Victorian Issues

Evolution

One of the most dramatic controversies in the Victorian age concerned theories of evolution. This controversy exploded into prominence in 1859 when Charles Darwin's *Origin of Species* was published, but it had been rumbling for many years previously. Sir Charles Lyell's *Principles of Geology* (1830) and Robert Chambers's popular book *Vestiges of Creation* (1843–46) had already raised issues that Tennyson aired in his *In Memoriam A. H. H.* (1850). It was Darwin, however, with his monumental marshaling of evidence to establish his theory of natural selection, who finally brought the topic fully into the open, and the public, as well as the experts, took sides.

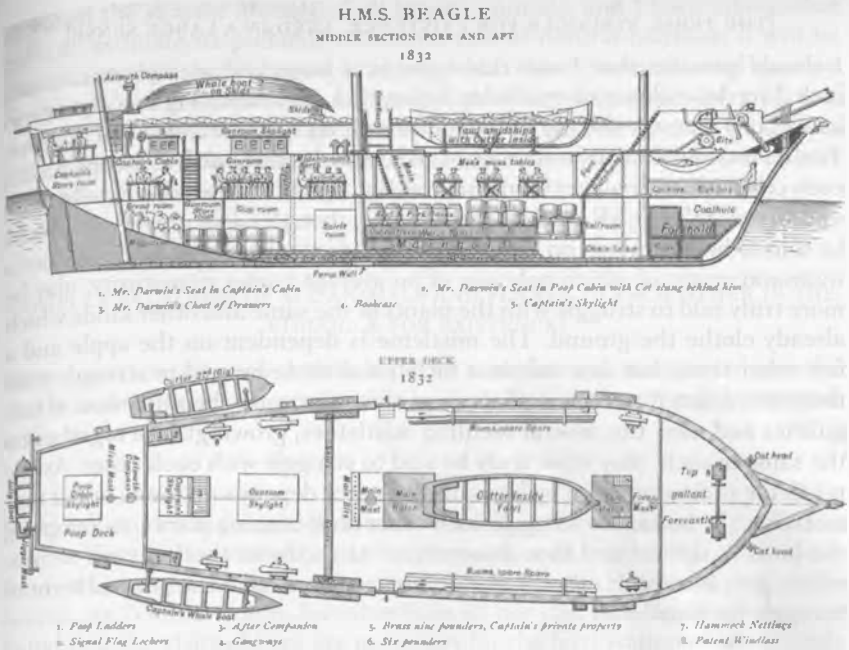
The opposition aroused by Darwin's treatise came from two different quarters. The first consisted of some of his fellow scientists, who affirmed that his theory was unsound. The second consisted of religious leaders who attacked his theory because it seemed to contradict a literal interpretation of the Bible. Sometimes the two kinds of opposition combined forces, as in 1860 when his scientific opponents selected Bishop Wilberforce to be their spokesman in spearheading their attack on *The Origin of Species*. In replying to such attacks, Darwin had the good fortune to be supported by two of the ablest popularizers of science in his day, T. H. Huxley and John Tyndall. Moreover, although shy by temperament, Darwin was himself (as Tyndall affirms and the selections printed here will illustrate) an exceptionally effective expositor of his own theories.

Darwin rightly saw himself as a scientist and for the most part restricted his attention to observations about the natural world; the applications of his concept of "the survival of the fittest" to activities within and between human societies and cultures, which came to be known in the late nineteenth century as "Social Darwinism," were primarily conducted by other writers, most notably Herbert Spencer. Nevertheless, the shock that Darwin felt as a young man when he first saw the "savages" of South America's Tierra del Fuego (described in the extract provided from *The Descent of Man*, 1871) stayed with him all his life, and was probably one of the factors that caused him to speculate about social behaviors and systems in evolutionary terms.

It is instructive to compare the selections here with Tennyson's *In Memoriam*, Robert Browning's "Caliban upon Setebos" (1864), and the extracts from the writings of Huxley.

CHARLES DARWIN

Charles Darwin (1809–1882) developed an interest in geology and biology at Cambridge, where he was studying to become a clergyman. Aided by a private income, he resolved to devote the rest of his life to scientific research. The observations he made during a long voyage to the South Seas on the HMS *Beagle* (on which he served as a naturalist) led Darwin to construct hypotheses about evolution. In 1858, more than twenty years after his return to England from his voyage, he ven-



The *Beagle*. These diagrams appeared in Darwin's *Journal of Researches into the Natural History and Geology of the Countries Visited During the Voyage Round the World of HMS Beagle* (1890).

tured to submit a paper developing his theory of the origin of species. A year later, when his theory appeared in book form, as *The Origin of Species*, Darwin emerged as a famous and controversial figure.

From The Origin of Species

From *Chapter* 3. *Struggle for Existence*

We will now discuss in a little more detail the struggle for existence. Nothing is easier than to admit in words the truth of the universal struggle for life, or more difficult—at least I have found it so—than constantly to bear this conclusion in mind. Yet unless it be thoroughly engrained in the mind, the whole economy of nature, with every fact on distribution, rarity, abundance, extinction, and variation, will be dimly seen or quite misunderstood. We behold the face of nature bright with gladness, we often see superabundance of food; we do not see or we forget, that the birds which are idly singing round us mostly live on insects or seeds, and are thus constantly destroying life; or we forget how largely these songsters, or their eggs, or their nestlings, are destroyed by birds and beasts of prey; we do not always bear in mind, that, though food may be now superabundant, it is not so at all seasons of each recurring year.

