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note the conflict of opinions, as expressed by myself, by Squier and by Prof. Raphael Pumpelly. Thus Pumpelly, on his return from his explorations in China,* appears to identify the name chalchihuitl with the *feitsni*, or jade, of the Chinese, probably because he had seen the jade ornaments in Squier's collection called chalchihuitl by Squier; but he refers, also, to the inlaid mask in the collection of the Museum of Practical Geology, London, which is a mosaic of turquoise, and not of jade.

I am still of the opinion, after careful consideration of all the evidence to this date, that my original identification of chalchuite with turquoise was correct. However opinions may differ, the fact remains that the Pueblo Indians of to-day apply the name to turquoise, and to turquoise only. If a Pueblo Indian of New Mexico or Arizona is asked for chalchuite, he produces green turquoise, and not emerald, jade or jasper, or other green stone.

It will be noted that I have modified the orthography of *chalchihuitl* to *chalchuite*, the latter being shorter and conforming to the usual terminal syllable of names of mineral species. It should, however, be pronounced *chal·chee·we te.*

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ASTROLOGY IN ASSYRIA.

It is announced that Mr. James A. Craig, Professor of Semitic Languages and Literature in the University of Michigan, has now in preparation and intends to publish an edition of the cuneiform texts which form the great Assyrian astrological corpus usually known as the "Illumination of Bel." Translations, analyses, notes and a vocabulary will form part of this edition, which promises to be one of importance, adding considerably to our knowledge of ancient Semitic religion in the valley of the Euphrates. These texts are founded on the tablets of Asurbanipal, which were written by his scribes for the magnificent library at Nineveh. Of these tablets about three hundred still exist in our day. They form one of the most important native authorities on astrological astronomy, omens and portents and divination, since many of the prognostications which they contain date from the earliest period of Babylonian civilization. In this connection we may recall attention to a recent publication on "Assyrian and Babylonian Religious Texts," also edited by Professor Craig. In this case the translations and explanations are few and meager, the volume being intended primarily for the use of Assyrian scholars. No expense or luxury has been spared in the get-up of this sumptuous volume; and it may be added—what is of far greater importance—that Professor Craig's work of copying the many texts has been done with remarkable accuracy.

* "Geological Researches in China, Mongolia and Japan." Smithsonian Contribution, 1866; page 118.

PREHISTORIC IRRIGATION.

BY STEPHEN D. PEET PH. D.

We spoke in the last number of the agriculture which was practiced by the Cliff-Dwellers, and its effect upon their social condition and village life. We shall treat of the same subject in this number, but shall illustrate it by the irrigating contrivances which were especially useful to the Pueblos and to the tribes south and west of the Cliff-Dwellers.

I. Our first effort will be to show the connection between the irrigation practised by the Pueblos and their social condition. There was, perhaps, no influence so strong as this. It affected not only their social status, but their form of government, their style of architecture, their art, and everything which was important. It secured to them subsistence in the midst of an arid region. It brought about a permanence of settlement. It concentrated the people into large communities. The most notable advantage was that irrigation from the very beginning gave the people a strength which enabled them to overcome all the difficulties in their way, and to hold their position among the peoples of that region.

1. It seems strange that in this remote region and amid the unfavorable surroundings, that the Pueblos should have developed so thoroughly and kept themselves up to the high grade which they had reached. In the midst of an arid region, with a climate which seemed to be always unfavorable to agriculture; surrounded by mountains which kept the clouds from gathering, with rocks and mesas whose height was forbidding, with streams which had through countless ages worn deep channels in the rocks and now flowed at immense distances below the surface, with everything unfavorable, they presented at the time of the discovery a form of society and a mode of life which were totally unlike any other upon the face of the earth. How do we account for this?

It is a common opinion that man is everywhere influenced by his surroundings, and whatever grade of civilization he has reached has been owing to this circumstance. Here, however, there seems to be an exception, for, if any people were ever placed in unfavorable surroundings, it was the Pueblos. There were tribes in their midst, who remained in the wild state, and who continued the hunter-life, roaming over the hill tops and through the valleys as nomads; building their rude huts, which they easily took down and removed to new places; but this people from an early date led a peaceful sedentary life, built their many-storied houses, were organized into villages, made

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Between Casa Grande and Florence the distance is nine miles. Several ancient irrigating ditches are seen on the road, some of which are quite deep. In one place I found an elliptical tank, almost as large as the one at Casa Grande and presenting a singular appearance. Lined water conduits are found at Tule, Arizona, and others at Casas Grandes in Sonora. The village of Tabira had four large artifical pools from which the people derived drinking water. The Pueblo Acoma subsists to-day upon the water collected into picturesque basins on the top of the rock, three hundred and fifty feet above the utterly dry valley. To such and similar devices the New Mexican villager had to resort, and it was a relief to him when he could nestle by the side of a permanent river, and raise beans and calabashes with the aid of primitive channels of irrigation. The tribes on the Rio Grande and people of Taos and Pecos enjoyed such privileges more than any of the other tribes. With them irrigation was easy, and frequent mention is made of it by the older writers.

