limits of variation, and it is, perhaps, due to this fact that it is so universally distributed. The littoral and pelagic forms are so different that they have been considered specifically distinct.

C. modestus is a rare form. Thus far it has been found in only a single locality in Wisconsin.

None of the American species of *Diaptomus* is identical with those of Europe, although in some cases the relationship is very close.

D. sicilis is the common pelagic form of the Great Lakes, but occurs also in smaller bodies of water. *D. ashlandi* has been found only in the Great Lakes.

The most common species in the smaller lakes is *D. oregonensis*. This was described by Lilljeborg from specimens collected in Oregon, and probably is common through our northern States. *D. minutus* is common in Newfoundland, Greenland and Iceland. It occurs in some of the small lakes in northern Wisconsin and in Green Lake. It is likely that it occurs quite generally through the northern part of North America, and possibly central Wisconsin is near its southern limit.

Especial interest attaches to the fauna of Green Lake. This is about seven miles long, with a maximum depth of nearly two hundred feet. While the pelagic fauna of the Great Lakes is quite distinct from that of the smaller lakes, we find in Green Lake both sets of faunæ. *D. sicilis* and *Limnocalanus macrurus* I have not found outside the Great Lakes except in Green Lake. But besides these species the pelagic fauna of Green Lake includes *C. brevispinosus* and *C. fluviatilis*, which are the characteristic species of the smaller lakes.

A more detailed account of the Wisconsin copepoda will soon appear in the Transactions of the Wisconsin Academy.

THE HILLOCK AND MOUND FORMATIONS OF SOUTHERN CALIFORNIA.

BY DANIEL CLEVELAND, SAN DIEGO, CALIFORNIA.

SOME time ago, in an article upon the nest of the trap-door spider, which appeared in *Science*, I mentioned the low mounds in which these nests in many districts are so often located, as being in themselves an interesting formation. I now propose to offer an explanation of the origin of the formation.

Let me begin by saying that these mounds are not confined to this vicinity, for they extend throughout this State and elsewhere on this coast and in Texas; but they are more numerous and better defined here than elsewhere; they are, in fact, a characteristic of certain large areas of our territory. For this reason, among others, I believe this to be the best field for observing and investigating this remarkable formation.

Lying just back of the commercial portion of the city of San Diego there is a great mesa or table-land, which stretches away for a distance of from eight to ten miles to the valleys at the base of the Coast Range. It possesses a rich brown soil, holding in many places considerable aggregations of loose stones which have drifted down from the neighboring mountains and been ground into pebbles. Here for miles the surface is gently undulating, with low mounds lying as close together and as numerous, considering their size, as the ground will permit. These mounds are from one to three feet in height above their bases, and are from ten to thirty feet in diameter, separated by greatly varying areas which in their depressions in many places contain accumulations of cobble stones. An unscientific person seeing these plains for the first time might imagine that they had once been densely populated by large burrowing animals which had left these hillocks to mark their subterranean dwellings.

Several theories have been advanced to account for this formation. The most probable hypothesis is suggested by the nature of the soil and the peculiar vegetation of these plains. The soil itself is dry and hard for the six to eight months constituting the rainless season. During the time of heavy rains it is soft and mellow. During the time of drought it becomes almost as hard as stone.

Each mound, it is evident enough, marks the former home of a shrub or, as was almost always the case, of a cluster of shrubbery, to whose agency the mound in large degree owed its existence. Three shrubs—Rhus laurina, Nutt.; Simmondsia Californica, Nutt.; and Isomeris arborea, Nutt.—are conspicuous among the large vegetation of these plains, and have been very important factors in the formation of these mounds. Of these plants Rhus laurina is the largest and is much more abundant than the other two. It is an interesting fact that these three shrubs are confined to this section of California, mostly to this county, and that they were all first collected at San Diego about 1840, and were named by the eccentric naturalist Thomas Nuttall. He established the genera Simmondsia and Isomeris. The habits of these plants peculiarly fit them for their office of mound builders. They grow in small compact groups. Many stems rise from the roots, which are large and spreading. The foliage of Rhus and Simmondsia especially is dense and falls close to the ground.

