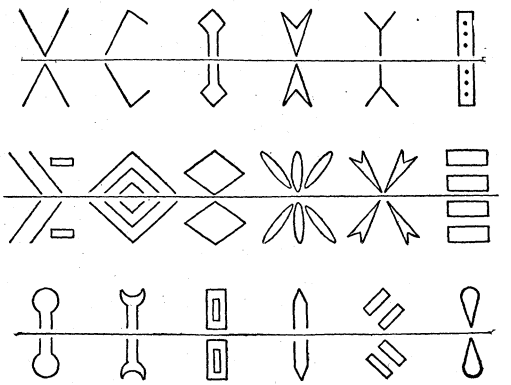
from a hundred or more that occurred to me. No effort has been made in the diagram to copy the actual appearances seen on the river-bank.



An essentially different style of representation would be needed in order to convey a just conception of the effect of the scene I witnessed. With the exception of the herring-bone figure, I cannot profess that either of the figures of the diagram is like any of those I saw in New Brunswick. It is to be remembered, however, that, whatever the forms may be that are produced by reflection from one particular bank of rock, the same kinds of forms will usually and probably be repeated again and again with the result that a pattern or 'design' will be produced.

I consider myself so little qualified to look up a matter wholly foreign to my usual studies, that I have made no effort to search for records of observations similar to the one here described, though I am strongly inclined to believe that such records must exist. I would say merely, that on again steaming up the Magaguidavic River at a time when a breeze was stirring, and the surface of the water was ruffled, I saw none of the picturing excepting in one quiet nook or cove, where a series of really superb herring-bone figures was produced by reflection from the surface of the calm water of the lines of stratification between the beds of rock, which were here tilted at a considerable angle. Although during this second visit I saw none of the 'reeding,' or of the other kinds of symmetrical figures which had so much impressed me before, the multiplicity of the herring-bones, i.e., the continued repetition of this figure, was specially noteworthy. A peculiar kind of beauty or sense of satisfaction to the eye was thus obtained, which a single figure would clearly not have been competent to give. It is reasonable to suppose, that wherever complete herring-bone figures are formed, as here, by reflection of those lines between the layers of rock which are continuous, and, so to say, perfect, a variety of related or derived figures will be produced by the reflection of lines which are not continuous; that is to say, the reflections from lines that are imperfect in any way, or broken into various lengths, would give rise to hieroglyphic characters in considerable variety, though they might all belong to one common group or kind.

At the time of my second visit to the river, I could see no reason to doubt that the figures might be seen almost any day when the time of high tide, and consequently of a full river, happened to be coincident with the calm moments so common in summer at the hours not far from sunrise and sunset.

As bearing on the question of human imitation, it is of interest to note, that while herring-bone patterns would naturally be produced wherever the lines of stratification of tilted layers of rock are reflected from calm water, i.e., in numberless localities, it is precisely these figures which have been most frequently delineated by savages upon pottery and other implements as one of their earliest artistic efforts.

Excepting the two instances here recorded, I have never noticed any such figures in the course of my own travels, nor have I heard of their being seen by others. I am assured, moreover, by several of the most competent and experienced observers of my acquaintance, that they have never witnessed any thing similar. I expect, however, for my own part, to see such figures from this time forth, when opportunity offers, and I trust that many other persons will do so. It is to be hoped, withal, that some of the more noteworthy effects of this sort may be accurately depicted.

F. H. Storer.

---

## *THE AMERICAN SWAMP CYPRESS.*

The following observations on the bald or swamp cypress of the southern states are condensed from the forthcoming second volume of the memoirs of the Kentucky geological survey. They embody the results of certain inquiries which show that this peculiar tree deserves more study than has been given to it by our botanists.

The Taxodium distichum is, as is well known, a common tree in the swamps of the southern states, extending from New Jersey to Texas, and northwardly in the Mississippi valley, to the lowlands of southern Illinois. It has several titles to distinction: it is not

only in all its proportions the noblest of all our coniferous trees east of the Rocky Mountains, vying in girth and height with the yellow poplar (the Liriodendron tulipifera of the botanists), but it is by far the most stately all the of trees belonging on the eastern face of the continent. Moreover, it has certain habits which are altogether peculiar to its species, and which constitute it a very exceptional member of the Coniferae.

