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THE CONSEQUENCES OF DARWINISM

MAN HAS HAD ONE HUNDRED YEARS to consider the consequences of Darwinism. Darwin's concepts of evolution, or transmutation of species, were first published in July of 1858 in an essay accompanying an essay of similar substance by Alfred Russel Wallace. In the fall of 1859 appeared Darwin's epochal book, *The Origin of Species by Means of Natural Selection,* subtitled in the best Victorian style, "The Preservation of Favoured Races in the Struggle for Life".

This was the book that established Darwin's theory as a new, and to many, an unpleasant fact of life. Echoes of the furore then aroused still ring from the dark and eerie caverns of the human mind despite the undeniable fact that evolution has occurred, is occurring, and will continue to occur. It turns out that evolution is a characteristic of life as we know it.

Who then was Darwin and what is Darwinism?

Charles Darwin was born in 1809 and died in 1882. He had an undistinguished undergraduate career at Edinburgh and Cambridge, where he decided not to be a physician or a theologian. He became a practising naturalist when he obtained a position on *H. M. S. Beagle,* which set out to explore and circumnavigate the world in 1831. For five years they sailed, and Darwin amassed a tremendous collection of biological and geological material for later study. By the time they returned to England, Darwin was dedicated to the search for facts that would show that evolution had occurred and provide the explanation how. By the time of publication of *The Origin of Species* twenty years later, Darwin had world eminence as a biologist and geologist because of his work on the *Beagle* collections, the publication of his adventures on the voyage, his theory of the origin of coral reefs, and his mastery of the intricacies of the anatomy and systematics of barnacles. After 1859, he had everlasting fame.

Charles Darwin's fame does not rest on the fact that he originated the concept of evolution—the idea that one type of organism can give rise to another. What he saw, and what now every biologist sees in the world of life, convinced him that evolution did occur. But a long line of eminent ancient Greeks tended to think this too. Some seventeenth and eighteenth-century natural philosophers expressed similar ideas, although not very clearly. Just at the beginning of Darwin's century the French biologist Lamarck propounded an elaborate "Scale of Beings" and something of a theoretical background for it. But no popular impression was made. There must have been in Darwinism something special.

The key to Darwinism is the term "Natural Selection". By this is meant that under given conditions certain members of a population are a little better off than certain others and, as a result, they are more likely to survive to reproduce. In this way, whatever it was that made them better off is liable to be inherited by their offspring. If this procedure is continued over a period of time, the "whatever" will become firmly established in the population. It will have been selected for. As various attributes are selected, under the influences of differing conditions, there will be a gradual change in the nature of the group—an evolution.

Today's Darwinism is this, much embellished with a hundred years' more data. Th. Dobzhansky has recently defined evolution as "a response of living matter to the challenges of environmental opportunity through the process of natural selection". The fact of evolution cannot be proved by a few concise statements or by the solution of equations. It is seen in the unending passage of facts that the biologist deals with. The career of a biologist is marked by a continually deepening understanding of the process. Evolution has given meaning to biology and has made biologists into historians. Darwinism has become a mode of thought.

The exciting thing that Darwin did was to provide a mobility, a pattern of change to the universe. In Darwin's day orthodoxy held that all things were immutable. Only in 1830 had Charles Lyell begun to stir the world to wonder at the slow but steady change in the geological landscape. This was a bitter enough pill to swallow for those who believed in the special creation of all things as they stood then. But to be confronted with Darwin's idea that not only the rocks but also God's creatures were subject to change was nearly enough to unseat some from their reason. And the suggestion that a relationship existed between man and monkey was the capstone of this demoralising idiocy.

The philosophical carnage was frightful, but it was soon over. The struggle between Darwinism and theology (for this is where the conflict lay) was over within twenty years. The overwhelming mass of facts, assembled in the main by Darwin himself and presented to the public by his advocates, left no room for doubt of the fact of evolution. Nothing biology has discovered since has disturbed that belief. Nonetheless, today there are still those opposed to the idea of evolution. There are also people who build perpetual motion machines. All these are best left to tilt happily at their chosen windmills.

Biologists deal with organic evolution, that is, the historical development of variously adapted organisms. But beyond this Darwinism released into the public domain, as it were, the concept of evolution or what we may call gradual change.

Let us see how the speculations and experiments of science have utilised the idea of evolution to explain the beginnings and development of all things. One school of cosmologists holds that originally there was nothing but a tenuous mass of hydrogen atoms. By interfering with one another's free motion these atoms formed eddies, underwent atomic transmutations, formed lumps and chunks and hunks of all known forms of matter which collided and reacted and grew and became the universe. This process is still continuing, fed by the raw material of space. This is the so-called steady-state universe, without beginning and without end.

