ART. XXIII.—*Late Observations concerning the Molluscan Fauna, and the Geographical extent of the Laramie Group*; by C. A. WHITE.

THE observations that have been made concerning the faunal characteristics and geographical extent of the Laramie Group during the past year are of considerable importance. We now know the strata of that group to exist at numerous and extensive localities through more than twenty-four degrees of latitude; that is, from the State of Nuevo Leon in Mexico to the Valley of the Saskatchewan in British America.

Before giving a statement of the late observations referred to, it is necessary to an understanding of them that I should make a few explanatory remarks.

When speaking of the invertebrate fauna of the Laramie Group I refer to the fauna of a formation that is wholly different from that of any of the marine Cretaceous formations, with one of which some writers have confounded it; a fauna that as a whole and in details stands out more clearly distinct from the fauna of all the other geological formations of North America than any of the latter do from each other. The Laramie fauna contains no true marine types of any kind, but it does contain many brackish-water molluscan forms, and also the remains of many fresh-water and land mollusks. This fauna characterizes a great wide-spread geological group of strata in the most distinct and unequivocal manner, several of its molluscan species now being known to occur at localities more than a thousand miles apart.

It is cause for great regret that the admirable Text-book of Geology lately published by Professor Archibald Geikie should contain so erroneous a statement as it does of the molluscan fauna of the Laramie Group. I do not hesitate to assert that not one of the molluscan species mentioned in that statement were ever found in strata of the Laramie Group; the non-marine forms which he mentions being evidently those which were discovered by Mr. Meek in an estuary deposit of true Cretaceous age, at Coalville, Utah. Furthermore, not one of the numerous species which do characterize that group are anywhere mentioned in the book. With due recognition also of the value of the geological labors of Professor J. J. Stevenson, who has published several articles in this Journal, and in the Wheeler Reports, upon the Laramie Group, I am quite unable to reconcile his statements with my own extensive observations of that group and the study of its fossils. That any true Laramie strata ever alternate with those of the Fox Hills Group, or any other marine Cretaceous group; or that any true marine

fossils were ever collected from any strata of the Laramie Group, I cannot admit. I regard all such statements as the result of a misunderstanding of the stratigraphical geology of the region in which such observations are said to have been made.

The true molluscan fauna of the Laramie Group has been published mainly by the late Mr. F. B. Meek and myself. Most of Mr. Meek's species are figured in vol. ix. of the U. S. Geological Survey of the Territories; where they are referred to the Fort Union and Judith River groups respectively, which are now known to be only portions of the great Laramie Group. I have illustrated this fauna to a large extent in the Annual Report of the U. S. Geological Survey of the Territories for 1878,* and in the third Annual Report of the Director of the established United States Geological Survey. The latter work, now passing through the press, contains illustrations of all the known molluscan species of the Laramie Group.

In former publications I have referred to the fact that the strata of this group have been recognized from northern New Mexico to the British Possessions; and from the meridian of Great Salt Lake to that of Western Kansas and Nebraska. Besides the results of a full season's personal work upon the Laramie Group in Montana, I have, within the past year, received collections of its characteristic molluscan fossils from Professor Samuel Aughey, which he obtained in Western Nebraska; from Mr. Lawrence Bruner of the Entomological Commission; from the valley of the Saskatchewan, and from Mr. James T. Gardner from the State of Nuevo Leon in Mexico.

Those collected by Mr. Bruner were obtained in the valley of the South Saskatchewan, twenty miles above the mouth of the Bow River. They number only three species, but they are referable to well-known Laramie forms. One of them is that which was described by Meek & Hayden from the Judith River group, under the name of *Ostrea glabra*; the second is *Corbicula (Leptesthes) fracta* Meek, the type-specimens of which came from the Bitter Creek series in Southern Wyoming; and the third is referred to *Goniobasis convexa* Meek and Hayden, the type specimens of which came from the Judith River Group.

The collection that has been received from Mexico was made at a point about seven and a half miles northwest of Lampazos in the State of Nuevo Leon, and numbers seven species, of which the following is a list:

* This volume is not yet published, but my extract from it, with 32 plates of illustrations, was published in 1880.

1. *Ostrea Wyomingensis* Meek.
2. *Anomia micronema* Meek.
3. *Modiola regularis* White?
4. *Corbula subundifera* White.
5. *Corbicula cytheriformis* Meek and Hayden?
6. *Odontobasis buccinoides* White.
7. *Melania Wyomingensis* Meek.

This Mexican collection, so far as it goes, is an almost exact duplication of the Laramie molluscan fauna of the Bitter Creek series as found at Rock Springs, Point of Rocks and Black Buttes, in Southern Wyoming, points which are more than a thousand miles north of the Mexican locality. The specimens represented by No. 1 are unmistakably like those from the original locality at Point of Rocks. Those of No. 2 are small examples such as are found at Rock Springs. The specimens of No. 3 are merely fragments, but they are presumably identical with *Modiola regularis* White, which occurs at Rock Springs. Those of No. 4 do not vary perceptibly from the type-specimens, which were found at Point of Rocks.

The *Corbicula* of No. 5 is closely like the form which I have referred to *C. cytheriformis*, found at Point of Rocks, but it is a little more angular upon its posterior slope. No. 6 cannot be separated from the type specimens of *Odontobasis buccinoides* that were found at Point of Rocks. The specimens of *Melania*, No. 7, present some variation from the type specimens that were found at Black Buttes, consisting mainly in their shorter form and the more pronounced character of the ornamentation. They are, however, regarded as of the same species, and their variation from the type specimens is no greater than the variation which they present among themselves. In short, the similarity of the Mexican and Wyoming shells is surprisingly close, considering their wide geographical separation.

These facts, together with others already published, show more and more clearly the integrity of the molluscan fauna of the great ancient intra-continental sea in which the Laramie Group was deposited, and its separateness from the faunæ of all other North American groups of strata.