have had, for the cause and author of that construction, an artificer who understood its mechanism and designed its use. This conclusion is invincible.

Paley's argument seemed invincible, and yet in less than a generation it was replaced in class-rooms, laboratories, and learned societies by that of Darwin. The reason of Darwin's triumphant success is often overlooked; it was because he discovered a serious omission in the Archdeacon's argument. Paley spoke of the watch as if it had come into existence all at

once by an act of special creation, whereas the truth was that the remote ancestor of the watch had appeared first as a small pocket clock in the fifteenth century and had undergone improvement after improvement until it had reached the state in which Archdeacon Paley discovered it on a heath late in the eighteenth century. In brief, the watch had evolved—it had a history. Darwin ousted Paley because in his " Origin of Species " he produced such a prodigious number of facts which could not be explained if special and instant creation were true, but which fell into place and assumed a rational order if the doctrine of evolution were valid in the world of living things. Many had proclaimed the doctrine of evolution before Darwin, but he was the first to convince men of its truth. It was the " Origin of Species " which caused men to realize that no matter what trade, profession, or special study engaged their attention, that trade, profession, or study had sprung from a small beginning and had reached its present state by a process of evolution. We can trace the rise of all the mechanical inventions which have so transformed our modern modes of life. Incited by Darwin's teaching, we have searched the ancient foundations of Rome, Crete, Egypt, and Mesopotamia, and have found that man's highest civilization has sprung from savagedom. Everything living and dead has been found to be subject to the law of evolution. The Bible itself has not escaped; scholars have dissected its books and have found that their contents are the accretions of various ages. If this is true of all things, living and dead, how can man hope to escape a law which is universal? The evidence of man's descent which Darwin produced in 1872 has never been refuted, nor has any one succeeded in explaining that evidence—save in Darwin's way.

I have stated that Darwin replaced Paley, and have spoken as if their doctrines were incompatible. Mr. Bonner and Prof. Fleming do not think so; they are of opinion that, if we are to give a complete explanation of the universe of which our earth and we form part, it is necessary to combine the teachings of both men. If Darwin was right in asserting that the famous watch had come into existence by a process of evolution, they hold that Paley was equally right when he postulated the existence of a watchmaker—that the watch could never have arrived at perfection unless there had been a directing intelligence at work on it. We must examine, for a moment, how each author formulates his claim for the reintroduction of Paleyism into modern thought.

> In short, [Prof. Fleming has written] the universe is not merely a Thing, it is a Thought, and thought implies and necessitates a Thinker. The use of the term "evolution" as a name for the cause of the order, adaptation, and beauty of the external world is an error. It is erroneous because it attributes the production of phenomena which appeal to our intelligence and emotion to an agency which is impersonal, unselfconscious, and has no intelligence or emotion itself, and therefore cannot produce them. . . . It is merely a personification of the concept of gradual and continuous change.

Then in a later passage, when writing of living things, he states:

> There is therefore hidden away in the germinal cells something equivalent to the plan of a house, in accordance with which the bricks or cells are

> not piled one upon another in disorder, but arranged in order so as to create an edifice.

In this way Prof. Fleming seeks to reconcile the doctrine of evolution with that of a planned creation.

Mr. Bonner seeks to harmonize modern science and ancient religion on somewhat different grounds, as may be seen from the following citations:

> Evolution, therefore, in the strict sense of the word, implies the orderly unfoldment on the plane of manifestation of *potentialities already inherent* in the formative principle of that which is said to evolve. It does not necessarily involve any causal relationship, in the strict sense, between a lower stage and a higher one.

Then, following Paley's example, Mr. Bonner illustrates the meaning of the above passage thus:

> In the erection of a cathedral the "idea," as we call it, of the finished product subsists first of all in the mind of the architect, from which it is carried outward in successive stages of plans and builders' instructions. . . . It is just as logical to postulate that man is evolved from the animals, in the sense of meaning that before there could be men there must be animals, and that the animals in some way contain the potentialities of man, as to state that the cathedral is "evolved" from its foundations.

Then follows the passage, already cited, which asserts that man "must have subsisted as a principle in the spiritual world from all eternity."