[THE TERM, STRUGGLE FOR EXISTENCE, USED IN A LARGE SENSE]

I should premise that I use this term in a large and metaphorical sense including dependence of one being on another, and including (which is more important) not only the life of the individual, but success in leaving progeny. Two canine animals, in a time of dearth, may be truly said to struggle with each other which shall get food and live. But a plant on the edge of a desert is said to struggle for life against the drought, though more properly it should be said to be dependent on the moisture. A plant which annually produces a thousand seeds, of which only one of an average comes to maturity, may be more truly said to struggle with the plants of the same and other kinds which already clothe the ground. The mistletoe is dependent on the apple and a few other trees, but can only in a farfetched sense be said to struggle with these trees, for, if too many of these parasites grow on the same tree, it languishes and dies. But several seedling mistletoes, growing close together on the same branch, may more truly be said to struggle with each other. As the mistletoe is disseminated by birds, its existence depends on them; and it may methodically be said to struggle with other fruit-bearing plants, in tempting the birds to devour and thus disseminate its seeds. In these several senses, which pass into each other, I use for convenience' sake the general term of Struggle for Existence.

[GEOMETRICAL RATIO OF INCREASE]

A struggle for existence inevitably follows from the high rate at which all organic beings tend to increase. Every being, which during its natural lifetime produces several eggs or seeds, must suffer destruction during some period of its life, and during some season or occasional year, otherwise, on the principle of geometrical increase, its numbers would quickly become so inordinately great that no country could support the product. Hence, as more individuals are produced than can possibly survive, there must in every case be a struggle for existence, either one individual with another of the same species, or with the individuals of distinct species, or with the physical conditions of life. It is the doctrine of Malthus[1] applied with manifold force to the whole animal and vegetable kingdoms; for in this case there can be no artificial increase of food, and no prudential restraint from marriage. Although some species may be now increasing, more or less rapidly, in numbers, all cannot do so, for the world would not hold them.

There is no exception to the rule that every organic being naturally increases at so high a rate, that, if not destroyed, the earth would soon be covered by the progeny of a single pair. Even slow-breeding man has doubled in twenty-five years, and at this rate, in less than a thousand years, there would literally not be standing-room for his progeny. Linnæus[2] has calculated that if an annual plant produced only two seeds—and there is no plant so unproductive as this—and their seedlings next year produced two, and so on, then in twenty years there should be a million plants. The elephant is

1. Thomas Robert Malthus (1766–1834), British social theorist who argued that the population, increasing geometrically, would grow beyond the means of subsistence, which increased arithmetically, without the necessary natural checks of poverty, disease, and starvation.

2. Carl Linnaeus (1707–1778), Swedish naturalist who developed the binomial system—genus plus species name—for naming plants and animals (e.g., *Viola tricolor*, below).

reckoned the slowest breeder of all known animals, and I have taken some pains to estimate its probable minimum rate of natural increase; it will be safest to assume that it begins breeding when thirty years old, and goes on breeding till ninety years old, bringing forth six young in the interval, and surviving till one hundred years old; if this be so, after a period of from 740 to 750 years there would be nearly nineteen million elephants alive, descended from the first pair.

* * *

[COMPLEX RELATIONS OF ALL ANIMALS AND PLANTS TO EACH OTHER IN THE STRUGGLE FOR EXISTENCE]

Many cases are on record showing how complex and unexpected are the checks and relations between organic beings, which have to struggle together in the same country.

* * *

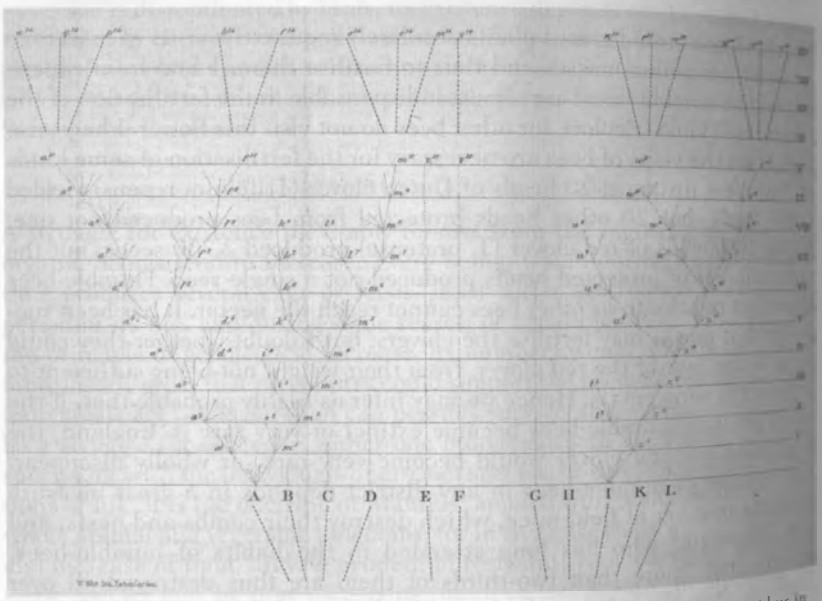
Nearly all our orchidaceous plants absolutely require the visits of insects to remove their pollen-masses and thus to fertilise them. I find from experiments that humble-bees[3] are almost indispensable to the fertilisation of the heartsease (Viola tricolor), for other bees do not visit this flower. I have also found that the visits of bees are necessary for the fertilisation of some kinds of clover; for instance, 20 heads of Dutch clover (Trifolium repens) yielded 2,290 seeds, but 20 other heads protected from bees produced not one. Again, 100 heads of red clover (T. pratense) produced 2,700 seeds, but the same number of protected heads produced not a single seed. Humble-bees alone visit red clover, as other bees cannot reach the nectar. It has been suggested that moths may fertilise the clovers; but I doubt whether they could do so in the case of the red clover, from their weight not being sufficient to depress the wing petals. Hence we may infer as highly probable that, if the whole genus of humble-bees became extinct or very rare in England, the heartsease and red clover would become very rare, or wholly disappear. The number of humble-bees in any district depends in a great measure upon the number of field-mice, which destroy their combs and nests; and Col. Newman,[4] who has long attended to the habits of humble-bees, believes that "more than two-thirds of them are thus destroyed all over England." Now the number of mice is largely dependent, as every one knows, on the number of cats; and Col. Newman says, "Near villages and small towns I have found the nests of humble-bees more numerous than elsewhere, which I attribute to the number of cats that destroy the mice." Hence it is quite credible that the presence of a feline animal in large numbers in a district might determine, through the intervention first of mice and then of bees, the frequency of certain flowers in that district!

