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AN INDIAN PERSPECTIVE OF DARWIN

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IT IS PROBABLY too early to assess Darwin's significance for human culture. It is, however, much easier to do so if one has the stereoscopic view afforded by a measure of intimacy with more than one of the main cultures of our planet. I could not have written this article before I became an Indian. To Europeans and Americans, it inevitably seems that Darwin's greatest achievement has been to convince educated men and women that biological evolution is a fact, that living plant and animal species are all descended from ancestral species very unlike themselves, and, in particular, that men are descended from animals. This was an important event in the intellectual life of Europe, because Christian theologians had drawn a sharp distinction between men and other living beings. In view of Jesus' remarks about sheep, sparrows, and lilies, this sharp distinction may well be a perversion of the essence of Christianity. St. Francis seems to have thought so.

But in India and China this distinction has not been made; and, according to Hindu, Buddhist, and Jaina ethics, animals have rights and duties. My wife has stated categorically that Darwin converted Europe to Hinduism. This is, I think, an exaggeration, but is nearer to the truth than it sounds. Hinduism is not a religion as this term is understood by the adherents of proselytizing religions. It is an attitude toward the universe compatible with a variety of religious and philosophical beliefs.

Such attitudes are best shown in imaginative writing and art. In one of the two great epics of ancient India, the Ramayana; the divine hero, Ram, is aided to regain his wife, Sita,

who has been abducted by the ogre, Ravan, by an army of monkeys and bears, acting on information received from vultures. In a relief at Mahabalipuram depicting scenes from the life of Krishna, which is one of the masterpieces of medieval Indian art, the whole background consists of cows' heads. For every Hindu, the setting of human experience is alive. Of course, he does not live up to his attitudes and beliefs. Nor do Christians. If even fifty per cent of Christians forgave their debtors, from the boss who owes a week's wages to the farmer who has mortgaged his means of livelihood, the economic fabric of Christian civilization would collapse in eight hours. Similarly, many, perhaps most, Indians are cruel to animals; but kindness to animals, including vegetarianism, is commoner in India than forgiveness of debtors is in Christendom.

If Darwin had died young, Wallace would presumably have promulgated the theory of evolution by natural selection when he did, and it would probably have been accepted, though, since Wallace's arguments covered a smaller field than Darwin's, the acceptance might have been slower. And since Wallace left loopholes open for supernatural intervention, which Darwin did not, the immediate effect on Western thought might have been less.

In my opinion, however, Darwin's most original contribution to biology is not the theory of evolution but his great series of books on experimental botany published in the latter part of his life. They are concerned with those aspects of plant life which are most like animal and human life. Two are devoted to climbing plants and insectivorous plants respectively, and three to sexuality in plants, particularly those aspects which are most human, such as the evil effects of incest (the theme of *Oedipus* and *The Cenci*) and the strange devices by which its most extreme form, self-fertilization, is avoided. The facts discovered are momentous. Among their applications are the discovery of plant hormones and the in

vention of the weed killers which resemble them chemically, and the systematic outbreeding of maize, of whose importance for the agriculture of the United States I need not write.

But what was the attitude which led to these discoveries? To answer this question, we must read not only Darwin's books, but his autobiography, and the memoir by his son, Francis. Perhaps the most enlightening passage is Francis' account of what his father called "a fool's experiment." Francis was ordered to play the bassoon to some seedlings. In fact, this did not influence their growth, as vibration of the table had done. However, other fool's experiments came off. Perhaps Darwin's classical fool's experiment was to cut a number of scalene triangles of paper, leave them on his lawn, and find that the earthworms which used some of them to plug their holes generally chose the most acute angle to drag as far as possible down the hole. Darwin did not draw a sharp line between earthworms and the old gentleman who had failed to interest him in mathematics at Cambridge.

Here are some passages from Francis' account of his father's attitude to plants: "I used to like to hear him admire the beauty of a flower; it was a kind of gratitude to the flower itself, and a personal love for its delicate form and colour. I seem to remember him gently touching a flower he delighted in; it was the same simple admiration that a child might have. He could not help personifying natural things. This feeling came out in abuse as well as praise—*e.g.*, of some seedlings—'The little beggars are doing just what I don't want them to.' His emotional attitude to animals was one of profound aesthetic admiration. One of his favorite words was 'wonderful.' Here is a typical passage concerning the second stage larvae of barnacles. 'They have six pairs of beautifully constructed natatory legs, a pair of magnificent compound eyes, and extremely complex antennae; but they have a closed and imperfect mouth, and cannot feed.'

In India we expect and find this attitude in saints. But it

does not issue, as in Darwin's case, in increased knowledge. The usual effect is a flood of sympathy with animal and human suffering which affects a few thousand people and then degenerates into a new set of ritual prohibitions. It led Darwin to observe the objects of his love with great accuracy. Darwin, then, from the Hindu angle, had at least some of the attributes of a saint.