Darwinism and Design

There are certain misconceptions and errors in the statements just quoted, to which I shall return presently, but in the meantime let us see how medical men account for the wonderful examples of design and contrivance which so abound in man's body. There is in the human thigh-bone, as Dr. Paley was well aware, just as clear evidence of engineering and architectural skill as are to be found in any watch. Such evidence of design is not so mysterious to us as it was to Dr. Paley, because, thanks to the modern improvement of the microscope, we have come to know something of the " bone-builders " concerned—great armies of mere specks of living protoplasm, known technically as *osteoblasts*. We have reason to regard osteoblasts as having a species of consciousness—at least, we know that they are sensitive to the strains and stresses which fall on them and respond by laying down material so as to meet and carry all transmitted forces. If the muscles of the thigh grow in power, osteoblasts bestir themselves and strengthen the bony struts and bulwarks of the femur. We know that they are normally under government, being controlled in their activities in several ways, particularly by substances which reach them from other parts of the body—substances now named " hormones." We know that at times they become rebellious, turning malignant and destructive, and we hope to discover the circumstances which so change their nature. We know that when the thigh is broken the osteoblasts in the neighbourhood of the fracture immediately set about effecting a repair; we are learning the nature of the signals and impulses which set them to work. In our investigations we studiously refuse to believe that osteoblasts possess

powers or qualities which are beyond the reach of our reason. We have never occasion to make any discrimination between "planner" and "doer," as Dr. Paley thought necessary to achieve that kind of result known as "design," and as Mr. Bonner and Prof. Fleming still think necessary. If a watch were a living thing, as the human thigh-bone is, then it would be found that watchmaker and watch were one. There is no duality of function in living matter. An osteoblast is both architect and mason in the very essence of its being.

Nay, the power to design is a property which is inherent in every form of living matter known to us. Without such a property matter could not exist in that state which we call living. Physicists, to account for the behaviour of dead matter, find it necessary to postulate a force which they name gravity. Likewise biologists, to account for the behaviour of living matter, find it necessary to postulate a property which we may name purposefulness. How gravity came into existence physicists do not know; biologists are equally ignorant of how purposefulness came into being. The physicist presumes that the law of gravity has prevailed since our solar system began to come into existence. The biologist has equally good reason for believing that the law of purposefulness has prevailed since the world of life began.

If I am asked to explain how the cells which build our bones come to be endowed with such marvellous faculties, I reply that I know of only one way of throwing light on the problem. That is the way we owe to Charles Darwin: it was he who taught us how to trace the history of such cells—to follow their evolution back to their oldest and simplest form; and in this case our search carries us back to the founda-

tions of the animal kingdom. We find that the simplest forms of living matter—single cells, microscopic in size and leading independent lives—already possess, to some degree, the power of skeleton-building. But we also find that the simplest form of living matter has much more: it can seek out a livelihood; it responds to light and to darkness; it shuns danger and shrinks from injury; it feels; it moves; it digests; it reproduces its kind; it is purposive in its actions. We can as yet but guess at the intricacy of its organization and machinery. But no one who sees the modern physicist exploring with success the constitution of atoms will venture to assert, as our critics have so often done in the past, that the deepest secrets of living matter are beyond our reach. It is the inherent and essential quality of living matter that it can both plan and execute; unless matter is purposive, it cannot be alive. For modern students of life the "thinker" and the "thought," the "directing intelligence," do not lie outside living matter, as Mr. Bonner and Prof. Fleming seem to think, but are of the essence of its constitution.

Evolution Misconceived

Having explained the attitude of modern biologists to the "argument from design," resuscitated by Mr. Bonner and Prof. Fleming in the citations made above, I turn to certain misconceptions on the part of Mr. Bonner. When he states that a "cathedral is 'evolved' from its foundations" it is clear that he has not grasped in the least degree what scientific men mean by evolution. A cathedral is built upon its foundations, but its evolution is a totally different matter. To trace the evolution of cathedrals, to discover how they came into existence, entails a prolonged search of man's

building activities; we have to follow their evolutionary history back through centuries, until we arrive at their earliest germ—a humble hovel. When man had learned to lay one stone on another the "idea" of cathedrals began to dawn; before then it was not in existence. It is important that we grasp this fundamental aspect of evolution because of the statement made by Mr. Bonner concerning man's evolution. "Man," Mr. Bonner declares, "must have subsisted, as a principle in the spiritual world, from all eternity." The "ideas" of man's inventions, such as that of the cathedral, of the watch, or of "wireless," have an equal claim to a past eternity, but truth-seeking students of evolution have no option but to assign their birth to the date of their first materialization. It cannot be said that "wireless" did not come into existence long ago because there was no need for it; one has but to think of what its value would have been to the rulers of the widely spread Roman Empire. The "idea" of wireless could not have come into existence until the "idea" of electricity had been discovered and exploited. The watch could not have been evolved until man had discovered brass, steel, and silver and learned how to work them. Every cathedral bears in its structure reliable evidence of its evolutionary history. To declare, as Mr. Bonner does, that the "lower cannot by itself alone produce the higher" is to contradict all that is known to scientific men; and to suppose that evolution is but a materialization of what was fore-ordained in the remotest recess of time is a guess which cannot be supported by any kind of proof.