In the case of every species, many different checks, acting at different periods of life, and during different seasons or years, probably come into play; some one check or some few being generally the most potent; but all will concur in determining the average number or even the existence of the

3. Bumblebees.

4. Henry Wenman Newman (1788–1865), British army officer who succeeded to his father's estates in 1829.

species. In some cases it can be shown that widely-different checks act on the same species in different districts. When we look at the plants and bushes clothing an entangled bank, we are tempted to attribute their proportional numbers and kinds to what we call chance. But how false a view is this! Every one has heard that when an American forest is cut down a very different vegetation springs up; but it has been observed that ancient Indian ruins in the Southern United States, which must formerly have been cleared of trees, now display the same beautiful diversity and proportion of kinds as in the surrounding virgin forest. What a struggle must have gone on during long centuries between the several kinds of trees each annually scattering its seeds by the thousand; what war between insect and insect—between insects, snails, and other animals with birds and beasts of prey—all striving to increase, all feeding on each other, or on the trees, their seeds and seedlings, or on the other plants which first clothed the ground and thus checked



Evolutionary Descent in Species. Darwin included this diagram in chapter 4 to "aid us in understanding this rather perplexing subject." "A to L represent the species of a genus large in its own country. . . . The little fan of diverging dotted lines of unequal lengths proceeding from (A), may represent its varying offspring. The variations are supposed to be extremely slight, but of the most diversified nature; they are not supposed all to appear simultaneously, but often after long intervals of time; nor are they all supposed to endure for equal periods. Only those variations which are in some way profitable will be preserved or naturally selected. And here the importance of the principle of benefit being derived from divergence of character comes in; for this will generally lead to the most different or divergent variations (represented by the outer dotted lines) being preserved and accumulated by natural selection. When a dotted line reaches one of the horizontal lines, and is there marked by a small numbered letter, a sufficient amount of variation is supposed to have been accumulated to have formed a fairly well-marked variety, such as would be thought worthy of record in a systematic work." The full explanation of the diagram runs to over nine pages.

the growth of the trees! Throw up a handful of feathers, and all fall to the ground according to definite laws; but how simple is the problem where each shall fall compared to that of the action and reaction of the innumerable plants and animals which have determined, in the course of centuries, the proportional numbers and kinds of trees now growing on the old Indian ruins!

From Chapter 15. Recapitulation and Conclusion

I see no good reason why the views given in this volume should shock the religious feelings of any one. It is satisfactory, as showing how transient such impressions are, to remember that the greatest discovery ever made by man, namely, the law of the attraction of gravity, was also attacked by Leibnitz,[5] "as subversive of natural, and inferentially of revealed, religion." A celebrated author and divine has written to me that "he has gradually learnt to see that it is just as noble a conception of the Deity to believe that He created a few original forms capable of self-development into other and needful forms, as to believe that He required a fresh act of creation to supply the voids caused by the action of His laws."

Why, it may be asked, until recently did nearly all the most eminent living naturalists and geologists disbelieve in the mutability of species? It cannot be asserted that organic beings in a state of nature are subject to no variation; it cannot be proved that the amount of variation in the course of long ages is a limited quality; no clear distinction has been, or can be, drawn between species and well-marked varieties. It cannot be maintained that species when intercrossed are invariably sterile, and varieties invariably fertile; or that sterility is a special endowment and sign of creation. The belief that species were immutable productions was almost unavoidable as long as the history of the world was thought to be of short duration;[6] and now that we have acquired some idea of the lapse of time, we are too apt to assume, without proof, that the geological record is so perfect that it would have afforded us plain evidence of the mutation of species, if they had undergone mutation.

But the chief cause of our natural unwillingness to admit that one species has given birth to clear and distinct species, is that we are always slow in admitting great changes of which we do not see the steps. The difficulty is the same as that felt by so many geologists, when Lyell[7] first insisted that long lines of inland cliffs had been formed, and great valleys excavated, by the agencies which we see still at work. The mind cannot possibly grasp the full meaning of the term of even a million years; it cannot add up and perceive the full effects of many slight variations, accumulated during an almost infinite number of generations.

Although I am fully convinced of the truth of the views given in this volume under the form of an abstract, I by no means expect to convince

5. Gottfried Wilhelm Leibniz (1646–1716), German philosopher and mathematician; he was a contemporary of Isaac Newton, who set forth the law of universal gravitation.

6. Calculations based on the genealogies within the Bible put the age of the world at no more than six thousand years.

7. Charles Lyell (1797–1875), geologist whose book *Principles of Geology* (1830–33) was important in dissociating geological theory from the Bible and in establishing nature as the record of the earth's history, which he saw as a process of lengthy and gradual change rather than swift catastrophic events.

experienced naturalists whose minds are stocked with a multitude of facts all viewed, during a long course of years, from a point of view directly opposite to mine. It is so easy to hide our ignorance under such expressions as the "plan of creation," "unity of design," &c., and to think that we give an explanation when we only re-state a fact. Any one whose disposition leads him to attach more weight to unexplained difficulties than to the explanation of a certain number of facts will certainly reject the theory. A few naturalists, endowed with much flexibility of mind, and who have already begun to doubt the immutability of species, may be influenced by this volume; but I look with confidence to the future,—to young and rising naturalists, who will be able to view both sides of the question with impartiality.[8] Whoever is led to believe that species are mutable will do good service by conscientiously expressing his conviction; for thus only can the load of prejudice by which this subject is overwhelmed be removed.

