

each finally reaches its fully developed mature form, showing all the great structural differences between the starfish and the dove, the beetle and the horse. That is, all animals begin development apparently alike, but gradually diverge from each other during the course of development.

"There are some extremely interesting and significant things about this divergence to which attention should be given. While all animals are apparently alike structurally at the beginning of development, so far as we can see, they do not all differ noticeably at the time of the first divergence in development. The first divergence in development is to be noted between two kinds of animals which belong to different great groups or classes. But two animals of different kinds, both belonging to some one great group, do not show differences until later in their development. This can best be understood by an example. All the butterflies and beetles and grasshoppers and flies belong to the great group or class of animals called *insecta*, or insects. Another great group of animals is known as the *Vertebrata* or backboneed animals. . . Now, an insect and a vertebrate diverge very soon in their development from each other; but two insects, such as a beetle and a honeybee, or any two vertebrates, such as a frog and pigeon, do not diverge from each other so soon. That is, all vertebrate animals diverge in one direction from the other great groups, but all the members of the great group keep together for some time longer. Then the subordinate groups of the *Vertebrata*, such as the fishes, the birds, and the others, diverge, and still later the different kinds of animals in each of these groups diverge from each other.

"The significance of the developmental phenomena is a matter about which naturalists have yet very much to learn. It is believed, however, by practically all naturalists that many of the various stages in the development of an animal correspond to or repeat, in many fundamental features at least, the structural condition of the animal's ancestors. Naturalists believe that all backboneed or vertebrate animals are related to each other through being descended from a common ancestry, the first or oldest backboneed animal. In fact, it is because all these backboneed animals -- the fishes, the batrachians, the reptiles, the birds, and the mammals -- have descended from a common ancestor that they all have a backbone. It is believed that the descendants of the first backboneed animal have in the course of many generations branched off little by little from the original type until there came to exist very real and obvious differences among the backboneed animals - - differences which among the living backboneed animals are familiar to all of us. The course of development of an individual animal is believed to be a very rapid and evidently much condensed and changed recapitulation of the history which the species or kind of animal to which the developing individual belongs has passed through in the course of its descent through a long series of gradually changing ancestors. . . If this is true, then we can readily understand why a fish and a salamander, a tortoise, a bird, and a rabbit, are all much alike, as they really are, in their earlier stages of development, and gradually come to differ more and more as they pass through later and later developmental stages."

-- D. S. Jordan and V. L. Kellogg, quoted by Horatio Hackett Newman, *Evolution Genetics and Eugenics* (Chicago: The University of Chicago Press, 1956), pp. 106-112.