When Man's Existence Became Possible

I have exemplified the manner by which students succeed in dating the objects of their enquiry; a watch cannot be older than the period of metals. This method of enquiry has an important bearing on the Darwinian conception of man's origin. For many millions of years the earth has kept a record of the sequence of events which mark the evolution of animal life. We know, from the study of fossil remains, the succession of types which have lived in ancient jungles and seas. A study of these fossil records assures us that the rule which holds true for human inventions is also valid for the transformations which mark the progress of animal life—namely, one evolutionary step has first to be taken before another becomes possible. It was not until the tertiary period of the earth's history was reached that events had marched to a point which made possible the appearance of the earliest and lowliest of primate animals. It was not until the middle period of the tertiary period that the higher primates came into a materialized or separate existence; from what we know of their organization it is unlikely that they could have appeared much before then. The structure, organization, and posture of the human body could not antedate those of the great anthropoids, any more than the discovery of X-rays could have preceded that of electricity. It may be a metaphysical truth, as Mr. Bonner claims, that man existed "potentially" in the first speck of living protoplasm, but medical men who are seeking to unravel the history of the human body and brain do not attempt to go beyond the period of their first materialization. All verifiable evidence assigns this event to a very late stage in the history of our earth. Beyond this period man did not exist.

Signs of Defeat

A close study of the articles by Mr. Bonner and Prof. Fleming yields ample grounds for believing that critics of Darwin's theory of man's origin are now fighting a rearguard action. They are in retreat. Mr. Bonner attempts in vain to hide the exhausted condition of the defence by putting up, to cover the retreat, a dense smoke-screen of metaphysical verbosity. Attacks are no longer launched with the passionate fierceness and argumentative zeal which characterized the earlier onslaught on Darwin. It is true we are having a recrudescence of Paleyism, but we no longer meet with the wild protagonist who claims a special or independent origin for his own species because man alone possessed a special muscle in his leg—the *peroneus tertius*. Nor, indeed, could a claim be now lodged on this ground, for further enquiry has shown that one other animal does occasionally possess this muscle—the gorilla. Nor are the peculiarities of man's foot urged now as a bar to his animal origin—at least not by any one who has taken the trouble to become acquainted with the many and striking correspondences in structure which link the foot of man to that of the gorilla and also of the chimpanzee. Even man's much-vaunted upright posture is no longer regarded as an obstacle to his lowly origin. Prof. Fleming frankly recognizes that the structural similarities which bind men to other animals have to be explained. He writes:

> The human race, dominant above all others on the surface of the globe, is unquestionably, as regards bodily structure, closely allied to the animal races, and especially to the higher mammalia. Great as are the differences, yet

> in broad outline the similarities are too manifest to be denied.

Mr. Bonner admits that

> There is also evident a certain similarity of organic structure between the higher mammals, such as the ape, and the highest animal of all, man—a similarity which extends also to those instincts, habits, and natural activities which are necessary to the preservation of physical life.

Mr. Bonner also recognizes that some explanation has to be given of the fact that man, like other animals, begins in an egg, and after passing through a remarkable series of transformations, in which he manifests curious affinities to lower types, emerges from the womb to be suckled and nursed just as are the young of apes. Darwin believed that his theory gave a satisfactory explanation of these strange phenomena, but Mr. Bonner is of another opinion, and puts forward a theory of his own which I take the liberty of quoting because it shows the straits to which Darwin's opponents are now reduced.

> The fact [Mr. Bonner writes] that the human embryo passes through the stages of all the lower kingdoms before arriving at the human is sometimes adduced in support of theories of this kind, but this again is not conclusive, since it is obvious that the human body, as the highest production of Nature, must contain in some manner the characteristics of all the kingdoms below itself.

If, as Mr. Bonner alleges, " the human soul is a principle of such power that it can animate and keep together

a human body after having acquired it," we cannot see why its fleshly toilet should be so prolonged and so elaborate and so closely alike to that of the ape. Nor can we see why it was necessary to put on, at passing stages, tags of dress borrowed from the garments of old-world beasts. Most people, if there were no alternative to Mr. Bonner's theory, would prefer the explanation recorded in the second chapter of Genesis.