Another school maintains that in the beginning all the matter of the universe was concentrated into one gigantic atom of unimaginable density. Such a thing being unstable, it blew up. Within the half hour of its explosion there were generated forces sufficient to transmute the primal stuff into all the elements of the universe. These chunks of matter were flung into space and are still spreading in all directions with undiminished speed.

Now these are serious hypotheses, in each case based on complex calculations and the assessment of much data. Nor are they the only cosmological theories of origin. No longer is there any theoretical block to postulating an origin of the universe on the basis of physical and chemical laws. And since the universe is of the wrong scale of size to be amenable to experimentation, there are no grounds to justify the dogmatic assertion of the superiority of one hypothesis over another. In any event we can afford no new dogmas; we have enough.

So—we have a universe. This is primarily a conglomeration of galaxies, each with its vast number of stars. Amongst the stars are solar systems—planets and their satellites circling a central sun. The origin of solar systems within galaxies is now generally considered to be by a process analogous to the means of formation of the galaxies within the universe. One now considers local gas clouds within which thermodynamic forces act on radial density distributions to condense planets out of dust. Gone, for the time at least, are the rather satisfying pictures of stars dashing madly together by blind, rare chance and splashing bits of planetary confetti about. We are led inexorably to the conclusion that the formation of solar systems was a common event during the evolution of the universe. A recent estimate suggests one hundred million as a possible number of solar systems in the universe. This is only one for every million million stars. Within this vast number of solar systems some considerable percentage must present conditions suitable for the development of living matter. A fragment of our uniqueness is gone.

Given the foothold of a planet, the natural chemical elements we know, and sunlight or a bit of radioactivity, burgeoning life is possible. Certain chemicals, based on the carbon atom, are called organic, for they are the mainstay of life. It is believed that early in the history of our planet there was a long period during which the elements combined in all manner of ways to form chemical compounds—a time of chemical evolution. Among these would be very simple carbon substances. It has been shown to be possible, using X-rays or ultraviolet or heat or electrical discharge, to change single carbon compounds into two-carbon compounds and these into substances containing four carbon atoms. In other words, the first steps to creating complex organic substances have been taken. The theory is available. Practicality is another matter.

Let us go back in time. It is known that our solar system and probably our galaxy are about 4600 million years old. By maybe some 2000 - 3000 million years ago enough chemical reaction had taken place for some compounds to exhibit the first quiverings of life. It seems possible that the first substances to have been organised to the point of livelihood were substances called nucleic acids. These are materials with the peculiar ability to reproduce themselves by using themselves as a pattern on which to construct more of the same nucleic acid by conversion of substances from the ambient medium. Clothed in protein, these molecular aggregations become nucleoproteins. Viruses are nucleoproteins; chromosomes are nucleoproteins.

Nucleic acids are constructed in such a way that each molecule of this stuff seems to act as a coding device. Nucleoprotein acts to control the metabolism of a cell, and the code built into its structure is the key to this control. Thus chromosomes, the contents of a cell nucleus, control the destiny of a cell. Because any organism derives from a single cell, the fertilized egg, the chromosomes control the destiny, or as we say, the heredity, of the individual. As the code is changed, so heredity is varied. Mutations are the changes in the code; the mutations are reproduced since the nucleic acid acts as a new pattern, and this leads to variation and, as parental chromosomes are mixed, the possibility of combinations and permutations of variations, which in turn present a wide field of action for natural selection.

The favourable variations are selected. The conditions of life determine what shall survive.

It is worth our while to look at evolution among the animals. The traditional picture starts with the Protozoa, the single-celled animals. Because of their apparent simplicity these are generally considered the first animals of those now existing. Among these a single cell carries on all the functions of life—eating, excreting, reacting, reproducing—a remarkable display of the versatility of protoplasm, the life-substance controlled by nucleoprotein.

Beyond the protozoans we find the animals called jellyfish, sea anemones, and corals. Basically these are sedentary beasts who sit like usurers, tentacles extended in all directions, ready to grasp anything that comes their way. These are animals of many cells, the activities of which are co-ordinated into the functions of tissues and organs. In a word, they are organised.

