SCHOOL SCIENCE AND MATHEMATICS

VOL. XXI, No. 8

NOVEMBER, 1921

WHOLE No. 181

THE BIG TREE OF TULE

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Most of us have a natural interest in things which are very old or very large. A spear point, imbedded in the bone of an animal which became extinct thousands of years before the beginning of historical records, makes us wonder what kind of a man threw the spear. The walls of Babylon impress us with their immense size. But some plants are very old and also very large. How old and how large? The size can be measured but a determination of the age may be difficult and, in many cases, uncertain.

Some more or less popular accounts claim that there are brown algae, kelps, of the Pacific Ocean, which reach a length of more than 1,000 feet. Oltmanns, a competent algologist, but who never visited our Pacific coast, shortens these kelps to about 600 feet; and competent botanists, studying the big brown sea weeds from Alaska to San Diego, and making exact measurements, have continued the shortening process, until it is certain that the longest plants are not to be found in the ocean.

It has been claimed that some Australian trees, of the genus *Eucalyptus*, reach a height of 450 feet, with a diameter of sixteen feet. If the claim is well founded, these are the tallest living organisms in the world, and taller than any of the extinct plants of geological ages; for, while some of the Paleozoic lycopods were immensely larger than any living representatives of that phylum, none of the tree forms of by-gone ages reached a height of much more than 100 feet. The monster vertebrates of the Mesozoic did not wander around among monster trees.

The Kauri (*Agathis australis*) of New Zealand should always be mentioned in any account of big trees. This magnificent

tree sometimes reaches a height of 150 feet, with a diameter of ten to fifteen feet; its smooth cylindrical trunk, scarcely tapering at all, rising fifty to eighty feet before it begins to branch. In spite of those practical people who see only the splendid timber, hard and strong as oak and clear as the highest grade of white pine, the government has been able to establish extensive reservations, so that there is no danger that the Kauri forests will become extinct.

The Sequias of California are so well known that they need only to be mentioned. They may reach more than 300 feet in height and a diameter of 36 feet has been recorded. They are the largest of living organisms and the National Geographic Magazine publishes a widely distributed picture with the caption, THE OLDEST LIVING THING.

The Big Tree of Tule, less widely known because it is off the beaten track of tourists, deserves a place among the big trees because its trunk has the greatest diameter and it, rather than the *Sequoia*, may be the oldest living thing in the world. It is a Cypress, *Taxodium mucronatum*, commonly known as the Montezuma Cypress, and so closely related to the Swamp or Bald Cypress, *Taxodium distichum* of the southern United States, that some botanists do not give it specific rank, but call it *Taxodium distichum*, var *mucronatum*.

It stands in the little churchyard of Santa Maria del Tule, about 250 miles southeast of the City of Mexico. More majestic proportions would be hard to imagine, for the trunk is fifty feet in diameter and a regiment of soldiers could rest in its shade. Twenty-eight people, with outstretched arms and with finger tips touching, can just reach around the trunk. The diameter is fourteen feet more than that of the largest of the Sequoias, but the height is only 150 feet. The tree is massive rather than tall (Figure 1).

Some have suggested that this is not a single tree, but a group of trees grown together, I examined the tree quite carefully but could find no evidence in favor of such a theory. In general appearance, it is beautifully symmetrical, as can be seen from the figure; and the branching seems to show conclusively that this is a single tree. It is simply a giant among its kind, just as there are giants among men. The names of Hercules, Samson and Goliath may sound mythical but, doubtless, gigantic men and tales of their exploits gave rise to whatever is mythical. Even now, an exact scientific account of the Big Tree—to those

who have not seen it—might sound exaggerated or even mythical.

When I visited the tree in 1908, there was not a dead twig in sight. The foliage has the same beautiful, feathery appearance as in our Swamp Cypress, but, unlike the Swamp Cypress, which sheds its leaves every Autumn, the Big Tree of Tule is

THE BIG TREE OF TULE, A FEW MILES SOUTH OF THE CITY OF OAXACA.
Diameter of trunk, 50 feet; age about 5,000 years.

evergreen. This does not necessarily exclude close relationship between the two, for it will be remembered that many trees which are deciduous in our northern states, become evergreen in the south.

