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Bio-Containment Strategy in Mendel's Laws and Darwin's Theory

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Description

The first full-fledged evolutionary scheme was Jean-Baptiste Lamarck's "transmutation" theory of 1809, which envisaged spontaneous generation continually producing simple forms of life that developed greater complexity in parallel lineages with an inherent progressive tendency, and postulated that on a local level, these lineages adapted to the environment by inheriting changes caused by their use or disuse in parents. The latter process was later called Lamarckism. These ideas were condemned by established naturalists as speculation lacking empirical support. In particular, Georges Cuvier insisted that species were unrelated and fixed, their similarities reflecting divine design for functional needs.

In the meantime, Ray's ideas of benevolent design had been developed by William Paley into the natural theology or evidences of the existence and attributes of the deity, which proposed complex adaptations as evidence of divine design and which was admired by Charles Darwin. Other naturalists of this time speculated on the evolutionary change of species over time according to natural laws. In 1751, he wrote of natural modifications occurring during reproduction and accumulating over many generations to produce new species.

Mendel's Laws

Mendel's laws of inheritance eventually supplanted most of Darwin's pangenesis theory. August Weismann made the important distinction between germ cells that give rise to gametes (such as sperm and egg cells) and the somatic cells of the body, demonstrating that heredity passes through the germ line only. Hugo de Vries connected Darwin's pangenesis theory to Weismann's germ/soma cell distinction and proposed that Darwin's pangenes were concentrated in the cell nucleus and when expressed they could move into the cytoplasm to change the cell's structure. De Vries was also one of the researchers who made Mendel's work well known, believing that Mendelian traits corresponded to the transfer of heritable variations along the germline.

To explain how new variants originate; de Vries developed a mutation theory that led to a temporary rift between those who accepted Darwinian evolution and biometricians who allied with de Vries. In the 1930s, pioneers in the field of population genetics, such as Ronald Fisher, Sewall Wright and J. B. S. Haldane set the foundations of evolution onto a robust statistical philosophy. The mechanisms of reproductive heritability and the origin of new traits remained a mystery. Towards this end, Darwin developed his provisional theory of pangenesis. In 1865, Gregor Mendel reported that traits were inherited in a predictable manner through the independent assortment and segregation of elements (later known as genes).

Darwin's Theory

The false contradiction between Darwin's theory, genetic mutations, and Mendelian inheritance was thus reconciled. Evidence that organisms are related by common descent with modification has been obtained by paleontology, comparative anatomy, biogeography, embryology, biochemistry, molecular genetics, and other biological disciplines. The idea first emerged from observations of systematic changes in the succession of fossil remains found in a sequence of layered rocks. Such layers have a cumulative thickness of tens of kilometers that represent at least 3.5 billion years of geological time. The general sequence of fossils from bottom upward in layered rocks had been recognized before Darwin proposed that the succession of biological forms strongly implied evolution.

The further back into the past one looked, the less the fossils resembled recent forms, the more the various lineages merged, and the broader the implications of a common ancestry. The mammalian ear and jaw offer an example in which paleontology and comparative anatomy combine to show common ancestry through transitional stages. The lower jaws of mammals contain only one bone, whereas those of reptiles have several. The other bones in the reptile jaw are homologous with bones now found in the mammalian ear. Paleontologists have discovered intermediate forms of mammal-like reptiles with a double jaw joint one composed of the bones that persist in mammalian jaws, the other consisting of bones that

eventually became the hammer and anvil of the mammalian ear. Similar examples are numerous.

Some species, such as human beings and our companion the dog, can live under a wide range of environmental conditions. Others are amazingly specialized. One species of the fungus laboulbenia grows exclusively on the rear portion of the covering wings of a single species of beetle found only in some cases of southern France. Biogeography also has contributed evidence for common descent. The diversity of life is stupendous. Approximately 250,000 species of living plants, 100,000 species of fungi, and 1.5 million species of animals and microorganisms have been described and named, and the census is far from complete.

The larvae of the fly Drosophila carcinophila can develop only in specialized grooves beneath the flaps of the third pair of oral appendages of the land crab gecarcinus ruricola, which is found only on certain Caribbean islands.

Despite the basic biological, chemical, and physical similarities found in all living things, a diversity of life exists not only among and between species but also within every natural population. The phenomenon of diversity has had a long history of study because so many of the variations that exist in nature are visible to the eye. That change can be a slight alteration in the sequence of the constituents of DNA (nucleotides), a larger change such as a structural alteration of a chromosome, or a complete change in the number of chromosomes. In any case, a change in the genetic material in the reproductive cells manifests itself as some kind of structural or chemical change in the offspring. The consequence of such a mutation depends upon the interaction of the mutant offspring with its environment.

The fact that organisms changed during prehistoric times and that new variations are constantly evolving can be verified by paleontological records as well as by breeding experiments in the laboratory. Long after Darwin assumed that variations existed; biologists discovered that they are caused by a change in the genetic material..