

ters began to disappear. The teeth had the typical number, 44, reduced; their structure made more complex; and their characters varied otherwise through use and adaptations to different purposes.

The feet had the number of digits reduced in most Ungulates, but not in the Coryphodon line, or in the Carnivores, or the Quadrumana, or rarely in the Insectivores or Rodents. Moreover, the feet lost the *plantigrade* tread in the Herbivores, and Carnivores, but not in the Quadrumana, Insectivores, or Rodents.

In most of the larger species the regularity in the carpal and tarsal series of the feet gave way to the oblique or alternating position of the bones required for firmness in running.

*Some of the causes favoring change.* — The development of so great a diversity of Eocene Vertebrate structures is the more remarkable in view of the absence of all evidence as to any great physical or meteorological disturbance to require new adaptations. No change of climate is indicated beyond what might have occasioned a feeble amount of migration. No evidence of disquiet in the earth's crust has been noted, excepting that relating to the imperceptible geosynclinal movements over the areas of the Eocene lakes attending the slow deposition of sediments.

The only sources of disquiet that can be appealed to as causes of biological change, are *biological* sources proceeding from the appetites or needs or impulses of the animals. Of these appetites the dominant one, the most imperative, the only daily recurring one, was the demand for food. As nearly half of the Mammals lived on animal food, there was perpetual strife between the stronger flesh-eaters and the weaker, and between all flesh-eaters and other species. It would naturally have driven the weak kinds to holes, or somewhere out of reach of their enemies, where poor food, darkness, and other privations, would have been unfavorable to high progress. The strife, moreover, as writers on the derivation of species have illustrated, would have promoted fleetness, cunning, devices for protection, and have favored those changes in the Mammalian structures that would better fit or accommodate the species to the new demands.

The evolution of the Horse through the necessity of running to escape from enemies has often been set forth as an example of the effects, under certain conditions, of such a cause. An animal of primitive Ungulate type, having the third or middle toe the longest of the five, raising itself on its toes for greater speed in running, and forcing itself forward naturally by its longer toe, had this toe, as Eocene and Miocene time passed, with the bone of the foot above it (the metatarsal and the metacarpal) enlarged and elongated, while the less-used toes either side dwindled till too short to reach the ground; and finally, through these and other concurrent changes, there was evolved, a long-legged one-toed animal — the Horse. It became tall and long-legged, not only by elongating growth in certain bones, but also through the functional appropriation by the leg of all of the foot excepting the terminal hoofed joint.