Dust blown by the steady trade winds of the dry season is arrested by the shrub and accumulates with the fallen leaves at its base, making a steady accretion of material. In this way a mound gradually rises about the plant, in time covering the lower branches and in the case of the smaller shrubs—Simmondsia and Isomeris—nearly or quite enveloping the whole plant. This process of mound building can still be seen in isolated hillocks. An examination of the older mounds confirms this theory. In the lower portion of the mound the earth is compact and indurated, while the surface soil is a light loam mixed with decayed and decaying leaves. The mound is protected from washing by the rains at the summit by the overhanging branches and foliage, and at the base by a compact mass of roots. Outside of the foliage and roots the process of erosion goes on steadily, though slowly, during the rainy season, when this soil is peculiarly susceptible to the action of water, and the hollows between the mounds are then formed.

When in the course of time the plant dies from natural decay, from being smothered by the drift that environs it or from the fires that sometimes sweep over these plains, the mounds, being deprived of protection, are attacked by wind and rain and gradually worn down. The mounds are thus made shallower and broader at the base, until from this steady subsidence they sink down and flatten out almost to the general level of the plain.

The presence of living shrubs upon the more perfect mounds and of masses of roots well preserved or in process of decay in mounds in subsidence, where no large growing vegetation has been seen for many years, and in the oldest and flattest mounds the disappearance of all traces of shrubs and roots, confirm our theory of mound formation and subsidence.

What the shrubs I have named—Rhus, Simmondsia and Isomeris—have effected in coöperation with the wind and rain in the formation of mounds in this section, has been accomplished elsewhere by other shrubs and trees. It is a familiar fact that upon the great prairies of Texas mats of timber are generally found upon the summit of hillocks, very much larger, of course, than the mounds of southern California, as those trees are larger than our shrubs.

CURRENT NOTES ON ANTHROPOLOGY.—XXXI.

[*Edited by D. G. Brinton, M.D., LL.D., D.Sc.*]

The Archæology of Oaxaca.

Two or three years ago the State of Oaxaca, in Mexico, established an Archæological Museum, and placed it in charge of the very competent and enthusiastic scientist, Dr. Nicolas Leon, of Michoacan, who had already won for himself a wide reputation as curator of the Museum at Morelia. Through some unfortunate political changes the modest appropriations awarded to both these institutions have been diverted into other channels. This is a matter of great regret to all who are interested in the preservation of the ancient monuments of Mexico and the further investigations into the numerous remains there found.

The State of Oaxaca especially has an archæological importance which attaches a unique value to the investigation of its remains. From the earliest days of which tradition records the echoes, it was the home of the Zapotecs, and the profoundest researches into the pre-Columbian origin of the Aztec and Mexican civilization point, not to the fabulous "Empire of the Toltecs," but to these Zapotecs as the tribe which first spread abroad

the light of a higher culture, who invented the famous sacred calendar, so long the subject of astonishment to the learned, and who constructed edifices of brick and stone whose massive walls, strange ornamentation and remarkable architectural details, place them among the most impressive of any on the continent.

One of these was described, not for the first time, but with considerable care, by the engineer Aureliano Estrada, in the Memorias de la Sociedad Scientifica Antonio Alzate, of Mexico, last year. It is a mass of buildings crowning the summit of the Cerro de Quiengola, a mountain some 2,500 feet in height in the District of Tehuantepec. It presents thick walls of stone and burnt brick, circular and square towers, truncated pyramids and all the proofs of an extensive population.

It is sincerely to be hoped that these and numerous other remains in this state will be protected from destruction and thoroughly examined to the benefit of science.

The Basques and the Iberians.

An unusual number of papers and essays on questions relating to the ethnic position of the Basques and their possible relationship to the ancient Iberians, have appeared in France within the last year.

First, the linguists have had much to say. It is well known that Wilhelm von Humboldt in the first decade of the present century wrote an admirable analysis of the place-names throughout Spain, showing, he believed, by them, that the Basques at the time of the Roman conquest extended westward from the Pyrenees to the Atlantic coast. His conclusions have been alternately accepted and denied by special students of the tongue, and so they are to-day. Professor Julien Vinson, for example, a distinguished Basque scholar, says: "There is no historic proof, nor even scientific probability, that the Basque at any time occupied a much larger area than at present. The opinion that the Iberian peninsula or other parts of southwestern Europe were peopled by a race or races speaking a kindred dialect is based merely on etymologies, and must be considered a pure hypothesis."

Directly the contrary is maintained by M. J. F. Bladé, who observes: "Inasmuch as, in a large area surrounding the present territory of the Basques, altars are almost daily found inscribed to gods unknown among the Celts, and tombs bearing names certainly not Celtic, the conclusion appears justified that these names are ancient Basque, and that this tongue once spread over Aquitania and Iberia."

