article of diet greatly relished by the Bicols, among whom I have been stationed for the past eighteen months. Rice and fish are the staple articles of diet for most Filipinos and in the provinces of the Camarines there is little variation from these two. Fishes of every size and many varieties are prepared in every conceivable form, but the samples enclosed are unique in that they are found here and nowhere else. * * * Many varieties of fish abound in the lake, but by far the most numerous are these minute specimens. They are called in the native Bicol tongue *sinarapan,* and when dried in the sun on a leaf are called *badi.* They are caught by a large sheet of close web, which is dipped under wherever a school congregates. They are put into tightly woven baskets from which the water soon drains, leaving a compact mass of fish. They are not minnows or immature fish. They are adults and attain no greater size. The natives buy them eagerly; and when the little fleet of fishermen return from their morning's quest and place their baskets upon the ground on the market place, they are instantly surrounded by a crowd of waiting children who, armed with every sort of dish, are anxious to take home the family meal. They bring three or four potato tubers, a handful or two of rice, or a few copper pennies, and in exchange receive about a pint of fish. In the kitchen the fish are made up with peppers or other spiced herbs, and they do not taste bad. The soldiers have become quite fond of this food, and liberally patronize the little native restaurants where it is served."

H. M. SMITH.

WASHINGTON, D. C.

DINOSAURS IN THE FT. PIERRE SHALES AND UNDERLYING BEDS IN MONTANA.

IN the summer of 1900 I made a collection of Dinosaur and Mosasaur remains from the Ft. Pierre beds, near Fish Creek, in Sweetgrass County, in Montana. I have not noticed any account of the collecting of Dinosaurs from this horizon.

The beds are composed of dark-colored shales, with occasional very thin lenses or layers of sand. Sometimes the shales have no grit, sometimes they contain much fine sand. There are many brown or grayish, rounded concretions or concretionary layers. These concretions are often very hard. In these are many of the fossils, both vertebrate and invertebrate. The mollusca are principally the well-known, characteristic Ft. Pierre forms such as Ammonites, Baculites, Scaphites, Nautali and many smaller forms.

In this locality the weathered surface of the beds forms a rolling, grass-clad prairie with occasional ravines cutting into the soft shales. The bones are sometimes found in these ravines and 'cut banks' and sometimes among the grass roots, some of the bones projecting above the short grass.

The harder sandstones in the formation above form a line of bluffs or 'rim-rock' which for many miles marks the southern boundary of the Ft. Pierre shales. There are also dark shales interbedded with these sandstones. This formation contains leaf impressions and many fragments of Dinosaur bones, but the fossils have not been studied and no characteristic ones were recognized.

Below the Ft. Pierre shales are hard, rather thin-bedded sandstones with interbedded shales. Still lower are hard and soft sandstones, the latter predominating. These contain plant impressions, fossil wood, a few apparently fresh-water or brackish-water shells and Turtle and Dinosaur bones. The latter, many of them, were in a beautiful state of preservation, but no nearly complete skeletons were found. In these beds are bands of peculiar black or very dark, hard nodules, that look something like basalt. These sometimes contain bones. The Dinosaur remains are of the *Claosaurus* type.

From the Ft. Pierre beds the greater part of the skeleton of one Dinosaur and a good number of bones of another were obtained, besides he skull and other parts of Mosasaurs. The more complete Dinosaur skeleton is in the museum of the University of Montana. It undoubtedly is a *Claosaurus.* The other portion of a skeleton is in my collection. It is much smaller and was undoubtedly quadrupedal in gait. The sacrum is nearly complete and is different from anything else that I have seen.

It is composed of three ankylosed vertebræ.

It is interesting to find Dinosaurs in these marine beds. The marine fossils are found mixed with the bones. While digging out the skeleton of *Claosaurus* nearly a dozen *Nautali* were found among the bones. As a rule, when bones are found a good part of the skeleton is there or there is evidence that it has been. Several skeletons had been found and the bones removed for curiosities before I had visited this region. The first skeleton I saw was shown to me by a young man, Mr. Albert Silberling, who lived on the ranch from which the others were dug. I think that very few fossil-hunters would have looked for Dinosaur bones here.

It seems that these deposits were made in a shallow inland sea or an estuary which, at least during a part of the time, was cut off from the ocean, for in places there is considerable gypsum. Perhaps we should hardly expect to find such large marine mollusca in such a place, but they evidently are not far from where they died. There is no evidence of strong tides, and if the shells had been washed up by these or the winds they would be broken, not complete as we find them.

As a rule land animals are not very perfectly preserved in marine deposits. In unearthing these animals, therefore, the question is always arising: "How did these bones get here?" Did these Dinosaurs that have been so modified, evidently fitting them for life on land, still retain their swimming habits, but occasionally suffer shipwreck and their carcasses sink to the bottom of the sea? By some invasion of the sea were they forced to stay and starve or 'swim for life' which proved in some cases to be for death? I have seen no indications that they were killed by violence or their carcasses destroyed by large carnivorous animals, though there has been a little disturbance of the bones. Did they die on some mud flat or did their carcasses float down some sluggish stream and get stranded in shallow water or get 'water-logged' and sink in deeper water? These are interesting questions, but more thorough and careful investigation is needed to decide the matter with any degree of certainty.

The University of Montana hopes before very long to publish a bulletin describing these beds and whatever is of interest in the collections obtained from them.

Earl Douglass.

Princeton, N. J.

Magmatic Differentiation of Rocks.

Since the time when the celebrated chemist Bunsen first elaborated his theory on the nature of rock magmas, the subject has been of great importance to the geologist. If one were asked to name three of the grander ideas which mark the progress of geology during the century just closed, this conception of magmatic differentiation of rocks would certainly be one of them. Of late years contributions to the subject have been numerous and important. Several of the most recent are especially noteworthy.

In the reconsideration, by H. S. Washington (*Bulletin Geological Society of America*, Volume XI.), of the 'Igneous Complex of Magnet Cove, Arkansas,' made exceptionally interesting through the elaborate efforts of J. Francis Williams, are recorded some observations on magmatic differentiation that are of unusual significance at this time. Contrary to previously expressed opinion, the several types of deep-seated rocks represented in the complex are regarded as integral parts of one great mass and as contemporaneous in origin, and therefore not due to successive intrusions. Furthermore, the structure of the whole mass is probably laccolithic in character.

A remarkable feature connected with the zonal distribution of the various rock-types is the complete reversal of the order almost invariably found among large masses of cooled magmas. Ordinarily the borders are basic and the central parts more acidic. But in the Magnet Cove mass the heavy constituents are in the center and the lighter silica, alumina and alkali components are on the edges. Notable instances of similar character are reported from Norway, Finland and Montana.

The exceptional character of the Magnet Cove mass appears to suggest unusual conditions. While the general subject of the causes of differentiation is not discussed at length, a possible explanation for the Arkansas complex