* * *

It may be asked how far I extend the doctrine of the modification of species. The question is difficult to answer, because the more distinct the forms are which we consider, by so much the arguments in favour of community of descent become fewer in number and less in force. But some arguments of the greatest weight extend very far. All the members of whole classes are connected together by a chain of affinities, and all can be classed on the same principle, in groups subordinate to groups. Fossil remains sometimes tend to fill up very wide intervals between existing orders.

Organs in a rudimentary condition plainly show that an early progenitor had the organ in a fully developed condition; and this in some cases implies an enormous amount of modification in the descendants. Throughout whole classes various structures are formed on the same pattern, and at a very early age the embryos closely resemble each other. Therefore I cannot doubt that the theory of descent with modification embraces all the members of the same great class or kingdom. I believe that animals are descended from at most only four or five progenitors, and plants from an equal or lesser number.

Analogy would lead me one step farther, namely, to the belief that all animals and plants are descended from some one prototype. But analogy may be a deceitful guide. Nevertheless all living things have much in common, in their chemical composition, their cellular structure, their laws of growth, and their liability to injurious influences. We see this even in so trifling a fact as that the same poison often similarly affects plants and animals; or that the poison secreted by the gall-fly produces monstrous growths on the wild rose or oak-tree. With all organic beings excepting perhaps some of the very lowest, sexual production seems to be essentially similar. With all, as far as is at present known the germinal vesicle is the same; so that all organisms start from a common origin. If we look even to the two main divisions—namely, to the animal and vegetable kingdoms—certain low forms are so far

8. Despite the initial theological resistance to Darwin's theory, his ideas were swiftly accepted by his fellow scientists, and intellectual elites, even in the Church, soon followed suit. It would take much longer for the larger public to come around, although Darwin's burial in Westminster Abbey—a great civic honor—suggests he had won over many of his fellow citizens.

intermediate in character that naturalists have disputed to which kingdom they should be referred. As Professor Asa Gray[9] has remarked, "the spores and other reproductive bodies of many of the lower algae may claim to have first a characteristically animal, and then an unequivocally vegetable existence." Therefore, on the principle of natural selection with divergence of character, it does not seem incredible that, from such low and intermediate form, both animals and plants may have been developed; and, if we admit this, we must likewise admit that all the organic beings which have ever lived on this earth may be descended from some one primordial form.

* * *

When we feel assured that all the individuals of the same species, and all the closely allied species of most genera, have within a not very remote period descended from one parent, and have migrated from some one birthplace; and when we better know the many means of migration, then, by the light which geology now throws, and will continue to throw, on former changes of climate and of the level of the land, we shall surely be enabled to trace in an admirable manner the former migrations of the inhabitants of the whole world. Even at present, by comparing the differences between the inhabitants of the sea on the opposite sides of a continent, and the nature of the various inhabitants on that continent, in relation to their apparent means of immigration, some light can be thrown on ancient geography.

The noble science of Geology loses glory from the extreme imperfection of the record.[1] The crust of the earth with its imbedded remains must not be looked at as a well-filled museum, but as a poor collection made at hazard and at rare intervals. The accumulation of each great fossiliferous formation will be recognised as having depended on an unusual concurrence of favourable circumstances, and the blank intervals between the successive stages as having been of vast duration. But we shall be able to gauge with some security the duration of these intervals by a comparison of the preceding and succeeding organic forms. We must be cautious in attempting to correlate as strictly contemporaneous two formations, which do not include many identical species, by the general succession of the forms of life. As species are produced and exterminated by slowly acting and still existing causes, and not by miraculous acts of creation; and as the most important of all causes of organic change is one which is almost independent of altered and perhaps suddenly altered physical conditions, namely, the mutual relation of organism to organism,—the improvement of one organism entailing the improvement or the extermination of others; it follows, that the amount of organic change in the fossils of consecutive formations probably serves as a fair measure of the relative though not actual lapse of time. A number of species, however, keeping in a body might remain for a long period unchanged, whilst within the same period several of these species by migrating into new countries and coming into competition with foreign associates, might become

9. American botanist (1810–1888).

1. Geology had captured the early Victorian imagination, largely thanks to the radical theories of Charles Lyell and to mounting interest in dinosaurs (a term coined in 1842 by the pioneering comparative anatomist Sir Richard Owen, who was the first to classify "dinosauria" as a suborder of large extinct reptiles). Perhaps Darwin here forecasts one reason why popular interest would shift in the later part of the century; after his *Origin* was published, biology, not geology, became the focal point of public debate.

modified; so that we must not overrate the accuracy of organic change as a measure of time.

In the future I see open fields for far more important researches. Psychology will be securely based on the foundation already well laid by Mr. Herbert Spencer,[2] that of the necessary acquirement of each mental power and capacity by gradation. Much light will be thrown on the origin of man and his history.

Authors of the highest eminence seem to be fully satisfied with the view that each species has been independently created. To my mind it accords better with what we know of the laws impressed on matter by the Creator, that the production and extinction of the past and present inhabitants of the world should have been due to secondary causes, like those determining the birth and death of the individual. When I view all beings not as special creations, but as the lineal descendants of some few beings which lived long before the first bed of the Cambrian system was deposited,[3] they seem to me to become ennobled. Judging from the past, we may safely infer that not one living species will transmit its unaltered likeness to a distant futurity. And of the species now living very few will transmit progeny of any kind to a far distant futurity; for the manner in which all organic beings are grouped, shows that the greater number of species in each genus, and all the species in many genera, have left no descendants, but have become utterly extinct. We can so far take a prophetic glance into futurity as to foretell that it will be the common and widely-spread species, belonging to the larger and dominant groups within each class, which will ultimately prevail and procreate new and dominant species. As all the living forms of life are the lineal descendants of those which lived long before the Cambrian epoch, we may feel certain that the ordinary succession by generation has never once been broken, and that no cataclysm has desolated the whole world. Hence we may look with some confidence to a secure future of great length. And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection.