If the first great step in the evolution of animals was the development of protoplasm around nucleoprotein to form a cell, and the second great step was the organisation of cells, the third great step was that which differentiates the worms from the jellyfish. Worms have a head. One may tend to overlook the importance of a head to a worm, but think—given a head, one then has a front and a rear. It implies that one is going somewhere. Given a determination to get somewhere, one then needs a belly on which to crawl and hence a back as well. Given a belly and a back one has, willy-nilly, a left-hand side and a right. A symmetry, based on motion, has arrived.

The forward progression comes before the head. The head is an assembly of sensory instruments to sample what one is running into. Especially sensitive touch receptors, tasters and smellers, eyes and ears are concentrated on the head. The mouth is there to take in food, because the head gets to it first.

Now, beyond the worms, much of organic evolution seems to have been concerned with the development of the head into a particularly efficient sensory apparatus, with a concomitant development of the means of getting messages to and from the brain and the rest of the body, i.e., a nervous system. In two great rival groups of animals this process has gone on, along rather different pathways. One of these groups is that of the arthropods, of which insects are the most prolific representatives. The second group comprises the backboned animals, the chordates, of which man is the dominant beast.

The insects and their cousins have highly developed senses and with them amazing reflexes and instincts—rapid and consistent reactions to which we can assign no control we might call thoughtful. This perhaps limits the individual insect, but the variety of species shows us that the system has survival value. It is the story of the application to a wide variety of situations of a successful type of co-ordinating device, the insect nervous system.

The history of the chordates, on the other hand, is largely the story of the gradual improvement of another basically satisfactory nervous system. This part of chordate evolution culminates in man amongst the mammals, after eons of preparation through what we would call apes, monkeys, tree shrews, and some still unnamed things. I must explain: when I say preparation I infer no guidance, no defined end; ancestors perfectly fit in their own environment, but many of their attributes passed on to us through time and changing conditions have had added to them unique responses to the challenge of the environment.

The senses of man which receive external stimuli are served by structures called exteroceptors. These are things such as the eye, the inner ear, and the taste buds. If, for example, a flash of light strikes the eye, the optic nerve is stimulated and a nerve impulse shoots along the nerve to the brain. It is the function of the brain to do something with this impulse, to initiate a reaction to the stimulus. In order to do this the brain must interpret the impulse. It must recognise the source, for one thing; in this case, that it is light and not sound. Then the brain must decide what the proper reaction is and must activate its motor area, which undertakes the control of the reaction. The motor area of the brain must send out commands to the part of the body that is to react, say the eyelids in our example. So it is necessary that the brain be provided with a multitude of nerve pathways for impulses to travel along, in order that the brain do its interpretative job properly. The more efficient the exteroceptors, the more complicated the reactions and the more difficult the interpretation, so the greater the number of pathways needed and the larger the brain.

Along with a wide spectrum of biological improvements among the chordates, such as improved respiration and circulation, the development of homeostatic mechanisms and so on, there went improvements of the brain. This was in part owing to improved nervous control of body functions, but largely because of improved interpretative and co-ordinative function within the brain itself. As this process went on things seen became more than just things; they became specific, remembered objects with identifiable attributes. Fish, frogs, and reptiles possess the rudiments of a memory, birds often seem to show cognition, and many mammals are truly percipient.

The rising of man above the mass of the mammals can be attributed to a couple of basic developments. The first, of course, was the evolution of the percipient brain. The second was the ancestral descent from the trees to two hind feet. Our arboreal ancestors were important, for they provided the grasping hand, so necessary for them for clinging to the small branches of trees. The fact that our ancestors landed on their two feet is important too, for it left the grasping hands free to pick up this and clutch at that.

Now I must for awhile abandon specific cause and effect, for we come to some remarkable relationships. A grasping hand to pick up things efficiently needs a great deal of refined nervous control, namely a well-developed brain. An efficient hand and its control would develop together. The thing picked up needs study and interpretation, which requires still more brain power. Being able to bring things to the face with a hand reduces the need for a long muzzle to nose about with, and at the same time, big, tearing teeth are not so necessary to an animal that can pick up a stick with which to bash its prey or its enemies. The muzzle is reduced—the face becomes flatter, and the skull can become lighter and rounder. It no longer needs great counterweights and muscle attachments behind, to balance the snout. Nor does it need heavy bony pillars to withstand the tremendous crushing power of the jaws. More room is left for brain. As the skull becomes rounder, it balances more delicately on top of the backbone. The erect posture is improved, which makes the hands still freer—and so on.

The end result is us, and our chief characteristic is a brain in which the interpretative functions have come to outweigh the rest—the reflexive, the coordinative, the functions of involuntary control.