Meanwhile, the physical anthropologists have been at work. Dr. Lajard, in the Bulletin of the Anthropological Society of Paris, published the results of a comparison of ancient and modern skulls in the Canary Islands, with a large number from Portugal and Spain; reaching the result, that not only was the race of the Guanches of the Canaries identical with that of the old Iberians, but that both point to the still older race of Cro Magnon, as their near relatives. This does not take in the Basques, but leaves them to one side; while, as we certainly know that the Guanches were blonde Hamites, closely akin to the Rifians at Morocco, it places the Iberians along with the North Africans.

As for the present Basque population, they are reported by M. De Cartailhac as losing their language and diminishing in number. Even in the most remote and secluded districts, the deaths are more numerous than the births, owing to the rarity of marriages; and French and Spanish are in a fair way to drive out this curious and venerable tongue from its last refuge in the fastnesses of the Pyrenees.

Man in South America.

There is no part of the world that offers a more curious subject of speculation as to its future than the continent of South America, as was well set forth in an address before the American Geographical Society, by its President, Mr. Gardiner G. Hubbard.

That the Amazon river system alone drains a basin of fertile land, basking under a climate of perpetual summer, greater in area than the whole of Europe, is an astounding fact in itself. This vast territory is practically uninhabited. Its aboriginal population is disappearing, or has disappeared, and the whites who in sparce number take their place, scarcely pretend to come with the expectation of remaining. There are tracts as large as the whole of France, of which we know less than of any equal area on the globe. Tribes of men are living there who are yet absolutely in the Stone Age, and who, even by barter or distant rumor, never heard of the European race or the use of metals.

The question up to which Mr. Hubbard leads his reader is second in importance to none in anthropology—that of acclimation. Is it possible for the white race, when it shall be endowed with all the resources of art and science which it is soon to have in its grasp, successfully to fight against the terrible odds of a tropical climate? He quotes in his favor the words of the historian, Buckle, and the naturalist, Bates; he might have added others of weight; but it cannot be doubted that most of the medical observers who have devoted themselves to this vast inquiry, lean to the opinion that never will the white race flourish under tropical skies

NOTES AND NEWS.

THE fifth summer meeting of the Geological Society of America will be held Tuesday and Wednesday, August 15 and 16, in the Geological Lecture Room, Science Hall, University of Wisconsin. On account of the World's Congress of Geologists convening in Chicago, August 24, an invitation will be sent to geologists residing outside of North America to attend this meeting and present papers. A meeting of exceptional interest is anticipated. Fellows desiring to read papers should send titles and abstracts not later than July 15, in order to secure insertion in the preliminary list of papers. Matters for the programme, distributed at the first session, should be sent in by August 10. The meeting-room has facilities for lantern views, and members are invited to bring such illustrations. Matter sent by express or mail may be addressed in care of the Secretary, Room 32, Science Hall, University of Wisconsin, Madison, Wis. Packages should be clearly marked with the sender's name and prepaid. The excursions offered to the Fellows of the Geological Society of America are as follows: To the Lake Superior Region, to Devil's Lake, to the Dells of the Wisconsin, and to the Driftless Area.

— The Pope Manufacturing Company, of Boston and Hartford, makers of the Columbia bicycles, have engaged of late in a novel enterprise. They offered some time ago to give one of their bicycles to the school teacher who should be most successful in detecting errors in the school books in use in this country, provided the errors were determined to be such either by the authors and publishers of the books or by an impartial board of examiners. Typographical mistakes and disputed points in history and opinion were not to be included, but only errors of fact or of statement which could be shown to be such. Responses came from all parts of the country and the company have already awarded several of their bicycles to the persons who complied with the conditions of the gift. The kind of errors detected may be learned from the pamphlet entitled "Errors in School Books," which the Pope Company have issued, and which has now appeared in a second edition. Some of the errors are hardly more than ambiguous statements; others are erroneous dates: while others still are misstatements of scientific fact, as, for instance, the statement in a geographical work that the earth moves around the sun in a circle. Most of the publishers took the criticisms good naturedly, and whenever they were shown to be well founded corrected the books accordingly. The Pope Company have now renewed their offer of a bicycle to each of the five persons who shall send them the greatest number of errors in school books before September 1, 1893, the present competition to be open to all persons and not to teachers alone. That errors in school books are specially mischievous is obvious, since the young people who use the books have not, as a rule, the means of detecting them, and though the class of errors to which the Pope Manufacturing Company have devoted themselves are not perhaps the worst, they are the most easily detected and proved, and we should be glad if this new enterprise might result in the exposure and correction of every one of them.