It is interesting to contemplate a tangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner, have all been produced by laws acting around us. These laws, taken in the largest sense, being Growth with Reproduction; Inheritance which is almost implied by reproduction; Variability from the indirect and direct action of the conditions of life, and from use and disuse: a Ratio of Increase so high as to lead to a Struggle for Life, and as a consequence to Natural Selection, entailing Divergence of Character and the Extinction of less-improved forms. Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that,

2. British social theorist (1820–1903), who developed the concept of social Darwinism.

3. I.e., before the earliest geological period of the Paleozoic (now dated at more than 544 million years ago).

whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved.

1859

CHARLES DARWIN

After he published *The Origin of Species,* Darwin wrote several treatises, some of which develop and clarify the theory of natural selection. One of these works, *The Descent of Man* (1871), was especially provocative in its stress on the similarities between humans and animals and in its naturalistic explanations of the beautiful colorings of birds, insects, and flowers.

From The Descent of Man

[NATURAL SELECTION AND SEXUAL SELECTION][1]

A brief summary will here be sufficient to recall to the reader's mind the more salient points in this work. Many of the views which have been advanced are highly speculative, and some no doubt will prove erroneous; but I have in every case given the reasons which have led me to one view rather than to another. It seemed worth while to try how far the principle of evolution would throw light on some of the more complex problems in the natural history of man. False facts are highly injurious to the progress of science, for they often long endure; but false views, if supported by some evidence, do little harm, as everyone takes a salutary pleasure in proving their falseness; and when this is done, one path towards error is closed and the road to truth is often at the same time opened.

The main conclusion arrived at in this work, and now held by many naturalists who are well competent to form a sound judgment, is that man is descended from some less highly organized form. The grounds upon which this conclusion rests will never be shaken, for the close similarity between man and the lower animals in embryonic development, as well as in innumerable points of structure and constitution, both of high and of the most trifling importance—the rudiments which he retains, and the abnormal reversions to which he is occasionally liable—are facts which cannot be disputed. They have long been known, but until recently they told us nothing with respect to the origin of man. Now when viewed by the light of our knowledge of the whole organic world, their meaning is unmistakable. The great principle of evolution stands up clear and firm, when these groups of facts are considered in connection with others, such as the mutual affinities of the members of the same group, their geographical distribution in past and present times, and their geological succession. It is incredible that all these

1. From chap. 21.

facts should speak falsely. He who is not content to look, like a savage, at the phenomena of nature as disconnected cannot any longer believe that man is the work of a separate act of creation. He will be forced to admit that the close resemblance of the embryo of man to that, for instance, of a dog—the construction of his skull, limbs, and whole frame, independently of the uses to which the parts may be put, on the same plan with that of other mammals—the occasional reappearance of various structures, for instance of several distinct muscles, which man does not normally possess, but which are common to the Quadrumana[2]—and a crowd of analogous facts—all point in the plainest manner to the conclusion that man is the codescendant with other mammals of a common progenitor.

* * *

By considering the embryological structure of man—the homologies which he presents with the lower animals, the rudiments which he retains, and the reversions to which he is liable—we can partly recall in imagination the former condition of our early progenitors; and can approximately place them in their proper position in the zoological series. We thus learn that man is descended from a hairy quadruped, furnished with a tail and pointed ears, probably arboreal in its habits, and an inhabitant of the Old World. This creature, if its whole structure had been examined by a naturalist, would have been classed amongst the Quadrumana, as surely as would the common and still more ancient progenitor of the Old and New World monkeys. The Quadrumana and all the higher mammals are probably derived from an ancient marsupial animal, and this through a long line of diversified forms, either from some reptile-like or some amphibianlike creature, and this again from some fishlike animal. In the dim obscurity of the past we can see that the early progenitor of all the Vertebrata must have been an aquatic animal, provided with branchiae,[3] with the two sexes united in the same individual, and with the most important organs of the body (such as the brain and heart) imperfectly developed. This animal seems to have been more like the larvae of our existing marine ascidians[4] than any other known form.

* * *

Sexual selection has been treated at great length in these volumes; for, as I have attempted to show, it has played an important part in the history of the organic world.

* * *

The belief in the power of sexual selection rests chiefly on the following considerations. The characters which we have the best reason for supposing to have been thus acquired are confined to one sex; and this alone renders it probable that they are in some way connected with the act of reproduction. These characters in innumerable instances are fully developed only at maturity; and often during only a part of the year, which is always the breeding

2. Animals, such as monkeys, whose hind feet and forefeet can be used as hands—hence "four-handed."
3. Gills.
4. Part of a group of marine animals called tunicata, or popularly "sea squirts," sometimes assumed to be ancestors of the vertebrate animals.

season. The males (passing over a few exceptional cases) are the most active in courtship; they are the best armed, and are rendered the most attractive in various ways. It is to be especially observed that the males display their attractions with elaborate care in the presence of the females; and that they rarely or never display them excepting during the season of love. It is incredible that all this display should be purposeless. Lastly we have distinct evidence with some quadrupeds and birds that the individuals of the one sex are capable of feeling a strong antipathy or preference for certain individuals of the opposite sex.