The evolutionary path over which we have travelled is clear. We come to conclude that we are special only in that the interpretative function of our brain is so highly developed that almost everything that enters *via* a sensory pathway is subject to an automatic and often unconscious interpretation. Sensory impressions also can be stored by the mind; these stored impressions are constantly drawn upon to aid interpretation. At its most-developed point the interpretative function is what we call imagination. We use it to create images.

Here is the key to man: imagination is at once his glory and his greatest deceit. It is imagination that brings man to call himself *Homo sapiens*—sapient man, thinking man, wise man, imaginative man. But our thinking, our being wise, is the smallest part of our mental activity. Thinking cannot yet supply more than the tiniest fraction of the answers, the proper interpretations, to the floods of sensory impressions that beat at us. We have not had time to explain fully the wind, the northern lights, the reproduction of life, the pattern of a shell, the reason for death.

But our imagination is not content to wait. What it does not understand it will invent excuses for. Its function is to provide some sort of answers by the collation and interpretation of impressions. Our survival as biological things depends upon the proper interpretation of stimuli so that our reaction and responses will be correct. The species flourishes only if it can react successfully to the challenges of the environment.

Fortunately, so far, man has not needed all his brain to survive. For instance, that part of his brain which can devise an elegant winterproof shelter and a means of food supply can support that part of his brain which believes that the moon is made of green cheese and that God smiles on those whose ritual is correct. Since there is no real connection between God and a warm house, the former luxury should not interfere with the latter need. In this way man can happily carry on, with his mind neatly divided into two separate compartments, one keeping him going, the other posing as his soul, because it does not know any better.

Now this seems a little harsh, does it not? I am in effect saying that what is called man's soul is the seat of all his irrationality. Well, this is true if one makes the attempt to separate the mind from the soul and the soul from the body. It is entirely irrational to suggest that mind and soul and body are different systems. They are not. They are indissolubly one, as a result of man's evolution. The part of man's mind that cannot be pragmatic is visionary. Let us recognise this, call it soul or not, so we shall know when we are dreaming of actuality, or even probability, and when we are away off in our own outer space, just keeping ourselves happy.

The history of man is filled with dazzling concepts, most of them sublime in origin and most of them ridiculous under the scrutiny of centuries. With a peculiar stubbornness we cling to these things. We will not cast out the hopes and fears of the Bronze Age. We are so little advanced in the understanding of ourselves that we still revere such things as revelation, which is imagination turning into hallucination. So much a part of our culture is this respect for hallucination that there is always a ready audience for him who will demonstrate the imminent end of the world, the value of the stars as a guide to everyday activity, the occurrence of little green men in big space ships, or the wonder-workings of extrasensory perception. Is it any wonder that we are so open to superstition and charlatanry?

To escape from these pitfalls calls for strict mental discipline, the marks of which are scepticism and patience: scepticism of freshly dug facts, and patience to wait until the entire hill is overturned. This, it seems to me, provides a stronger conservatism for our times than that of the old mythology. So many things called fundamental are merely archaic. We may yet have only uncovered a small proportion of any fundamentals that exist.

Paradoxically, it appears that the longer we wait for facts, that is, exercise patience, the longer we shall have to continue to wait, for it is coming to be realized that the farthest point of all, infinity, is only at the limit of our senses and technology and the bounds of our knowledge. We cannot reach infinity, for there is more beyond infinity. Let the theologians seize that for God, but in so doing they abandon both scepticism and patience. If we move infinity by extending our senses and our knowledge (as science does every day), then God is forced to shift and back, and theology draws another line, daring man to step across.

Man will. And this is part of the trouble, for the pace of change and progress is too great for most of us. Most of us are frightened by what some of us are learning. Infinity is too abstruse and too much to wait for. God is no less abstruse, but He at least has been with us for 5000 years and that is a comfort, so that it is easy to turn to Him.

Perhaps then the major consequence of Darwinism is a realization that, at his present state of evolution, man is inherently schizoid. Man's hope must be that his evolution will continue until this condition is corrected, when he will be truly sapient. That this will be so is doubtful. The chief characteristic of the process of organic evolution is that most species have been extinguished, either as a result of failure to adapt to changing conditions or as a result of changing completely in response to environmental needs. One cannot foresee what will become of man. One only knows that man's struggle is mostly with himself, the elements of nature seemingly having become secondary influences on him. Rare is the man who will recognize his own power for freedom or admit the clotting effects of his own superstitions. Man seems determined not to let himself succeed. And he may not.