The Montezuma Cypress was abundant in the Valley of Mexico when Columbus discovered America. At that time, the city of Mexico was an American Venice, with canals for streets, and it was customary for rich Aztecs to have floating artificial islands with little cottages on them, which could be poled around on the neighboring lakes; but the Spaniards drained the lakes and the big Cypress trees disappeared. In the city of Mexico a single historic specimen, the *Arbol del Noche Triste* (tree of the Sorrowful Night), under which Cortez rested after his disastrous defeat, still stands, protected from tourists by an iron fence. The Montezuma Cypress is still found along rivers, but specimens are comparatively small, not surpassing the Swamp Cypress of our southern states.

How old is the Big Tree of Tule? The age of a tree is determined, as far as it can be determined at all, by counting the annual rings. A piece of trunk of a specimen less than five feet in diameter showed about 200 rings on a radius of twelve inches. The counting is difficult and not altogether certain, because the rings are close together and often indefinite. If the rings of the Big Tree have about the same width as in this sample, the age cannot be less than 5,000 years; for it is well known that the largest rings are near the center and rings become smaller and smaller as a tree grows older. Some of the California Sequoias have reached an age of 4,000 years, but the Big Tree of Tule is at least a thousand years older.

More than a hundred years ago, Humboldt, the great traveler, visited the Big Tree and, on the east side of it, carved an inscription, now partly overgrown, so that the beginning and end of each line has been covered by wound tissue. The development of this tissue indicates that the tree is growing very slowly, so that the annual rings must be much smaller than those formed a couple of thousand years ago.

Resting under the shade of the Big Tree and remembering its great age, one could hardly avoid thinking of events which have occurred during its lifetime. Before the Pyramids of Egypt were built, it was a sturdy tree; and before Moses led the children of Israel out of the wilderness, it must have reached the usual size of the species; when Rome was founded, it must have been known as a big tree; in the days of King Arthur and his table round, its reputation as a giant among its kind must have been established; and ever since there have been Mexican traditions, Indians have made pious pilgrimages to the Big

Tree of Tule. It must have been a familiar object to the prehistoric men who built the Pyramids on the near-by Monte Alban, and who erected the wonderful buildings now known as the Ruins of Mitla.

Such an exceptional tree ought to be preserved. It is not in much danger from natives, because they regard it with veneration; and the fact that it stands in a churchyard is an added protection. But still more effective, as far as travelers and tourists are concerned, is the wise foresight of the government which, remembering the vandal propensity of tourists, stationed such efficient guards at the tree, that John Doe, Chicago, and John Smith, New York, have not been able to disfigure the trunk by carving their names upon it. Let us hope that during the recent unsettled conditions, Mexico has continued to safeguard the Big Tree of Tule.

TEMPERING COPPER BY THE ANCIENTS.

The general belief that the ancients were able to harden or temper copper to a greater extent than is now possible is a myth, in the opinion of the United States Geological Survey, Department of the Interior. It is well known to metallurgists that processes of rolling will harden copper to some extent and that it can also be hardened by the addition of other metals. Specimens of ancient so-called "tempered" copper that have been examined have invariably proved to be no harder than copper that is manufactured to-day, or to be simply an alloy of copper and some other metal.

KINDS OF CHEMISTRY.

Professor David Snedden, discussing the subject, "Desirable Aims of School and College Chemistry," contended that the time is ripe for differentiating two radically unlike types of courses, certainly in secondary schools, and probably in colleges.

The first type of course should have as its primary purpose culture in the sense of interests and appreciations. It should be designed primarily for those who will probably not encounter needs of giving appreciation to chemical knowledge and technique except as utilizers.

The second type of course should be for those who expect later on to apply in some sort of productive process their chemical knowledge and training in process. Courses of this character should, manifestly, be rigorous, exacting, and systematic.

But courses of the first type should be essentially *liberal*—that is, *liberating*. They should culminate in wide and varied appreciations, insights, vital interests. The methods of instruction and training should assuredly not be rigorous and exacting in a sense appropriate to the other type of course. But liberal education here should not be confused, as it often is, with superficial, sloppy education. There are fine standards of amateur execution and appreciation, no less certainly than there are fine standards of professional performance.

Once differentiate the two types of courses here suggested, it seems probable that the teaching of science will take on a new vitality.