Bearing these facts in mind, and not forgetting the marked results of man's unconscious selection, it seems to me almost certain that if the individuals of one sex were during a long series of generations to prefer pairing with certain individuals of the other sex, characterized in some peculiar manner, the offspring would slowly but surely become modified in this same manner. I have not attempted to conceal that, excepting when the males are more numerous than the females, or when polygamy prevails, it is doubtful how the more attractive males succeed in leaving a larger number of offspring to inherit their superiority in ornaments or other charms than the less attractive males; but I have shown that this would probably follow from the females—especially the more vigorous females which would be the first to breed, preferring not only the more attractive but at the same time the more vigorous and victorious males.

Although we have some positive evidence that birds appreciate bright and beautiful objects, as with the bowerbirds of Australia, and although they certainly appreciate the power of song, yet I fully admit that it is an astonishing fact that the females of many birds and some mammals should be endowed with sufficient taste for what has apparently been effected through sexual selection; and this is even more astonishing in the case of reptiles, fish, and insects. But we really know very little about the minds of the lower animals. It cannot be supposed that male birds of paradise or peacocks, for instance, should take so much pains in erecting, spreading, and vibrating their beautiful plumes before the females for no purpose. We should remember the fact given on excellent authority in a former chapter, namely that several peahens, when debarred from an admired male, remained widows during a whole season rather than pair with another bird.

Nevertheless I know of no fact in natural history more wonderful than that the female argus pheasant should be able to appreciate the exquisite shading of the ball-and-socket ornaments and the elegant patterns on the wing feathers of the male. He who thinks that the male was created as he now exists must admit that the great plumes, which prevent the wings from being used for flight, and which, as well as the primary feathers, are displayed in a manner quite peculiar to this one species during the act of courtship, and at no other time, were given to him as an ornament. If so, he must likewise admit that the female was created and endowed with the capacity of appreciating such ornaments. I differ only in the conviction that the male argus pheasant acquired his beauty gradually, through the females having preferred during many generations the more highly ornamented males; the aesthetic capacity of the females having been advanced through exercise or habit in the same manner as our own taste is gradually improved. In the male, through the fortunate chance of a few feathers not having been modified, we can distinctly

see how simple spots with a little fulvous[5] shading on one side might have been developed by small and graduated steps into the wonderful ball-and-socket ornaments; and it is probable that they were actually thus developed.

* * *

He who admits the principle of sexual selection will be led to the remarkable conclusion that the cerebral system not only regulates most of the existing functions of the body, but has indirectly influenced the progressive development of various bodily structures and of certain mental qualities. Courage, pugnacity, perseverance, strength and size of body, weapons of all kinds, musical organs, both vocal and instrumental, bright colours, stripes and marks, and ornamental appendages have all been indirectly gained by the one sex or the other, through the influence of love and jealousy, through the appreciation of the beautiful in sound, color or form, and through the exertion of a choice; and these powers of the mind manifestly depend on the development of the cerebral system.

* * *

The main conclusion arrived at in this work, namely that man is descended from some lowly-organized form, will, I regret to think, be highly distasteful to many persons. But there can hardly be a doubt that we are descended from barbarians. The astonishment which I felt on first seeing a party of Fuegians[6] on a wild and broken shore will never be forgotten by me, for the reflection at once rushed into my mind—such were our ancestors. These men were absolutely naked and bedaubed with paint, their long hair was tangled, their mouths frothed with excitement, and their expression was wild, startled, and distrustful. They possessed hardly any arts,[7] and like wild animals lived on what they could catch; they had no government, and were merciless to everyone not of their own small tribe. He who has seen a savage in his native land will not feel much shame, if forced to acknowledge that the blood of some more humble creature flows in his veins. For my own part I would as soon be descended from that heroic little monkey, who braved his dreaded enemy in order to save the life of his keeper; or from that old baboon, who, descending from the mountains, carried away in triumph his young comrade from a crowd of astonished dogs[8]—as from a savage who delights to torture his enemies, offers up bloody sacrifices, practices infanticide without remorse, treats his wives like slaves, knows no decency, and is haunted by the grossest superstitions.

Man may be excused for feeling some pride at having risen, though not through his own exertions, to the very summit of the organic scale; and the fact of his having thus risen, instead of having been aboriginally placed there, may give him hopes for a still higher destiny in the distant future. But we are not here concerned with hopes or fears, only with the truth as far as our reason allows us to discover it. I have given the evidence to the best of my ability; and we must acknowledge, as it seems to me, that man with all his noble qualities, with sympathy which feels for the most debased, with

5. Dull yellow.
6. Natives inhabiting the islands off the southern tip of South America. Tierra del Fuego, which Darwin had visited in 1832. See his *Voyage of the Beagle* (1839), chap. 10.
7. Crafts and skills.
8. Incidents described in chap. 4 to demonstrate that animals may be endowed with a moral sense.

benevolence which extends not only to other men but to the humblest living creature, with his godlike intellect which has penetrated into the movements and constitution of the solar system—with all these exalted powers—Man still bears in his bodily frame the indelible stamp of his lowly origin.

1871

LEONARD HUXLEY

At meetings of the British Association for the Advancement of Science, the reading of a paper is followed by a discussion. In 1860, at Oxford, this discussion developed into a debate between Thomas Henry Huxley (1825–1895), a defender of Charles Darwin's theories, and Bishop Samuel Wilberforce (1805–1873). Although he had studied mathematics as an undergraduate, Wilberforce could hardly lay claim to be a scientist. He was willing, nevertheless, to speak on behalf of those scientists who disagreed with *The Origin of Species* (1859), and he reportedly came to the meeting ready to "smash Darwin." The bishop's principal qualifications for this role were his great powers as a smoothly persuasive orator (he was commonly known by his detractors as "Soapy Sam"), but he met more than his match in Huxley.