Further Evidence of Man's Origin

The truth is that, as our methods of enquiry improve and as our search goes deeper, the constitutional similarities between man and the higher primates impress us, not less, but more. Two years ago Drs. Lansteiner and Miller, of the Rockfeller Institute for Medical Research, carried out a prolonged enquiry into the reactions of human blood by more delicate methods than had been used before. They wished to verify observations made by previous enquirers, who had declared that the only blood which gave reactions closely similar to that of man was that of the great anthropoid apes. In summing up the results of their enquiry they state :

> In our studies only the blood of the anthropoid apes gave such [*i.e.*, human] reactions—a fact attesting to the close relationship with man.[1]

We now know that the elaborate changes undergone by the human egg when it becomes lodged in the womb are almost alike in ape and man, and that all of these changes are foreshadowed and approached in the placentation of the lower primates. As we come to know the susceptibilities of anthropoid apes to disease we realize that, in this respect, they closely

[1] *Journal of Experimental Medicine*, December, 1925, p. 870.

resemble man. They are, at least in captivity, liable to that very human disease appendicitis. It was from the brain of anthropoids that medical men first learned to map out the functional areas of the human brain. Notwithstanding this increase of evidence, affording presumptive proof of man's anthropoid origin, both Mr. Bonner and Prof. Fleming give their verdict against Darwin.

> There is not [states Mr. Bonner] a shred of conclusive evidence for the animal ancestry of man : the whole structure of its colossal delusion rests upon certain similarities between the physical nature of man and that of the animals —similarities which are easily explainable without postulating any descent of man from apes.

Unfortunately this " easy " explanation is still Mr. Bonner's secret; I know of only one explanation which can claim to be scientific, and that was given by Charles Darwin fifty-six years ago. Prof. Fleming, more accustomed to the weighing of scientific evidence, is less dogmatic in his decisions. He realizes " that there are difficulties in the form and details of Biblical statements as to man's origin, but they are not yet resolved by substituting for them the doubtful hypothesis of a continuous evolution from amœba to man." The Biblical record, I may remark, was made 3000 years ago by men who knew more of astronomy than of zoology. Would Prof. Fleming prefer their knowledge of astronomy to that of the present day ? If he refuses to accept their astronomy, how can he prefer their zoology, of which they knew so little ?

Reasons for Rejecting Darwinism

What, then, is the real reason which compels our two critics to reject the theory of man's origin ? Both

express their main objection most explicitly. Prof. Fleming, after enumerating man's mental attributes —his " altruistic qualities," his " amazing achievements," his " religious faculties "—asks the question: " Can these faculties and powers be explained in terms simply involving matter and energy? " And he answers it thus: " To assume that we can explain Mind and Spirit in terms of matter is to violate the fundamental canons of philosophic thought." Medical men, I fear, have no respect for these " fundamental canons." In the successful diagnosis and treatment of mental disorders they break them daily. They find that the moment that the nerve cells of the brain are deprived of oxygen—which is matter—they cease to act; they find their action can be disturbed by such material substances as alcohol; they can be thrown out of action by opium and chloroform; they know that temperament is altered and moods are changed by materials supplied to the nerve cells by stomach, liver, and glands; they see disease play material havoc with the delicate and intricate living machinery of the brain, destroying will-power and turning wisdom into stupidity. Modern medicine has banished for good the idea that insanity is to be explained and cured by regarding its unfortunate subjects as being possessed of " evil spirits " or of " devils "; no real headway was made in our knowledge of the human brain as long as it was regarded as a mere shelter for spiritual abstractions. Considering all the evidence, is it not much more likely that Prof. Fleming's " fundamental canons " are at fault rather than the materialistic considerations, which now carry such weight with those who are best qualified to form an opinion? Besides, Prof. Fleming admits that other animals besides man are endowed with a " Psyche," if but a small one.

Mr. Bonner's objection also concerns man's mental attributes, but he is somewhat more elusive in his statement than Prof. Fleming. He informs us that

> A man is not his body, the changing corruptible thing which is palpable to the physical senses; it is the soul, or whatever be the name applied to the animating and self-conscious principle behind the body, that is man.