In fact, the movement of art in the last century has been away from Darwin, not only in Europe and North America, but in other countries strongly influenced by them. We are less interested in the details of natural objects than were our grandparents. I expect this is a mere symptom of the senility of "western" culture. I do not expect any cultural renaissance until scientific research is an honored and powerful occupation. When scientists, and particularly biologists, can influence taste, I think the program for visual art will be "Back to Albrecht Dürer."

Even before this, I venture to hope that Darwinism may be starting to affect our logic. We do not always realize how much of our ordinary thought is due to Aristotle's difficulties in classifying animals, and to the methods of classifying them which he finally adopted. The greatest Christian theologians, including St. Thomas Aquinas and Calvin, adopted Aristotle's logic, though not his metaphysics.

Aristotle's logic is based on similarities. Darwin, in the last chapter of *The Origin of the Species*, foreshadowed a logic based on differences. I quote two sentences only: "Systematists will have only to decide (not that this will be easy) whether any form be sufficiently constant and distinct from other forms, to be capable of definition, and if definable, whether the difference be sufficiently important to deserve a specific name." "Hence, without rejecting the consideration of the present existence of intermediate gradations between any two forms, we shall be led to weigh more carefully and to value higher the actual amount of difference between them."

We can now see that this last sentence was the program for a whole branch of statistics. Today we can answer two questions which could not be answered in Darwin's time. First, "Does population A of animals, plants, or men differ significantly from population B, or could the observed difference be due to random sampling from the same larger population?" Second, "Does population C differ more or less from population A than from population B?" What is perhaps of most significance is that the statistical methods devised by Gossett, Pearson, Mahalanobis, and others to answer these questions as to biological data are now becoming important in physics, geology, and other sciences. Many scientists think that all the sciences will become statistical. If so, Darwin will be recognized as a pioneer in this development.

In the field of ethics, Darwinism has probably so far been responsible for more harm than good, as a result of gross misrepresentation, for which, however, he himself bears some responsibility. Darwin was led to the theory of natural selection by reading Malthus. But natural selection still operates in a population so fortunate that there is room for every member of it. For example, the human population of North America has been increasing steadily since 1700 A.D. or earlier, and for two centuries land was available on the open frontier. However, some of the inhabitants in 1700 left many more descendants than others. There was selection for fertility, resistance to disease, and other characteristics. The population of France has been nearly stationary for sixty years, but not through famine or pestilence. However, natural selection occurs within it.

Again, Darwin naturally concentrated on obviously adaptive characters, such as teeth, horns, and the like, which are of value in the struggle between predator and prey, or between competing males. Their value is more obvious than, say, that of the production of granulocytes, which are needed to resist many infections. However, natural selection is far

more efficient in eliminating human babies without granulocytes (a recessive character), all of whom die in their first year, than wild mammals whose black color renders them conspicuous to enemies.

In consequence, although he repeatedly pointed out the importance of physiological adaptation, he certainly left the impression that the struggle for life was analogous to war and economic competition in the human species. And Darwinism was used to justify such activities. The persons who did so were presumably aware of Jesus' statement, "Blessed are the meek, for they shall inherit the earth." They were not aware that this statement is substantially true, both in human and evolutionary history. Centripetal selection is normal. That is to say, extremes leave fewer offspring than animals or plants near the average. This appears to be so even if selection occurs fairly rapidly. Giant species appear to be much less likely than those of moderate size to leave descendants.

It is a commonplace of human history that ruling classes die out. They may be massacred, but infertility seems a commoner fate. Fisher has argued cogently that the practice of marrying heiresses (who must be members of small families) has concentrated genes for infertility among ruling classes. Kinsey reported sexual behavior making for low fertility among the richer and better educated Americans. Whatever the reasons, economic success is usually correlated with biological failure. The American Negroes offer a conspicuous example of the truth of Jesus' statement. An appreciable fraction of West Africans was sufficiently meek to be capable of living as slaves, which members of prouder races were not. In consequence, their descendants are now in a majority in several regions of the American continent and its neighboring islands.

If this fact of the survival of the meek is ever realized, the consequences may be surprising. I cannot myself foresee

them. For the meek do not want to inherit the earth. I have been studying the theory of evolution fairly intensively for some forty years, and I am convinced that, given the facts of genetics, natural selection can be relied on to produce unexpected results.

To sum up, Darwin was too great a man to assess just yet. In each succeeding generation, new aspects of his work appear important. Those which I have emphasized may appear less important fifty years hence. But perhaps the perspective of Darwin from an Indian point of view may be a corrective to the "western" and Soviet perspectives.

