

three species exist, one of *Ornithorhynchus* and two of *Echidna*) are the lowest of Mammals, and have many Amphibian and Reptilian characters in their skeleton, besides that striking one of bearing eggs, like Reptiles and Birds. They are called *Prototheria* in some zoölogical systems; and this they undoubtedly are in type, though the Duck-like bill and webbed foot of the *Ornithorhynchus* are unquestionably degenerate characteristics; for the earliest species had almost certainly a full set of teeth. That they were first in origin, however, is far from proved.

Among Reptiles, the Permian type represented by the genus *Palæohatteria*, with the associated *Rhynchocephalia*, as explained on page 707, is the most generalized or comprehensive of the class. Besides its Amphibian relations on one side and its Reptilian on the other, it has, as Baur explains, characteristics also of Birds and Mammals. This author regards the type as the precursor type of the class of Reptiles and also of the class of Birds. It is like Mammals, he states, and unlike all other Reptiles, except the Rhynchocephals, in having the foramen of the distal end of the humerus on the *inner* side of the epicondyle; in other Reptiles it is on the *outer* side or is absent; and it is absent from all Amphibians and Birds. It is probable, therefore, that, nearly as Baur concludes, the line from the Amphibians which gave off a Rhynchocephalian branch, later gave off a Mammalian.

The relation of Birds to the Dinosaurs in pelvis and hind limbs, especially to the Carnivorous kinds, was pointed out by Huxley; and it is supposed that the two types may have originated from a common type in either the Triassic or Permian period. The Jurassic bird, *Archæopteryx*, which is so remarkably Reptilian, has the long limbs, and but little else, of a Dinosaur; and this feature in the hind limbs of both is partly a consequence of an elongation of the metatarsals. The cranium and the sternum are Bird-like, but not so the fore limbs, pelvis, and some other parts. The Berlin specimen was first described as a Reptile by Carl Vogt. The relations of Birds to Dinosaurs in the structure of the skeleton are largely a consequence of the demands made by the animal on its hind limbs; and the unlike demands on the fore limbs are the source of divergences.

General Changes Attending Biological Progress.

1. *Reduction in multiplicate numbers.*—The reduction in number of posterior vertebræ when the Fish type passed to that of the Amphibian has been noticed on page 726. Their absence from the upper lobe of the tail in most Triassic Ganoids, rendering the Fish homocercal in place of heterocercal, is a change in the same direction, like that which takes place when the Tadpole becomes a Frog, or the young of a Ganoid or other Fish loses a caudal lobe, or some caudal vertebræ, when becoming adult. The long vertebrated tail of the Jurassic Bird was a related multiplicate feature, which disappeared early in Cretaceous time, if not before it.

The reduction of the number of parts in the limbs of Fishes before the close of the Paleozoic to the typical number of five for the digits in