defining the range of animals whose range one knows, in terms of the ranges of plants and animals whose range one does not know.

Lutz' method of "Geographic Average" (1921, *Amer. Mus. Novitates,* 5) involves considerable calculation, which brings to light with great effort the astounding information that the "mid-range" of a northern species is north of the "mid-range" of a southern species.

He voices considerable discontent with the zones as being indefinite and indistinct. Whereupon he proceeds to define anew the undefinable and to redistinguish the indistinguishable.

Inasmuch as all sharp changes in fauna are dependent on similarly marked changes in topography, it would seem reasonable to adopt physiographic regions, instead of zones, "major environments," and "geographic averages."

For the United States this has been made remarkably easy by the publication of "Physiographic Divisions of the United States," by Nevin S. Fenneman, *Ann. Ass. Amer. Geog.,* VI, 1917, which is the result of long continued work on the part of a committee of the association.

The lines of these divisions in many cases agree with the zones and with the plant formations. This is to be expected for the ranges of many animals should logically stop at a physiographic break, or at a line of sudden change in temperature or moisture, and the former usually carries with it the two latter.

Furthermore the use of these physiographic regions clears the way for intelligent association of animal and plant ranges with the geology and soil conditions, and brings to light routes of dispersal.

For instance, this system makes clear the presence of the Connecticut valley and the Hudson-Champlain trough, in which many southern forms extend north, but to draw these on the map as Upper Austral, indicating faunal identity with Piedmont Virginia (also Upper Austral) is sheer falsehood.

The beauty of this method, however, is its ease of application. These regions can be *seen,* their boundaries can be *seen,* and there is seldom any doubt as to which region one is in or from which specimens came.

Of course, all animals do not respect physiographic boundaries, any more than all animals respect the lines drawn on maps to represent faunal zones.

None of our methods of indicating general distribution is perfect. None ever can be. Zoogeographers might well give some consideration to the results of the "new geography," and afford themselves some justification for their title.

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CLINKERTILL, A NEW METAMORPHIC ROCK

IN view of the interest attached to the study and identification of tillite a note about a rather unusual form of till may be of interest. This occurrence has never been described so far as the writer is aware.

Capping the northern bluffs bordering the Missouri river in portions of sections 16, 17 and 18, Township 154 west, Range 95 north, Williams County, North Dakota, is a typical bowlder-clay. This till lies on the truncated edges of the gently easterly dipping, lignite bearing, Fort Union Beds. In the sections mentioned above a heavy bed of lignite, here known as the Williston bed[1] immediately underlies the drift. Here as elsewhere the Williston bed has burned back from the outcrop baking the overlying till in places to a thickness of 30 feet or 40 feet. The clinkertill so formed varies in color from salmon-pink to dark brown, brick-red being the common color. In selected spots the material is fused to a porous, scoria-like mass but in most part is only slightly indurated by the heat. This baked till so formed resists weathering and removal and forms the capping of steep bluffs and buttes or mesas.

The most common pebbles found in this clinkertill are granite and limestone. The granite pebbles appear to be unaltered by the heat and the limestone pebbles but slightly as they effervesce freely in hydrochloric acid.

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[1] Collier, A. J., "The Nesson Anticline," Bulletin 691 G., U. S. G. S., p. 213.