The Story of the Evolution of Life

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In many animals the development of the egg cell into the young as they appear at birth takes place within the mother's body. Omitting the highly complicated processes, which occur in the cell prior to its division, we may say that as soon as the ovum is fertilised, it splits into two halves, and these two daughter cells which arise from the splitting, in turn divide into four, the four into eight, the eight into sixteen, and so on. These phenonema are termed cell multiplication and they are common to all animals, plants, and men.

The many celled body which arises from the multiplication of the original cell assumes the appearance of a mulberry. This sphere of cells is alike throughout, then as the sphere develops, a liquid substance occupies the centre which pushes the cells more and more outwards until they form a single layer enclosing a watery interior. The ovum now becomes a hollow globe surrounded by a chain of cells. Then one portion of the sphere becomes depressed, and the depression grows deeper and deeper until there arises a complete invagination in this depressed section and the cells which compose it are steadily driven inwards until they touch those of the opposite side of the ovum. The hollow sphere has now been modified into an open receptacle,, shaped like a horse-shoe the walls of which are formed by a double cell layer. This constitutes the famous gastrula stage of animal embrology and all animals save the lowest appear to exhibit this special feature.

Sponges, snails, worms, urchins, iish, reptiles, birds, and mammals pass through this stage of gastrulation, although in a few of the highest organisms it has become slightly modified.

Perhaps a clearer idea of what the gastrula looks like will be conveyed to the reader if we compare it with an india rubber ball, hollow within, which has been pierced at the surface, and the perforated part pressed inward, until contact with the distended section is complete. If we now turn the double layered cup we have made out of our original ball so that the opening is directed downwards, we form a fair model of the general outline of the gastrula.

It is significant that this cellular arrangement is precisely that displayed by certain of the lower animals throughout life. In sponges for instances, the opening of the gastrula forms the animal's mouth, the intednal cavity the stomach, and the outer layer of cells the skin. Such is the comparatively simple structure of many of the inferior animals during life. In higher animals this gastrula stage is succeeded by the formation of a third layer of cells which arises between the two original external and internal layers. The outward layer of the gastrula is termed the ectoderm, and the inner layer the endoderm, and now, in all organisms above sponges and polyps, this third layer, the mesoderb, puts in an appearance. This third layer is larger than the others and is more complicated in structure but, leaving out several technical details it is enough to state that the outer layer (ectoderm) gives rise to the skin, the nervous system, and the special organs of taste, smell, hearing, sight, and touch. The middle layer (mesoderm) produces the skeleton, the organs of circulation, including the heart, with other important muscles and organs. Finally, the last and innermost layer evolves into the intestinal canal, the liver , lungs, and their various appendages.

Up to this stage all animals above the sponges, jelly fishes, and others are alike, but as further development takes place, the various main groups of animal life, from the worms onward to man now depart along different routes in their subsequent growth. Our chief concern is the mammalian order, and we will confine ourselves to that. This may however, be said, that when the student inquires into the embryological history of the worms, star fishes, snails, spiders, etc., he will discover similar evidences of progressive modification.

There still survives a small animal—the Lancelet or Amphioxus—which almost as closely resembles a worm as a fish. This creature possesses no head or limbs, while its heart and other internal organs are most primitive in character. But it betrays its kinship with the backboned animals through its soft notochord which extends along its body. Now this soft backbone (notochord) appears in an early stage of embryological life in all the higher animals but with them the notched of the Amphioxus is replaced by a bony structure—the vertebral column—at a later period of development. Several other striking resemblances to organs possessed by the Amphioxus are displayed in the early embryonic history of other vertebrates while a very curious worm called Balanoglossus also presents clear resemblances to fishes of a lowly type. Fishes and other gill breathing animals do not need the lungs necessary to land animals. The gills possessed by fish are retained permanently, but we betray our fish-like ancestry by passing through a stage in which we bear in our unborn bodies the gill slits and gill arches of our fish-like forerunners and these reminiscences of an original life in the ocean are shown by all the innumerable vertebrates that breathe in air, and at the very period when the embryo of the terrestrial animal is provided with these gill appendages the heart itself is fashioned on a fish-like plan. The heart is two-chambered, as in a fish, not four-chambered, as in the mammal at birth, and it more than hints at its mode of ascent by assuming, when it changes form a two-chambered organ, the outlines of the three-chambered heart, such is that which exists in reptiles and frogs. Finally, it assumes the mammalian form. The lungs, again, are obviously the modified swim bladder or float of the fish. All these and numerous other facts, conspire to testify to our ascent from marine ancestors living in the immensely distant past.