In another passage we learn that

> A human soul is always and eternally a human soul—not needing to evolve from anything else or into anything else, but manifesting in a physical body in order to unfold, or evolve in the strict sense, its undeveloped potentialities, to become self-gnostic and fulfil its eternal purpose.

Clearly this novel interpretation of the human body—one which is very similar to that accepted by Sir Oliver Lodge, Sir A. Conan Doyle, and other spiritualists—is one of very direct interest to medical men, who will naturally expect Mr. Bonner to lay before them verifiable evidence of his assertions. The only evidence he does produce is contained in the following passage:

> The fact that the human body disintegrates at physical death is a proof that there is some principle which controls and animates the body during life but which deserts it at death; . . . therefore the animating principle, whether it be called soul or by any other name, is of an immaterial nature.

Now, in its disruption after death the human body is in no wise peculiar; death and corruption overtake

all forms of living matter. In Mr. Bonner's sense a cabbage has a soul; so have the amœba and the typhoid bacillus. If we construe appearances thus, we must assign a soul to every organ of the animal body; a man's heart may be beating in the laboratory of the experimental physiologist when the rest of the body lies sealed down within a coffin. Nay, each microscopic corpuscle of the heart has a soul, for in recent times colonies of them have been kept alive many years after the original heart has gone the way of all flesh. Nor is the soul in the wide sense used by Mr. Bonner, or in the narrower sense in which most people use the term, really an immaterial essence. In the wider as in the narrower sense the soul lives only as long as it transforms energy, and he is a bold physicist who now asserts that energy is not material in its ultimate constitution. When the supply of energy is withdrawn from living matter, its "soul" departs, just as certainly as the red glow vanishes from the electric radiator when its switch is turned off.

The Nature of the Soul

The human soul is an infinitely more intricate manifestation than Mr. Bonner has yet realized. As we medical men know it, that manifestation depends solely on the brain: the brain must be alive; it must be supplied with energy; it must transform that energy to live, think, feel, and be conscious. The human brain is beyond compare the most wonderfully complex and elaborate of all living structures known to us. In the arrangement of its parts it is inconceivably intricate; we know something of its manner of working even now, but it will take many centuries of continuous effort before we can become masters of its detail. Medical men regard the human soul as the inward

response and outward manifestation which is given by every living human brain.

The human brain is Nature's greatest miracle; it would be unbelievable that such a creation could have come into being in the animal kingdom did we not have before our eyes the graded steps which lead up to it. Between the lowest and the highest primate, from marmoset to man, occur a series of brains which represent, or seem to represent, steps in the evolutionary ladder up which the human brain has ascended.

The Present Position of the Problem of Man's Origin

What, then, is the position of the problem of man's origin as we anthropologists now see it? We have been accumulating evidence for over half a century, and we can explain our facts in only one way—by postulating that the theory of evolution holds true for the whole kingdom of life, including man. As regards man, we have to explain two sets of facts—first, those in which he resembles higher primate animals; second, those in which he differs from them. We explain the resemblances, just as we explain those which link brother to sister and cousin to cousin, by presuming a common inheritance. But how do we explain the differences? Prof. Fleming recognizes the poverty of our present resources when he asks:

> What were the influences or forces at work to reduce the size of teeth and jaw, shorten the arms, diminish hair on the body, remove the prehensile great toe, improve the grasp of the hand, make easy the upright position of the body, enlarge the skull capacity and increase the complexity of the brain structure?

These are just the problems on which we are now engaged, and we may claim to be making headway: to some of his queries we can already make a partial answer; none of them is beyond the scope of our powers of investigation and elucidation. Not one of Darwin's contemporaries would have believed that we should now know the actual machinery of heredity; yet beyond doubt it has been discovered and studied at work within the nucleus of the fertilized egg. From the student of heredity and from the experimental embryologist we are receiving, and will continue to receive, explanations of our many enigmas. And in every case the explanations which are received make the theory of evolution more credible and more trustworthy. It is the way of science to discover facts long before it can explain their causal origin. We know for certain that light comes from the sun, but do we know as yet the exact manner in which it succeeds in reaching us? For myself the evolution of man from animals is a matter of an equal order of truth, although as yet no one knows the forces concerned and how these forces were and are regulated. We have every reason to suppose that the means of evolution are still in us and around us, and are not beyond the reach of final discovery.

EPILOGUE

WHAT I have written has brought me worldly advice from friends and many admonitory letters—some through the post, and others through the public press. Most of my correspondents cling to the belief that men and women are honest, just, and charitable only because heaven and hell are in front of