Because no complete transcript of this celebrated debate was made at the time, Huxley's son Leonard (1860–1933), in writing his father's biography, had to reconstruct the scene by combining quotations from reports made by magazine writers and other witnesses. The account given here is from chapter 14.

From The Life and Letters of Thomas Henry Huxley

[THE HUXLEY-WILBERFORCE DEBATE AT OXFORD]

The famous Oxford Meeting of 1860 was of no small importance in Huxley's career. It was not merely that he helped to save a great cause from being stifled under misrepresentation and ridicule—that he helped to extort for it a fair hearing; it was now that he first made himself known in popular estimation as a dangerous adversary in debate—a personal force in the world of science which could not be neglected. From this moment he entered the front fighting line in the most exposed quarter of the field. * * *

It was the merest chance, as I have already said, that Huxley attended the meeting of the section that morning. Dr. Draper[1] of New York was to read a paper on the *Intellectual Development of Europe considered with reference to the views of Mr. Darwin*. "I can still hear," writes one who was present, "the American accents of Dr. Draper's opening address when he asked 'Air we a fortuitous concourse of atoms?'" However, it was not to hear him, but the eloquence of the Bishop, that the members of the Association crowded in such numbers into the Lecture Room of the Museum, that this, the appointed meeting place of the section, had to be abandoned for the long west room,

1. John W. Draper (1811–1882), British-born chemist, photographer, and historian who was a professor at the University of the City of New York.

In Memoriam A. H. H. When Arthur Hallam died suddenly at the age of twenty-two, probably of a stroke, Tennyson felt that his life had been shattered. Hallam was not only Tennyson's closest friend, and his sister's fiancé, but a critic and champion of his poetry. Widely regarded as the most promising young man of his generation, Hallam had written a review of Tennyson's first book of poetry that is still one of the best assessments of it. When Tennyson lost Hallam's love and support, he was overwhelmed with doubts about his own life and vocation and about the meaning of the universe and humankind's place in it, doubts reinforced by his study of geology and other sciences. To express the variety of his feelings and reflections, he began to compose a series of lyrics. Tennyson later arranged these "short swallow-flights of song," as he called them, written at intervals over a period of seventeen years, into one long elegy. Although the resulting poem has many affinities with traditional elegies like Milton's "Lycidas" (1638) and Shelley's *Adonais* (1821), its structure is strikingly different. It is made up of individual lyric units that are seemingly self-contained but take their full meaning from their place in the whole. As T. S. Eliot has written, "It is unique: it is a long poem made by putting together lyrics, which have only the unity and continuity of a diary, the concentrated diary of a man confessing himself." Though intensely personal, the elegy expressed the religious doubts of his age. It is also a love poem. Like Shakespeare's sonnets, to which the poem alludes, *In Memoriam* vests its most intense emotion in male relationships.

The sections of the poem record a progressive development from despair to some sort of hope. Some of the early sections of the poem resemble traditional pastoral elegies, including those portraying the voyage during which Hallam's body was brought to England for burial (sections 9 to 15 and 19). Other early sections portraying the speaker's loneliness, in which even Christmas festivities seem joyless (sections 28 to 30), are more distinctive. The poem's internal chronology covers a span of around three years, and with the passage of time, indicated by anniversaries and by recurring changes of the seasons, the speaker comes to accept the loss and to assert his belief in life and in an afterlife. In particular the recurring Christmases (sections 28, 78, 104) indicate the stages of his development, yet the pattern of progress in the poem is not a simple unimpeded movement upward. Dramatic conflicts recur throughout. Thus the most intense expression of doubt occurs not at the beginning of *In Memoriam* but as late as sections 54, 55, and 56.

The quatrain form in which the whole poem is written is usually called the "*In Memoriam* stanza," although it had been occasionally used by earlier poets. So rigid a form taxed Tennyson's ingenuity in achieving variety, but it is one of several means by which the diverse parts of the poem are knitted together.

The introductory section, consisting of eleven stanzas, is commonly referred to as the "Prologue," although Tennyson did not assign a title to it. It was written in 1849, after the rest of the poem was complete.

From In Memoriam A. H. H.

OBIIT MDCCCXXXIII[1]

Strong Son of God, immortal Love,
  Whom we, that have not seen thy face,
  By faith, and faith alone, embrace,
Believing where we cannot prove;[2]

Thine are these orbs[3] of light and shade;
  Thou madest Life in man and brute;
  Thou madest Death; and lo, thy foot
Is on the skull which thou hast made.

Thou wilt not leave us in the dust:
  Thou madest man, he knows not why,
  He thinks he was not made to die;
And thou hast made him: thou art just.

Thou seemest human and divine,
  The highest, holiest manhood, thou.
  Our wills are ours, we know not how;
Our wills are ours, to make them thine.

Our little systems[4] have their day;
  They have their day and cease to be;
  They are but broken lights of thee,
And thou, O Lord, art more than they.

We have but faith: we cannot know,
  For knowledge is of things we see;
  And yet we trust it comes from thee,
A beam in darkness: let it grow.

Let knowledge grow from more to more,
  But more of reverence in us dwell;
  That mind and soul, according well,
May make one music as before,[5]

But vaster. We are fools and slight;
  We mock thee when we do not fear:
  But help thy foolish ones to bear;
Help thy vain worlds to bear thy light.

Forgive what seemed my sin in me,
  What seemed my worth since I began;
  For merit lives from man to man,
And not from man, O Lord, to thee.

1. He died 1833 (Latin).
2. Cf. John 20.24–29, in which Jesus rebukes Thomas for his doubts concerning the Resurrection: "Blessed are they that have not seen, and yet have believed."
3. The sun and moon (according to Tennyson's note).
4. Of religion and philosophy.
5. As in the days of fixed religious faith.