In the nine months of his prenatal life man epitomises his aeon long evolution. The backbone of the unborn child is prolonged into a moveable tail, its toes and thumbs are apelike, and three months prior to birth the babe's body is covered with hair, the palms of the hands and the soles of the feet alone being bare. The child's nose is distinctly monkey-like, its head is abnormally large, and its arms, like those of its simian ancestors, are extremely long. First fishlike, then reptilian, later still resembling a hairy quadruped, the developing babe proclaims to all unprejudiced minds its relationship to the other backboned creatures of the living world.

Further testimony to the truth of evolution is supplied by the geographical distribution of the faunal and floral populations of our planet. The botanical and zoological provinces of today present powerful evidences of an evolutionary character. It is universally acknowledged that Australia and New Zealand have been separated from the main land masses of our globe for many millions of years. The evolutionist therefore expects to discover that the flora and fauna of these continental islands constitute an array of life in several ways peculiar to its habitat. And he should also find unequivocal evidences relating to ancient forms of life. Each of these anticipations is adequately realised. The only important higher mammal resident in Australia at the time of its discovery was the dog, and this animal arrived with the native races of that region. The bats and rodents dwelling in this area easily reached it by flying or swimming there from adjoining lands. Australia is the home of one of the oldest and least evolved of terrestrial orders, the Marsupials or pouched organisms such as the Kangaroo. It is also the last refuge of an even lowlier group, the Monotremata, whose expiring representatives, the Duckbill Platypup, a small beaver like creature with a beak and clawed and webbed feet; and the echidna, a spiny ant-eating animal, are confined to this region. These achaic creatures lay eggs which contain not only the protoplasm from which the embryo arises, but the food yolk which nourishes it until it emerges from the egg, when it begins to suckle at its mother's breast. The birds of Australia are remarkably peculiar, and a volume might be written on the facts relating to this region which strongly support the doctrine of evolution.

In terms of the theory of special creation organic forms ought to be found in situations most suitable to their general advantage. That plants and animals are more or less adapted to their natural habitat is undeniably true; in conditions in which they never occur in a state of nature, when introduced into an alien environment by accident or design. The rabbit was an entire stranger to Australia yet, when taken there by man, it multiplied beyond all precedent. The watercress, again, when introduced from Europe to New Zealand, grew in the rivers to a height of 8 or 10 feet. Innumberable important plants sent from the Old World to the New, and from the New World to the Old, add to the beauty of landscape and garden, and in the case of the potato, usually add to the food supply. Wheat, unknown in America as a normal growth until transported from Europe, became one of the most valuable crops of the Western Hemisphere. Scores of similar instances exist, all of which indicate that the ideal habitat of any particular organism is seldom that in which it normally dwells. Other causes, then, than those ascribed to supernatural design, must be responsible for the past and present distribution of living forms.

In ocean, island, peninsular and continent, alike, all the world over, the phenomena of distribution point to evolution, and to that alone. There is space available for a few salient examples drawn from island life, but these might be greatly multiplied by illustrations from continent or sea. Dotted throughout the oceans and ascending from immense depths are various islands of volcanic origin. These stranded peaks are distant from continental lands. They rise from the abysses of the sea, are on all sides surrounded by deep water, and are therefore unlikely like the British Isles to have once formed part of the adjoining continent. Consequently we should find fauna and flora of oceanic isles displaying modifications such as separation from the organisms from which they are descended must ultimately produce. Changed climatal conditions also should show their influence. Both these requirements are completely fulfilled. There is in each instance potent evidence that these deep sea islands were from time to time invaded after their formation by stray arrivals from adjacent land.

Darwin, Wallace and other biologists have fully established the striking facts now to be presented. The Azores form a group of islands nearly 1,000 miles from the shores of Portugal, which emerge from ocean depths of from 2,000 to 2,500 fathoms. These volcanic islands have existed for millions of years, yet they contain no mammals whatever except those carried there by man. Birds are abundant, there is one bat, there are various insects, and 74 species of beetles. With the exception of 14 species of beetles, and one bird special to the isles, all the other animals are European except 19 beetles native to the Canaries and Madeira, and three that have drifted over the ocean from America. Even the beetles peculiar to the Azores are clearly related to European species, while of the 500 species of plants, 40 are confined to the isles, although they are obviously descended from European forms.

The Bermudas comprise another group of Islands