When this tree grows on the dry ground, or on a surface where the water does not stand during the summer half of the year, it differs in no important feature from its kindred species; but, when it grows in swamps which are flooded during the spring or summer months, the roots form excrescences, which rise so that their crests overtop the level of the water during these seasons. These excrescences are of varying height, their projection above the level of the roots depending on the depth of the swamp-waters during those seasons of growth. These conditions may be satisfied by projections, or 'knees' as they are called, that rise only a few inches above the root, or they may rise to the height of five or six feet above the soil. These knees are sub-cylindrical in form; near the base they are elongated in the direction in which the root extends; above, they give a nearly circular section; at the top they are crowned by a cabbage-shaped expansion of bark of irregular shape, rough and warty without, often hollow within. They are often as much as eighteen inches in diameter. They are so commonly hollow, and of such size, that they are sometimes used by the natives for beehives or for well-buckets, for either of which uses they are tolerably well adapted. A tree of large size, say six feet in diameter, will often have as many as thirty or forty of these knees projecting above the swamp-water which surrounds its base.

Looking closely at these knees, we observe, that, unless they are evidently decayed, they generally have a very porous, spongy bark over the surface of their crests; and the bark on this summit, peeling off from time to time, often exposes a singularly spongy surface, such as we find in the inner bark of the pine-tree when the coarse outer bark is peeled away.

There have been many conjectures as to the function of these knees. It has been supposed that they were in the nature of suckers or branches from the roots, which gave rise to new trees; but, after examining thousands of these knees, I am convinced that they never have this nature. In no case have I seen or heard of any buds appearing on them. The only clew to their function I have obtained in the following way: whenever it happens that the knees become entirely submerged during the growing season, the trees to which they belong inevitably die. Very extensive proof of this point was given by the general submergence of extensive districts during the earthquakes of 1811–13, in the region near the Mississippi, where the cypress-trees over a region several hundred miles in area were killed by a subsidence that brought the water a foot or two below the crests of the knees. In Reel-Foot Lake, in Kentucky and Tennessee, thousands of these long ordinary cypress-boles still stand in the shallow waters, though it is now seventy years since they were killed by the slight submergence of their knees.

The same thing can be seen on a smaller scale in several mill-ponds in western Kentucky, where the change in level of the swamp-water has brought these excrescences below the surface of the water. These facts — viz., the absence of the knees when the tree grows on high land, and the death of the tree when the knees are permanently submerged — lead me to the opinion that the use of these excrescences is to bring the sap while in the roots in contact with the air. That they have this function is made more probable by the fact that their heads, i.e., the parts which always project above the water during the growing season, remain very vascular, and, by a process of desquamation, secure the exposure of the inner bark to the air.

It is evident that this tree affords us a very interesting instance of a specialized structure, that only develops when the plant occupies a certain position. We often find this tree artificially transplanted to the gardens of the western country. It then shows no distinct tendency to form knees, though the surface of the roots show a few short spurs not over an inch or so high.

It is a well-known fact that the genus Taxodium dates back into the early tertiaries. I am not aware, however, that fossil knees have ever been found. We have only to examine the borders of the swamps to see that it cannot, on the uplands, maintain a battle with the contending broad-leaved trees, though in any artificial open place it will grow with singular luxuriance.

It seems to me likely that we have here a very interesting case of a species owing its survival to a peculiar habit of growth. There can hardly be a doubt that the kindred of this Taxodium held an important place on the continent before the development of the broad-

leaved trees. It seems not unlikely that it was crowded out on the higher ground, and forced to limit itself to this station which the swamps afford. In these permanent though shallow waters it clearly has an advantage over the broad-leaved forms of trees.

I am not aware that any structures resembling these knees are found among other plants. If it be the fact that they are peculiar to the Taxodium distichum, we have in this species a very remarkable case of a peculiar organ developed for a special purpose.

There is another interesting problem concerning this species. The seeds *seem* to germinate beneath the water. I have seen many young trees growing in what must be permanent swamp, where the soil was buried to the depth of a foot or more. I have long desired to try some experiments on this point, but have not been able to do so. I hope that some observer will undertake the inquiry.

