

emerging from the sea and becoming submerged again, stating: "The very close similarity between the mammals living at the present time on either side of Bering strait is strong evidence that up to late Pleistocene times there was free migration between the two continents" Various additional proofs of this comparatively recent connection are on record.*

Gadow,⁵ the eminent zoögeographer, states that the object of the study of geographical distribution is the history of life in space and time, which, in turn, embraces every branch of science. Study of the geological history of North America shows that several great glacial periods have occurred, covering a large part of Canada with great sheets of ice, smoothing off hills and depositing vast quantities of boulders, gravel, sand and finer detritus over large areas. The gradual southward movement of the ice sheet would naturally force the animal species ahead of the ice, and in fact we find remains of musk-oxen in the central parts of the United States and remains of reindeer in southern Europe, regions from which these species have been absent during historic time. During the inclement glacial periods some of the less adaptable forms became extinct. Other species were either of tougher fibre, or were able to find suitable new homes, and in many cases their descendants moved northward with the recession of the ice and became separated from their former neighbours. In the meantime, changed conditions and environment were instrumental in developing differences which are now recognized as distinct species or geographical races or subspecies of the parent stock. The results of these forced or voluntary migrations, changes of climate, food and habitat are reflected in the greater or less differences which are found between the species of the same family in the Old and New Worlds, in the east and west of the same country, in the forests and on the prairies, and at low and high elevations.

Effects of Human Interference.—The effects of geological and climatic changes were probably very slow in their effects upon the primitive faunas, extending over thousands or even millions of years. There is little evidence that noticeable changes have occurred in the actual forms of wild species during the period of man's history, although a few species have been domesticated and different varieties bred by artificial selection. Early man, few in numbers, with primitive weapons and inefficient tools, made slow work of cutting down forests and destroying the wild life, and even in the early part of the Christian era much of northern and central Europe was thinly peopled. North America was subjugated at a greatly speeded rate. The early settlers brought in fire-arms and developed a trade in furs and hides, and the rapid increase of population both of man and the domestic animals which he brought in to serve his needs made the occupation of much land necessary for fields and pastures. Predatory wild animals have had to be reduced in numbers and many species have been totally extirpated over wide areas, and otherwise harmless and useful animals which consume the food supply of man and his domestic stock have to be controlled.

A comparison of the accounts of the early pioneers in Canada or the eastern United States, or the early travellers on the Western Plains, with conditions at the

*One of the latest is by Wagner,⁴ who cites Jordan (1929, *Novit. Zool.*) to the effect that out of 131 nearctic species of fleas found in North America, not less than 107 inhabit the western area of the North American continent, whereas in the eastern area we find but 31, and in the central area, which separates the two zones, 26. Wagner states that in 1936 the number of established North American species—not to speak of those imported from other parts of the globe—attained almost 160: the greater part of them was described from the western area of the continent. Many of the western species coincide with the species of eastern Asia, a fact which cannot be said of the species indigenous to eastern North America. Dr. Wagner remarks that "this fact deserves an attentive study from the standpoint of the distribution of Asiatic and North American mammals".