4. There were reservoirs on the mesas, which were constructed by placing dams across the channels or water-spouts; leaving the low places to be filled with rain during the summer, or melted snow in the spring. There was a contrivance for supplying the wants of the village, which was very ingenious. It consisted of making a series of reservoirs, some of them above the village, some of them below, and causing the water to flow through the court, where it was used for domestic purposes, and afterward gathered into a pond and then distributed to the fields. One such existed at Pecos. Another was found at Quivira. Both have been described by Mr. Bandelier. The latter is represented in the cut.

RESERVOIRS AT QUIVIRA.

5. There were lakes in places, which furnished an abundant supply. There was a sacred lake near Walpi, which was visited by Mrs Stevenson, Prof. Tylor, and others. It was regarded as the home of the children, who were lost, but whose spirits were allowed to visit the Pueblos at their sacred feasts and carry the sacred waters to the little children, who were gathered in the estufas, and were permitted to drink from the bowls handed to them by the priests at the time of their initiation.

The lake called "Montezuma Wells" has been described. This was near a large area of agricultural land, but was surrounded by cliffs, in the sides of which are many interesting cliff dwellings. The well or pond must have furnished an abundant supply of water for the use of the people.

6. There were streams near which the pueblos were built, and which supplied the wants of the people, but were not used for irrigating purposes, as the rain was depended upon mainly. The Chaco was such a stream. Here, there were fourteen villages scattered along the banks; all of them large, and once filled with a flourishing population. It was a rich valley, and was probably once filled with garden beds and fields of maize, which furnished an abundant subsistence. The valley was deserted probably before the advent of the white man, but was, perhaps, abandoned on account of the invasion of the savages.

7. The so-called garden beds or hanging gardens, which were built in terraces on the sides of the mesas, are very interesting. They remind us of the hanging gardens of the East, and of the terraces on the Alps, where grapes are raised, and the ancient ridges in Great Britain, which have excited so much curiosity among the archæologists.*

Garden beds of a peculiar construction are found on the Sonora River in Arizona. They are described as follows by Mr. A. F. Bandelier:

Rows of boulders, such as could be picked up in the bed of the torrent, were laid on the ground parallel to one another, intersected by transverse rows at irregular angles, thus forming rectangular areas of various lengths. They look like rude dams laid across the course of the Arroya. They were so laid in order to keep a certain expanse of ground free from the drift brought in by the streams, and to keep the floods from carrying away the crops. These contrivances belong to the kind of agricultural expedients by means of which the waters of the mountain torrents were made to serve for the irrigation of crops planted in their path.

Between Santiago and the foot of the Sierra Madre are dams and dykes which extend across the Arroyas. Between the dykes are more or less regular shaped plots of tillable land, called by the inhabitants "Labores," or tilled patches. Connected with these artificial garden beds are ruins of houses, which are small buildings containing from two to four rooms.

Mr. Carl Lumholtz speaks of the garden beds which are connected with the deserted pueblos and ancient cave dwellings of the Sierra Madre. He says:

Deserted pueblos, consisting of square stone houses, are frequently met with. They are generally found on the top of the hills and mountains, and are surrounded by fortifications in the shape of stone walls. The most interesting remains, however, are in the caves, which contain houses at times three stories high, with small windows and cross-like doors, in the ordinary conventional Indian way; even stone staircases are once in a while met with. There and everywhere through the Sierra Madre, we found *trincherus*, or stone terraces, built across small valleys, evidently intended for agricultural purposes.

On every steep mountain side these extraordinary terraces of solid, large stones, constructed in the cyclopean style of masonry, arose to a height of fifteen, nay, twenty feet. We observed them even at an altitude of 7,400 feet. At one point we counted eight of them within a space of 150 feet, the aborigines having gained, by the enormous amount of labor expended, 3,500 square feet of additional surface ground; in other words, they only made room for 500 or 600 "hills" of maize.

Small, enclosed gardens called "Farming Pueblos" are common, both at Zuni and among the Tusayans. The enclosing walls are generally made of stone, sometimes of stone in combination with stakes. Upright slabs of stone have been used

* See Bandelier's Report, Part II., page 17.

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