THE DEPARTMENTS OF GEOGRAPHY.

BY HUGH ROBERT MILL, D. SC., LONDON.

THE sub-division of any portion of science must be largely empirical, and in accordance rather with practical convenience than with natural planes of cleavage. Thus we are accustomed to such phrases as mathematical geography, physical geography, astronomical geography, ancient geography, political geography, and the like, although it would be very difficult to piece together the fragments which pass under these names so as to make up a coherent geography. In endeavoring to sub-divide the content of geography in such a way as to bring out the natural interrelations of its parts and their logical sequence, for purposes of exhaustive study, it has occurred to me to represent the whole metaphorically by a pyramid of several courses of masonry differing in material and finish but each supported by those below and supporting those above. Thus the fundamental course would be mathematical geography, constructed of great blocks hewn from the quarries of the only absolute science, accurately squared and fitted. It includes all that has to do with exact measurement of space and time and motion, the form and dimensions of the earth, its motions and the construction of maps. Upon this base is reared the second tier, physical geography, the material for which, less homogeneous and perfect than the foregoing, comes from quarries scattered over the realms of many sciences, from chemistry, physics and the different departments of geology, from meteorology and the science of the oceans. It is concerned with all these phenomena which depend on differences of substance, structure and state, and accounts for the origin of surface features and of scenery, the interactions of lithosphere, hydrosphere and atmosphere and the effect on each of solar energy. Next in order and less regular in structure, dependent on physical geography as physical is on mathematical, I place bio-geography, wherein the influence of life is taken into account. This serves to explain how vital processes of plant and animal affect the structure of the earth, and how the lifeless features of the globe regulate the distribution of vegetation and of animals. Arising directly from this floor, but as yet only imperfectly put together, is the course of anthropo-geography, the elucidation of the action of mankind as an animal species upon the globe. The unit of consideration is mankind as a whole; the variety of races, conditions of life and density of population are the features taken into account, and the interaction between man and nature has to be studied in its widest aspects. The changes in the relation of different tribes to their habitat belong to this zone, and these changes are the basis of historical geography, which gives origin to the next tier of our pyramid, in which the influence of races of men on the earth finds a place. This may be termed, for lack of a better name, political geography; its units are uncertain and transitory, for the hold of nations on regions is subject to continual change. But political geography is stability itself compared with the rough pile of commercial geography which caps if it does not crown the edifice. Here it is no longer the racial or national view-point which determines the conditions, but the individual greedy of gain or struggling for life. The distribution of natural resources is the fundamental condition, and the national frontier has rarely much in common with the political.

But here a further simile must be brought in. This cap of the pyramid plays the part of a keystone as well, and binds the whole structure together. As rain filtering through a mass of brick or stonework dissolves the mortar of the upper parts, and redeposits it in the lower courses, so the stream of self-interest permeates the whole structure of geography, and its results are felt throughout. Commercial motives consolidate national life, accentuate racial differences, redistribute animals and plants, modify physical conditions, start investigations into the nature of the earth, and even invade the solid groundwork of mathematics with the practical counsels of common-sense.

There are many people, but there were more, who deny to the sphere of geography anything beyond the measuring of distances and the mapping of distributions. The legitimate scope of the science, however, includes very much more, and the simile which I have sketched may help some students to understand and some teachers to apply the principles of geography.

THE AGE OF THE IRON ORES OF EAST TEXAS.[1]

BY WILLIAM KENNEDY, AUSTIN, TEXAS.

EXTENSIVE deposits of brown iron ore, or limonite, occur throughout east Texas, from the State line westward to the Brazos River, and covering a roughly irregular triangular area, having its base resting upon the Sulphur Fork of the Red River across the northern side of Cass County and extending westward until the apex touches the Brazos.

Regarding the age of these deposits considerable confusion appears to have arisen. In the Tenth Census Professor Pumpelly assigns them to the Quaternary. Why this age was given to these ores is not stated. They simply appear among the Quaternary deposits in the Texas section shown on plate VIII., of the fifteenth volume, and no mention is made anywhere in the text of any authority for so placing them. As the only Texas ore of which any notice is taken in this volume is that found in Marion County, and then worked in the Kelleyville furnace, it may be presumed that, as that ore is of the nodular variety and corresponds very closely in physical appearance and approximately in chemical composition to the ores found in Mississippi by Dr. Hilgard and described by him as belonging to his Orange Sand formation, and consequently of Quaternary age, Professor Pumpelly considered the Marion County ores to have the same origin and date, and so placed them in the Quaternary when making his section.

The next investigator was Mr. Lawrence C. Johnson, an Assistant on the United States Geological Survey. Mr. Johnson had been assigned to make an examination of the iron ores of northern Louisiana in 1885, and in 1886 his instructions were modified and extended so as to enable him to examine the east Texas deposits. This investigator appears to have been the first to recognize the existence of two divisions among the ores. These he separated, assigning the name of *nodular* ore to the one variety, and by the term *lacustrine* designated the other. This latter class he again divided into "laminated" and "buff crumbly" ores, according to their texture and physical appearance.

While dividing the ores into these two great divisions, he at the same time placed them in different ages and under entirely different conditions. The nodular ore, Mr. Johnson considered as belonging to the lignitic Tertiary, and we find him, after describing the ores of Marion County, saying: "All this portion of the iron field, including Upshur, Camp, Morris, Marion and Cass Counties, is assigned to the great Lignitic of the Geological Column." (Iron Ores of Northern Louisiana and Eastern Texas, Ex. Doc. 195, first session, Fiftieth Congress, p. 34.)

[1]Read before the Texas Academy of Science, Dec. 16, 1893.