This tree is certain to have a great economic value. Its great size, its favorable position in relation to our great water-courses, its very rapid growth and excellent timber qualities, are all calculated to commend it for use as a constructive wood. There are many million acres of land in the southern states where it could be cultivated to advantage. If kept from competition with the deciduous trees, it will do as well on any moist lowlands as in the actual swamps. Its growth is more rapid than that of any other of our timber-trees; the wood is said to be much stronger than that of any pine; it endures well in the open air without paint, as is shown by the fact that the trunks of trees killed in 1811 still stand undecayed in the swamps near the Mississippi River.

N. S. SHALER.

## *RECENT BABYLONIAN RESEARCH.*

IN the Proceedings of the Society of biblical archeology for November, 1882, Mr. T. G. Pinches, the Assyrian scholar of the British museum, reports a discovery of more than ordinary interest. This is an historical notice on an inscribed cylinder, coming from the ancient city of Sippar, and belonging to Nabonidus, the last of the native Babylonian kings. The cylinder was written before Cyrus had captured Babylon, but after his conquest of the Medes. The inscription of Nabonidus, after the usual introductory formulas, relates the reconstruction of several famous temples. The first of these, the temple of the Moon-god at Haran, had been destroyed by the Medes. Being instructed by the gods Marduk and Sin to rebuild it, Nabonidus recalls for this purpose his armies from Gaza, on the borders of Egypt. He informs us that the temple had once before been restored by the Assyrian king Assurbanipal (Sardanapalus), and that he found, while engaged in the work, the inscribed cylinders of Assurbanipal and of Shalmaneser II.

The great historic event referred to in this part of the inscription is the fall of the Median empire before Cyrus the Great. When commanded to restore the temple by the god Marduk, Nabonidus replies that the Medes have destroyed it, and receives from Marduk the promise that they in their turn shall also be destroyed. Nabonidus then relates: "At the beginning of the third year, they (the gods) caused them (literally 'him,' the Median nation) to go out to war; and Cyrus, king of the land Anzan, their (lit. 'his,' i.e., the Median nation's) young servant, overthrew with his small army the Median hosts, captured Astyages, king of the Medes, and carried him bound to his own (Cyrus's) land."

The undoubted value of this passage for the solution of the riddle left us by the conflicting testimony of the Greek writers, as to the relations of Cyrus and the Persians to Astyages and the Medes, is in part impaired by the ambiguous use of the pronouns. It is partly owing to this ambiguity that the translation just given differs from that of Mr. Pinches, who renders: "In the third year, he [the god Marduk] caused Cyrus, king of Anzan, his young servant, to go with his little army; he overthrew the wide-spreading Ṣabmanda [Medes], he captured Iš̆tumegu (Astyages), king of Ṣabmanda, and took his treasures to his (own) land." It is difficult to say whether the words 'his servant' mean servant of Marduk, as Mr. Pinches supposes, or servant (= tributary) of the Median people; but the latter seems, for certain grammatical reasons, more probable. It is also improbable that Nabonidus, a special votary of Marduk, should speak of Cyrus, a foreigner, as a servant of the same deity, although we know that later, perhaps for state reasons, Cyrus was friendly to the worship of Marduk (V. Rawl. 35). It is more probable, that, when Nabonidus mentions Cyrus as 'his small servant,' he means to say that Cyrus was a vassal prince to the Medes. The translation 'him bound' (*kamûtsu*, lit. 'his bondage'), instead of 'his treasures,' is well established (I. Rawl. 13, 24 ff.), and adds not a little to the interest of the passage.

In the cuneiform annals of Cyrus, written after he had captured Babylon, we have this monarch's brief account of the war with Media (*Trans. soc. bibl. arch.*, vii. 155 f.). After a renewed careful collation of this important passage, Mr. Pinches has published the original a second time (*Proc. soc. bibl. arch.*, Nov., 1882). It is unfortunate that the ends of the lines are lost by mutilation of the clay tablet containing the inscription. Following is a translation of this passage: "[Astyages relied upon his troops] and marched against Cyrus, king of Anšan to [capture him?] . . . The troops of Astyages revolted against him, made him prisoner [and delivered him] to Cyrus . . . Cyrus (marched) to Ecbatana, the royal city. [He captured] the silver, gold, treasures (?), (and) possessions (?), which Ecbatana had gotten by plunder and he carried to Anšan the treasures