Forgive my grief for one removed,
Thy creature, whom I found so fair.
I trust he lives in thee, and there
I find him worthier to be loved.

Forgive these wild and wandering cries,
Confusions of a wasted° youth;
Forgive them where they fail in truth,
And in thy wisdom make me wise.

deluded

1849

1

I held it truth, with him who sings
To one clear harp in divers tones,[6]
That men may rise on stepping stones
Of their dead selves to higher things.

But who shall so forecast the years
And find in loss a gain to match?
Or reach a hand through time to catch
The far-off interest of tears?

Let Love clasp Grief lest both be drowned,
Let darkness keep her raven gloss.
Ah, sweeter to be drunk with loss,
To dance with Death, to beat the ground,

Than that the victor Hours should scorn
The long result of love, and boast,
"Behold the man that loved and lost,
But all he was is overworn."

2

Old yew, which graspest at the stones
That name the underlying dead,
Thy fibres net the dreamless head,
Thy roots are wrapped about the bones.

The seasons bring the flower again,
And bring the firstling to the flock;
And in the dusk of thee the clock
Beats out the little lives of men.

O, not for thee the glow, the bloom,
Who changest not in any gale,

6. Identified by Tennyson as the German poet Johann Wolfgang von Goethe (1749–1832).

Nor branding summer suns avail
To touch thy thousand years of gloom[7]

And gazing on thee, sullen tree,
Sick for° thy stubborn hardihood, *envying*
I seem to fail from out my blood
And grow incorporate into thee.

3

O Sorrow, cruel fellowship,
O Priestess in the vaults of Death,
O sweet and bitter in a breath,
What whispers from thy lying lip?

"The stars," she whispers, "blindly run;
A web is woven across the sky;
From out waste places comes a cry,
And murmurs from the dying sun;

"And all the phantom, Nature, stands—
With all the music in her tone,
A hollow echo of my own—
A hollow form with empty hands."

And shall I take a thing so blind,
Embrace her° as my natural good; *Sorrow*
Or crush her, like a vice of blood,
Upon the threshold of the mind?

4

To Sleep I give my powers away;
My will is bondsman to the dark;
I sit within a helmless bark,
And with my heart I muse and say:

O heart, how fares it with thee now,
That thou should fail from thy desire,
Who scarcely darest to inquire,
"What is it makes me beat so low?"

Something it is which thou hast lost,
Some pleasure from thine early years.
Break thou deep vase of chilling tears,
That grief hath shaken into frost![8]

7. The ancient yew tree, growing in the grounds near the clock tower and church where Hallam was to be buried, seems neither to blossom in spring nor to change from its dark mournful color in summer. "Thousand years": cf. Book of Common Prayer, Psalm 90, "For a thousand years in Thy sight are but as yesterday when it is past, and as a watch in the night."

8. Water can be brought below freezing-point and not turn into ice—if it be kept still; but if it be moved suddenly it turns into ice and may break a vase [Tennyson's note].

Behold, we know not anything;
I can but trust that good shall fall
At last—far off—at last, to all,
And every winter change to spring.

So runs my dream; but what am I?
An infant crying in the night;
An infant crying for the light,
And with no language but a cry.

55

The wish, that of the living whole
No life may fail beyond the grave,
Derives it not from what we have
The likest God within the soul?[1]

Are God and Nature then at strife,
That Nature lends such evil dreams?
So careful of the type she seems,
So careless of the single life,

That I, considering everywhere
Her secret meaning in her deeds,
And finding that of fifty seeds
She often brings but one to bear,

I falter where I firmly trod,
And falling with my weight of cares
Upon the great world's altar-stairs
That slope through darkness up to God,

I stretch lame hands of faith, and grope,
And gather dust and chaff, and call
To what I feel is Lord of all,
And faintly trust the larger hope.[2]

56

"So careful of the type?" but no.
From scarpèd[3] cliff and quarried stone
She° cries, "A thousand types are gone;
I care for nothing, all shall go.

"Thou makest thine appeal to me:
I bring to life, I bring to death;
The spirit does but mean the breath:
I know no more." And he, shall he,

Nature

1. According to Tennyson, the "inner conscience—the divine in man."
2. As expressed in lines 1 and 2.
3. Cut away so that the strata are exposed.

Man, her last work, who seemed so fair,
Such splendid purpose in his eyes,
Who rolled the psalm to wintry skies,
Who built him fanes° of fruitless prayer, *temples*

Who trusted God was love indeed
And love Creation's final law—
Though Nature, red in tooth and claw
With ravine, shrieked against his creed—

Who loved, who suffered countless ills,
Who battled for the True, the Just,
Be blown about the desert dust,
Or sealed within the iron hills?[4]

No more? A monster then, a dream,
A discord. Dragons of the prime,° *primeval age*
That tare° each other in their slime, *tore (archaic)*
Were mellow music matched with° him. *compared to*

O life as futile, then, as frail!
O for thy voice to soothe and bless!
What hope of answer, or redress?
Behind the veil, behind the veil.

57

Peace; come away: the song of woe
Is after all an earthly song.
Peace; come away: we do him wrong
To sing so wildly: let us go.

Come; let us go: your cheeks are pale;
Methinks my friend is richly shrined;
But half my life I leave behind.
But I shall pass, my work will fail.

Yet in these ears, till hearing dies,
One set slow bell will seem to toll
The passing of the sweetest soul
That ever looked with human eyes.

I hear it now, and o'er and o'er,
Eternal greetings to the dead;
And "Ave,° Ave, Ave," said, *Hail (Latin)*
"Adieu, adieu," forevermore.

58

In those sad words I took farewell.
Like echoes in sepulchral halls,

4. Preserved like fossils in rock.